The Validity of Theology as an Academic Discipline: A Study in the Light of the History and Philosophy of Science and with Special Reference to Relevant Aspects of the Thought of Austin Farrer

by

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[Abstract]

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An analysis of relevant aspects of the history of science shows that theology's loss of credibility in an increasingly science-oriented age can be attributed to unresolved disputes from the past over metaphysical, epistemological and methodological issues.

In Chapters 1 and 2, an attempt is made to show that the basic disagreements between science and theology can be traced to the ongoing quest for the principles of knowing shared by all disciplines.

In Chapters 3 to 6, an attempt is made to identify these principles. Firstly, the processes and principles by which science acquires its knowledge and deems it to be objective are examined. Secondly it is argued that these same processes and principles are not the special property of science but are used by the humanities as well. Thirdly, it is contended that these principles are "empirico-critical." They enable us to bridge the gap between thought and reality and gain access to knowledge of the external world. A more comprehensive model for knowing is proposed.

Chapters 7 to 9 examine whether it is possible to apply empirico-critical principles to theology. From a study of relevant aspects of Austin Farrer's thought, it is argued (i) that the processes of knowing in theology are the same as those in the sciences and the humanities, (ii) that, though theology's procedures and techniques are necessarily different from, say, the sciences because of its subject matter, these are capable of adhering to the same principles of objectivity, and (iii) that, in principle, theological decision-making is possible, even in the most controversial debates.

The conclusion is that since the same processes and principles of trustworthy knowing in the sciences and humanities are fully applicable to theology, theology's viability as a source of trustworthy knowing should no longer be held in doubt.

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In an increasingly science-oriented world, the respectability of theology as a valid discipline has been seriously questioned by philosophers, scientists and even theologians themselves. The cause of theology's loss of credibility has been thought by some to be due to a straightforward incompatibility between the claims of science and those of theology. However, an analysis of relevant aspects of the history and philosophy of science shows that the causes are far broader and deeper. They are ultimately concerned with the ongoing quest for the principles of knowing shared by all disciplines.

The initial task of the research in Chapters 1 and 2 was to identify the source of theology's present-day problems. It was thought that by studying relevant aspects of the history and philosophy of science, it would be possible to locate the fundamental issues at stake between science and theology. From a historical analysis of the two most commonly cited conflicts involving Galileo and Darwin, it was shown that the disputes were metaphysical, epistemological and methodological. These factors are very closely related. They are ultimately concerned with three basic questions -

(i) What concepts are most appropriate for thinking about the world?
(ii) What counts as trustworthy knowledge?
(iii) What kind of approach yields knowledge that is trustworthy?

The source of these disagreements was traced to a paradigm change which was instituted at the rise of modern science. The shift was of

such magnitude, it challenged the principles of all branches of knowing, theology included. Disputes about these principles have still not been adequately settled.

In the twentieth century, this contentious debate is manifest in two different strands of the philosophy of science. I have referred to these in the thesis as the philosophers' philosophy of science (which is held mostly by philosophers and some scientists) and the scientists' philosophy of science (which is held mostly by scientists and some philosophers).

The main difference between these two schools of thought lies in the extent to which each takes account of the practice of science. In Chapter 3, I endeavour to show that because the scientists' philosophy of science is closely aligned to the practice of science, it has been able to give a more adequate account of how scientists actually acquire knowledge and deem it to be objective. However, the philosophers' philosophy of science, which has not been closely aligned to the practice of science, has dominated thought for a number of centuries in varied forms such as rationalism, empiricism and logical positivism.

Because the philosophers' philosophy of science did not examine its assumptions in the light of the practice of science, they failed to identify the actual principles by which scientists acquire their knowledge. Consequently, their criteria of what constitutes trustworthy knowledge have been inadequate.

Theologians, endeavouring to communicate Christian belief within the dominant thought forms of particular periods, embraced the more prominent concepts of the philosophers' philosophy of science and addressed themselves to the problems raised by that school of thought.

As a result, the basic disagreements between science and theology have rarely been identified.

Science, meanwhile, having found a set of principles by which it could successfully resolve its problems, had less and less to do with the philosophers' philosophy of science. Since the principles of scientific practice have afforded science the means to advance its knowledge, it is proposed that if these principles which have challenged all other branches of knowing can be shown to be applicable to other disciplines, it will be clear that they are not the special property of science but the general principles of knowing. Further, if these same principles can be shown to be fully applicable to theology, the validity of that discipline need no longer be questioned.

Thus, the rest of Chapter 3 is taken up with examining how scientists actually acquire knowledge and achieve as high a level of objectivity as is possible for their knowledge. It is argued that scientists use both rational and sensory procedures in acquiring knowledge.

To demonstrate this second point, it was necessary to use the cognitive sciences to study the nature of discovery, insight and creativity. In the past, the philosophers' philosophy of science regarded discovery, insight and creativity as psychological states and was dismissive of their role in rational thought. In Chapter 4, a detailed examination of these three aspects discloses that they are, in fact, rational. Moreover, former concepts of rationality which excluded these are shown to have been too restrictive.

An examination of the nature of thinking in the second half of Chapter 4 attempts to show that thought is basically

symbolic/metaphoric. The functions of symbolic/metaphoric thought enable us to represent events and states of affairs in thought and to perform the mental operations needed for knowledge to be expanded. The procedures involved are heuristic. Reasoning progresses step by step and is related to the facts. Though these procedures are vulnerable to error, error is minimized by ensuring that thought is constrained by factual knowledge. The chapter concludes with a discussion of how objectivity is achieved in the sciences by adhering rigorously to a number of essential principles.

In Chapter 5, it is argued that these same principles are also adhered to in the humanities. Science and the humanities can both be seen to belong to an empirico-hermeneutical continuum. Though procedures and techniques employed in science are more experimental, and those in the humanities more hermeneutical, because of their different subject matters, both types of approach are capable of adhering to the principles of objectivity. This is because both methods of approach are capable of employing both rational and sensory constraints in decision-making. The complementary relation of sensory and rational constraints is crucial if the highest level of objectivity possible is to be achieved for knowledge. Since these constraints place checks on both the empirical and rational procedures necessary in the acquisition of knowledge, I have called them "empirico-critical."

The crucial role of rational and sensory constraints in empirico-critical enquiry is examined in Chapter 6. It is shown that they place vital checks on thought to ensure that it is meshed with reality. In this way the gap between thought and the external world is bridged.

The latter half of Chapter 6 deals with the two issues of reference and realism. It is shown how knowledge of the external world is represented in thought through symbolic/metaphoric functions. The important role of language is examined, and the issue of how terms are used to fix a reference is discussed. An argument for the way we gain access to knowledge of the external world is proposed, with reference to the dual functions of "interanimation" and "non-definitional reference-fixing."

It is argued that knowledge, including theological knowledge, is always revisable. However, a change of reference does not necessarily entail a change in the object of reference. This matter is of particular importance in later discussions of our apprehension of God. Chapter 6 is concluded with an analysis of how access to knowledge of things, which are neither immediately available to the senses or to sense-extending instruments, is located and grounded. A more comprehensive model for knowing is proposed as a consequence.

Since the principles of trustworthy knowing in the sciences and the humanities are seen to be empirico-critical, the question of whether these principles are fully applicable to theology is then discussed. By analysing relevant aspects of the thought of Austin Farrer, particularly his understanding of the role of "images" and "imagination," it is argued in Chapter 7 that the processes of theological knowing are comparable to the processes of knowing in the sciences and the humanities. We apprehend God, using the same symbolic/metaphoric functions as are used in other forms of knowing. These are the processes by which we comprehend what we apprehend. The functions of "interanimation" and "non-definitional reference-fixing" are comparable to those used in the sciences.

The question of whether the principles of empirico-critical enquiry are fully applicable to theology is dealt with in Chapter 8. Farrer's argument that an interaction exists between science and theology is examined, and the three areas where the evidences for and against theological realities are to be located, are specified, viz. the religiously significant events in the development of Christian belief, our present knowledge of the natural world and our experience of personal existence.

Empirico-critical theology is defended (i) by showing that the procedures and techniques of theology, though different from other disciplines because of their different subject matter, are capable of adhering to empirico-critical principles, and (ii) by indicating how these principles are used to assess our present-day apprehensions of God.

Since it could be said that current controversies appear to show that rational decision-making is not possible in theology, this matter is discussed in Chapter 9. It is contended that this factor is not an argument against the possibility of empirico-critical theology. It can be shown that conflicts in theology are often created by the failure to observe the constraints necessary in empirico-critical enquiry, or by the inadequate application of those principles to the procedures and techniques of theology.

Taking one of the most controversial christological conflicts of recent times, an attempt is made to show how theological judgements are possible between rival viewpoints. It is argued that theological decision-making, like scientific decision-making, faced with perplexing data, is capable of being rational. Though there will still be residual problems, these are the growing points of theological enquiry

as in other disciplines. A brief discussion of the implications of the research for interdisciplinary exchange is included.

The thesis concludes that since the processes and principles of trustworthy knowing, which apply to the sciences and the humanities, are fully applicable to theology, the viability of that discipline as a source of trustworthy knowing need no longer be held in doubt.

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CHAPTER ONE

THE VALIDITY OF THEOLOGY (1)

1.1 Introduction.

The respectability of theology as a valid discipline has for many years been called into question by philosophers[1] and scientists,[2] who have been sceptical of its claims. In addition, recently a still more serious challenge has come from within, wherein theologians have disagreed radically amongst themselves as to the truth of their claims.[3] In the long-run, the effect of all this criticism has proven to be theology's undoing. From its once elevated status of "Queen" of the disciplines, theology has now found itself in the invidious position of having to struggle to maintain a place for itself.[4] Many of its claims appear to have been discredited by the findings of modern science and it has become highly questionable whether its practice can produce any valid information. Not surprisingly, modern science has emerged as "Queen" in its place, and this ascendancy has been maintained noticeably throughout the twentieth century.[5]

The idea that any discipline should be made "Queen" is very dubious. I shall argue against it below. However, for the moment, our immediate concern is with the problem of the increasing precariousness of theology's place in academic settings. If, in the face of all its dilemmas, its position has become tenuous in the twentieth century, one is bound to ask what the prognosis is likely to

be for the twenty-first century.

The cause of theology's loss of credibility has been thought by some to be due to a straightforward incompatibility between the claims of science and those of theology. However, the following analysis of relevant aspects of the history of science will show that entirely different issues were at stake.

One of the past difficulties has been that the circumstances in which hostile attitudes to theology have developed have rarely been studied in their full historical context. The real issues have therefore been missed.

From an analysis of two of the most commonly cited conflicts in science and theology, which involved Galileo and Darwin, I shall attempt to show that the disagreements between science and theology have been over three basic questions -

(i) What concepts are most appropriate for viewing the world?
(ii) What counts as trustworthy knowledge?
(iii) What kind of approach yields knowledge that is trustworthy?

In the discussion, I hope to show that these three questions are related to the ongoing quest for the principles of knowing shared by all disciplines. Their source can be traced to basic metaphysical, epistemological and methodological changes which were instituted at the rise of modern science. These changes were of such magnitude that the principles of all branches of knowing, theology included, were severely challenged. Disputes over these principles have still not been adequately settled. In the twentieth century, this contentious debate is manifest in two different strands of the philosophy of science. I have referred to these in the thesis as the philosophers' philosophy of science and the scientists' philosophy of science.

The main difference between these two schools of thought will be seen in the extent to which each takes account of the actual practice of science. I shall endeavour to show that because the scientists' philosophy of science is closely aligned to the actual practice of science, this philosophy of science has been able to give a more adequate account of how scientists actually acquire knowledge and ensure that as high a level of objectivity as is possible is achieved for their knowledge. However, the strand of thought which I have referred to as the philosophers' philosophy of science, and which is exemplified in rationalism, empiricism, positivism, logical positivism and fallibilism, is the philosophy of science which has been most dominant. Theologians, endeavouring to communicate Christian belief within the main thoughtforms of particular periods, have addressed themselves to the issues raised by the philosophers' philosophy of science. As a consequence, the actual matters at issue between theology and science have rarely been identified.

In a science-oriented world, in which the respectability of theology as a viable academic discipline has been questioned, it is important to specify the issues and to examine the source of the problems.

As the overall task is complex, involving the identification of the principles of knowing in all disciplines, the thesis has been divided into three broad sections. In Chapters 1 and 2, I shall attempt to show -

(i) that the basic disagreements between science and theology have been metaphysical, epistemological and methodological; and

(ii) that conflicts in these three areas are ultimately related to the more fundamental issue about the principles of

trustworthy knowing for all disciplines.

In Chapters 3 to 6 of the thesis, I shall endeavour to identify the actual principles of trustworthy knowing -

(i) by examining the processes and principles by which science acquires knowledge and ensures that it obtains as high a level of objectivity as is possible for its knowledge;

(ii) by showing that these same processes and principles are not the special property of science, but are used by the humanities as well; and

(iii) by defending the view that, in adhering rigorously to these principles, researchers are able to gain access to trustworthy knowledge of an external world.

I shall attempt to show in this section that previous understandings of the practice of science were inadequate. Consequently the model for scientific knowing in the past has been based on a number of misconceptions about the nature of objectivity. Once these misunderstandings are removed, it can be shown that science, like the humanities, relies on both sensory and rational procedures for the acquisition of knowledge. Also, the complementary function of both sensory and rational constraints is crucial in ensuring that thought and reality are meshed. Without these constraints, objectivity could be lost. I have called the principles of objectivity empirico-critical[6] since they place checks on both the empirical and critical aspects of research.

The second section of the thesis will be completed with the observation that a more comprehensive model of knowing is required if the actual processes and principles for acquiring trustworthy knowledge are to be fully incorporated into the model.

The third section of the thesis (Chapters 7 to 9), will examine whether it is possible to apply empirico-critical principles to

theological enquiry. In this part of the argument I shall endeavour to show from a study of relevant aspects of Austin Farrer's thought that empirico-critical theology is possible. I shall attempt to demonstrate the following -

(i) that the processes of knowing in theology are the same as those in the sciences and the humanities;

(ii) that though theology's procedures and techniques are necessarily different from say the sciences because of its subject matter, theological enquiry is capable of adhering to the principles of empirico-critical enquiry;

(iii) that, in principle, rational decision-making is possible in the most controversial of theological conflicts, such as the present-day christological arguments.

I shall argue that since it can be shown that empirico-critical principles are fully applicable to theology, its respectability as a source of trustworthy knowing should no longer be held in doubt. Also, if my argument holds true, important implications follow in respect of interdisciplinary studies: the benefit of theological thought will be seen to be as valuable to the sciences and humanities as the contribution of knowledge from the sciences and humanities is to theology.

Before beginning on the first section of this research, there are two preliminary points to note. Firstly, I have confined my enquiry to specifically Christian theology, since historically that tradition of thought is the one on which theological faculties in the universities have been based. It is also the tradition of thought which is in question. The relation between Christian theology and other religions is nevertheless important. However, as it is a very different issue from the one to be discussed in this thesis, brief mention of it only will be possible in 8.6 below.

Secondly, as the issues relating to the processes and principles

of trustworthy knowing are very complex and cannot be dealt with by a chain of argument, I have had to pursue the enquiry under a number of related topics. It has been necessary also to expound and analyse the thought of several major thinkers at some length, as my overall argument turns on their research. The approach has enabled me to use the findings of a number of independent fields of enquiry, such as the cognitive sciences, the philosophy of science, the philosophy of language and biblical studies as building-blocks to establish my own argument for the principles of knowing and the viability of theology.

I shall begin the enquiry with an analysis of relevant aspects of the history of science in order to trace the transmission of the ideas of natural philosophy to the rise of modern science. In the process, I shall attempt to indicate -

(i) how Aristotelian ideas came to hold such authority in western thought and Christian theology in the west; and

(ii) that in two of the most commonly cited conflicts between science and theology, the disputes were not only metaphysical (i.e. about world-views), but were also epistemological and methodological.

1.2 Relevant Aspects of the History of Science.

In Volume One of his Medieval and Early Modern Science, A. C. Crombie notes that "The history of science is the history of systems of thought about the natural world."[7] One of the reasons such systems have captured the interest of the historian is that, when major conceptual shifts have taken place within them, the effect of such changes has also generally been reflected in the way that man has viewed himself and his entire world thereafter. The historian's interest, therefore, has been to catalogue these shifts and to assess

their influence on the course of civilisation.

Although the origins of the rise of modern science can be traced as far back as the thirteenth century, it was towards the end of the sixteenth century that the revolution which was to come really began to gather momentum. As Crombie observes -

> The new science...profoundly affected man's idea of the world and of himself, and it was to have a position in relation to society unknown in earlier times. The effects of the new science on thought and life have, in fact, been so great and special that the Scientific Revolution has been compared in the history of civilisation to the rise of ancient Greek philosophy in the 6th and 5th centuries B.C. and to the spread of Christianity throughout the Roman Empire in the 3rd and 4th centuries A.D.[8]

In order to understand the gradual though manifold changes which were to come, and the effects of these on the world of thought generally, it is necessary to see this revolution within the perspective of the development of scientific thought. It should then be possible to demonstrate the profound changes which were not only occurring within scientific thought and radically altering the direction of that thought, but were also challenging the established view of the world on which other areas of thought rested. The magnitude of the shift in world-view which was required in order to incorporate these changes, was to be met with strong resistance from a number of quarters, not the least of these being the Church. The reasons for this resistance will be seen to be basically social.

1.2.1 The Concepts of Greek Science.

Crombie has pointed out that the cuneiform texts of the Babylonians and Assyrians indicate that even the ancients had a well-developed method for predicting astronomical motions. By the third century B.C. these were as accurate as those developed in

Greece. Despite this skill, the Babylonians and Assyrians did not try to explain natural phenomena. Instead their texts contained myths in which natural forces were personified as functions of a society of gods.[9] The Greeks, on the other hand, though acknowledging that much of their science was dependent on traditions culled from ancient civilizations such as Egypt and Mesopotamia,[10] sought for "the intelligible impersonal permanence underlying the world of change."[11] By assuming permanence amidst change, by reducing the myths of antiquity to the status of scientific theories and by quantifying prediction, the Greeks virtually invented natural science. As Crombie notes,

> With this idea, of which their development of geometry became the paradigm, giving it its most precise expression, Greek science must be seen as the origin of all that has followed. It was the triumph of order brought by abstract thought into the chaos of immediate experience...[12]

The period 400–300 B.C. marks the time in Athens when the two great Greek philosophers, Plato (427–347 B.C.) and his pupil Aristotle (384–322 B.C.) were teaching and writing. In so far as the development of science is concerned, Plato's influence[13] was mainly in the field of mathematics, and also in astronomy. His thoughts concerning his general theory of the universe of phenomena are found in the Timaeus, whilst his method for testing whether a problem is soluble is set forth in the Meno. His view of the universe provided a framework for the later doctrine of Neo-Platonism, which taught that there was a very close relation between macrocosm ("great world," i.e. the universe) and microcosm ("little world," i.e. man) in which the structure and nature of the universe foreshadowed the structure and nature of man. This view of the world was to remain dominant until the second half of the thirteenth

century, and is therefore basic for the understanding of early medieval science (c.400-1250 A.D.).

In the Roman period (50 B.C.-400 A.D.) art, science and medicine were mainly borrowed from the Greeks, ensuring the transmission of ancient classical thought. In particular, the elder Pliny (23-79 A.D.) produced his Naturalis Historia, which was a thirty-seven book encyclopaedia of the whole science of the period and included the knowledge and beliefs of forgotten Greek and Roman writers.[14] This volume was later the largest known collection of natural facts available in the period of the Dark Ages.[15]

After the decline and fall of the Roman Empire and the rise of Christendom, Platonic thought continued to be transmitted and to influence man's view of the world. Both Platonism and its later development, Neo-Platonism, permeated early Christianity through the writings and teachings of the early Church Fathers, predominantly through those of St. Augustine of Hippo (354-430 A.D.). This influence remained dominant through the early Middle Ages, though it was later to recede.

In the middle of the twelfth century, as translations of Arabic and Greek texts became available, Aristotelian thought in particular began to gain greater importance. By the middle of the thirteenth century, Aristotelian philosophy and science were fully accepted. This new influence was reflected in Christian thought, chiefly through the works of St. Thomas Aquinas, who skilfully synthesized Christian thought with Aristotelianism.[16] Repercussions from the adoption by the Church of Aristotelian thought were to be far-reaching in their effect. Eventually, elements of this kind of thinking were at the basis of the Church's conflict with Galileo several centuries later.

It is therefore pertinent at this point of the discussion to give particular attention to Aristotle's scientific views, since these feature so prominently in the later struggles associated with the emergence of modern science.[17]

Aristotle's writings covered the whole area of knowledge. His scientific interests were contained in his biological works, in his physical philosophy and in his astronomy.[18] Apart from a highly developed philosophy, his scientific works were presented in a sophisticated and formalised system of thought. When Greek Science was rediscovered in the Middle Ages, the very systematization of Aristotle's works meant that medieval science was provided with a readily accessible body of classical thought on which to build.[19]

Aristotle's physical and astronomical conceptions assumed a finite and static view of the universe. Earth was fixed at the centre, surrounded by a series of concentric spheres.[20] In the words of A. C. Crombie -

> First came the spherical envelopes of the other three terrestrial elements, water, air and fire, respectively. Surrounding the sphere of fire were the crystalline spheres in which were embedded and carried round, respectively, the moon, Mercury, Venus, the sun, Mars, Jupiter, and Saturn,... Beyond the sphere of the last planet came that of the fixed stars, and beyond this last sphere - nothing.[21]

C. Singer has observed that this system of a basically static and finite universe substantially influenced the way in which nature was viewed for two thousand years.[22] Its effect was particularly obvious from the twelfth century onwards.

Mention should also be made here of two fundamental principles which lay at the heart of this structure of the universe. The first was that a body or substance possessed an assigned "form" or "nature" with which its behaviour would always be in accord. The second

principle was that the totality of these "forms" or "natures" were arranged in a hierarchically ordered whole. Thus everything had an assigned place which was natural to it and an assigned behaviour which was also natural to it.[23]

Closely related to these two principles were Aristotle's concepts of motion and rest, which were later to be directly challenged. His concept of motion entailed that things moved naturally towards their place according to their assigned "natures." For a thing to be in its place, therefore, meant not only the fulfilment of its "nature," but also a fulfilment of the condition which he called rest.[24]

His concepts of motion and rest were also related to his concept of change. He conceived of change "...as a process of becoming from a state of privation and potentiality...to actualisation."[25] For a thing to be at rest was equivalent to its being in a state of privation and potentiality. When a thing was brought into existence or was released from whatever was hindering it, this exemplified both his concept of motion and the state of actualisation achieved through the process of change. However, for there to be motion, a thing had either to be moved by itself or by something else.[26] In the Physics, Book 8, Ch.4, Aristotle says -

> If then the motion of all things that are in motion is either natural or unnatural and violent, and all things whose motion is violent and unnatural are moved by something, and something other than themselves, and again all things whose motion is natural are moved by something - both those that are moved by themselves...and those that are not moved by themselves...; then all things that are in motion must be moved by something.[27]

Aristotle drew his conclusions from observing that bodies do come

to rest if they are not being moved, and, further, that when restraints are released, things do either rise or fall. He also held that the velocity of movement would be proportional to the force by which they were moved.[28] Ultimately all change and motion in the universe was originated by the sphere of the fixed stars, later called the primum movens by the scholastics.[29]

Historically, only the logical works of Aristotle had been available to the Latin West, having been translated by Boethius (480-524 A.D.) in the sixth century.[30] Greek learning in the main had been cut off from Western thought after the conquest of the Eastern Empire by the Arabs. For centuries intolerance and mutual suspicion had ensured the intellectual isolation of East and West.[31] So whilst in the East the Arabs in the seventh century had the advantage of the heritage from antiquity of both the Byzantine and Persian Empires[32] and enjoyed a revival of learning in Islam from 900-1200 A.D.,[33] the West was largely dependent on collections such as Pliny's Naturalis Historia and the compilations of Isidore of Seville (560-636 A.D.), whose etymologies provided a source of all kinds of knowledge from astronomy to medicine.[34] Such works at least kept Greek learning alive in the West.

In the early Middle Ages in the West the world outlook was predominantly theological and moral. Hence natural knowledge was often sought more as a means of illustrating moral realities than for its own sake.[35] This is not to say that excellent scientific work was not done in the medieval period. However, as Crombie has pointed out, "...some of the best medieval scientific work was done on particular problems studied without any reference to theology or

philosophy..."[36] [my emphasis]. Meanwhile, the "...central development of medieval science took place," he says, "...within a general framework of philosophy closely bearing on theology, and specifically within the system of university studies run by clerics...."[37] So interest in the natural world was still largely tied to philosophical and theological ends. Science had not yet developed as an autonomous discipline.

It is important to stress that the early Church Fathers, particularly St. Augustine, encouraged the search for the rational basis of faith. They wrestled with the perplexities posed by the acceptance on the one hand of the learning of the Greek philosophers and the determination on the other to maintain Christian doctrine. Crombie argues that St. Augustine was opposed to making absurd statements in regard to Science in order to preserve fundamental Christian doctrines. Though it is true that St. Augustine enjoyed confirming Scripture from Science, his overall concern was to save Scripture from falsification by observation and reason, and to hand over purely natural questions to scientific investigation. In other words, he accepted the fact that some questions could only be decided by natural science and were outside the province of the theologian.[38]

So the study of philosophy and of natural science from early times was not viewed as incompatible with the Christian life. Nevertheless, because moral and theological ends still largely dominated the general ethos, natural knowledge continued in the main to hold a place of secondary importance throughout the early Middle Ages and up to the seventeenth century, providing a ready source of symbols for claimed moral and theological realities.[39] However,

in the early twelfth century a new fermentation was occurring in the Latin West. As Crombie notes -

> The first explanation of the universe in terms of natural causes, after the dissatisfaction with the attempt to interpret it merely in terms of moral symbols, was associated with the school of Chartres and was deeply influenced by the teaching of Plato. Early in the 12th century Chartres had shown a renewed interest in the scientific ideas contained in the Timaeus.[40]

1.2.2 The Recovery of Greco-Arabic Scientific Works.

The school of Chartres was also in touch with the translators at Toledo and in Southern Italy who were working on Arabic and Greek texts, with the consequence that the Ptolemaic astronomy and Aristotelian physics were first welcomed to the West through the school of Chartres.[41]

It should be pointed out that when trading relations gradually resumed between the Arab East and the Latin West in the twelfth century, the classical works, particularly of Aristotle and Euclid, were by no means received passively into the West, despite the fact that they came, for the most part, as a coherent whole. Much energy was expended on analysis as well as on attempting to achieve correct translation.[42]

The task was not an easy one, for translation was hampered by three factors. There was difficulty in mastering both the languages of the Arabs and the Greeks; the subject matter was intricate; the technical terminology was complicated. By the late thirteenth century many translations had been revised, either working directly from the Greek or with a better knowledge of the Arabic.[43]

Even though Aristotelian thought became readily accessible in the

thirteenth century to the Latin West, its authority there was by no means certain at first. In Paris in 1210, the teaching of Aristotle's views on natural philosophy or any commentaries on them, was prohibited by the provincial ecclesiastical council. Similarly, in 1215 and subsequently, there were other prohibitions, none of which were successfully enforced.[44] However this categorical condemnation of Aristotelian Science was by no means supported by all in the early thirteenth century. For in 1205 Innocent III had exhorted the Masters and Scholars of Paris to revive the study of Greek learning by going to Greece itself,[45] and in 1231 Pope Gregory IX appointed a commission to revise some of the natural works of Aristotle.[46] Also, in 1260, William of Moerbeke, encouraged by St. Thomas Aquinas, completed his direct translation of nearly all of Aristotle's works from the Greek.[47]

One of the difficulties was that there were conflicting schools of thought on Aristotle. Averroës (1126-1198), the Arab authority on Aristotle, held an absolutely determinist interpretation of the universe. The Averroïst school in Paris, led by Siger of Brabant, denied personal immortality, the freedom of the will and moral responsibility, whilst accepting the eternity of the world and the human race. Against this view, which represented a challenge to Christian orthodoxy, were the Dominicans, St. Albertus Magnus (c.1200-1280) and his pupil St. Thomas Aquinas (c.1225-1275). Whilst they accepted Aristotle's physics and natural philosophy in the main, they rejected his absolute determinism of the universe. Such was this opposition that in 1270 St. Thomas wrote his <u>De Unitate Intellectus Contra Averroïstas</u> to refute that view.[48]

In 1277, the determinist interpretation of Aristotle was

condemned by the Bishop of Paris and by the Archbishop of Canterbury, John Pecham. This banning of the Averroïst interpretation of Aristotle was, in effect, a condemnation of determinism. However, as Crombie points out, by banning the Averroïst view, the Bishops opened the way for criticism of Aristotle's works, which, in turn, was to eventuate in the undermining of that system.[49]

The situation, says Crombie, afforded them the freedom "to form hypotheses regardless of Aristotle's authority, to develop the empirical habit of mind working within a rational framework, and to extend scientific discovery."[50] Later, though, through the synthesizing of Christian thought with Aristotelianism, Aristotle's thought came to hold such authority in respect of Christian teaching in the West that to challenge the authority of Aristotle was, in effect, equivalent to challenging the authority of the Church. Significant though this is, if its full import is to be understood, there are several historical matters which must be discussed first before this particular issue can be taken up.

1.2.3 The Rise to Dominance of Aristotelian Thought.

The three names of Robert Grosseteste (c.1168-1253), St. Albertus Magnus and St. Thomas Aquinas stand out as those most instrumental in ensuring that Aristotelian thought was accepted into Western Christian thought. What concerned such thinkers most was the relation of faith and reason in the wake of this new science with its philosophical implications.[51] Could things still be seen by theologians as the work of a Divine Providence if in fact they could be adequately explained in terms of natural causes by natural philosophy? Many such questions arose, appearing to drive a wedge between the truths of

religion and the truths of reason.

The works of St. Thomas Aquinas, in particular, were by far the most influential in proposing a resolution to the apparent contradictions between faith and reason, theology and natural science. His detailed and skilfully formed arguments can be found in the Summa Contra Gentiles and in his monolithic Summa Theologica.[52] His enormous works effectively reconciled Christian Theology to the Aristotelian thought-world. This was to have far-reaching effects.

As Aristotelian thought increasingly gained authority in the Latin West, it was virtually inevitable that, because of its established links with Christian Doctrine, any attack on the authority of Aristotle would in essence be interpreted by the Church as an attack on its doctrines and also on its authority.

In the discussion so far, I have traced the relevant historical aspects of the transmission and preservation of Greek Science and its recovery in Arabic form in the West. Attention has also been paid to the Church's role in, at first, resisting Aristotelian science mainly because of the Averroïst determinist interpretations, but eventually granting it its imprimatur, an approval which was even more firmly established through the definitive theological works of St. Thomas Aquinas. However, it would be nothing short of misleading if attention were not drawn to another absolutely crucial factor which was also operative in ensuring the ready absorption of Aristotelian concepts by the West and their continued resilience, despite the fact that some of these conceptions were increasingly at odds with those being suggested by the ongoing scientific enquiry.

As already mentioned above, Aristotle's works in particular

provided the medieval world with both a highly developed philosophy and a readily accessible system of scientific thought. In order to understand the precise effect of this, we must turn to W. Whewell's History of the Inductive Sciences.[53] Here can be found a most interesting analysis of how the technical forms of the Greek philosophical schools served to give "fixity and permanence" to traditional dogmas.[54] Now it was the sophisticated forms of this philosophy that Whewell says provided the very structure by which the Aristotelian tradition of thought was able to remain dominant over such a long period. "Technical phraseology," he says, "is powerful... for the perpetuation either of truth or error."[55]

It is popularly believed that the reason that the Greeks did not succeed in generating an autonomous scientific tradition despite the ingenuity of their reflection was because they neglected fact and relied solely on speculative thought.[56] Whewell has contested this view and argued that the problem was not that at all. Rather, it was that their "ideas were not distinct and appropriate to the facts."[57] The significance of this point will be seen when this issue is discussed more fully in relation to the problem of acquiring reliable knowledge.[58]

In the meantime, the issue of the predominance of the Aristotelian thought-world and its concepts in the late Middle Ages should not be underestimated. In fact it was largely because Aristotelian thought was vested with such authority that the concepts of this system were retained unquestioningly, initially inhibiting science's emergence as an autonomous discipline.

In Metaphysics and Measurement[59] A. Koyré details the extent to which Aristotelian concepts, e.g. motion and rest,

encased in a cosmology which assumed a finite and static view of the universe, held such sway that even thinkers such as Kepler, the founder of modern astronomy, did not manage to establish the basis of modern physical science.[60] Before the expanding body of physical knowledge and the observations of everyday life could be formulated into an independent tradition of scientific thinking, the Greek understanding of the cosmos as a hierarchically-ordered finite world with its static concepts had to make way for an entirely different thought-world. So despite the fact that Aristotelian dynamics had its many critics from "Hipparchus and John Philoponos, through John Buridan and Nicole Oresme, down to Leonardo da Vinci, Benedetti and Galileo,"[61] the rise of modern science was not possible until this complete change had been effected. As Koyré has observed -

> ...what the founders of modern science, among them Galileo, had to do, was not to criticize and to combat certain faulty theories, and to correct or to replace them by better ones. They had to do something quite different. They had to destroy one world and to replace it by another. They had to reshape the framework of our intellect itself, to restate and to reform its concepts, to evolve a new approach to Being, a new concept of knowledge, a new concept of science...[62]

1.3 Galileo Galilei.

By combining mathematical reasoning and experimental observation, Galileo Galilei (1564-1642), was, with Kepler, the first to use critical procedures with considerable maturity and effectiveness. By so doing, he introduced a method which directly challenged the concepts of the Aristotelian thought-world. The effect of his method was eventually completely to radicalise science and bring him into direct conflict with the Church.[63]

Galileo's conflicts with the Church must be given careful and detailed treatment at this point of the discussion for several major reasons. First of all, only a proper historical analysis of the situation can establish the correctness or otherwise of the view that the opposition he experienced from the Church was not simply the result of a straightforward conflict between science and religion. Secondly, there are elements, which, once identified, will indicate the changes, instigated by Galileo's approach, that challenged established thought. Thirdly, these elements are historically very important for they show that Galileo's controversy with the Church was ultimately related to basic epistemological issues concerning the way in which knowledge is acquired. Fourthly, although it will be seen that Galileo's ideas, especially in the area of dynamics, were in fact not entirely correct, he still provided the fertile ground on which Newton and others were able to develop and build up the classical mechanics of the seventeenth century and establish once and for all a revolution in scientific thought which has since had an effect on all other areas of thinking, challenging the respectability of a number of disciplines, amongst which theology must be included.

1.4 Galileo's Methodology.

Probably the most useful point at which to begin this complex analysis is by discussing Galileo's methodology because the shifts which came about in scientific thought in this period of time, enabling science to develop as an autonomous tradition, can largely be attributed to the effectiveness of his approach.

As discussed earlier, the Aristotelian thought-world assumed that

the place and behaviour of things were determined by their intrinsic "natures" or "forms," (1.2.1). By limiting his enquiry to those physical aspects of the world which could be quantified, Galileo, in his later work, effectively shelved the metaphysical questions which related to "forms" or "natures." These subsequently became the main focus of attention in Locke, Boyle and Newton in the problem of primary and secondary qualities, the origin of which is in Galileo's Il Saggiatore.[64]

Galileo's primary concern was to study phenomena under simplified and controlled conditions and to apply mathematical procedures in order to quantify and systematise his observations. By combining experimentation and mathematical abstraction, he introduced a new method which was capable of identifying regulative principles, locating proximate causes and demonstrating given effects. Whereas previously concepts had been derived as direct generalizations from commonsense experience, Galileo's method, which enabled phenomena to be expressed in mathematical terms, made it possible to build up concepts which could be assessed quantitatively and qualitatively.[65]

It was the successful application of this methodology in seventeenth century mechanics which eventually changed man's whole conception of nature and brought about the destruction of the Aristotelian system of cosmology which had dominated and permeated Western thought for so long.[66]

It is important to note that Galileo did not achieve the changes in dynamics only because of his systematic use of experimental and mathematical methods but also because his very methodology enabled him to formulate an alternative concept of motion to the Aristotelian

one.[67] Though Galileo's concept was incomplete, it was much more appropriate to observations of the physical world than Aristotle's. Whereas Aristotle held that things were only at rest when they were in the place assigned to them by their "nature," and explained motion in terms of process whereby a thing moved in a straight line directly to its assigned place in the universe, Galileo, ignoring "nature" and "form," proceeded to formulate his concept from careful observation and calculation. He concluded that the persistence of motion was not a function of the air, determined by a thing's place and nature. Instead, he proposed a concept of inert motion whereby motion was conceived of as the state of any moving body which persisted unchanged unless acted upon by some force, and was equivalent to rest. This, of course, was in direct conflict with the Aristotelian view, which in conceiving of motion in terms of a process of becoming required an explanation for its persistence.[68]

Galileo's observations, challenging these explanations, were contained in his Dialogues Concerning the Two Chief Principal Systems of the World, which appeared in 1632. This volume was to prove very contentious. In the mouth of Simplicio he placed the argument for the Aristotelian view of the universe, and in the mouth of Salviati he expressed his own argument, which was clearly in favour of Copernicus' theory enunciated in De Revolutionibus Orbium Coelestium that the earth is not the centre of the universe but rotates around the sun as do other planets.[69]

There are two basic assumptions in Galileo's methodology. Firstly, he believed that nature was mathematical, i.e. realized in

geometrical form. Secondly, he held to the fact that there was a direct correspondence between the abstractions he reached by reflecting on the concrete regularities observed in the behaviour of phenomena, and the phenomena themselves. In other words, this methodology assumed that there was "a real intelligible structure in objective nature...",[70] an issue which will be of paramount importance later in this discussion when we come to the problem of objectivity in both scientific and religious thinking (Chapters 3, 6, 7, 8 and 9). However, we need to note that whilst partially shelving the Aristotelian concept of "essential natures," Galileo was only able to make the advances he did because he assumed the existence of an external world which conformed to a structure that could be expressed mathematically and tested experimentally. As Crombie has said -

> Galileo...asserted that the real physical world <u>actually consisted</u> of the mathematical entities and their laws, and that these laws were discoverable in detail with absolute certainty.[71]

The above issues are important for they provide us with an understanding of the kind of knowledge which early modern science believed it was acquiring, and indicate by contrast not only a shift away from the methods of the natural philosophy of that time but also a resolute commitment to the experimental method, which by its very success, would increasingly present a challenge to other forms of enquiry, particularly the theological one.

It is against this background which Galileo's conflicts with the Church must be understood.

<u>1.5 Galileo's Conflict with the Church</u>.

It is important to note that Galileo himself did not find any

conflict between his scientific and religious beliefs, since he held that Scripture was concerned with knowledge of man's spiritual relation to God and not with knowledge of the natural world.[72] Theologically, he maintained that though God was author of both the "Book of Nature" and the Scriptures, the former expressed physical theory in the language of mathematical science whilst the latter expressed man's moral destiny within the context of the natural world, but in language which was essentially figurative. In fact his open letter to the Grand Duchess of Tuscany in 1615 was written precisely to deny the charge that he was an unbeliever and also to restrain the Church from condemning the Copernican system. The Church, on the other hand, resisted Copernicus' theory on the grounds that it contradicted the view of the world found in the Bible[73] and the Aristotelian world-view with which Christian theology, through the work of Aquinas, had become entwined.

Another factor was that Galileo had improved on the refracting telescope, and was able to attain a magnifying power of X32. This enabled him to carry out astronomical observations which convinced him that Copernicus' view was in fact correct.

> He observed that the moon's light was reflected from that of the sun, and that its surface was covered by mountains and valleys; and that the Milky Way was composed of separate stars. He also discovered the existence of the four satellites of Jupiter; sunspots (from which he deduced the rotation of the sun); the 'rings' of Saturn; and the phases of Venus and Mars.[74]

Additionally, earlier in his career, whilst Professor of Mathematics at Pisa, he had made the startling discovery that objects, irrespective of their size and weight, fell with equal velocity. Since this theory contradicted Aristotle's teaching on dynamics, it provoked considerable hostility and Galileo was forced to retire to

Florence in 1591 for a period. However, in the following year he was appointed Professor of Mathematics at Padua where he stayed for eighteen years, attracting students from many parts of Europe. Here it was that his ideas on motion reached greater maturity, and though still incomplete, were the concepts which enabled Newton to complete the terrestrial and celestial mechanics of the seventeenth century by unifying the laws of motion into a single system.[75]

The intellectual revolution brought about by Galileo's insistence on the use of experimental and mathematical methods as the means of isolating and examining regularities in physical phenomena not only challenged the long established and authoritative Aristotelian view of a finite and static universe and Aristotelian dynamics, but also gave clear support to the Copernican system.

In an attempt to justify a thought-world which was so contrary to the Aristotelian cosmology, to which the Christian Church adhered,

Galileo wrote in his open letter to the Grand Duchess -

> 'It seems to me that in discussing natural problems we ought not to start from the authority of the texts of the Scriptures, but from the experience of the senses and from necessary demonstrations...it is clear that those things concerning natural effects which either the experience of the senses sets before our eyes or necessary demonstrations prove to us, ought not to be called in question on any account, much less condemned on the basis of texts of Scripture which may, in the words used, seem to mean something different...'[76]

Crombie expresses well the result of this reasoning when he says that

Galileo concluded that -

> Clearly, ...it was not the intention of the Holy Ghost to teach us physics or astronomy, or to show us whether the earth moved or was at rest. These questions were theologically neutral, although certainly we should respect the sacred text, and where appropriate use the conclusions of science to help to discover its meaning. The purpose of the Holy Ghost in the Scriptures, as he expressed it wittily in a remark which he attributed to Cardinal Baronio, was to teach us 'how to go to heaven, not how the heavens go.'[77]

In 1616, not long after the writing of this letter, there was a decree banning the teaching of the Copernican system.[78] The events preceding this ban were precipitated by a supporter of Galileo, Paolo Antonio Foscarini, a Carmelite Friar, who held that the Copernican System should be accepted as "a physical truth" and not "as a mere calculating device."[79] He also argued that Scripture could be reconciled with it, citing relevant passages to substantiate his case. This support drew a response from Cardinal Robert Bellarmine (1542-1621), who by this stage was seventy years old. Bellarmine, many years earlier in 1600, had framed the decision which had led to death at the stake for Giordano Bruno, supposedly for his maintenance of the Copernican view, though L. Thorndike in the History of Magic and Experimental Science, says that it was because of his apostasy from his order.[80] In any case, Bellarmine, in this instance, took a more moderate approach. He argued that the new astronomy should be treated as "probable opinion and plausible conjecture," which in effect meant that the statements of Scripture could be taken as authoritative scientific statements and the Aristotelian cosmology to which Christian doctrine had become attached could be retained.[81]

Not content with this resolution, Galileo waited for an opportunity to prove that the Copernican model was the correct one. In 1623, when Maffeo Barberini was elected to the papacy as Pope Urban VIII, his chance arose. However, Urban would only agree to his publishing on the Copernican question if the system was taken as merely hypothetical. Also the decree of 1616, banning the teaching of the Copernican system, still stood. Therefore, in order to comply with the Pope's conditions, Galileo added a preface and a conclusion to the Dialogue, stating that his arguments were only probable and

hypothetical. Thereupon, having received the imprimatur of the Archbishop of Florence, he published under the official sanction of the Church. However, as the actual substance of the Dialogue clearly indicated that Galileo was persuaded of the truth of the Copernican view, Pope Urban accused Galileo of breaking his undertaking to him.

The Roman Inquisition subsequently charged him with defying the decree of 1616 by ostensibly presenting the condemned teaching as a hypothesis whilst all the time still clearly adhering to its truth. After prolonged proceedings he was found guilty, and, in 1633, in the Dominican Convent of Santa Maria Sopras Minerva, was required to renounce on oath his adherence to the Copernican system. The Dialogue was banned.[82]

It is ironical that this prohibition ultimately retarded the thinking of the Church but not the practice of Science. As Crombie observes -

> The decree against the Copernican theses and Galileo's condemnation placed Catholics in a false position for more than a century, without preventing excellent work being done in practical astronomy in Italy and other Catholic countries and the uninhibited development of other sciences there.[83]

1.6 Deeper Implications of Galileo's Conflict with the Church.

From the above discussion, it can be seen that Galileo's conflict with the Church was not simply a straightforward conflict between science and religion. Far deeper matters were at issue. The conflict over world-views, which constituted a direct challenge to the Church's authority by Galileo, was in fact the manifestation of a more fundamental disagreement over questions about what concepts are appropriate for viewing the world, what counts as trustworthy

knowledge and what kind of approach can yield knowledge that is trustworthy.

Galileo's methodology, which encompassed a more mature and effective application of mathematics and experimentation, not only gave rise to modern science but brought about a revolution in thought generally. He had successfully identified the principles and procedures by which thought and reality could be enmeshed. The metaphysical, epistemological and methodological changes which he introduced and which brought him into fierce opposition with the Church were the bases from which Christiaan Huygens (1629-1695), Sir Isaac Newton (1642-1727) and others built the classical mechanics of the seventeenth century. These changes had inevitable repercussions on philosophical reflection.[84]

The sixteenth and seventeenth centuries mark the period in which science increasingly demonstrated its independence as a tradition of thought from philosophy and theology. Galileo's effective use of the experimental method, in particular, constituted a definite and irreversible movement towards methods already in occasional use by researchers such as Theodoric of Freibourg.[85] These contrasted with much practical science in natural philosophy which relied on naïve concepts drawn from commonsense experience. His approach gave to science potentially the means of identifying accurately the properties and characteristics of the natural world and of testing the status of that knowledge with carefully devised experiments. Also, technical skills were continually being extended by improved instrumentation, though it should be noted that the revolution in scientific thought was carried through <u>before</u> the invention of the telescope, microscope, thermometer or an accurate clock.[86] This new methodology and the

improved technical facilities enabled scientists to build up concepts of the universe which were much more adequate. As a result their understanding of the physical world greatly expanded. Ever since, modern science, relying on a marriage of conceptual analysis, mathematical expression and empirical procedures, has built up for itself a tradition of thought, the credentials of which have been established by the success with which scientists have been able to manipulate, control and accurately predict the behaviour of natural phenomena.

In the discussion so far I have endeavoured to show that the historical events of Galileo's conflicts with the Church indicate that at this very early stage serious difficulties were already emerging not only in regard to the Church and its relation to the facts of everyday life but also for theology and its relation to scientific thought.

We may summarize these issues briefly. In challenging the Aristotelian world-view, Galileo also challenged the world-view to which Christian theology had become attached. The Church viewed his position as a break with authority, which of course it was. The Church's conflict with Galileo, however, was not only a disagreement over world-views. Galileo had introduced a method, the results of which could be tested. His method was in certain key ways empirical, and was capable of establishing what the facts were. So the argument was not only metaphysical (i.e. about world-views), but also epistemological and methodological (i.e. about how we acquire knowledge and ensure that our knowledge is trustworthy).

Science had found techniques of quantification and testing; but what of theology? Herein lay the origins of what was eventually to

become one of the most crucial issues for twentieth century theology. Galileo had established a method for science which afforded the discipline enormous success in resolving a number of different problems quickly.[87] Increasingly, it was obvious that theological reflection neither advanced nor undermined the findings of science. As a result, from this time on science began to develop as an autonomous discipline.

It was inevitable that in a still later period a further question would be raised: if theological concepts were no longer relevant to science, had science progressed beyond the age of theological ideas? Certainly thinkers such as the French philosopher and mathematician, Auguste Comte (1798-1857), thought so. Hence there has been an ever-increasing pressure on theology to demonstrate its credentials.

A perusal of the history of theological thought will show theology's continual failure to meet this demand.[88] Its inability to do so was at least partly due to the fact that, in the midst of conflict, the fundamental issue, as to what constituted the principles of trustworthy knowing, was not identified.

In spite of the fact that Galileo failed to escape the inevitable consequences of challenging ecclesiastical authority, the Church, on the other hand, only succeeded in exercizing its ecclesiastical authority at the unprecedented expense of placing itself in a false position in regard to matters concerning the physical world, and, worse still, failing to retain its credibility as a consequence. In the final analysis its only gain was to show that it still possessed the necessary social power as an ecclesiastical institution to restrain one of its dissenting members by prohibiting him from disseminating his teachings. After his trial, Galileo was confined

for the rest of his life to his farm at Arcetri, which overlooked Florence, but he continued his work, completing his major contribution to mechanics in his Discourses Concerning Two New Sciences, which was published in 1638, but this time in Holland![89] The Church may have prevented him from teaching but it could not stifle the spirit of free enquiry within him.

The canons of free and open enquiry which were given such an impetus by Galileo's experimental method still confront theology to-day.

CHAPTER TWO

THE VALIDITY OF THEOLOGY (2)

It is important, at this point of the discussion, to raise another different but equally significant matter, which added to theology's difficulties at the rise of modern science and thereafter. This concerns two recognizably different strands in the twentieth century of the philosophy of science which began to emerge soon after the Galileo controversy.

2.1 Two Different Strands in the Philosophy of Science.

The origin of this bifurcation is found in the seventeenth century with the works of Descartes. René Descartes (1596-1650), French philosopher, mathematician and scientist, with Galileo, adhered to the Copernican system of the universe. However, on hearing that Galileo was condemned by the Church, he refrained in 1633 from publishing his own work, Le Monde, on this issue.[1] Although he made very significant contributions to mathematics and the mathematical techniques of physics, Descartes' alarm over Galileo's indictment by the Church caused him to act very cautiously in regard to his own publications which supported the Copernican cosmology. In 1644, when he decided to publish his cosmology in his Principia Philosophiae, he did so by presenting his physical theories as mere fictions and conventions.[2]

However, there was an important difference methodologically between Descartes and Galileo, and it is here that the bifurcation of the two philosophies of science originates. Whereas Galileo adhered strictly to the use of mathematics and experimentation as the means of establishing his view of the physical universe and confined his view accordingly, Descartes went beyond these and developed his cosmology to a large extent on entirely non-mathematical lines. By so doing, he went beyond the physical reasoning of Galileo and, applying rational analysis, constructed an entire system of science. His method, which later came to be called "Cartesian," was basically philosophical, though he in no way despised experimentation.[3] However, unlike Galileo, he was prepared to go beyond the limits of experimentation and set out an account of the universe from premisses which he held could not be doubted rationally, making rigorous deductions from these. Beginning with his famous cogito ergo sum (I think, therefore I exist), he reasoned to "the existence of his own body [and] of other 'extended substances,'"[4] and from there to the existence of the material universe and of God.

It was partly this methodology as well as the details of the Cartesian system, which Newton disputed in his Principia Mathematica (1687).[5] As Crombie argues -

> The discussions of the philosophy of science by scientists that most profoundly influenced the development of scientific thought in the 17th century all concerned the relationship between specific theories formulated for the purpose of predicting particular phenomena, and the mechanical philosophy of nature in terms of which it was assumed that all explanations in physics must be given.... By the time the Royal Society had received its first charter in 1662 and the Académie des Sciences had been established in 1666, the attitudes to the problem had tended to polarize around the two dominant philosophies of science of the period, the empiricism and experimentalism inspired by Bacon and Galileo with its inveterate dislike of systems, and the Cartesian rationalism with its unifying conception of universal principles applying to every aspect of

the physical world...[6]

Before proceeding further, it should be stated quite explicitly that the distinction between these two philosophies of science arose out of two different views, held by those who practised science, about the nature of science and the extent to which the findings of science could be generalised to give knowledge about other aspects of the world. Galileo, and later Newton, were opposed to accepting as scientific anything which went beyond the limits of the possibility of experimentation. To them, that kind of thinking was to be regarded as speculative. Descartes disagreed in principle with this. He was convinced that it was possible to extend the methods of science to include all that could be reached by strict rational analysis. As Descartes' approach was more philosophical than experimental, and perhaps also because historically this strand of the philosophy of science was eventually taken up by philosophers, Crombie has called it "the philosophy of science of the philosophers." This is not to say, however, that this particular philosophical position has been adhered to only by philosophers and not by some scientists also. In fact, when this particular view of the nature of science hardened into rationalism, empiricism and positivism, the assumptions of the latter two positions were adopted by certain scientists as well as a number of philosophers. Nevertheless, for ease of distinction, I have adopted Crombie's categories, calling the more philosophical approach to the philosophy of science "the philosophers' philosophy of science," and the more experimental approach "the scientists' philosophy of science."

The philosophy of science of the "scientists" as distinct from that of the "philosophers" was, in the main, first championed by

Robert Boyle (1627-1691) and Newton, though not in any systematic or formal sense. It should first be noted that both Boyle and Newton, like Galileo before them, saw no conflict between their scientific pursuits and theological belief, and were advocates of "natural religion." Boyle, in particular, considered that his experimental method helped to preserve the integrity of theology, by establishing the kind of world which God had created.[7] Nevertheless, they were convinced that scientific theories were concerned with genuine knowledge, obtained from a real and objective world. Unlike Descartes, they clearly distinguished between laws which were established experimentally which could be used to make accurate predictions, and those assumptions which were still speculative. Thus they adhered to experimental principles. Scientific theories were not to be taken as mere fictions, calculating devices or hypothetical statements. The methods of science were capable of testing the truth or falsity of claims about the existence or nature of states of affairs, thereby enabling a number of physical laws to be formulated within a framework of "realism."[8]

It is crucially important that this distinction be made between the two different philosophies of science, for it marks critical circumstances and changes which eventually influenced the course of scientific, philosophical and theological thought for many centuries. The briefest discussion of these is now necessary in order to understand some of the dilemmas with which theologians are faced to-day, partly as a consequence.

In the first place the extent to which Descartes developed his scientific system on non-mathematical lines meant that his mechanical philosophy became more and more detached from empirical foundations.

As such, the new science was, unwittingly, being transformed back into a philosophy of nature again, even though the concepts were different from the old Aristotelian natural philosophy. As a system of natural philosophy, it raised many perplexing problems for philosophy. These interests shaped the direction not only of epistemology and metaphysics but also affected the way in which the whole nature of science was conceived.

In the hands of George Berkeley (1685-1753), and later David Hume (1711-1776) and Immanuel Kant (1724-1804), the "philosophers'" understanding of science was not only to prove devastating for enquiry into knowledge about God but was also to become a threat to all knowledge. This, says Crombie, opened the way for the "anti-theological and anti-metaphysical positivism of Auguste Comte (1798-1857) and John Stuart Mill (1806-73), and to the agnosticism of T. H. Huxley...".[9]

As philosophers in the eighteenth and nineteenth centuries struggled with the difficulty of relating their understanding of science to questions concerning the possibility of knowledge, theologians accordingly wrestled with similar questions that were posed for the possibility of knowledge about God. Attempts were made to found a natural theology which would be in agreement with a supposedly rationally ordered universe. Their failure to achieve this is seen in the reactionary theologies in the twentieth century of Barth, Bultmann and Tillich.[10]

On the other hand, the philosophy of science implicit in the science of Newton and Boyle, which Crombie has called "the philosophy of science of the scientists," confined its analyses to the empirical, and consciously distinguished these from all that was still

speculative or hypothetical. This view is expressed particularly clearly by Newton in a letter which he wrote to Henry Oldenburg on 2nd June, 1672 -

> 'For the best and safest method of philosophizing seems to be, first diligently to investigate the properties of things and establish them by experiment, and then to seek hypotheses to explain them. For hypotheses ought to be fitted merely to explain the properties of things and not attempt to predetermine them except in so far as they can be an aid to experiments. If anyone offers conjectures about the truth of things from the mere possibility of hypotheses, I do not see how any thing can be determined in any science...'[11]

Newton was convinced that science discovered the real processes of nature and that this was its ultimate objective. He therefore undertook the task rigorously and in so doing, extended the methods of Galileo to the great advancement of the science of mechanics.

Crombie has cited two further evidences from the seventeenth century in support of his view that the philosophy of science of the "scientists" developed along different lines to what he has called the "philosophers'" perception of science. The first is in the well-known preface of Traité de la Lumière, published by the Dutch astronomer-physicist, Christiaan Huygens in 1690. In this, he notes that the method of reasoning has moved away from demonstrating that the conclusions of the new physics are "...necessary consequences deduced from first principles accepted as axiomatic..." to the "...justification of the theoretical principles themselves by their observable consequences."[12]

The second piece of evidence which Crombie cites is from the French theologian and scientist, Blaise Pascal (1623-1662), found in his Pensées (395), which were published in 1669 after his death: "Nous avons une impuissance de prouver, invincible à tout le dogmatisme. Nous avons une idée de la vérité, invincible

à tout le pyrrhonisme!"[13] This expresses the view that has now become traditional in the method of science, viz. that theories are put forward as though true but are always submitted to experimental testing to establish whether or not they are in fact true.

Now the methodological differences between the above two strands of the philosophy of science are critical. The "philosophers'" conclusions were established by making deductions from first principles, which were taken to be self-evident. The "scientists'" conclusions were reached through experimentation and quantification. Herein lay a methodological difference of crucial significance.

The "philosophers'" approach to the new science led them into manifold problems. This was at least in part due to the fact that the "philosophers'" philosophy of science had become detached from empirical foundations which, in turn, adversely affected the "philosophers'" attempts to gain access to the real world.[14] Not only did a gap develop between their reflection and the world of everyday experience but the resultant philosophy itself generated perplexing intellectual problems about the nature of the world and the nature of knowledge.

These same problems also affected the theologians, since in endeavouring to come to terms with the challenges of the new science, they had identified with the "philosophers'" understanding of science, removed as it was from empirical foundations. Thereby, theology adopted all the philosophical problems that arose out of speculative thought and sought to resolve these in so far as they bore on theological matters.[15]

In the meantime, modern science, having found an effective method of enquiry, was able to achieve enormous success in resolving

scientific problems. The philosophy of science implicit in scientific practice differed markedly from the philosophy of science of the "philosophers" in just this respect, viz. the conscious limitation brought about by its adherence to the principles of experimentation and quantification, and its refusal to diverge from these.

The "philosophers," on the other hand, were prepared to go beyond these limits, universalizing the implications of scientific research into grand metaphysical theories in an attempt to explain the nature of the universe in one unified system. The difficulty was that such an approach generated its own set of problems. As the energy, genius and interest of philosophers were engaged with these, the "philosophers'" philosophy of science held less interest for scientists and vice versa.

Consequently, the two strands of philosophy of science had less to do with each other, till, as Crombie has noted, in the twentieth century there is now a distinct "dichotomy between the philosophy of science of scientists and that of philosophers...",[16] though this is increasingly under challenge in biology and to some extent in physics.

2.2 Effects on the Science/Theology Relation.

As far as the relation between science and theology was concerned, it was clear on the one hand that the seventeenth century scientists had demonstrated the validity of their methods by achieving enormous success in solving science's problems. On the other hand, theologians enjoyed no such assurance. They were perpetually unable to establish an approach which could resolve the dilemmas within

theology or bridge the ever-widening credibility gap between the claims of theology and the findings of modern science.

A major drawback was that in adopting the assumptions of the "philosophers'" understanding of science, theologians addressed themselves to the questions which arose out of that school of thought. They were thereby diverted from the actual difficulties which existed between science and religion.

It must be emphasized that the above issues only become obvious with historical hindsight. In the situation itself, the rise of modern science brought in its train considerable intellectual turmoil. This made it difficult in the height of controversy to discern matters clearly.

As already argued above, the changes which came with modern science not only called into question the former authoritative Aristotelian world-view, but also the whole basis of knowledge and the methods by which knowledge was acquired. Hence, the issue was not only about which concepts were the most appropriate and correct in relation to our understanding of the world, but also how these concepts were formed in the first place and whether the knowledge incorporated into them could be established as trustworthy. The deeper concern can thus be seen to be about the principles of reliable knowing, though prima facie the quarrels were manifest in conflicts about different world-views.

Through the scientific procedures established by Galileo and brought to completion by Newton it had been demonstrated that the methods of experimentation and quantification were capable of generating concepts which could solve perplexing physical problems, greatly expanding that area of knowledge. Theologians had been unable

to establish critical procedures which could in any way match the success of science. This was partly because it had not identified the methodological gap which had opened up between science and theology, and partly because, in following the "philosophers'" philosophy of science, they were thus confronted by a set of problems raised by a world-view which had become detached from empirical foundations. As a consequence it suffered much the same fate as the "philosophers'" philosophy of science: it held no interest for the scientist, and, worse still, became an object of ridicule and scorn whenever it endeavoured to contradict the premisses of science. This was particularly so in the case of Darwin's conflicts with the Church in the nineteenth century.

Before pursuing this matter, I shall consider how the seventeenth century scientists, especially Newton, viewed the relation between science and theology.

2.3 Newton's Understanding of the Relation of Science and Theology.

From the outset it is important to state clearly that Newton did not enter into any formal defence of theology but, like most men of that generation, had a positive interest in it. As noted above (2.1), the seventeenth century scientists thought that science was entirely compatible with religion, and, though introducing new methods for science, in no way saw these as a challenge to the methods of theology. Instead, they were often found going to great lengths to explain that the new methods of science in no way undermined theological concern.[17] However, in retrospect, Newton's efforts to demonstrate the harmony between science and religion must be seen

as one of the major stumblingblocks for modern theology.

In Newton's two major works, Principia and Opticks, there are explicit expressions of his view that his discoveries in physics provide new evidence for God's existence and God's providence.[18] It is clear that he believed that his mechanistic model of the world was compatible with the idea of an intelligent creator with a purposeful end for the creation. The problem was that as the domain of explanation by mechanisms increased, it was inevitable that the role of God's activity in the natural world would appear to decrease, since on this view it was possible to assume that the activity of God was coterminal with the mechanical functions of nature and therefore clearly dispensable.

In order to counter such obvious difficulties, and possibly because there were still puzzling aspects of the natural world which could not be satisfactorily accounted for by mechanism, Newton postulated the necessity of God's intervention. As H. G. Alexander has pointed out in his introduction to the Leibniz-Clarke Correspondence,[19] Newton's use of the concept of God's intervention was primarily to fill a gap in scientific explanation rather than to provide a defence for theology. He argued that since no natural explanation could be given for the pattern of the planets, this must be attributed to the intervention of God. Similarly, he held that continuing irregularities in their motion were adjusted by God from time to time, and that it was God's intervention also which prevented the stars from collapsing together contrary to gravitational pull. This form of explanation used by Newton, together with the gravitational proof of the existence of God (i.e. the view that as gravity was not a power of material objects, it must be the power of a

superior agent),[20] was eventually to prove fatal for theology.

In the next century, the deficiencies in Newton's physical arguments were exposed when Laplace was able to give a fuller account of planetary motion and to show that the "irregularities" of motion which concerned Newton were due either to inaccurate observations or to a number of perturbations, which over a long time-span would balance each other out.[21] Hence, there was no need to postulate an interventionist God to account for these factors.

In modern day parlance, the form of explanation used by Newton has been dubbed a "God of the gaps" argument. This kind of approach appeals to a rather crude notion of an interventionist God in order to explain areas of scientific ignorance. The problem with this type of argument is that as scientific knowledge increases and the gaps of ignorance are closed off, the unsophisticated concept of God to which this appeals is conveniently jettisoned with devastating consequences for theology. Newton's approach, however well-intentioned, benefited neither science nor religion. Relating science and religion in this way was wrongheaded from the start and doomed to fail.

The ease with which the theological case could be dispensed with as scientific knowledge advanced foreshadowed the ease also with which science would ascend to the position of "Queen," whilst the validity of the former "Queen," theology, would be increasingly questioned.

In situations where the advances of science challenged former scientific concepts and with them inevitably those of philosophy and theology, theology was placed in the unenviable position of being unable effectively to demonstrate the truth of its claims. This failure was further accentuated when, in place of critical procedures, other inappropriate approaches were relied on, ultimately to theology's

great disadvantage. The Newtonian-type harmonizing of science and religion was a case in point of this kind of alternative resolution with devastating effects for the respectability of theology.

In the eighteenth and nineteenth centuries, despite great efforts by major thinkers such as Immanuel Kant to analyse the problems of natural religion, theology remained unable to establish a method of approach which could satisfy empirical demands. Hence, by the time of the Darwinian controversy in the second half of the nineteenth century, even though the circumstances and quarrels were in many respects quite different from those of Galileo's conflict with the Church in the seventeenth century, at heart they were still epistemological, i.e. to do with the acquisition of knowledge and not, as has been popularly thought, due to a straightforward conflict between science and religion.

2.4 Darwin and "Natural Selection."

Charles Darwin, the English naturalist, (1809-1882), brought to fruition ideas which had been discussed by several biological writers in the first half of the nineteenth century. Earlier he had read Malthus' Essay, from which he derived his idea of the struggle for existence and the survival of the fittest, and Lyell's Principles, which helped formulate his general doctrine of evolution. Though both ideas were held at that time, and in some respects held together, Darwin was the first to bring them together adequately in his explanation of how evolution takes place.[22]

He directed his attention to variation in the species, studying persistence, origin and fate. His theory of "natural selection" was

that some members of a species survived better than others because of differences in their characteristics, which fitted them better under the conditions of their environment. Since these lived longer and were the ones to reproduce, the variations which were passed on to the next generation tended to be the favourable ones which enabled, therefore, the survival of the fittest.

His major work, On the Origin of Species by Means of Natural Selection, was published in 1859, provoking acrimonious opposition from some churchmen and others who held a doctrine of the special creation of man. In 1871, Darwin published The Descent of Man in which he argued that "man and the anthropoid apes must have a common ancestor."[23] Darwin did not like using the word "evolution," but preferred to refer to this problem in biology as "the species question," as he wished to confine his interests to the evidence he had gathered rather than construct a metaphysical theory out of his observations. However, his conception of how the species had developed still drew enormous opposition from the ranks of scientists and churchmen alike.

In the world of science he was opposed by Sir Richard Owen (1804-1892), a Scottish palaeontologist of considerable importance,[24] and Jean Louis Rodolphe Agassiz (1807-1873), a Swiss biologist and well accomplished in his field.[25] Both these men followed the "idea" or "type" of Goethe[26] (1749-1832) and Cuvier[27] (1769-1832), who adhered to the fixity of species. Cuvier, in particular, was opposed to evolutionist approaches. This opposition was reflected in the basically hostile reaction to Darwinism in France, where Cuvier's influence was still predominant.

Even in Germany, where Darwinism was readily accepted, this was

still with reservations, mainly because of weaknesses in the theory. Albrecht Kölliker (1817-1905), a Swiss, was one of the ablest critics of Darwin's position.[28] His three major criticisms are enumerated by Singer as follows -

1. Absence of any experience of the formation of a species.

2. Absence of any evidence that unions of different varieties...are relatively more sterile than unions of the same variety.

3. Extreme rarity of true intermediate forms between known species, whether living or fossil.[29]

Kölliker's concern was that Darwin's theory could not be tested by experience, (i.e. the mechanism rather than the results of its operation). In this respect Kölliker was correct. The appeal of the theory lay not in the comprehensiveness of the evidence but in its comprehensive explanation of the available data. Nevertheless, despite the inadequacy of Darwin's understanding, his importance historically is that his principle of natural selection revolutionized biological thought and virtually affected all other areas of thought as well.[30]

Much doubt was cast on the mechanism of evolution proposed by Darwin once the work of Gregor Mendel (1822-1884) was rediscovered in 1900, bringing with it a specific view of inheritance, which indicated the incompleteness of Darwin's theory. Singer summarizes these and later developments aptly by saying -

> In the twentieth century, with the rise of genetics and the mathematical treatment of natural selection, the "species question" seems nearing an answer, though this cannot be simple or probably the same for all groups of living things. In the wider range of thought, whether in science, or philosophy, or religion, or economics, or literature, or even in the higher arts, the "evolution idea" is triumphant though its identity with "progress" has long ago passed into the limbo of wishful thinking.31

Darwin's basic theory of natural selection, in its modern formulation in terms of the later understanding of genetics, is now generally regarded as correct, as R. J. Berry in his article "Natura non facit saltum" has indicated.[32] What is still disputed is its completeness. However, recent alternative theories are usually presented as complementary to, not exclusive of natural selection.[33]

2.5 Darwin's Conflict with Christian Doctrine.

Darwin's theory contradicted two basic assumptions which had been part of established thought including theological thought. He argued that existing species had evolved from a common ancestry, had survived the struggle for existence and now existed in their present form as a result of chance, not of design. A very large number of variations had not survived, which accounted for the obvious gaps in the observed species. Those which had survived were able to do so because they were adapted to their circumstances.

If Darwin's theory was correct, the long-held view that each species was created in its present form would be overthrown and so would the assumption which supported it, viz. that species existed as they did because these was a purposive end for which they were created. Further, if in fact his arguments concerning common ancestry were true, then belief in man's elevated and unique place in creation was under threat.

The debates which ensued contributed little to assessing the truth of his theory, since many of those who opposed his views had little understanding of the issues involved. Instead, ridicule and

accusations of Darwin's lack of originality were used as the means of dispensing with the theory.[36]

A case in point was the clash between Bishop Wilberforce and Thomas Huxley at the meeting of the British Association in Oxford in 1860. Huxley effectively countered Wilberforce's rhetoric, rebuking the bishop for his ignorant interference. Sir John Lubbock, later Lord Avebury, added weight to the Darwinian view, by explaining the embryological evidence for evolution.[36] The irony is that in later years it was to become clear that Darwin and his followers had greatly underestimated the complexity of life.[37]

The difficulty of such clashes was that whilst Christian theology lacked an adequate means for establishing the truth of its claims, it was unable to deal with challenges from science to its basic doctrines about the nature of man and his relation to the world. Defensive arguments only served to raise the ire of Darwin's supporters. Able thinkers and debaters such as Huxley took up the offensive against religion. The antagonism was mutual.[38]

The ferocity of these conflicts with the claims of Christian belief only served to confirm the scientists' resolve to guard their new-found autonomy jealously, whilst theologians went to even greater lengths either to insulate the claims of theology from rational enquiry or so to liberalize theological doctrines that any intellectual conflicts were conveniently removed. This was not without considerable loss to the identity of Christian belief. In the long term, these attempted resolutions failed to satisfy theology's critics. The sharp separation and compartmentalisation of science from religion which followed was virtually inevitable.

Contemporary interest to relate science and theology has mostly

been concerned with accommodating theology to evolution and examining the implications of this move on Christian doctrine, particularly with respect to creation.[34] Despite the fact that work in this field has made a valuable contribution to theology, their limitation is that they have not directly touched the heart of theology's problems. The main concern has been with how one thinks about God if evolution is true. The question of how one acquires knowledge of God in the first place has not been addressed.

Though the precepts of evolution must certainly be taken into account in twentieth century theologising, it is methodologically unsound to adopt the assumptions of any metaphysical system as the foundation of theology. (See discussion in 4.2 and Chapters 8 and 9). As we have already seen, the reconciliation of Christian theology with the concepts of the Aristotelian thought-world proved problematical when those assumptions were called into question and overthrown. The credibility of theological reflection needs to be established in its own right if theology is to be viable.

2.6 Summary of the Issues.

From the above detailed examination of the historical context of the Church's conflict with Galileo in the seventeenth century (1.3 to 1.6) and the controversies with Darwin in the nineteenth century (2.4 to 2.5), it should be obvious that these were not straightforward conflicts between science and religion. The issues were far more complex in each instance. The close analysis of these has indicated that profound matters were at stake, and that the circumstances of these conflicts were in fact only a manifestation of deeper concerns.

It has generally been thought that the main cause was a crisis of world-view, brought about by the revolution of thought at the rise of modern science. However, I have argued that this interpretation needs to be expanded.

Contrary to the popular view that the Church's conflicts with Galileo and Darwin were two instances in which the Church's doctrines were at odds with the findings of scientific research, I have argued that the real disagreements were metaphysical, epistemological and methodological. These ultimately were related to the fundamental issue of how one acquires knowledge and ensures that it is trustworthy. The source of the conflicts can be traced to the rise of modern science when Galileo instituted an empirical method which was brought to completion by Newton and which demonstrated its enormous effectiveness by solving science's problems. Theologians were unable to produce an approach which could enjoy comparable success. Subsequently, the successful practice of science led to findings which not only undermined the authority of the former Aristotelian world-view within which theological thought had been cast, but challenged the whole basis of knowledge and the methods by which knowledge had formerly been acquired. The loss of respectability for theology was at heart concerned with these issues and its inability to demonstrate its credentials in the face of such formidable challenges from the thought-world of science.

One of the serious dilemmas confronting theologians to-day is to find a way to maintain intellectual rigour on the one hand but still retain what is essential to theology on the other. In order to come to terms with this problem, theologians must first determine what is essential to Christian belief. They must then find a means of

resolving the dilemma of how to hold what is essential to theology without compromising the intellect.

The whole burden of these two chapters has been to attempt to show from an analysis of relevant aspects of the History of Science that the crucial point at which theology has continually foundered has been where it has been unable to map a pathway to indicate how its knowledge is acquired, and how the truth of that knowledge is established.

This fact emphasizes all too poignantly the crucial need for theologians to address themselves to the central questions, viz. whether it is possible to vindicate theology, and, if so, what kind of approach will prove adequate for the task. It is for this reason that these matters have been made the crux of this thesis.

2.7 The Question of being "Queen."

Whereas in the early and late Middle Ages theology held the position of "Queen of the Sciences," in the twentieth century that situation has been reversed. Science has risen to supremacy, becoming "Queen," whilst the viability of theology as a serious intellectual discipline is now seriously questioned by many.

The idea that any discipline should be "Queen" is, however, highly dubious. This is because the same problems which existed when theology was "Queen" apply equally in the case of science. By this I am referring to the state of affairs when a branch of thought is universalized into a whole metaphysical system.

In the case of the "philosophers'" philosophy of science (2.1 and 2.2), it was observed that when science was made into an all-embracing

system of thought, grave difficulties arose because its reflection had become detached from empirical foundations and it was used as a determinative framework for judging the truth or falsity of all other areas of thought, even ones in which such canons were clearly inappropriate.

In Chapter 5, I shall discuss the science/arts relation and endeavour to show that the dominance of any one discipline over all others arises from a mistaken understanding of the subject matter of each discipline and the nature of their relations to one another in the universe. I shall attempt to show that the model should be one which respects interdisciplinary exchange rather than one which strives for dominance to the exclusion or near exclusion of other avenues of research. (See 5.2.4 and 9.7).

2.8 Science as the Paradigm of All Knowledge.

It could be said that my argument so far appears heavily to favour the paradigm of knowledge in the empirical sciences as the paradigm of all knowledge. However this is not the case at all. The methods of enquiry appropriate to science are certainly not directly applicable to the social sciences, the traditional arts disciplines, or for that matter theology. One does not need even to reflect on that matter. However, the fact that modern science has been able to establish approaches to its subject matter, the principles for which are assessable and testable, has afforded it the means of practising its discipline with enormous success. The burning question is whether other disciplines can achieve comparable success in their search for knowledge; not whether they must use the same methods as science,

methods which are so obviously inappropriate when applied to other contexts.

Despite this, some may still argue that scientific knowledge is "objective" whereas knowledge in the traditional arts disciplines, and more so in theology, is "subjective." The question of theology's validity therefore still remains in grave doubt. This is a problem to which we must now turn. In the ensuing chapters I shall pursue the question of whether the credibility of theology can be defended and, if so, what kind of approach is necessary in order to achieve this.

CHAPTER THREE

OBJECTIVITY AND THE ACQUISITION OF KNOWLEDGE (1)

The belief that scientific knowledge is "objective" and knowledge in the traditional arts disciplines (e.g. history, literature and theology), "subjective" has long been challenged. Despite this fact the belief continues to be held in the popular mind. This is not only because the issues involved are complex and therefore difficult to absorb, but also because the belief itself rests on a view of science which, in the light of current debate, is now thought to be an inadequate appraisal of the actual practice of science. It is therefore pertinent at this juncture to re-examine the basis of this belief.

Of course, I am well aware that, even if the dichotomising of the sciences and arts as objective and subjective respectively should prove to be incorrect, it could still be argued that it is highly questionable whether theology, on the basis of its past practice, can be classed as a traditional arts subject anyway. However, that is an issue which I shall have to take up at a more appropriate point later when I discuss the status of theological "knowledge" in Chapters 7, 8 and 9.

In the meantime, it is important first to settle the question of whether the classification of scientific knowledge as "objective" and knowledge in the traditional arts disciplines as "subjective" is acceptable.

3.1 The Concept of Objectivity.

In the past the concept of objectivity has been popularly associated with ideas of detachment (i.e. that researchers conduct enquiry independent of and without reference to any theoretical viewpoint) whereas the concept of subjectivity has been associated with ideas of personal bias (i.e. that the enquiry of researchers is so biased to a particular theoretical viewpoint that independence of thought is lost). It has also been assumed that objectivity is achieved as a result of the methods of the natural sciences, which are empirical, and that subjectivity prevails wherever the methods of enquiry are necessarily non-empirical, as for instance in the traditional arts disciplines.

Partly because the methods of natural science have been associated with notions of objectivity and detachment and partly because there has been a growing awareness of the necessity of critical methods in research, an increasing number of academics, particularly in the social sciences, in history and linguistics, have attempted to approximate their methods to those of the natural sciences. Theology has not been without its representatives in this attempt either. The intention behind such moves is obvious: if the methods of science can achieve objective knowledge, then those self-same methods, adapted to another field of enquiry, should ensure objectivity for that field as well.

The problem with approaches such as these is that they assume that the methods of science guarantee objectivity. However, as Mary Hesse has pointed out in The Structure of Scientific Inference,[1] and more recently in Revolutions and

Reconstructions in the Philosophy of Science,[2] the assumptions underlying this concept of objectivity have "been subjected to damaging criticism."[3] The historical background to this situation can be stated very briefly.

In the nineteenth and twentieth centuries there arose the schools of philosophical thought known as "positivism" and "logical positivism" respectively. These schools argued that only science and those branches of thought which could claim to be modelled on scientific methods should rightly be designated "knowledge." Emphasis was placed on "observation," and only those statements which could be verified by sense experience were accepted as true, since they were supposed to be independent of the effect of any beliefs held by the observer. Consequently, that which arose from introspection, insight and creativity was seen as belonging to subjective psychology, and not the concern of philosophy or logic.[4]

However, the ideals of objectivity implicit in these forms of positivist thought were to be subject in the twentieth century to two major criticisms. The first of these, though still basically positivist, was conducted along logical lines and did in fact change the face of earlier positivist thought.[5] This approach was pursued by thinkers such as Carnap, Hempel, Nagel, Braithwaite and Popper. By presupposing the methods, tools and rigour of mathematical logic, they endeavoured to justify science as a logical enterprise. The main difficulty with such approaches was that they reduced the principles of knowing to a limited aspect of science, viz. the results of observation and experimentation, overlooking the important role of a number of rational procedures which are also fundamental to the acquisition of knowledge in science. As a consequence, the canons of

objectivity which they identified were limited and did not provide an account that was in any way comparable with the actual procedures which are used to achieve objectivity in the practice of science. The philosophies of science which they offered were therefore quite inadequate.

In this respect it should be noted that Karl Popper's principle of falsifiability was a decided advance on the attempts of the others to find the logical criteria for scientific knowledge. However his work was still open to criticism on a number of counts. The main problem was that he failed to recognize that in addition to using the canons of formal logic together with the findings of experimental evidence to falsify an hypothesis, scientists also have to rely on non-formal canons of right reasoning to arrive at their theories, formulate better hypotheses, make new discoveries and follow through the implications of their research. Scientific decisions are not made solely on the basis of an ideal of falsifiability through deductive logic as he implied.[6]

The second criticism of the older positivist ideals of objectivity was made along historical lines and constituted a much more radical criticism of the older style positivism than the logical approaches, just referred to above. It went much further, rejecting not only the positivist ideals of objectivity but the entire attempt to construct a philosophy of science along logical lines. This approach was pursued by thinkers such as Kuhn, Feyerabend, Toulmin and in some respects Quine. Instead of seeking logical criteria, they endeavoured to arrive at a philosophy of science by appealing to historical examples drawn from the practice of science and by arguing from the development of scientific thought. In so doing, they were

successful in undermining a number of positivist ideals by showing the theory-dependence of observation and experimentation. However, as Hesse has pointed out, this was achieved at a price. The outcome of such approaches was a form of historical relativism.[7] They described science either "...wholly within its own context, without 'external' judgements of validity" or as a discipline whose judgements were made "...relative to the consensus of a scientific elite."[8]

Thus, though the logical and historical approaches were successful in undermining the positivist ideals of objectivity which had dominated nineteenth and twentieth century thought, the models of scientific knowledge which they proposed as replacements for those of positivism were unacceptable because in one respect or other they were inadequate as accounts of the actual practice of science.

A <u>via media</u> has been proposed by Hesse to avoid the dual pitfalls of logical formalism on the one hand and historical relativism on the other. She has maintained that there are basic criteria operative in scientific practice by which groups of scientists judge the truth-value of their theories, and that these possess an internal logical coherence and rationality. Her approach has been to study the logical structure of science as a means of resolving epistemological issues (i.e. those concerned with the theory of knowledge) and also ontological issues (i.e. those concerned with the theory of what kind of things there are).[9]

Much of her work is thus extremely relevant to the present discussion concerning the concept of objectivity and the acquisition of scientific knowledge. (See 5.2 below). However, there is one important reservation in respect of her criticisms of historical approaches which must be made clear from the outset.

Though she has been rightly critical of the manner in which historical approaches have abandoned the search for logical criteria of truth, and has suggested a via media between the pitfalls of logical formalism and historical relativism, (a way which would include "notions of empirical truth-value and of logical inference,")[10] it must be emphasized that throughout this thesis I shall be arguing that such a pathway can only be mapped out successfully if it is done with full reference to the actual practice of science. If this is not ensured, the resulting philosophy of science will again suffer from inordinate distortion. It will have become detached from those very constraints in scientific practice which constitute the canons of objectivity.

As we saw in the discussion in Chapter 2 (2.1) and again at the beginning of this section (3.1), the historical roots of the philosophers' philosophy of science, which hardened into rationalism, empiricism and positivism, can be traced to this basic oversight. So, though Hesse's criticism of the pragmatic appeals of historical approaches to the philosophy of science must be taken utterly seriously because of the problem of relativism, it is important to stress that for a philosophy of science to be adequate it must nevertheless still be constructed with full reference to the history of its practice, i.e. "to what scientists actually do, and how they actually think."[11] Otherwise it will fail to elucidate the actual principles of science.

It is one thing to develop a model for scientific knowledge on the basis of the kind of historical appeals to which Mary Hesse has objected and described as "pragmatic, intuitive, subjective and ultimately polemical explanations and justifications of the

development of science."[12] Such undertakings have generally been unconcerned with the actual principles of science and have therefore barely given an account of them. However, it is quite another thing to analyse the practice of science as fully manifested in its history in order to identify the principles of judgement which science employs, particularly with reference to the question of achieving objectivity.

It is the latter procedure which I am attempting in this thesis, as the means of determining the concept of objectivity which is applicable to the acquisition of scientific knowledge. Once this concept is established, it will be possible to identify the criteria by which scientists judge that the knowledge they have acquired is objective.

I shall pursue this matter in three stages. Firstly, I shall attempt to show how the concept of objectivity, as understood in the actual practice of science, differs from the popular ideals of objectivity which were initially propounded by positivist philosophy (3.2, 3.3 and 3.4). Secondly, I shall endeavour to isolate the principles which are operative when scientists believe they have achieved an acceptable level of objectivity (4.1, 4.3 and 5.2.3). Thirdly, I shall discuss the issues currently engaging philosophers of science and highlighted by Hesse in her objections to historical as well as sociology of knowledge approaches to the philosophy of science, viz. the debate concerning reference and realism, and whether scientific knowledge is genuine knowledge (5.3, 5.4, 6.1, 6.5 and 6.6).

Though the discussion of the above will necessarily extend over the remainder of this and the next three chapters, it is crucial that

this analysis be made. For it is my contention that the case for the validity of theology as an academic discipline is contingent on the resolution of these issues. This is because when the principles by which science achieves credibility for its knowledge are established, we will then be in a position to discuss whether the methods of theology are capable of satisfying those principles, and, if so, whether theology is also able to gain access to a reality comparable to that achieved by other disciplines in general, and science in particular.

For the present, we must turn to the first stage of the task and deal with the most basic issue, viz. the concept of objectivity in the natural sciences. In the following discussion, I shall endeavour to show why the popular belief that there is a dichotomy between scientific knowledge, which is presumed to be detached and objective, and knowledge in the arts, which is presumed to be biased and subjective, is not acceptable. A closer examination of the practice of science will, in fact, overwhelmingly indicate that scientists do not think that objectivity is guaranteed by their methods; on the contrary, knowledge is only deemed to be objective by scientists if, in acquiring that knowledge, a number of essential principles has first been satisfied.

3.2 Objectivity and Scientific Practice.

In the 1950's writers such as Michael Polanyi and Arthur Koestler seriously questioned the popularly held view that the sciences were objective and the arts subjective. Although the contributions of these two thinkers are more illuminative than they are instructive, as

will be obvious from the discussion below, their writings provide an apt and important basis from which an examination of the concept of objectivity and its relation to scientific practice can fruitfully be pursued. For this reason, I shall briefly consider their thought seriatim.

In 1958 Polanyi published Personal Knowledge,[13] which, in his own words, "greatly expanded"[14] themes which he had delineated in an earlier publication, Science, Faith and Society.[15] His continuing enquiry into the concept of knowing eventually resulted in his book The Tacit Dimension,[16] published in 1967, in which he endeavoured to enunciate his understanding of "the structure of tacit knowing."[17] In so doing he made two assumptions which bore directly on crucial philosophical and psychological points in respect of the acquisition of knowledge. In the first instance Polanyi held that there is a rationality in the world which is inherent and which commands our regard.[18] In the second instance he proposed the view that we possess "tacit powers" by which we are able to recognize and reflect on what is rational, thus achieving a deeper understanding of reality.[19]

Polanyi was convinced that the old ideals of objectivity were absurd since they overlooked the essential role of human agency in all knowing. He therefore sought to re-examine the concept of objectivity by analysing the procedures of scientific practice. It was from reflecting on this analysis, together with the insights obtained from his understanding of Gestalt psychology, that he arrived at his conclusions.[20] Needless to say he was well aware that his critics, still wed to the old ideals of objectivity, would judge his analysis as "a piece of mystery-mongering."[21] Hence, in Personal Knowledge

he said -

> To say that the discovery of objective truth in science consists in the apprehension of a rationality which commands our respect and arouses our contemplative admiration; that such discovery, while using the experience of our senses as clues, transcends this experience by embracing the vision of a reality beyond the impression of our senses, a vision which speaks for itself in guiding us to an even deeper understanding of reality - such an account of scientific procedure would be generally shrugged aside as out-dated Platonism: a piece of mystery-mongering unworthy of an enlightened age.[22]

It is obvious from Polanyi's writings that he thought his position could be vindicated by paying attention to the psychological aspects of knowing and by adopting a more judicious approach to the overall question of the nature of scientific enquiry.[23] That these hopes were not entirely fulfilled can possibly be accounted for by two factors.

The first is a matter of historical circumstance and need only be noted, viz. that at the time at which Polanyi was writing, the vast body of relevant research and literature, which was to become available in the human sciences (e.g. on consciousness and cognitive processes)[24] and the philosophy of science (e.g. on realism and reference),[25] and which would have greatly enhanced his study, was not in existence. The second is of more concern in that Polanyi was prepared to work with his notions of "inherent rationality" and "tacit powers" without submitting these to careful analysis. As a consequence, not only did his otherwise comprehensive work suffer, but he left his argument open to the justifiable criticism that it masked critical epistemological questions. (See discussion 6.2 below also).

Later in this discussion it will be seen that a very similar criticism can be made of Arthur Koestler's writings on related issues, though for entirely different reasons. Nevertheless, I have brought

Polanyi and Koestler into this discussion, because they have both drawn attention to vital factors which are operative in the acquisition of scientific knowledge and which, in the past, have been overlooked. This oversight, it will be seen, has left us with a highly distorted account of how objectivity is obtained in the natural sciences. It is therefore essential that the insights which Polanyi and Koestler have provided should be considered carefully, notwithstanding the fact that they can each be criticized for lacking a sufficiently critical edge to their thought.

The strength of Polanyi's argument is that he has rightly identified that when claims are made that scientific knowledge is objective, the personal participation of the knower in acquiring that knowledge is generally ignored. It has then been assumed that one of the factors which renders knowledge objective is that it has been acquired by strictly impersonal and detached means.[26] Polanyi argued that this was positively misleading, for even in science we need the skilful comprehension of an agent before that which <u>can be known</u> is <u>actually known</u>. Without the agency of a knowing subject, we would be incapable of acquiring any knowledge whatsoever. Hence, to conclude that the participation of a human agent in the act of knowing rendered that knowledge subjective would be absurd. In the past, not even scientists have thought it necessary to judge the knowledge they have obtained subjective on the grounds that its acquisition was dependent on the participation of a knower. Therefore, the view that personal participation is a barrier to achieving objectivity must be regarded as incorrect.[27]

However, Polanyi did not wish to claim that the participation of an agent in the act of knowing was immune from subjective influence.

On the contrary, he made a great deal of this point, insisting that skills, connoisseurship, commitment, intellectual powers and passions were all significant components of the act of knowing.[28] These, he said, made science as vulnerable to personal bias as they did all other forms of enquiry.

It is worthwhile noting at this point that the recent publication of W. Broad and N. Wade, Betrayers of the Truth,[29] on fraud and deceit in science, corroborates only too well this last point of Polanyi's.

The main target of Polanyi's opposition was the positivist philosophers, discussed above (3.1), who claimed that true statements were those which could be verified through sense experience and who denied that reasoning was an indispensable component of the whole process of knowing. As we also noted above, the positivists classified introspection, insight and creativity as the concern of subjective psychology and not the concern of philosophy or logic. Accordingly, they placed no importance on the rational content of these or any other elements in scientific thought. Sense experience was the ultimate verifier of true statements. In refuting their views, Polanyi argued that immediate experience was more open to the effects of personal bias than theory, since theory, at least, was not subject to personal fluctuations![30]

Though it is neither appropriate nor possible within the limited space of this thesis to discuss in full Polanyi's case against positivism, it is important to note that he could have added much more weight to his objections and have provided a far clearer account of the concept of objectivity had he given greater attention to discussing how rigour is actually obtained in scientific practice,

viz. through procedures which meet a number of essential principles. (For fuller details of these principles see 4.3 below). Surprisingly, his writings emphasized the psychological and philosophical aspects of the act of knowing but gave minimal treatment to the procedures and principles which are used to achieve independent results in science. As a consequence, the effect of his opposition to the positivist ideals of objectivity was very much diminished. I shall be arguing below that these very procedures and principles are as important to consider as the psychological and philosophical factors which are naturally operative in the acquisition of knowledge (4.3, 5.2 and 6.1).

In the meantime, attention must be given to a further insightful aspect of Polanyi's thought which is related to the point made initially concerning the participation of a knowing subject. What determines objectivity, he contended, was not whether we can know something without the agency of a knowing subject, but whether the knowing subject is in touch with what he called "a hidden reality."[31] Knowing, he maintained, was the active comprehension of that which is capable of being known.[32]

In this respect his argument was twofold. Firstly, he held that reality is an "inherent quality" not immediately obvious to sense experience but apprehendable by rational means. Contrary to the ideals of objectivity propounded by positivist philosophy, which claimed that objective knowledge consists of an accumulation of observations available to the senses, Polanyi insisted that an analysis of scientific discovery indicated that in actuality scientists, sensing the intimation of a hidden reality from a number of clues, apprehended a vision of reality <u>prior to</u> formulating

their theories and prior to experimentation.[33] Secondly, he maintained that this apprehension was possible because man possessed the intellectual power for recognizing the rational features in nature.[34]

Although positivist philosophy in the nineteenth century condemned such views as "metaphysical" or "mystical," Polanyi argued that their own approach to scientific research belied their position. For instance, Ernst Mach (1838-1916), one of its earliest exponents, founded the Vienna school of positivism through his book Die Mechanik, published in 1883. Mach rejected the view that the human mind was actively involved in the formulation of scientific theory. He held that scientific theory was no more than a summary of sensory experience.[35]

The irony of the situation, said Polanyi, was that it was Mach's writings which had such a deep influence on Albert Einstein (1879-1955). Mach had been very critical of Newton's definition of space and absolute rest since he argued that there was no way this claim could be tested by experience. He therefore condemned Newton's views as dogmatic and meaningless, arguing that Newtonian dynamics should be reformulated in such a way that any reference to movement of bodies should be cast "as the relative motion of bodies with respect to each other."[36]

It was this latter insight concerning Newtonian dynamics which, according to Polanyi, profoundly influenced Einstein as a boy, and which later was to bear significantly on his discovery of relativity. The irony was that Mach, who rejected the role of insight in the formulation of scientific theory, was himself to suggest an alternative theory which relied on just such an insight and which in turn was to

feature significantly as a catalyst in the formulation of Einstein's theory of relativity.[37] Says Polanyi -

> Mach's great merit lay in possessing an intimation of a mechanical universe in which Newton's assumption of a single point at absolute rest was eliminated.... Its power lay precisely in that appeal to rationality which Mach wished to eliminate from the foundations of science.[38]
>
> When Einstein discovered rationality in nature, unaided by any observation that had not been available for at least fifty years before, our positivistic textbooks promptly covered up the scandal by an appropriately embellished account of his discovery.[39]

R. W. Clark in Einstein: The Life and Times[40] gives details of Einstein's own description of his discovery which largely corroborate Polanyi's account.[41] (See also further discussion of this matter in 6.1.3).

There are another two difficulties which arise from Polanyi's views. His position rests on two major assumptions, concerning the objective status of rationality and the function of intellectual powers, which are left virtually undefended.

Firstly, the question concerning the existence of an external reality that is accessible to rational enquiry is a philosophical issue of paramount importance. On it hangs the question of whether it is possible to have knowledge of our world at all. As far as theology is concerned, the possibility of God's existence and our knowledge of him also partly turns on this issue. By merely assuming that rationality was inherent, Polanyi very much weakened his own argument. Since fundamental epistemological questions are at stake, an examination of these matters will be taken up below (6.1, 6.5 and 6.6).

Secondly, though his argument on the nature and function of intellectual powers in the act of knowing highlights the indispensable role of rational reflection in scientific practice, he makes no

attempt to delineate the precise ways in which the psychological aspects of knowing are connected with logical thought. He merely asserts that a relation exists. His failure to discuss this issue explicitly leaves his concept of tacit knowing supported only by the structures of Gestalt psychology, with no mention of how these connect with the logical structures integral to scientific reasoning. In a later discussion on scientific discovery I shall endeavour to show how both psychological and logical functions connect in reaching new insights in the whole process of knowing (4.1 and 4.2).

Before doing so, it is important to examine the contribution which Arthur Koestler has made to this debate.

3.3 Insight and Discovery.

In The Act of Creation[42] Arthur Koestler endeavoured to examine the psychological process of discovery. The particular subject of his enquiry was the "spontaneous flash of insight" experienced by people in the arts and sciences when they make a discovery.

In an earlier publication, The Sleepwalkers,[43] Koestler described his interest as being in "...the obscure workings of the creative mind."[44] [My emphasis]. Now this is precisely where the difficulty lies in his writings. He was apt to leave one with the impression that creative activity is, in itself, mysterious and ecstatic.[45] However, I shall be arguing that there is much research now available which indicates that there is an examinable basis and structure to creative thought, i.e. it is not as obscure as Koestler suggested. This is not to deny that ecstatic joy and a sense of awe may be experienced when a substantial discovery is made. What

is denied is that ecstasy and mystery are in themselves the bases of a creative act (4.1.1).

Nonetheless, as with Polanyi, Koestler's study illuminates vital aspects of the knowing process which are generally not taken into consideration. This is why his thought needs to be brought into the present discussion.

Koestler distinguished the experience of "a spontaneous flash of insight" from the routines of normal associative thought, describing it as a "creative leap."[46] Prior to such an experience a number of predisposing psychological factors could be identified as well as a number of cognitive factors.

Of the predisposing psychological factors, he said that there were basically two. The first is the presence of intellectual frustration when a person is confronted with a difficult problem. This he called a "blocked situation."[47] The discovery of Archimedes' principle, he said, was an example of one such situation. Archimedes (287-212 B.C.), Greek mathematician and physicist, was confronted with the problem of determining whether the crown Hiero had been given was made of pure gold or not, without impairing the crown in any way. The frustration of the "blocked situation," he argued, increased stress, providing greater motivational impetus to solve the problem.[48] Hence, says Koestler -

> One day, while getting into his bath, Archimedes watched absent-mindedly the familiar sight of the water-level rising from one smudge on the basin to the next as a result of the immersion of his body, and it occurred to him in a flash that the volume of water displaced was equal to the volume of the immersed parts of his own body - which therefore could simply be measured by the pint.[49]

The second predispositional psychological factor is what he called the "period of incubation."[50] This is when the whole

personality, including the "...unverbalized and unconscious layers...become saturated with the problem, so that on some level of the mind it remains active...until either chance or intuition provides a link to a quite different matrix...".[51]

Of the cognitive factors, Koestler identified three. First, in seeking a solution to the problem, one sees a connection between one situation and another as the clue to resolving the problem in the former. This he called "the discovery of hidden analogies."[52] The process, he said, occurs either by way of "...conscious, logical reasoning aided by chance,"[53] as in the case of Louis Pasteur (1822-1895), (see details immediately below), or through unconscious processes. As an instance of how the unconscious processes functioned in discovery, he cited the example of Friedrich August Kekulé (1829-1896), Professor of Chemistry in Ghent, whose significant dream of a serpent biting its tail was to provide a model for molecular constitution which was to revolutionize organic chemistry.[54]

It is important to note that before Kekulé's dream there was a period of seven or eight years in which he was preoccupied with the problem.[55] The vision of the serpent biting its tail was the last of a series of such dreams, but it was this one which suggested to Kekulé his revolutionary theory "that the molecules of certain important organic compounds are not open structures but closed chains or 'rings.'"[56] Koestler argued that the connection the discoverer makes, whether conscious or unconscious, is in fact that of seeing an analogy between one set of circumstances and another. However, this insight is dependent on a second factor being present.

The second cognitive factor is that of "ripeness."[57] In this regard he again cited Pasteur, who recognized that the principles of

the naturally occurring immunology for smallpox by injection with the cowpox could be generalized into a technique which could be applied to all infectious diseases. In order to illustrate his idea of "ripeness," Koestler points out that Pasteur was familiar with Edward Jenner's work on vaccination, published in 1798,[58] in which patients could be immunized against smallpox by an injection of the material taken from the skin sores of cattle. However, for nearly a century, though vaccination was practised in Europe and America, the principles underlying it were thought only to apply in the case of smallpox. Further, Pasteur had already established that a number of afflictions such as cattle fever and rabies were caused by micro-organisms.

The "ripeness," argued Koestler, is given by the discoverer being already aware of certain facts or ideas. Because Pasteur was acquainted with Jenner's work and was predisposed to the thought that something like vaccination was the best way of controlling infectious diseases,[59] and because he had already established that disease was caused by micro-organisms,[60] the situation was "ripe" for him to bring these two frames of reference together. The result was his accidental discovery of attenuation and his recognition of the means by which a general technique for vaccination could be established that no longer had to rely on the chance natural occurrence of an immunizing agent in some host organism.[61]

In order to appreciate the force of Koestler's argument about predisposing cognitive factors, it is necessary to understand the details of Pasteur's discovery.

In the spring of 1879 Pasteur was studying chicken cholera, a disease which led to the sudden death of fowls. His discovery of

"attenuation" or the weakening of the virulence of micro-organisms came about when he was experimenting with cultures of the bacillus for chicken cholera. He was attempting to isolate the micro-organism in a pure culture so that it could be injected into the hens and prove his case that chicken cholera was caused by that microbe. By accident the cultures were left in the laboratory over the summer. In the autumn, when he resumed his work, he found to his amazement that the chickens injected with the bacillus which had been left out over the summer suffered only slight illness and recovered. Thinking that the old cultures had been spoilt, he injected the same chickens with a fresh culture of virulent bacilli and in addition injected a new batch of chickens with the fresh culture as well. The chickens injected with only the fresh culture all died whereas those which had also received one injection of the so called "spoiled" culture all survived. Pasteur realized that, in the case of the old cultures, attenuation, i.e. a weakening of the virulence of the microbe, had taken place.[62]

According to Koestler, an eye-witness' account of the scene when Pasteur was told of this curious development was as follows -

> He 'remained silent for a minute, then exclaimed as if he had seen a vision: "Don't you see that these animals have been <u>vaccinated</u>!"'[63]

Koestler goes on to say -

> The vision which Pasteur had seen at that historic moment was, once again, the discovery of a hidden analogy: the surviving chicks of the first batch were protected against cholera by their inoculation with the 'spoilt' culture as humans are protected against smallpox by inoculation with pox bacilli in a modified, bovine form.[64]

A fuller and more precise record of Pasteur's discovery of attenuation and the ultimate generalization of this process to the creation of vaccines can be found in R. Harré's <u>Great Scientific</u>

Experiments.[65] Harré notes that having discovered attenuation, Pasteur set about determining the precise time intervals necessary before attenuation occurred. He found that when the culture for chicken cholera was left for a period which was greater than one month, attenuation came about. However, his attempts to identify the factors operative in the process were not successful.[66]

Despite this, Pasteur had found a method for decreasing the virulence of microbes progressively and of artificially creating vaccines for diseases which afflicted man. The success of this method was demonstrated publicly on 5th May, 1881, at Pouilly le Fort. By then, Pasteur had established in his laboratory that the anthrax bacillus attenuated in eight days. At the great anthrax experiment at Pouilly le Fort, he injected an attenuated anthrax strain into twenty-four sheep, a goat and six cows. On 31st May, all thirty-one animals which had been vaccinated were injected with a fully virulent culture as were an additional twenty-nine unvaccinated ones. By 2nd June, no sign of the disease could be detected in the vaccinated animals, whereas by that evening all the unvaccinated sheep had died and the unvaccinated cows were seriously ill.[67]

It is important to note from Pasteur's own report and from other sources that his discovery of attenuation and the subsequent insights he gained from his experimentation are far less ecstatic than Koestler's telling of them.[68] This difference is significant and will be discussed below (3.4), for it will be seen from this that the role of theory is as functionally important in the making of discoveries as are predisposing psychological and cognitive factors. This is a fact which Koestler tended to overlook. Nevertheless,

Koestler's insistence that certain psychological and cognitive factors are essential elements of the knowing process needs to be taken into account. His citing of Pasteur's discovery was specifically to exemplify two of these cognitive aspects, viz. the resolution of problems by connection of one set of circumstances with another by seeing an analogy between them, and the function of "ripeness" as a necessary condition of the making of these connections in the first place.

Though it was simply a series of logical steps which in the end led Pasteur to his conclusions, Koestler's point is that predispositional cognitive factors, viz. the "ripeness" of situation and the making of analogical connections, were necessarily present before it was possible for attenuation to be discovered or for the accident to be exploited to the benefit of science. As Pasteur himself was later to say, "Chance favours only the prepared mind."[69]

This brings us to the third predisposing cognitive factor mentioned by Koestler, viz. the creative act. Quoting Pasteur's case again, Koestler noted that the situation was not only ripe for the two frames of reference to be brought together, in that he had an exceptional grasp of the rules of both as well as a chance occurrence in the laboratory, but that he actually made the connection between <u>unrelated</u> dimensions of experience, viz. the world of vaccination and the world of micro-organisms. This act, Koestler held, was a creative act of the mind, which "uncovers, selects, re-shuffles, combines, synthesizes already existing facts, ideas, faculties, skills."[70] Hence he says -

> Man's knowledge of the changes of the tides and the phases of the moon is as old as his observation that apples fall to

> earth in the ripeness of time. Yet the combination of these and other equally familiar data in Newton's theory of gravity changed mankind's outlook on the world.[71]

The creative act in discovery, he thought, was due to the "intuitive power of an exceptional mind,"[72] which functioned either by way of a "more or less conscious, logical reasoning" or by "sudden insights which seem to emerge spontaneously from the depth of the unconscious."[73] The same was true of artistic creation. "It is summed up," he said, "by two opposite pronouncements: Bernard Shaw's 'Ninety per cent perspiration, ten per cent inspiration,' on the one hand, Picasso's 'I do not seek - I find' (je ne cherche pas, je trouve), on the other."[74]

Either way, Koestler argued, the "sudden flashes of insight" reported in both the arts and the exact sciences suggest that the nature of the "creative leap" in discovery is not solely the result of rational thought or of scientific experimentation. We might also add that if Koestler's analysis is at all correct, then the objectivity which we attribute to scientific knowledge in particular must rest on factors other than a strict deduction of theory from experimentation. Nevertheless, there is still a residual problem in Koestler's argument.

His insistence that insight and discovery often proceeded from the depths of the unconscious, and were the result of irrational, mysterious or ecstatic activity, was bound to leave his readers with the impression that in the final analysis the basis of creative thought is obscure and inaccessible to enquiry. However, in the light of current research in the psychology of discovery, which I shall discuss in 4.1.5 below, it is now clear that the "creative leap" in discovery has a basis which is, by and large, examinable.

In summary we can say that Koestler's attempt to show that the positivist ideals of objective knowledge were refuted by what we know of the way science acquires knowledge represents a vital contribution to the ongoing debate. However, his thinking that discovery, insight and creativity were basically mysterious, ecstatic and irrational components in the process of scientific enquiry was unfortunate. It masked the need for further research into the psychological factors of the process of knowing.

Thus, as I indicated earlier, Koestler's account of the process of knowing is as open to criticism as Polanyi's. It is therefore essential, whilst acknowledging the vital insights that both Polanyi and Koestler brought to previously neglected aspects of the process of knowing, to probe these areas more critically and establish their precise relation to the multi-faceted concerns which have now emerged in this enquiry. Only then will it be possible to elucidate the fundamental principles which are applicable when objectivity is judged to have been attained in the practice of science.

3.4 Scientific Reasoning and the Acquisition of Knowledge.

As one way into the very complex question of how knowledge is acquired in the sciences and deemed to be objective, I shall examine in detail the specific issues which have arisen from the above analysis of Polanyi's and Koestler's thought in conjunction with the work of N. R. Hanson and several other significant thinkers.

In 1958, Hanson published his book, Patterns of Discovery,[75] in which he noted that there was a discrepancy between the way in which some philosophers have regarded physics and

the actual practice of the physicist. He commented as follows -

> Philosophers sometimes regard physics as a kind of mathematical photography and its laws as formal pictures of regularities. But the physicist often seeks not a general description of what he observes, but a general pattern of phenomena within which what he observes will appear intelligible. It is thus that observations come to cohere systematically.... The great unifications of Galileo, Kepler, Newton, Maxwell, Einstein, Bohr, Schrödinger and Heisenberg were pre-eminently discoveries of terse formulae from which explanations of diverse phenomena could be generated as a matter of course; they were not discoveries of undetected regularities.[76]

Hanson's criticism of the philosophers in the quotation above is basically a criticism of what I referred to earlier as "the philosophers' philosophy of science" (2.1), i.e. the philosophy of science which became increasingly detached from the principles of experimentation and quantification and relied on the principles of rational analysis as the route to knowledge of the world. Polanyi's and Koestler's arguments against the ideals of objectivity can, in essence, also be said to be a rejection of the philosophers' philosophy of science and its implications for knowledge generally.

At the beginning of Chapter 2, I argued that the historical roots of the philosophers' philosophy of science are found in the period soon after the Galileo controversy when Descartes adopted a different methodological approach from Galileo's and one which both Boyle and Newton opposed (2.1). This position hardened into rationalism, empiricism and positivism.

It is the philosophers' philosophy of science which has dominated thought for a number of centuries, particularly in the twentieth century in the form of positivism. This line of thought would probably not have held such sway had its adherents been prepared to examine their philosophy in the light of the actual practice of

science. Instead, lack of this kind of analysis resulted in a number of philosophers and some scientists building into their philosophy of science certain ideals of objectivity which were quite inappropriate to the actual practice of science.

Flaws in the philosophers' philosophy of science have been exposed by the work of several philosophers in recent times,[77] a fact to which I have already briefly alluded in discussing Hesse's view above (3.1). Nevertheless, as I also noted earlier, positivist ideals still have a considerable influence on popular thought, supporting a concept of objectivity which is entirely misleading. It has been my contention, therefore, that one way of arriving at a philosophy of science which would be demonstrably comparable with the actual practice of science would be to undertake a proper analysis of how knowledge is acquired when science is practised. In so doing, it should become clear that it is the scientists' philosophy of science and not the philosophers' philosophy of science which actually undergirds the practice of science. It should also be possible to show that the principles of objectivity which are operative in the scientists' philosophy of science are very different from those ideals of objectivity thought to belong to the practice of science by those who hold the philosophers' philosophy of science in the form of positivism.

In this connection, Hanson has identified one of the key factors which has largely contributed to this hiatus in the philosophy of science. He has pointed out that because a number of philosophers have not carefully considered the actual practice of science and have simply assumed that scientific knowledge is directly correlated with the results of sense experience, they have concentrated their

attention on a very limited aspect of science. Consequently, the crucial and complementary role in scientific practice of other aspects such as the "reasoning back from observations to formulae from which... observation statements and their explanations follow..."[78] has been overlooked. Hanson called this method of reasoning the "retroductive"[79] procedure. (See discussion in 3.4.2).

He was quick to point out that he was in no way questioning the fact that experimentation is an indispensable step in the practice of science. On the contrary, his objection was to those philosophies of science which naïvely assumed that this was the sole factor to be taken into account. Such philosophies were bound to be distorted. As we have already seen, it was just one such distorted strand of the philosophy of science which dominated thought for a number of centuries, most predominantly in the nineteenth and twentieth centuries in the form of positivist philosophy (3.1).

As many aspects of Hanson's analysis of scientific practice converge with those highlighted in Polanyi's and Koestler's thought, aspects which, I have argued, were basically overlooked in considerations of scientific reasoning in the past, it is now appropriate that we examine Hanson's argument in the light of these. In the following discussion it will also be seen that, as regards this thesis, the most interesting part of Hanson's thinking is his now classically acknowledged analysis of the relation of theory to scientific practice.

3.4.1 The Relation of Theory to Discovery, Observation and Experimentation.

Scientific enquiry does not take place in an intellectual vacuum,

even though experiments are generally conducted in a controlled and artificial setting. This was the very point which Polanyi was also making when he stressed that a knowing subject is necessarily involved before that which can be known is actually known (3.2). In practice this otherwise obvious fact is generally overlooked precisely because the conducting of experiments and the making of observations are usually undertaken within a controlled and artificial setting. The result has been that one is often left with the impression that scientific knowledge consists of an accumulation of facts gathered by means which are completely detached from intellectual activity. The old positivist view of observation rested on just such an impression, leading to the distorted idea that one could gain access to a number of properties of the external world solely through the senses or the extension of the senses by instrumentation, and thereby acquire objective knowledge. However, a closer examination will show that the contrary is true, viz. that a great deal of intellectual activity as well is involved in experimentation and observation, and that this activity provides the very context by which observations can be recognized as scientifically interesting in the first place.

This is not to say that scientific knowledge is incapable of achieving a status independent of the knower. For instance, scientists usually assume that the knowledge they acquire is knowledge of an external world. They do not question the fact that it should be possible for two or more people to observe one and the same object or set of objects, or one and the same scene or set of circumstances from the same place and expect to have common experiences. Thus these issues are not generally in dispute among scientists or, for that matter, among some philosophers of science. What is in dispute is the

popularly held belief that what scientists actually do in science is pile up facts by collecting the data of sense experience through experimentation and observation, and that scientific knowledge can then be deduced from these facts. This is the issue which now needs to be discussed.

Before doing so, it is important to note that this is by no means the only matter at issue among philosophers of science. As indicated briefly above when discussing the history of the philosophy of science (3.1), a number of philosophers of science, who approach their study using historical or sociology of knowledge methods, have disputed the view that scientists actually obtain knowledge of an external world. Philosophers of this ilk think that the knowledge which scientists acquire is entirely relative either to the context of the interests and methods of science, with no reference to an external reality, or to the judgements of a scientific elite. Either way, these philosophers consider that the scientists' belief that they are obtaining objective knowledge of an external world is, to say the least, mistaken.

In order to avoid complicating an already complex situation even further, this latter issue of whether science obtains knowledge of an external world or not will have to be left till Chapter 6. The reason for this strategy is that some of the more perplexing questions about how objectivity is achieved need to be discussed first and an attempt made to resolve them; otherwise the drift of the debate will be too difficult to follow.

For the present, I shall accept the scientists' assumption that the knowledge they acquire is in fact knowledge of an external world, and return first of all to justify my claim that experimentation and

observation are not simple, detached tasks in science, but that they involve a great deal of intellectual activity as well.

Hanson has made a strong case to show that apart from the physical manipulation of materials, scientists do not simply observe the results of their experiments in a detached way. For even in the making of observations, a number of theoretical presuppositions are necessarily involved. Hence, he has argued that when one makes an observation "...one does not first soak up an optical pattern and then clamp an interpretation on it."[80] There are not two acts, seeing and then interpreting. When one observes, an organizational factor is at work which involves a complex number of relations. For instance, one may see a zebra as black with white stripes whilst someone else may see it as white with black stripes. The difference is not optical. The difference is in the way in which one organizes the elements in visual experience.[81]

Several clarificatory points need to be made here. It is quite possible for readers to be confused by Hanson's analysis, since he uses the word "see" in a very broad sense, to carry the associations which generally apply to the word "observe." As a consequence, it could be mistakenly thought that he is denying that it is possible for two or more observers to have common retinal reactions from the same visual sense data. This is not the case at all. It is therefore better if his word "see" is read as "observe," since the crucial point which he is making relates to <u>observation</u> and not to <u>optical experience</u>.

Another reason this distinction needs to be made clear is to emphasize the fact that his argument is really directed against the positivists, who held that when an observer "sees" or "observes," the

act itself consists of a sense impression of an external reality which gives the observer immediate access to certain properties of the external world.[82] Contrary to such a position, Hanson proposed that there were a number of other factors involved in observation which organized the very act of observing. He related his argument directly to the psychology of perception, particularly as it is found in Gestalt psychology.[83]

Though it is beyond the scope of this thesis to include a discussion of the effect of perceptual experience on observation, it is important to make clear that current experimental research in the psychology of perception, which has become available since the time at which Hanson was writing, provides extensive support for the view that our concepts organize what we perceive, and thereby what we observe.[84] Hanson maintained that this organizational factor is what provides the context for visual experience. Thus, he reasoned -

> Would Sir Lawrence Bragg and an Eskimo baby see the same thing when looking at an X-ray tube? Yes, and no. Yes - they are visually aware of the same object. No - the ways in which they are visually aware are profoundly different. Seeing is not only the having of a visual experience; it is also the way in which the visual experience is had.[85]

Similarly, a layman visiting a physics laboratory would need to learn a certain amount of physics before he would be able to apprehend the significance of the objects before him as the physicist sees them. For unless his visual field is organized for him within the context of the knowledge, experience and theories of the physicist, he would see the same lines, colours and shapes as the physicist but not be able to observe their significance for physics.[86]

What is one to say then when disagreements occur between

physicists? Is this not simply an instance, despite Hanson's denial, in which physicists are making the same observations but clamping different interpretations on them? Not so, said Hanson. Because we know that there are several factors operative in observation, the explanation is more likely to be located in the conceptual organization of each of the physicists. In other words, there is a real difference in the way that they have made their observations. Thus Hanson says -

> To say that Tycho and Kepler, Simplicius and Galileo, Hooke and Newton, Priestley and Lavoisier, Soddy and Einstein, De Broglie and Born, Heinsenberg and Bohm all make the same observations but use them differently is too easy.... Were there no sense in which they were different observations they could not be used differently.[87]

He was aware, of course, that the fact that researchers may not appreciate data in the same way could prove perplexing for those who thought that observation was some kind of detached activity, independent of perception. Thus he cautioned that "...sorting out difficulties about data, evidence, observation, may require more than simply gesturing at observable objects."[88]

Whilst it must be acknowledged that Hanson has made his point well in showing that theoretical presuppositions are a functional aspect of observation, and, further, that the analysis of what is observed involves the skilled judgement of the scientist, he makes no attempt to discuss which procedures are necessary in making these skilled judgements. He has merely indicated that the task is not a straightforward one because of what he has called the "theory-ladenness"[89] of observation: scientists are not just amassing a huge number of sensory facts; they are involved in showing "how the facts hang together."[90] All very true, we might say, but if observations are "theory-laden," can scientists still claim to be

acquiring knowledge which is objective? If so, how is this achieved? These are matters which Hanson did not go into. It was this kind of lack to which Hesse was alluding in her criticism of historical approaches to the philosophy of science.[91] (See also discussion in 3.1).

As we have already mentioned and shall discuss more fully (4.3), scientists consider that they achieve objectivity by ensuring that their research methods conform to a number of essential principles. In the meantime, it is important to note that Hanson left himself open to severe criticism at this crucial point, because he did not discuss in detail the procedures by which difficult decisions relating to data, evidence and observation are settled in science.

Nevertheless, it is still necessary for us to consider carefully the substantial point which he has made in regard to the concepts which organize the observation of data, as this fact has important implications for our present discussion concerning the acquisition of knowledge.

3.4.2 The Importance of Organizing Concepts.

Hanson has demonstrated that what constitutes knowledge for the scientist cannot be defined as a straightforward amassing of sensory experience. That would be misleading. For even before scientists gather any data, make any observations or look for any evidence, they must have some conceptual understanding of the overall area of interest into which they wish to enquire.

It is this conceptual understanding which Hanson argued directly organizes sensory input, giving a context to what is observed. Thus, he says -

> ...physical science is not just a systematic exposure of the senses to the world; it is also a way of thinking about the world, a way of forming conceptions. The paradigm observer is not the man who sees and reports what all normal observers see and report, but the man who sees in familiar objects what no one else has seen before.[92]

Not only is it clear that positivist philosophy has been quite wrong in assuming that observation is merely a direct account of sense experience, but it is also evident that conceptual organization is a primary factor in the process of knowing, connecting sensory input. It is precisely because the conceptual factors have been overlooked in the past in consideration of the practice of science that very inadequate accounts of science have arisen. As a result, physics has been naïvely represented by some philosophers as the accumulation of data from sense experience and the mere conducting of low-grade experiments.[93] This is quite inadequate to the physical scientist's actual task in the acquisition of knowledge, which Hanson argued was immeasurably more complex, particularly at the microphysical end of things. In microphysics, explanation could not even begin if theoretical entities and their properties were not presupposed.[94]

Further, in science generally, we would not even be able to recognize the significance of what is before us if we had no prior understanding of the situation whatsoever. This is because significance is not an intrinsic characteristic. Things only become significant for us when they become intelligible within a particular conceptual context. It is the organizing context, argued Hanson, which enables a person to gain insight. Insight does not change what is there. Insight enables us to recognize the significance of what is already there. However, unless we appreciate the organization of the

whole, we would not have the means by which we could recognize the significance of any of the individual features. Explanation of any of the features is only possible when the whole is understood, for the whole context is what gives significance to each of the features and makes them intelligible in the first place.[95]

It could be argued that theoretical presuppositions do not always precede observation, as is the case when one registers the presence of surprising or apparently anomalous phenomena. In one respect this would appear to be true. However, if we take the case of the discovery of attenuation by Pasteur after the culture had been left out over the summer, we see that Pasteur only discovered attenuation when he observed that the results of his autumn experiments did not conform to what was already known, experienced and presupposed theoretically. Thus conceptual organization of a kind is still required as the basis from which phenomena can be judged as surprising or anomalous.

We can therefore summarize the above by saying that when phenomena are recognized as significant, the judgement is made possible in one of two ways: either (i) because the phenomena fit or almost fit a set of concepts already held, thereby confirming or extending those concepts, or (ii) because the phenomena are surprising and differ so markedly from the concepts presupposed as to require a radical change in those concepts, sometimes of paradigmatic proportions.

Now this is the point at which Hanson's argument for what he called "retroduction" applies, i.e. <u>the reasoning back from observations to formulae</u> from which statements and their explanations follow. We employ retroductive procedures, he said, in

our attempt to find a set of concepts which will either unify data or account for surprizing or anomalous data. Confronted with the data, we seek an intelligible understanding of it. Intelligibility is given not by seeking for a general description of what one has observed, but by seeking for a general "conceptual pattern" which can organize the phenomena into an intelligible whole.

What are these "patterns?" The patterns are no more than our theories. Theories "constitute a 'conceptual Gestalt.'"[96] We do not arrive at them by piecing together the phenomena we have observed, bit by bit. The procedure is altogether different from this. We seek an intelligible explanation of what we have observed by reasoning back from our observations (retroduction). In so doing, we arrive at formulae, which in turn need to be tested through the formulation of new hypotheses, experimentation and observation. In the test situation, a theory will be either refined or completely overthrown. In the case of the latter's occurring, a new organizational "pattern," which is altogether different from the one which is being tested, will have to be sought.

From this stage on, Hanson enumerated a number of different and important factors concerning the relation of theory and observation, but he did not attempt to give a full or coherent account of how theory and observation function in the acquisition of scientific knowledge. Yet, it is vital that this relation be traced in the practice of science if we are to ascertain the principles by which scientists consider that they have acquired knowledge which is objective. I shall therefore attempt to develop such an account, by using insights from Hanson's, Polanyi's and Koestler's work and extending these with the work of other thinkers.

CHAPTER FOUR

OBJECTIVITY AND THE ACQUISITION OF KNOWLEDGE (2)

The value of Hanson's contribution, as we noted in the last chapter, is that he has emphasized that rational procedures are as fundamental as sensory ones in the making of scientific judgements. We shall later have to consider the particular relation of experimentation and measurement to these rational procedures (5.2.3c). For the present, however, it is necessary to give a more comprehensive account of how theoretical presuppositions function in the acquisition of knowledge in order to show that objectivity is not guaranteed by the methods of science, as many have thought, but that objectivity is achieved by ensuring that science's methods adhere strictly to a number of essential principles.

I shall take up the discussion at the point at which Hanson ceased to develop it, viz. where he argued that we reason back from our observations in order to find a theory which will give an intelligible explanation of our observations, and that thereafter we test our theories, refine them and in some cases even overthrow them. Hanson stopped short of discussing the procedures by which we find replacements if our theories have to be overthrown. It is unfortunate that he did not address himself to this matter for, from the following analysis, it will be seen that some of the most illuminating material about how scientific knowledge is actually acquired can be obtained from examining these procedures.

From the discussion so far, we have seen that when scientists are confronted with a new situation in which surprising or anomalous phenomena challenge past theories, a new theory, which can provide an intelligible explanation for the anomalous or surprising material, may be necessary. As such, the new theory should be able to explain more than previous theories have been able to do and thereby advance knowledge in that particular area of research.

It has also been pointed out above that there are some situations in which not only a new theory is required, but also a radical change of paradigmatic proportions has to be made before substantial advances can be achieved in research again. In other words, a complete reappraisal of the whole subject matter may be necessary. In these instances the conceptual changes required would constitute a revolution in thought similar to that which occurred at the rise of modern science. (See 1.2.3, 1.4 and 1.6).

Hanson made it clear that changes in conceptual organization are generally best demonstrated in "frontier" thinking, i.e. at the place where new directions in enquiry are emerging.[1] When conceptual changes are necessitated, scientists may have to exercise a great deal of ingenuity and imagination before they will be able to produce a theory which will satisfactorily account for perplexing anomalies or puzzling phenomena. The rational decisions involved in this process are quite complex, as will be seen from the analysis below, and relate directly to the psychological activities of discovery, insight and creativity.

Earlier I noted that the positivist schools of thought classified activities such as these as the concern of subjective psychology, and thought that they did not therefore come under the concern of

philosophy or logic (3.1). However, I shall endeavour to show that this classification was quite incorrect. These activities do not belong to so-called subjective psychology, but, as indicated by current developments in psychological research, have, in the second half of the twentieth century, rightly become the concern of experimental psychology, particularly in its developmental and cognitive aspects. As such, their study has much to contribute to the understanding of scientific reasoning, which in its turn is basically a philosophical concern.

Though only a comparatively limited discussion of the breadth of the psychological research in this area is possible within the confines of this thesis, it is of paramount importance that attention be drawn to the direct bearing which a number of psychological factors has on the nature of the present enquiry.

4.1 The Rationality of Discovery, Insight and Creativity.

My main interest in isolating discovery, insight and creativity for special examination in this section is because these factors are continuously described as operative on the forefront of knowledge. It follows that a study of them should elucidate how scientists, in particular, arrive at new theories when surprising phenomena or constantly recurring anomalies make it impossible to retain past theories. In this respect, Koestler's discussion above, becomes pertinent (3.3).

The difficulty with Koestler's analysis was that, on the whole, he saw discovery, insight and creativity as the result of irrational, mysterious or ecstatic activity. It is easy for these then to be

dismissed as belonging to subjective psychology. However, contrary to what Koestler thought, the following brief survey of recent psychological research will show that these activities do, in fact, possess a rational structure.

Admittedly, some controversy still surrounds this area of research, since, experimentally, it is still in a relatively early stage of development. However, what must be emphasized is that the controversy is no longer over whether discovery, insight and creativity have an examinable cognitive base but over what the precise elements and nature of such activities are.[2]

4.1.1 Defining Creativity.

a. Its origins. In Beyond the Information Given,[3] J. S. Bruner, a developmental psychologist, has published a number of his essays written from the late 1950's onwards on creativity and discovery. His article entitled "The Conditions of Creativity,"[4] defines creativity as "An act that produces effective surprise."[5] The content of this act, he says, is as diverse as are the different activities in which people engage. The meaning of the word "surprise" is more difficult to specify but, says Bruner, is best elaborated as "...the unexpected that strikes one with wonder or astonishment."[6]

It will be helpful at this point to contrast Bruner's thinking with Koestler's view that the creative act was mysterious, ecstatic and irrational in its origins. Bruner's position is quite different. He made an important distinction between the affective aspects of the creative act (i.e. those which pertain to emotional states) and the cognitive aspects (i.e. those which pertain to thought). This vital distinction enables us to classify things such as wonder,

astonishment and a sense of awe/mystery as affective states. Wonder and astonishment may arise either from what he called "intuitive insight" or from the "slow accretion of knowledge," but they are essentially produced by the creative act; they are not its source.[7] If Bruner is correct, as the experimental evidence presented below strongly indicates (4.1.4, 4.1.5, and 4.1.6), then creativity cannot be explained in terms of these affective states, which is what Koestler tended to do. The explanation of creativity must lie elsewhere, presumably in its cognitive aspects.

b. Its nature. In this regard, Bruner's preliminary investigations are most illuminative, for he has identified several different conditions which may be present when creativity occurs and which effectively produce surprise and wonder. The first of these he called predictive effectiveness. It is exemplified in the sciences when one discovers a formula or a theory which has high predictive value. The second he called formal effectiveness. This condition is exemplified in mathematics or logic when one orders the elements in such a way that one sees relationships which were not previously evident. The third he called metaphoric effectiveness. It is exemplified in literature and art when connections are made between diverse experiences by the mediation of symbol, metaphor or image. It does not function systematically; it combines ideas between which no previous connections have been thought possible, and is more like a "leap."[8]

Each of the above conditions arises from some form of combinatorial activity in which a new perspective is given. They are not reached by systematic permutation, though this is not to say that a computer could not be programmed to produce these effects over an

infinite number of trials. Regardless of whether a particular combination can be reached systematically over an infinite number of trials and appear in a mass of computer printout, the point which is being made here is a different one, viz. that a participating subject will still always be necessary before any such effects, whether achieved by systematic permutation or not, can be recognized as advancements in knowledge in the first place! Thus, the argument for creativity is basically twofold: in the first place it argues for the role of discernment, and in the second place it argues for the means by which such discerning judgements are made.

For Bruner, the creative act can neither be identified as the result of laboriously systematic permutations nor that of a chance guess. An element of judgement is involved. He goes on to say -

> I suspect that in each empirical field there is developed in the creating scientist a kind of 'intuitive familiarity,'...that gives him a sense of what combinations are likely to have predictive effectiveness and which are absurd.[9]

In the case of literature and art, Bruner considered that it was the common sharing of deep plights among human beings that made communication possible. He therefore objected to Jung's proposal of a "collective unconscious,"[10] since he held that a much more comprehensive explanation could be given for creativity than merely by appealing to concepts which were so opaque.

c. Its function. Bruner held that the value of the creative act is that it helps us extend our experience of the world further. The products of such an act are manifold. They enable us to re-order experience and thought; they provide us with new means of manipulating the world, e.g. by the creation of the wheel or the recognition of formulae such as $E = mc^2$; or we are enabled to improve our

techniques for gaining greater access to information about the world. The psychologists' task ultimately is to devise "a proper scientific theory" by which such acts can be better understood and predicted.[11]

d. Its cognitive structure. In an earlier article, published in 1957, entitled "Going Beyond the Information Given,"[12] Bruner tried to construct an argument to show that we are able to go beyond the realm of sense experience and apprehend the world we live in. He pursued this by examining a number of examples of how this occurs. We go beyond the senses, he argued, to identify the class of the object being perceived, relying on a number of defining properties and cues. He cited William James' analysis in support of this.[13] Another instance is when only some letters of a word are presented, e.g. P*YC*OL*GY, and we are able to recognize that the word is PSYCHOLOGY. Further, we go beyond the information given in formal logic, e.g. two propositions are presented such as A>B, B>C and we can without difficulty infer A>C.

The question which still needed to be answered was what kind of cognitive structure it was which made it possible for us to go beyond the realm of sense and apprehend the world we live in. Bruner's answer lay within the context of his general theory of cognition. He held that we learn certain "formal schemata" which we use to organize a large diversity of information. By so doing, we are able to code information into a number of different systems, e.g. of identification, of probability or of logic. We are then able to manipulate the encoded information, often by combining the codes of one system with those of another.

Creative activity takes place at the point where, having mastered

how to place things in generic coding systems and how to "read off" information from those systems, one is confronted with a new situation for which the coding systems will generally either not quite apply or be totally inapplicable. At this stage, one must either refine one's coding systems or, if this is not possible, one must invent "efficient and applicable coding systems" which can then be appropriately applied to the information obtained. The latter is what is often described as the "creative analogical leap."[14]

Whereas, therefore, Koestler acknowledged that there were several cognitive factors which were antecedent to the creative act, but still described the creative act as basically ecstatic in its origins, Bruner has suggested that it arises from more formal cognitive aspects to which certain affective states are also attached. Scientists must construct "formal models or theories that have predictive value," and be able to combine and generalize these into new and more general systems in order to enable them to extend their knowledge beyond the mere recording of sense experience.[15] The sheer inventiveness involved in this act through combining previously unrelated ideas is what has been aptly described as a "leap," and is often accompanied by "surprise" because of the illuminations such new combinations can produce. Thus, the act can be described as creative, for it invents a new coding system; as analogical, for it sees connections between one set of circumstances and another; and as ecstatic, because such new insights produce awe, wonder and/or surprise.

The psychologists' particular interest has been to examine what is involved in such processes. Our interest in the psychologists' findings is that they can provide us with important information about the rational procedures which are involved in scientific reasoning and

at the same time delineate the means by which our theoretical presuppositions function in the acquisition of knowledge.

4.1.2 Defining Discovery and Insight.

This now brings us to a discussion of two specific forms of creative thought, viz. discovery and insight. Discovery, said Bruner,[16] should not only be thought of in its narrower sense as describing the activity of a scientist at the growing edge of his field of enquiry, but also in its broader application in everyday situations where children discover things for themselves through exploring or in general problem-solving. This point is very important since it has been when discovery, insight and creativity have been seen as rare elements, belonging to the few, that not only has their study been neglected but their crucial significance for understanding the nature of thought has been completely overlooked.

Bruner's position was that discovery is an activity which is engaged in by all who seek to obtain knowledge, whether or not that knowledge has already been discovered by anyone before. Whether of a child or a research scientist on the frontier of knowledge, he observed that discovery "favors the well-prepared mind." (Cf. Koestler's idea of "ripeness" and also Pasteur's autobiographical comment on the same issue (3.3)). Both the rearrangement and transformation of evidence is characteristic of discovery, and it is from such reassembling that additional and new insights are obtained.[17] Insight can therefore be described as the new understanding which is gained when things are discovered. (Cf. also Hanson's understanding of insight, 3.4.2).

In a series of experimental studies, Bruner identified an

interesting dimension in children's cognitive activity in the way they may respond if given a problem situation to solve. They ranged from those who quite unsystematically try out a number of hypotheses, looking for a chance solution, to those who systematically and cumulatively tested out hypotheses in an attempt to locate or construct a plausible solution. He found that the end of the spectrum to which the children belonged was related to whether or not they thought that there was a pattern to be found which acted as a real constraint on the events before them. Those who thought that there was no real pattern to be found lacked persistence, ignored or violated information and were unsystematic and unorganized. Those who thought that there was a real pattern to be found persisted doggedly, connected up information and were sensitive to its constraints, employed cunning and strategy to obtain more information, and were organized and systematic in their search.[18]

Discovery, says Bruner, is related to the latter strategy. In the first place, we assume that there is a real pattern to be found and we expect that organized, skilled and persistent endeavour will find it. (Cf. Polanyi's argument that we assume an inherent rationality, 3.2, and my evaluation of his concept, 6.2). Next follows the actual search for the assumed pattern. This step involves an attempt to find regularity and relatedness, being sensitive to constraints, processing information, and persistently looking for an organizing pattern. (Cf. Hanson's argument re organizing patterns, 3.4.2). In addition to the above, it is important to note that skills developed from familiarity with a range of phenomena and sheer knowledge of the subject matter are paramount preconditions for discovery to take place.[19]

4.1.3 Summary.

The value of Bruner's analysis overall is that it expands on Polanyi's, Koestler's and Hanson's work by providing some of the vital psychological content needed for a fuller understanding of their accounts of how we acquire knowledge. It also provides vital information concerning the nature of the rational steps which are involved when we go beyond the realm of the senses and apprehend the world.

However, Bruner's work was primarily investigatory and should be regarded as such. Also, as P. E. Vernon's book of readings, entitled Creativity,[20] indicates only too well, reliable experimental work was lacking in these earlier stages. Nevertheless, some interesting factors have emerged from the ongoing research, some of which lend considerable weight to Bruner's exploratory analysis of creativity. More recently, important and significant findings have been obtained in experimental studies conducted in the areas of physiological psychology, developmental and educational psychology, personality and creative behaviour.

I shall first briefly discuss some of the readings from Vernon's collection, since he provides an important historical perspective through his overview of how research on creativity developed from early times. Then I shall examine the even more interesting phenomena arising from current experimental studies.

4.1.4 Other Investigatory Studies.

a. Clinical. As Vernon has pointed out, some of the most helpful information has been yielded from experiments carried out on

"problem-solving" and "blockages." This would appear to corroborate Koestler's argument that there are predispositional factors to the creative act. In the clinical situation, research work such as that of Anne Roe,[21] in which she interviewed and tested 64 eminent scientists, has produced some interesting preliminary information about the nature of creative thought. She found that environmental factors, such as the value a family places on learning, the development of intellectual interests at an early age, the encouragement of children by their teacher to work on their own and find things out on their own, and the degree to which personal independence could be and was developed, were shared in common by the scientists and were more likely to account for the high levels of creativity than were hereditary factors.

Much earlier, in the 1930's, "genius" was thought to be hereditary and to belong to the few, so there was little interest in attempting either to test or to quantify this characteristic in intelligence tests. Also, creativity was thought to be mysterious and unanalysable, and therefore not to possess an examinable basis. Both these ideas are now dispelled. In fact, there has been some evidence culled by Newell, Shaw and Simon (1962) to show that in mathematics and chess playing typical features of creative thinking are amenable to computer simulation.[22]

b. Autobiographical. From another source altogether, viz. autobiographical accounts, Vernon has shown that great composers such as Mozart[23] and Tchaikovsky[24] indicate that their moments of intense creativity, though experienced ecstatically, are moments in which their compositions have been seen conceptually as a whole (cf. Hanson's 'conceptual gestalt' 3.4.2). However, this has not been

without a great deal of prior preparation, in which the idea of a composition has developed into its fulness.

Tchaikovsky noted that composition was not "a cold exercise of the intellect."[25] However, he also observed that the moments of disinclination to work at a composition both before and after intense moments of inspiration were as formative of the work as was the period of inspiration itself. Thus he wrote in June, 1878, from Kamenka -

> What has been set down in a moment of ardour must now be critically examined, improved, extended or condensed, as the form requires.... I cannot complain of poverty of imagination, or lack of inventive power; but, on the other hand, I have always suffered from my want of skill in the management of form. Only after strenuous labour have I at last succeeded in making the form of my compositions correspond, more or less, with their contents.[26]

c. Psychometric. By far the most important investigatory study done on creativity was found in the psychometric approaches (i.e. the attempt to obtain a psychological measure of creative ability).[27] An enormous spate of work on creativity tests emerged in the 1950's and 1960's following Thurstone's multi-factor theory and, even more so, Guilford's comprehensive model of intellectual abilities. Using factor analysis, Guilford isolated 120 separate, measurable abilities.[28] Prior to this work, intelligence had been measured only in terms of a narrow band of intellectual activities related to a child's capacities for schoolwork, and had ignored other types of cognitive functioning.[29] Major conceptual changes were necessary both in the way in which creativity was conceived, as belonging to the few and as unanalysable, and also in relation to measures of intelligence.

In the 1960's a changed conception of creativity led to its being seen as "a potential property of all men," identifiable, subject to

nurture and suitable for education.[30] (Note: this changed concept was also assumed by Bruner, 4.1.1 and 4.1.2). However, despite this new understanding of creativity, the real difficulty was still to find the appropriate criteria by which tests of creativity could be validated and also to devise tests which could provide reliable measures of it. This is where the greatest area of controversy arose.

One of the most scathing criticisms of research in this area is found in L. Hudson's article "The Question of Creativity" (1966).[31] Nevertheless, more careful work carried out around that time by researchers such as M. A. Wallach and N. Kogan (1965), published in "A New Look at the Creativity-Intelligence Distinction,"[32] and R. J. Shapiro (1968) in "Creative Research Scientists,"[33] showed that it was possible to obtain more reliable correlations. Improvements in both the devising and administering of tests considerably advanced knowledge in this area, resulting in the favourable situation currently in which experimental research has been able to produce important detailed information of this aspect of thought. It is in this area of current psychological research where the most interesting material related to the concerns of this thesis are to be found.

4.1.5 Current Psychological Research.

Though it is not possible to undertake a comprehensive survey of the vast amount of research which has opened up in this area, I shall discuss some of the most significant aspects involved which relate specifically to this thesis.

In the past, it has been popularly held that thought was of two types. There was conscious, rational thought, which followed strict logical rules, and there was imaginative, intuitive thought, which it

was believed arose from the unconscious.[34] The latter was not confined to strict, logical procedures and could even be irrational. Hence, rationality was conceived of as restricted to the former, whilst intuitive thought was conceived of as at best subjective and unanalysable. This false dichotomizing of thought left in its wake a complete misconception of the nature of rationality, which was to have widespread ramifications. Not only was this restricted understanding of rationality manifest in a long tradition of philosophy, which I have referred to above as the philosophers' philosophy of science, but it also adversely influenced those theologies which adopted this philosophical framework for their reflection.

In Chapters 7 and 8 we shall see that Austin Farrer, whose theology signalled an important new direction in theological thought seriously challenged the philosophical view which restricted rationality to the logical and overlooked the indispensable role of the imagination in rational thought. Both logical and creative thought, he argued, were involved in the acquisition of knowledge and must be seen as integral to the whole process of reasoning (7.3.1).

Also, in another area altogether, viz. the philosophy of science, the recent publication of W. H. Newton-Smith's The Rationality of Science[35] has not only seriously questioned these earlier models of rationality but also challenged the much later and extreme alternative theories which claim that science is non-rational. Newton-Smith argues instead for a position which he calls "temperate rationalism."[36] (I shall discuss the implications of these findings in Chapter 6).

In so far as the psychological field is concerned, increased investigation recently by experimentation in cognitive science has

also led to the undermining of these misconceptions as to what constitutes rationality. As a result, a more adequate understanding of cognition and cognitive functioning has emerged in the 1980's.[37] However, notwithstanding all the research findings and the emergence of a more adequate understanding, the old misconceptions of rationality, which have rested on a false dichotomizing of thought into the so called "logical" (and therefore "rational") and the "intuitive" (and therefore "non-rational" or "irrational"), still persist in the popular mind.

It is therefore essential that the present discussion of creative thought be clearly placed within the context of the <u>new conception</u> of the nature of thought, i.e. as a function of <u>both</u> logical and imaginative aspects. Also, in so far as it is now possible, the cognitive functions of discovery, insight and creativity should be carefully re-assessed in the light of the findings of current psychological research and no longer be thought of within the context of the old framework, which has only served to give a distorted account of their operation.

In 1983, R. J. Blackwell published a very interesting article "Scientific Discovery: The Search for New Categories"[38] which is in fact a discussion of T. Kisiel's "Scientific Discovery: The Larger Problem Situation"[39] and H. I. Brown's "Assimilation and Discovery."[40] All three articles appear in the same volume of <u>New Ideas in Psychology</u>.

Kisiel and Brown share a common goal, viz. they argue that scientific discovery relies on "heuristic methods."[41] The main interest of their studies has been to show that these heuristic methods are basically <u>rational</u>, even though they differ from the

conventionally accepted methods of rational analysis which proceed by the strict rules of formal logic. As Brown offers a more detailed study of this matter than Kisiel, I shall concentrate my discussion on his work mainly.

He defines heuristics as those methods which "provide maxims or guidelines for attacking a problem."[42] These maxims are ones which have been found to have worked in the past for problems that were analogous. Thus he argues -

> A person equipped with a set of relevant heuristics is in a position to attack a problem in an organized, coherent and rational manner, even though there is no prior guarantee that any of these approaches will lead to a satisfactory solution.[43]

Brown illustrates his point by citing the differences between the processes of differential and integral calculus. In the former there are a finite number of steps in relation to a set of rules which guarantee a solution at the completion of those steps. In the latter, there is a variety of methods, which have been known to work in specific cases and which are available for integrating functions which are integrable. However, these methods are heuristic as there is no guarantee that they will work in a particular case. In addition, they must be used with a great deal of skill.[44]

The methods of scientific discovery, argues Brown, fall into this class which he has defined as heuristic. In order to identify what these methods are, it is necessary to re-examine the history of science. As one attempt towards this overall goal, Brown analyzes two of Galileo's research projects, viz. his attempt to develop a mathematical theory of the strength of materials and his discovery of mountains on the moon.

Brown's purpose is twofold: firstly, to show that discovery

is essentially a rational process and, secondly, to undermine the philosophical tradition which has restricted the concept of rationality only to those instances which are the outcome of procedures which operate via a set of strict logical rules that can guarantee a solution to a problem. Heuristic methods are not of this type. Yet, Brown claims, the steps by which they proceed are rational.

Using Piaget's underlying idea of assimilation, Brown begins by analysing the cognitive procedures involved when objects are subsumed under a system of concepts -

> To subsume an object under a concept...is to assimilate that object to a particular conceptual structure, and a major advantage of such assimilation is that it now becomes possible to think productively about that object.[45]

The reason why such productive thought is possible is because a concept always occurs in relation to a set of concepts, which not only can convey a great deal of information about the member concept but also can serve as a legitimate constraint on what can appropriately be conceived of in relation to the member concept and any object subsumed under it.

In the early stages of an enquiry, it may be possible to subsume an object under more than one conceptual scheme. For instance, a dark spot in the distance may be seen as either a shadow or a hole. The differences between the conceptual schemes will affect both the expectation and questions raised in relation to the object, since the expectations and questions which can appropriately be raised in relation to either conceptual scheme are constrained by the set of concepts belonging to that scheme. The attempt to assimilate the object to either scheme should enable us to cull further information

by which we shall then be able to identify more precisely to which particular scheme the concept is really assimilable.

In addition, the scope and precision of the conceptual structure itself, to which an object has been assimilated, will either enhance or inhibit the enquiry. Should the conceptual structure itself be imprecise or limited, it will provide little information to aid enquiry. Brown says -

> ...conceptual structures range from the relatively sparse and imprecise systems operative in much of our everyday experience, to the much richer and more detailed frameworks provided by explicit scientific theories.[46]

He accepts that when objects continually resist assimilation, the concepts themselves must be modified. Further, changes in concepts may at times be so radical as to require a complete overthrow of the conceptual structure, as was the case in relativity and quantum mechanics. Nevertheless, the main thrust of his analysis has been to show on the one hand that the assimilation of information is pursued in an organized and systematic way and that such methods can lead to the making of fundamental discoveries.[47] On the other hand, his purpose is to demonstrate that the steps involved are not those of formal logic; they are <u>heuristic</u>.

In order to make this distinction clearer, Brown discusses the cognitive procedures involved in the case of a civil engineer analysing the structure of a factory building. He must first represent the structure using a diagram and fill in the details which are applicable. The diagram does not look like the object, (the factory building) since it has been <u>reconceived</u> within the terms of structural theory. The civil engineer, says Brown, has assimilated the building to his theory, and this <u>reconceptualization</u> allows

him to apply the techniques of his theory to the structure. Similarly, physicists have to reconceive physical objects in terms of a set of concepts belonging to physical theory before the theory can be skilfully applied to the domain of their enquiry. So says Brown -

> It is this process of assimilation that is at work when an astronomer redescribes the solar system as a set of massive points with forces acting on them, or when a physicist seeks the proper Hamiltonian operator for an atomic system - ... The same process is at work when a logician translates an argument into logical symbolism in order to be able to test its validity by means of the techniques of symbolic logic. In all of these cases one can systematically and rationally pursue the end of assimilating objects to a conceptual structure... even though in all of these cases there is no algorithm available which can guarantee that an appropriate assimilation will be found.[48]

Brown then goes on to show from a careful examination of two cases from Galileo's work how basic discoveries can be made by this process of assimilation, which it is not necessary to go into here but the details of which can be found in the text of his article.[49]

Though I have already pointed out above that Bruner distinguished the creative act in discovery as basically cognitive in its origins (4.1.1), Brown's work goes much further. He has not only established that there is a cognitive base to discovery but he has also endeavoured to show that the procedure is rational, despite the fact that heuristic methods are employed to solve existing problems instead of referring to strict logical rules.

This is not to say, however, that when a solution is reached, logical principles do not have to be applied to test the validity of the inferences made. Nevertheless his argument is really directed to making a different point, viz. that even though heuristic methods are employed, this fact does not render the procedures non-rational, as has been thought in the past by those who have

held that scientific discovery, at best, belonged to psychological study, and was not the concern of philosophy or logic (3.1).

Though I must not digress too far at this point, it is necessary at this juncture to foreshadow that the question of the rationality of heuristic methods will take on primary importance in Chapters 7 and 8, where I shall discuss the nature of "revelation" and how we acquire knowledge of God (7.3, 8.5 and 8.6). This brief interpolation is merely to explain why I have dwelt on this particular issue at such length.

In discussing Brown's work, R. J. Blackwell has made an important distinction. Brown, he says, has given an account of the actual process of one of the forms of creative thought, viz. discovery, as it occurs in scientific practice. This account must be distinguished from attempts at "logical reconstruction" which have been advocated by certain philosophers of science.[50] A logical reconstruction of scientific discovery, says Blackwell, would in essence be an artificial replacement of an account of the actual process of scientific knowing. Even if, in retrospect, the logic of scientific discovery could be reconstructed, (which, incidentally, Popper said was not possible, and therefore relegated discovery to being outside the concern of logic) it is misleading to insist that unless reasoning proceeds according to the steps of a reconstructed logic of scientific discovery it cannot be counted as rational.[51]

On the contrary, as has been seen so far, heuristic procedures, which are typical of so many of the procedures in scientific practice, have a clearly demonstrable cognitive base, the steps to which can be mapped, the structures of which can be shown to

conform with logical principles, but the method of which does not generally proceed by following the strict rules of formal logic.

Brown's analysis provides a very important launching place for discussing the direction of current psychological research on the nature of scientific discovery in particular. However, his work merely exposes the tip of the iceberg. An enormous amount of research has been undertaken since in an effort to identify the precise nature of creative thought, not only in respect of scientific discovery. As a consequence, the relations involved in heuristic procedures have been shown to be very complex indeed. Assimilation is just one of the strands. The very complexity of these relations has generated a considerable controversy of its own.

For instance, one critical issue is exhibited in the debate between D. N. Perkins (1983)[52] and T. Poze (1983)[53] over the question of the importance of analogical thinking to discovery in science. Perkins repudiates the ideas of Koestler and others that analogical thinking, which connects up previously unrelated ideas, is the form of thought involved in discovery. He argues that they have been highly selective in their sampling. His own investigations into problem solving, he maintains, indicate the opposite, viz. that analogical thinking rarely features in the making of discoveries.[54]

Disputing Perkins' position, Poze distinguishes clearly between analogical thinking and analytical thinking, and endeavours to show that Perkins' negative findings were a result of his own inadequate understanding of the form and function of analogy.[55] He points out that though analysis can break a problem down into its parts, there are certain problems which cannot be solved by analysis

and for which analogical thinking is necessary. In such cases, using analogical thinking, one can make connections where none have been made or thought possible before, thereby producing a creative solution to the problem. The middle ground between these two poles consists of those problems which admit of solution _either_ by analytical _or_ analogical means.

By comparison, we may say, analytical thinking is generally the more _efficient_ means of solving a problem but it certainly cannot always provide the _effective_ means for doing so.[56]

An interesting outcome of conflicts such as the above is that they clearly illustrate, as I have argued earlier, that the debate on discovery, insight and creativity is now over _what_ the cognitive elements of these functions are, and no longer over _whether_ they possess an examinable basis. However, such controversy also indicates that the problems associated with these activities cannot be settled simply by indicating that their origins are _cognitive_ and not _affective_, or by claiming that their procedures are _rational_ and not _irrational_. A great deal more needs to be established as regards the nature and function of cognition in this area so that the actual form of the reasoning involved and its implications for philosophy and logic can be examined more closely.

The considerable resistance, such as is found in the early writings of Popper,[57] towards accepting the fact that procedures of this kind can count as _rational_ and should not simply be relegated to experimental psychology, turns upon whether current psychological research is able to demonstrate _what_ the rational base of these forms of reasoning actually consists in. Only then will their import as concerns of philosophy and logic be made patently

clear.

Though a full analysis of the cognitive issues involved lies far beyond the scope of this thesis, I shall still need to outline the state of the research, since this information bears substantially first of all on the question of whether the claim to rationality can be demonstrated and, if so, how objectivity is ensured in respect of these rational aspects of the knowing process.

Currently, research in a number of areas suggests what the complex nature and relation of these cognitions are and that there are important constraints which are operative in respect of such processes of thought. I shall deal initially with these in so far as they bear on the nature of creativity and then discuss those general aspects of cognitive theory which have special significance for understanding the creative processes.

4.1.6 The Complex Relations in Cognition.

a. Creativity and intelligence. It was pointed out above that early psychometric work carried out by Guilford, which led to his isolating 120 separate, measurable activities of intellectual abilities, also showed that the factors usually attributed to creativity were integral to intellectual activity (4.1.4c). Current research, which has been pursued in respect of the relation of creativity and intelligence by Darja Piciga-Rojko (1984),[58] has provided an interesting adjunct to the increasing body of information on the role of creativity in rational thought. The Piciga-Rojko study holds that two types of cognition are involved in creative activity. The first she said is intelligence or vertical cognition and proceeds from premise to premise, reaching one solution. The second she said

was creativity or lateral cognition, and consists of the potential to produce ideas. She argues that scientists must balance both intelligence (vertical cognition) and creativity (lateral cognition) in order to produce work which is original. The cognitive process for the creative artist is in some respects similar but in other respects different from that of the creative scientist.[59]

Studies, such as this one, certainly corroborate the view that both logical and imaginative activities are involved in thought and give further support to Brown's argument that, in the acquisition of knowledge, scientists use heuristic procedures.

b. Developmental schema and creativity. Along a rather different line of research, W. J. Lesner and D. Hillman (1983)[60] have analysed creativity through the psychological theories of Freud, Erickson and Piaget and endeavoured to indicate a developmental schema of creativity. Of particular interest is their discussion of Piaget's theory of cognitive development and its relation to the concept of creativity. Their account goes further than Brown's analysis above (4.1.4), since Brown was able to deal only with Piaget's idea of assimilation. Lesner and Hillman point out that Piaget's concepts of organization, adaptation, assimilation and accommodation provide an important understanding of the modes of operation which occur when ideas affect intellectual development.

> Organization refers to the proclivity for all organisms to systematize or organize their processes into coherent physical or psychological systems.... Adaptation, on the other hand, is that tendency all organisms have to adapt to the environment and may be considered in terms of two complementary processes, assimilation and accommodation, depending on whether the individual's cognitive schemas shape (assimilation) or are shaped by (accommodation) the environment.[61] [my emphases].

In going further than Brown, their study was able to provide

insight into how, psychologically, new information is absorbed and processed, leading to the cognitive point at which we must either refine our theories or overthrow them.

Lesner and Hillman go on to point out that the very principles which Piaget defined as basic to the process of intelligence are also the ones related to the creative process. In Piaget's view, creativity and intelligence interacted with each other in such a way that they produced intellectual activity at ever advancing levels. The conclusion of the Lesner and Hillman study is that creativity is not "a rare or magical process." It is a potential activity common to all, which can be developed in both its cognitive and in its social/emotional aspects.[62]

What is particularly interesting in their analysis is that they have shown that creative thought functions through the same channels as other intellectual activity. So not only is creativity clearly identifiable as a form of intellectual thought, but its function is also integral to the whole process of thinking. (cf. Guilford on this same point (4.1.4c) and Darja Piciga-Rojko (1984) (4.1.6a).

This being the case, i.e. that it is integral to the whole process of thinking, it is of paramount importance that we examine creative thought within the context of cognition generally, in order to ascertain whether the constraints which apply to logical thought apply equally to its creative aspects. This is a task which I shall undertake in 4.1.6e and f below.

In the meantime, we must examine other aspects of the complex relations involved in creative thought, particularly the role of imagery and dreams.

c. Dreams and imagery in creative thought. Research in physiological psychology has produced interesting information on this aspect of the creative processes. A study carried out in the Department of Psychophysiology and Psychiatry in the U.S.S.R. by V. S. Rotenberg[63] examined the relationship between dreams and the role of the right hemisphere spatial imagery in relation to creative processes. It was found, among other factors, that there is a limited relationship between the imagery of dreams and creative productivity. The relationship is not one of cause-effect; it is more likely that dreams can provide a setting for a creative act. Rotenberg concluded from his study that far more complex relations were involved.

It will be useful at this point to compare the findings of Rotenberg's study with Koestler's biographical account of Kekulé's dream experience and the discovery of the benzene ring (3.3). It would appear that Kekulé's long period of incubation of seven or eight years prior to his dream experience, during which time he wrestled with the problems of organic chemistry, and the fact that he only finally resolved the problems after making the connection between two unrelated areas, viz. when he saw an analogy between his dream of the serpent biting its tail and the model of a "ring" or "closed chain" as the structure of the molecules of certain organic compounds, are corroborated by Rotenberg's research findings that a direct cause-effect relation does not exist between dreams and discovery; rather a complex number of cognitive relations are involved in the whole process. Similarly, Kekulé's dream experience accords with Rotenberg's further observation that dreams can provide a conducive setting for discoveries of this kind.

That being the case, the question still remains as to why it is

that dream settings are conducive to creativity. I have already argued that appeals to the unconscious, which were made by Koestler, as the means of explaining how creative acts arise in such settings, is basically unsatisfactory, because the concept of the unconscious is, of itself, so opaque. Also, I have maintained that far more illumination could be thrown on the problem by undertaking a more detailed analysis of the complex relations within cognition generally.

In this respect, it would be helpful to look very briefly at how concepts are built up. In the following discussion I shall endeavour to show that it is highly likely that it is the imagery aspect in dreams which can best explain why dream settings are conducive to creative activity. Nevertheless, as will also be made clear in the discussion which follows, it is very important to note that considerable controversy still surrounds the nature and function of images in cognition. Not among the least of the problems is the fact that a certain ambiguity surrounds the use of the word "image." In discussions about mental representation, the word "image" is, in some instances, taken to refer to visual representation; in other instances the term is used to refer to either symbolic or metaphoric representation. It will therefore be necessary to distinguish clearly between these two different ways in which the word "image" is used.

There are also wider implications that follow from making distinct the way in which the term "image" is applied which directly affect theology. This is particularly true of the theology of Austin Farrer. It was because his notion of "image" was understood in different ways that it became the "sticking point" on which many, mistaking what Farrer meant by the term, ultimately also misunderstood his argument about the form which our apprehension of God takes. As

we shall see in 7.3.2 below, Farrer's use of the term "images" was in the symbolic/metaphoric sense, not the visual.

Attention should also be drawn to another problem which exists in regard to the notion of "image" in so far as it relates to the forming of concepts. When we conceive of things, a question which has often been debated in the past has been whether the mode of the operation is in "words" or in "images."[64] It is therefore essential that some consideration be given to this issue as well.

d. Concepts, words and images. In the old view of rationality, which I alluded to briefly in 4.1.5 above, it was generally assumed that words were the primary objects in rational reflection and that the propositions which they embodied were the substance of logical analysis. Further, it was assumed that images were the objects of imagination and that their content formed the substance of intuitive thought. The inference was then drawn that logical analysis was a function of the rational domain of thought and examinable; intuition the function of the irrational or at best non-rational domain of intellectual activity and not examinable.[65]

This dichotomising of thought came to be known as "faculty psychology."[66] Its effect was twofold. Firstly, it severely restricted the concept of rationality to the operations of formal logic, since it was held that if words and the propositions they embodied were the substance of conscious thought and analysable, rationality could be defined as the product of those functions. As a consequence, all other operations, such as the role of "image," in both its visual and symbolic/metaphoric forms, together with imaginative reflection, were regarded as non-rational, as belonging to

unconscious thought and unanalysable.

Secondly, once rationality was assumed to be thus defined, this popular but highly distorted view of conscious thought dominated philosophy, particularly in the form of logical positivism in the first half of the twentieth century. Also, within the field of psychology itself, it affected the way in which intelligence was conceived and, in turn, the way in which tests for intelligence were constructed.

Though the particular relation of creativity to intelligence is still far from settled,[67] measures of intelligence are certainly no longer conceived of as falling within such narrow categories. In fact, in the present day, when intelligence tests are administered, they are generally given within a battery of tests, which include measures for both creativity and personality factors.

One of the hindrances of research into the nature of thinking has been the fact that, in addition to the necessary experimental work which still needs to be covered, a comprehensive structure within which the whole psychology of thinking could be conceived has been lacking. Neil Bolton's The Psychology of Thinking,[68] though published some time ago in 1972, goes some way towards remedying this overall lack. In discussing the wide spectrum of investigatory studies undertaken on the subject of thinking, Bolton has endeavoured to show that there is a growing consensus underlying the diversity of research, and that this of itself, should be able to "provide us with a psychology of thinking which is at once unitary and many-sided."[69] His work draws together the body of research which was available by the early 1970's, and pinpoints how the findings of quite different theoretical viewpoints actually complement one

another. Thus, he argues, it is possible to build up a composite understanding of the psychology of thinking from these evidences.

By contrast, the apparent conflicts which have at times been set up between different aspects of the processes of thinking, e.g. between "words" and "images," and between the "logical" and "intuitive" aspects of thought, can thus be seen for what they are, viz. the result of a highly dichotomized and inadequate view of thinking. The same could also be said of the limited concept of thinking itself, which arose in the first place because of a too restrictive concept of rationality.

When concepts are too restrictive, they will necessarily limit comprehension. A great deal of information can be missed as a consequence and the outcome of one's research seriously distorted.[70] We have already seen how this occurred when, because of an inadequate concept of thinking, intelligence also was conceived of in too restrictive a way (4.1.4c). Bolton has argued that creativity is an integral part of thinking,[71] a view which is not only more adequate but which, as we have already seen, has since been corroborated by recent research (4.1.4, 4.1.6a). Hence, when discussing the different aspects of thought, it is important not to set them in conflict with one another. Instead, their complex relations to each other should be carefully analysed in an attempt to discern their function within the context of thinking as a whole, and also as an aid to building up an adequate concept of the psychology of thinking.

Having said that, it is essential that we realize that we have not done much more than raise the lid on Pandora's box! In fact, Gillian Cohen's analysis of the role of concepts, words and images in

thinking, in her book The Psychology of Cognition,[72] indicates just how complex these overall relations are within cognition.

However, two factors will become obvious from an examination of her writings, viz. (i) that both words and images have an integral function within cognition and (ii) that the conception of these in the past as mutually exclusive modes of operation can now basically be shown to be incorrect. Also, by clarifying our understanding of how concepts, words and images relate to each other in cognitive activity, I hope also to cast more light on their role in creative thought and elucidate my reasons for saying that it is most likely that imagery is the facilitative element which makes dream settings conducive to creative activity (4.1.6c).

As one way of examining the role and relation of concepts, words and images in thought, Cohen has enquired into how knowledge is represented, stored, cross-referenced and indexed so that it can be reached and retrieved on demand. First of all, she has noted that the elements of semantic memory are abstract concepts and not words. She says, "The knowledge represented in semantic memory can exist in the absence of language, or be linked to different languages."[73]

Next, she maintains that a "composite or hybrid" model is required to account for the diversity of mechanisms which are used in the acquisition of knowledge. For instance, in acquiring, storing and retrieving everyday knowledge, familiarity and frequency play an important role. However, in the processing of new knowledge, different strategies, related to existing background knowledge, motivation, intentions and a number of other factors, are employed.

> The comprehension of a single simple sentence involves the construction and storage of inferences and elaborated interpretations, and re-shuffling or modification of information already in store.[74]

The complexity and diversity of identifiable operations has increased as experimental investigations have extended, such that it has been well-nigh impossible to construct a theory which is sufficiently comprehensive to encompass all the findings.[75]

When one comes to visual information and its representation in memory, the research is deadlocked. This has mainly been because researchers have not yet been able to establish that images and propositions represent information in different ways with different consequences functionally. However, Cohen cautions against those who would either minimize or deny that imagery has a function in cognition on the grounds that enormous use is made of pictures, diagrams, graphs and maps to communicate information. Such means of conveying information are generally more quickly grasped and more easily retained than verbal means. Also, visual information has the distinct advantage over verbal information in that several visual items can be contemplated simultaneously. Verbal information is necessarily sequential and its items must be reviewed successively.[76] She thinks visual imagery may, for this reason, be more valuable in creative thought.

Nevertheless, Gillian Cohen has emphasized that a thinker without language is cognitively disabled. On the other hand, language must not be seen as a sufficient condition of intellectual success. The great advantage of language is that it enables a person not only to acquire information but also to gain access to a store of knowledge. However, a great deal more is involved in forming and developing concepts than just the manipulation of language. In fact, experimentally there is much to suggest that human thinking is a

multiple activity.[77]

From Cohen's analysis, it is possible for us to say several things in regard to the relation of concepts, words and images in cognition generally. Firstly, she has made it abundantly clear that a number of psychological factors as well as previous background knowledge are fundamentally important in the act of comprehension. Concepts are not built up by a straightforward manipulation of words and/or images.

Secondly, the identifiable operations involved in this process have increased in number as experimentation has progressed. Hence, the previous dichotomising of the modes of operation into the "logical" and "intuitive" have not only been too simplistic but basically incorrect. The psychology of cognition is a much more complex process in which many factors, including the verbal and visual, are involved.

Thirdly, the research regarding the relation between verbal and visual operations and their representations in memory is virtually deadlocked. As I have already pointed out above, the confusion caused by the fact that the same term "image" has been used both to refer to visual and to symbolic/metaphoric representation has added confusion to this area of enquiry, though Cohen does not comment on this fact, nor does she discuss symbolic/metaphoric representation. Nevertheless, she has explicitly warned researchers against either minimising or denying the role of visual information in thinking, since it represents such a prominent aspect of thought. She also notes that, by comparison, visual information has an advantage over verbal information and suggests that it may have greater value in creative thought. In this connection, her strong suggestion gives support to my argument that imagery, in the form of visual information, could

well be the facilitative element in dream settings which makes them conducive to creative thought. This being the case, we must not exclude visual factors from our consideration of the processes of thought. Nevertheless, as pointed out above in 4.1.6c, Rotenberg has shown that the relation between dreams and imagery is only limited. So it should also be noted that imagery represents only one of the complex relations which account for creative activity.

Fourthly, she has drawn our attention to the substantially indispensable role of language in cognition in the acquisition of information and in gaining access to a store of knowledge. However, she has also pointed out that more than the manipulation of language is involved in the forming and developing of concepts. From her discussion we can conclude that verbal manipulation and visual information are at least two of the functions involved in mental representation, but by no means the only two. As already mentioned above, the term "image" has also been used to refer to a symbolic/metaphoric function which is operative in thought, and this would appear to identify at least a third function. It is unfortunate that Cohen did not give attention to this last function. As we shall see later in the discussion of "mental models" (4.1.6d to 4.1.6f; also 6.1.1 and 6.3) the symbolic/metaphoric function performs a major role in thinking, particularly in the frontiers of thought.

She did, however, maintain that the functions involved in thought are multiple; the form of its representation is abstract. The question of the form of mental representation still remains a controversial one in cognitive psychology. Cohen did not attempt to specify the form of mental representation too precisely. Apart from noting that the elements of semantic memory are

abstract concepts and not words, she did not say whether these abstract forms are all of one kind or whether, if there is more than one kind, they can be distinguished from one another.

Currently, there are three schools of thought. The first of these (represented by Paivio, Shepard and Kosslyn) has maintained that images are distinct from other sorts of mental representation. The second (represented by Baylor, Pylyshyn and Palmer) has held that there is only one underlying form of mental representation and this corresponds to propositions.[78] The third, maintained by P. N. Johnson-Laird,[79] whose view on "mental models" I shall discuss in detail below, has argued that there are at least three types of mental representation, viz. -

(i) mental models,
(ii) propositional representations and
(iii) images.[80]

However, Johnson-Laird insists that generally the dominant mode of representation is in the form of mental models. He argues from his research that we construct mental models of determinate descriptions and only abandon these in favour of the propositional ones when we encounter indeterminacy in a description.

For the purposes of this thesis, it is only necessary for us to note from all the discussion so far that Johnson-Laird's three types of form, at least, appear to be the ones involved in transposing the things of our world into things which we can think about. As regards the functions involved in forming our concepts, these can be said to be multiple.

We may summarize the above by saying that, in the building up of concepts, it would seem that the cognitive functions involved are multiple, and that there are three forms by which thought is

represented, viz. mental models, propositional representation and images. Though the precise relation of these forms has not been determined beyond question experimentally, there is much to suggest that the dominant mode of representation is that of mental models.

Having said that, it is still necessary to detail more precisely the way that mental models function in cognition and to discuss the question of whether or not their function can be said to belong to the rational domains of thought.

e. Mental models and rationality. A. J. Sanford, in his recent publication Cognition and Cognitive Psychology,[81] has argued cogently that mental models are the form of mental representation which enables us to represent thought to ourselves. Though his work is by no means conclusive, his analysis provides important insights into the problems which still surround the study of cognition. I shall discuss Sanford's argument for mental models first, but it will also be necessary to extend his work with the far more comprehensive research on this matter which has been undertaken by P. N. Johnson-Laird.

Sanford approached the question of mental models by studying the special case of discovery in problem-solving. He contended that when discoveries are made in problem-solving, these provide the best examples of the cognitive processes which are involved in decision-making. These processes, he argued, are rational. His case rests on his particular definition of rationality. He maintained that in the light of the increased information about cognition, rationality is now more appropriately described as "'applying logical principles' rather than 'thinking logically;'"[82] people manipulate mental models within the constraints of some logical system, but do

not conform to that restrictive notion of rationality which required strict adherence to formal logic.

Sanford's distinction between "applying logical principles" and "thinking logically" is made not only to emphasize how the greater part of our thinking proceeds, but also to indicate clearly that this form of thinking still must adhere to logical principles, and, as such, is rational.

Earlier we discussed Poze's research (1983) in which he distinguished analytical thinking from analogical thinking. Poze argued that though analysis can break a problem down into its parts, it is not able always to solve a problem. Hence, analogical thinking is necessary, as it allows one to make connections where none have been made or thought possible before. In some cases, Poze held that both analytical and analogical thinking were necessary. However, he did not expand to any extent on what he called analogical thinking.

From Sanford's account, it would appear that what researchers like Poze are endeavouring to describe is a form of thinking which reasons by using mental models. Thus he argues, when people are confronted with problems, they work on them by forming a mental model of the problem. The model is embedded in the memory and easily accessible to recall.[83] The mental model is constructed by means of a process of mapping that connects the problem-statement with "scenarios" or "schemata" which are already in one's background knowledge. Analogical reasoning, he says, is one good example of this mechanism.[84] (cf. Brown's description of heuristic methods, 4.1.5; also Lesner and Hillman's description of developmental schema and creativity, 4.1.6b).

It is important to note that this connecting up or mapping is

achieved by what Sanford called "intuitive," as distinct from "analytic," reasoning.[85] However, herein lies a problem. Says Sanford, "many intuitions have the property of being both faulty and of high confidence."[86]

The full force of this difficulty will be most obvious when we come to discuss whether scientists can be assured that their knowledge is objective (4.3, 6.1 and 6.6). It should become clear from those discussions that the role of analysis, at the very least, is indispensable. So even if intuitive reasoning, i.e. the process of making a connection between the problem-statement and relevant background knowledge (schemata), is integral to the whole process of acquiring knowledge, the theories that such reasoning produces must still be checked out logically, no matter which means have been employed to achieve them. (cf. Pasteur's experiments in which he worked out the logical steps implied in his discovery in order to establish the principles of attenuation, 3.3). As we will see later, logical checks represent one of the essential steps towards achieving objectivity. It is also important to note that where empirical checks are applicable, these must not be overlooked either. The crucial importance of empirical testing will be discussed in Chapter 5.

In the meantime, we must return to discuss some of the problems which can ensue from the mapping of mental models by intuitive procedures. Once a model is established, it tends to be retained in the memory and is difficult to replace. In this respect it may have either a facilitative or an inhibitory role in thinking. When new knowledge is acquired, if it is knowledge which fits the existing model, it can be quickly assimilated and the role is facilitative. On the other hand, if it is knowledge which does not fit the existing

model and resists assimilation because an alternative model is required, the existing model has an inhibitory role. What usually happens in this latter instance is that the initial model continues to be activated, since it is already available in memory. It, therefore, makes it very difficult to construct another.[87]

As we saw earlier in this thesis (1.2.3), at the time of the dominance of Aristotelian thought, the existing models for motion, rest and place made it very difficult for the scientists of that time to make the conceptual changes which were necessary before the rise of modern science was possible. In this respect, A. Koyré's discussion in Metaphysics and Measurement of just how great an intellectual effort was required before these conceptual changes could come about is enlightening. It illustrates clearly how resilient mental models can be once they have been constructed and stored in memory.[88]

The question which immediately presents itself in the light of such circumstances is this: if "intuitive" approaches to solving problems can lead to such "faulty" results, which have been held with "high confidence," thereby aiding the resilience of these inadequate mental models in memory, can the claim that such approaches are rational be sustained?

As we saw in our discussion above of Brown's argument for heuristic procedures and their rationality (4.1.5), he argued that whilst it is true that such methods of reasoning cannot, of themselves, guarantee that their outcome will be free from error, they can still be said to be rational for three reasons: they proceed step by step; they do not contravene logical principles; and there are inbuilt constraints from background knowledge as to what can

legitimately be conceived.

In developing his theory of cognition, Sanford is basically in agreement with Brown's position, but goes further in citing the research of P. N. Johnson-Laird on mental models as additional support of his claim that an argument for the rationality of these procedures can be sustained.[89]

At this point it will be necessary for us to turn to the work of Johnson-Laird, as he has undertaken an even fuller and more enlightening study of the function of mental models and the constraints which apply in respect of them. An examination of his research should therefore be helpful to our attempt to assess whether such forms of reasoning can really be counted as rational.

f. Mental representation and cognitive constraints. In his book, entitled Mental Models,[90] Johnson-Laird has pointed out that the psychological core of understanding consists in our having a "working model" of a phenomenon in our minds. Mental models enable us to reflect on, communicate and reason about the reality they model. Their essential feature is that they can symbolize reality to a greater or lesser extent in order to aid thought or calculation. They do not mirror or correspond completely with what they model. To be useful, they need merely simulate or have some similar relation to the structure of the phenomena which they model. Mental models, he says, allow us to try out alternatives, to make judgements, to recall the past or think about the future.[91]

Basically, Johnson-Laird's position derives from his view that the function of thought is essentially symbolic; the form is mainly mental models.[92] It is important to realize that he uses the term "symbolism" very generally. By it, he simply means the representation

of the things of our world in thought.

Whilst on the whole we encode information into many different systems, either linguistic or otherwise, these systems of symbolisation eventually all fall into three basic categories, viz. mental models, propositional representation and images, the main one being mental models. His theory of comprehension can be conceived of as involving a hierarchical system of symbolisation,[93] a fact which he acknowledges.

Although there is still a great deal of controversy over the details of the complex relations in cognition, Johnson-Laird has pinpointed a crucially important aspect of thought. He has identified that a general process of symbolisation is central to the way we comprehend our world. Hence, he argues -

> ...mental models play a central and unifying role in representing objects, states of affairs, sequences of events, the way the world is, and the social and psychological actions of daily life. They enable individuals to make inferences and predictions, to understand phenomena, to decide what action to take and to control its execution, and above all to experience events by proxy; they allow language to be used to create representations comparable to those deriving from direct acquaintance with the world; and they relate words to the world by way of conception and perception.[94]

Just how crucial Johnson-Laird's understanding of symbolisation is to the concerns of this thesis will become clear later when I shall discuss the essential role of symbolisation as the means by which we gain access to knowledge of our world (6.1.1 and 6.3).

In the meantime, we must address ourselves to another significant aspect of his work. This is in connection with his argument that the construction of mental models and the reasoning which takes place on the basis of them are "nothing more than computational processes."[95] It is important to understand that he is not

attempting to reduce the psychology of reasoning to a mere mathematical form. Rather, his aim has been to show that because the kind of reasoning which uses mental models and proceeds heuristically can be translated into binary code and is wholly expressible in computational terms, then a strong case indeed exists to support the view that such procedures are in fact rational.[96] (cf. also Bruner's views on combinatorial activity and computing, 4.1.1b). Further, it supports Johnson-Laird's argument, as detailed below, that rational thought can, after all, proceed without having to depend on formal rules of inference.[97]

The main thrust of Johnson-Laird's book has been to contest the conventional approaches to reasoning which, in assuming that a mental logic underlies rational thought, have sought to find what the mental rules of inference are. In opposing this position, Johnson-Laird has maintained that, typically, reasoning proceeds "without recourse to a mental logic with formal rules of inference."[98] [my emphasis] What occurs in practice, more often than not, he says, is that we learn the truth conditions of a term, not the formal rules of inference. Hence valid reasoning has been possible without a knowledge of the rules of formal logic.[99] Therefore, he argues, a radically different conception of inference is necessary if we are to understand the processes by which people reason. (cf. Brown's argument for "heuristic" methods, 4.1.5, and Sanford's views on "intuitive" procedures and mapping, 4.1.6e).

However, it is possible to argue that even if a subject may not have been schooled in the rules of formal logic per se, that, of itself, does not rule out the fact that the subject may still be reasoning with direct reference to a set of formal rules. In

contesting this view, Johnson-Laird says -

> At first sight, this process may seem as though it depends on formal rules of inference, but the repeated reference to truth values is a good clue that the deduction is not merely a result of a syntactic process of derivation. In fact, the procedure depends on a knowledge of the truth conditions of connectives, an ability to substitute a truth value for a proposition, and a capacity to work out the resulting effects of making such a substitution in a complex proposition.[100]

The point he is making here is that the assumption that inferences are made with reference to a set of formal rules cannot be supported experimentally. From the reports of experimental subjects it would appear that what they actually do is "evaluate the meaning of a complex proposition from a knowledge of the truth values of its constituents...".[101] In the process, inadequate mental models are eliminated.

Further, from an analysis of the subjects' reports, it was found that, in making these judgements, they had proceeded by simplifying the complex problems with which they were confronted into manageable components. By substituting truth values for its constituents, subjects were able to pursue the consequence of such substitutions and solve complex problems. Johnson-Laird has called this approach the "compositional procedure."[103]

Later, when I come to discuss the principles of objectivity and the way these principles are applied in the acquisition of knowledge in science generally (Chapters 5 and 6) and in theology in particular (Chapters 8 and 9), the importance of the above three factors as <u>cognitive constraints</u> in the making of rational decisions both in science and in theology will be seen to be most crucial.

However, it must be clearly emphasized that in citing the work of Johnson-Laird, I am not in any way suggesting that reference to the

rules of formal logic is dispensable in regard to the testing of whether inferences are valid or not. On the contrary, the point which I am endeavouring to make, following Johnson-Laird, is that when we reason we proceed in a number of ways, the most common being by substituting truth values rather than by consciously consulting a truth table or the rules of formal logic.[104] Further, this mode of operation is carried out by using mental models to which fundamental constraints apply.

At an early stage of such procedures, the inferences made are rarely valid deductions. At most, they enjoy the status of being plausible conjectures.[105] What occurs, Johnson-Laird says, is that on the basis of information at hand, the context of that information, and other background knowledge, a subject constructs a single mental model. The information is retained in the model by default, until subsequent evidence overrules it. Further, a subject can perform any number of operations in relation to the model in an entirely logical way without necessarily employing rules of inference, inferential schemata or any other kind of means corresponding to a logical calculus.[106] This is <u>because</u> "compositional procedures" are rational; they observe existing constraints and apply logical principles.

By this means, inferences are drawn by relating the components of a mental model to factual knowledge. As a consequence, the model is continuously revised, new predictions can be formulated and our understanding of the world is increasingly expanded.

The upshot of Johnson-Laird's research has been to show that a person develops logic as an intellectual tool; formal logic is not, as has traditionally been thought by psychologists such as Jean Piaget,

integral to intellectual development.[107] Hence he argued -

> What children learn first are the truth conditions of expressions: they learn the contribution of connectives, quantifiers, and other such terms to these truth conditions. And, until they have acquired this knowledge about their language, they are in no position to make verbal inferences. Once they have learned such truth conditions, there may still be impediments that prevent them from realizing their full inferential competence.[108]

Thus, as I acknowledged earlier in discussing Brown's study, it is true that "heuristic" methods cannot guarantee their outcome. However, the cognitive constraints which are inherent in these methods make it possible to reach valid inferences without having to refer to a set of formal rules. The procedures are rational but do not conform to the conventional belief that rationality is achieved only by following the rules of formal logic. Hence, it is fitting at this point to recall Sanford's view, discussed in 4.1.6e, in which he argued that in respect of the actual function of thinking, rationality is more accurately described as "the applying of logical principles" rather than as "thinking logically."

In summary we can now say that current psychological research has shown that rational procedures are entirely possible outside of the strict following of the rules of formal logic. We do not need to restrict ourselves to the operations of formal logic per se in order to think rationally. For, as we have seen so clearly from Johnson-Laird's research in particular, when we think, we most commonly proceed by constructing a mental model from the information which is available and, using "compositional procedures" that provide important cognitive constraints, we either revise the model we have constructed or reach a stage where we must eliminate it.

Rationality, therefore, can be achieved in a variety of ways.

Contrary to previous belief, knowledge of the rules of formal logic is not mandatory. In order to think rationally, a person must, however, have developed a skill for making inferences in respect of factual knowledge.[109] Both logical and imaginative procedures are involved in so doing. These operations, as has now been shown, are not only rational, but enable us considerably to increase productive thought. If rationality is confined to the operations of formal logic only, as some have endeavoured to insist upon in the past, a considerable proportion of rational thought in its most creative aspects is, by definition, excluded. As a consequence, our understanding of thinking is distorted and, worse still, the possibility of advancing our knowledge is severely restricted as a consequence.

Of course, it could still be argued that the kind of reasoning which I have analysed above is only typical of a narrow band of scientific practice, viz. that which occurs in scientific discovery, and, as such, does not warrant either the attention or importance which I have given to it. Though this objection could be said to be true in one sense, it is grossly misleading on all other counts. For, as I have argued in 4.1.5 above and throughout this section, discovery, insight and creativity are not rare or isolated aspects of thinking, but are integral to the whole process of thinking. They function through the same channels of intellectual activity as other forms of thought, and are typically constrained by the same principles which apply to cognition generally.

It is true that they represent one identifiable aspect of thought, viz. what may generally be referred to as the creative/imaginative activities within thinking, but it is essential to see that current

psychological research clearly indicates that creative/imaginative thought does not function in isolation from the logical aspects of thought. Therefore, it is misleading to identify creative/imaginative thought as only operative where great discoveries are made in science. On the contrary, creative/imaginative thought, being integral to the whole process of thinking, is an <u>essential</u> element of reflection. (Cf. (i) Guilford's factor analysis that isolated 120 separate, measurable intellectual abilities amongst which were a number of creative factors[110]; (ii) Bruner's argument that discovery should not be confined to the growing edge of the scientist's enquiry, for it is engaged in by all who seek to obtain knowledge, whether or not that knowledge has already been discovered by anyone before (4.1.2); (iii) Lesner and Hillman's study which shows that new information is absorbed and processed through the ordinary processes of thinking of which creativity is a functional part (4.1.6b)).

Therefore, to suggest that creative thought is only applicable in the case of great scientific discoveries where theories are overthrown or an entire paradigm shift is necessary, is to present a distorted view of intellectual activity altogether. Current psychological research clearly indicates that logical and imaginative functions are integral to the process of thinking and cannot be separated off without giving a highly distorted and artificial account of the psychology of thinking as a direct consequence (4.1.5, 4.1.6a, b and d).

Nevertheless, the reason for having concentrated on an analysis of discovery, insight and creativity in this section is that such instances provide some of the clearest examples of the processes of thinking which are involved when new information is absorbed and

conceptual changes of considerable dimension are necessary. They are able to provide us with some of the most illuminating material as to how scientific knowledge is actually acquired. Far from focussing on one miniscule aspect of scientific enquiry and resting my case on that, the contrary is in fact true. For the above analysis has brought to light the highly significant fact that creative thought is integral to thinking, and, as such, must be seen as a functional aspect of general cognition. Understood, as it should be, in its proper relation to other aspects of cognition, there are important implications which follow. Not the least of these is a challenge to the past concept of rationality. This concept must now be seen as very inadequate indeed, based as it has been on assumptions which, in the face of current psychological research, are quite untenable.

This being so, it is now necessary to draw the threads of this long and complex discussion together in order to elucidate the vitally important perspective which the findings of psychological research actually bring to the philosophy of science.

4.2 The Relation of Psychological Research to Scientific Reasoning.

At the beginning of this chapter I argued that current research in experimental psychology, particularly in its developmental and cognitive aspects, had much to contribute to the understanding of scientific reasoning. However, an objection could be raised that all I have done in the discussion above is give a description of a number of cognitive activities and their relation to one another. This is not the case at all. It has been necessary to undertake the above analysis in order to demonstrate two things -

(i) that the findings of psychological research have a direct bearing on the philosophy of science, since they provide vital information in regard to the acquisition of knowledge, and

(ii) that the canons of objectivity which apply in scientific practice, particularly in its rational aspects, can be specified once a fuller understanding of how science acquires its knowledge has been established through using the findings of cognitive science.

Whereas it was previously thought that objectivity was guaranteed by the methods of science, which consisted of the accumulation of a number of sensory measures, from the psychological findings above it has been shown that in fact there are complex rational procedures which are also involved in scientific enquiry. The main value of the findings of cognitive science for this thesis is that they provide us with vital information about the nature of these rational procedures. In this regard, several important implications for the philosophy of science ensue.

One of the major contributions of psychological research is that it has highlighted existing misconceptions within both psychology and philosophy. In psychology, many former conceptions have been overturned: conceptions of intelligence which were too narrow and excluded creative thought; of creativity as rare, belonging to the "genius" and arising from unconscious, ecstatic and non-rational sources; of words as the objects of rational thought and images as the objects of intuitive/imaginative and at times irrational thought. As a result, a far more comprehensive and explicit account of the psychology of thinking has been reached. Intelligence has been shown to embody a broad number of factors, creative ones included; creativity has been shown to be a common ability of all, cognitive in its origins and analysable; and the forms by which the things of the

world are represented in thought have been shown to be symbolic and most likely of three types, viz. mental models, propositions and images.

Not only has this opened up our understanding of cognition considerably, but it has also presented a direct challenge to the previous assumptions about the whole psychology of thinking. This is particularly true of what was assumed in the past by philosophers in regard to the concept of rationality.

As I noted above in 4.1.5, because of the false dichotomizing of thought into the so-called "logical" and the so-called "intuitive," a highly restricted concept of rationality persisted in a long tradition of philosophy as a result. Conscious, rational thought was defined as that which followed strict logical rules. Since imaginative/creative thought did not proceed in this manner, it was considered not to be rational and therefore not the concern of philosophy or logic. Though recent studies, particularly in the philosophy of language and in the philosophy of science, have undermined these conceptions,[111] the added advantage afforded by the findings of cognitive science is that they have been able to establish experimentally that creative thought is integral to intelligence and that both logical and creative/imaginative aspects function in thought. Further, other studies have indicated that the procedures used in the acquisition of knowledge are typically heuristic and that such procedures are demonstrably rational. These findings have led to a necessary and complete reappraisal of the concepts of intelligence, creativity and rationality.

Despite these changes, the old misconceptions have persisted in popular belief and their residual effects have continued in a wide

area of thought, not the least of which have been aspects of the philosophy of science and of theology. I shall briefly discuss these effects in respect of the philosophy of science, but shall leave their discussion in respect of theological thought until Chapter 7.

In 2.1 and 3.1 above, I argued that where the philosophy of science had become detached from the practice of science, it suffered from inordinate distortions. The reason was that the very principles in scientific practice which formed the canons of objectivity and were necessary to any adequate philosophy of science were overlooked. So whilst the resultant philosophies of science were in themselves constitutive of a coherent body of reflection, they were no longer a reflection on the actual practice of science! As I pointed out above, the historical roots of the strand of thought that Crombie called the philosophers' philosophy of science, which hardened into rationalism, and later diverged into empiricism and positivism, can be traced to this basic oversight.

There are now two identifiable strands of the philosophy of science. One of the unfortunate outcomes of this separation is that the philosophers' philosophy of science has been the strand which has risen to prominence in the twentieth century, gaining acceptance as the representative account of science. Hence, disciplines such as theology, which have found it necessary to consider the implications of science for their enquiry, have taken the philosophers' philosophy of science as their point of reference. By so doing, they have also embraced the positivist ideals which are implicit in that philosophy. (See 3.1 and 3.2). Since these ideals have been taken as the measure of objective knowledge, they have also come to be regarded as the criteria of truth by which a discipline should be assessed.

The consequences for theology have been quite devastating.

The aftermath of the positivist ideals of objectivity has continued to affect theology even to the present day. Basically, theological thought split off into two directions in an effort to establish its credibility in the face of these intellectual demands, creating a hiatus in theological reflection. In contemporary theology this divergence is manifest on the one hand by those who have undertaken radically to revise theology as a means of gaining intelligibility for it (e.g. D. Cupitt), and on the other hand by those who have abandoned any attempt to reconcile theology with the intellectual demands afforded by the scientific world, (e.g. D. Z. Phillips), claiming immunity from having to do so on the grounds that theological thought is sui generis, i.e. it belongs to a class of its own and is therefore not subject to the usual canons of rational enquiry. However, I shall be arguing that neither of these resolutions is satisfactory. (See discussion 7.3.3, 8.1, 8.2, 8.4 and 9.3).

In the meantime, as noted in 3.1 above, because the positivist ideals of objectivity did not accord with how objectivity was actually being achieved in the practice of science, these ideals were subject to damaging criticism, such that the situation now exists in which it is no longer tenable to conceive of objectivity in terms of the former positivist ideals.

One of the major difficulties which has contributed to these disparities has been that the philosophers' philosophy of science was basically an inadequate account of the practice of science, which rendered the concept of objectivity implicit within it inadequate as well. As I argued earlier, for a philosophy of science to be

adequate, it is essential that it be constructed with full reference to what scientists actually do and how they actually think. Otherwise, it will be impossible for us to establish what the principles of science actually are and how objectivity is ensured.

As the means of achieving this end, I argued that it was necessary to study the history of the practice of science. Whilst undertaking this task, it became obvious that it was also necessary to analyze relevant tenets of cognitive psychology, since it could be seen that these factors impinged directly on how knowledge was acquired and could provide us with critical information. The research undertaken has, in fact, enabled us to establish how knowledge is acquired and also to identify how objectivity is achieved in the process. Further, as the enquiry has progressed, it has become increasingly obvious that objectivity in the sciences is obtained by applying a number of principles and not by accumulating a number of sensory measures, as was formerly assumed by positivist philosophy and is still held by some in popular thought to-day.

It is now important to conclude this chapter by specifying in general what these principles of objectivity are and how they are applied.

4.3 The Principles of Objectivity.

In examining the concept of objectivity in 3.1, I noted that attempts to undermine the positivist ideals of objectivity along logical and historical lines were only partially successful, since they failed to give an adequate alternative account of the principles of science. I have argued that an adequate account of the

practice of science must be established first before it will be possible to identify the actual principles by which science acquires its knowledge and by which it satisfies itself that the knowledge it has acquired is objective.

In pursuing this task, several factors have emerged which clearly indicate that both rational and empirical procedures are operative in the acquisition of knowledge, and, further, that both rational and empirical constraints apply in respect of those procedures as the means of ensuring a level of objectivity for the knowledge acquired.

Polanyi (3.2) and Bruner (4.1.1b), have both argued convincingly for the essential function of a knowing subject before that which can be known is actually known. Polanyi has also pointed out that the participation of a knowing subject does not render scientific knowledge "subjective," but it makes science as vulnerable to personal bias as all other forms of enquiry. He conceived of the act of knowing as fundamentally an apprehension of reality.

Koestler's account of the process of knowing (3.3) has contributed many valuable insights in regard to both psychological and cognitive factors operative in the knower. He has provided an important context for understanding all that is involved in the acquisition of knowledge. He basically thought, however, that the origins of creative thought arose from the unconscious, were ecstatic and possibly irrational. Bruner's analysis (4.1.1, 4.1.2 and 4.1.3) together with greatly improved psychometric studies and more recent experimental research (4.1.4 and 4.1.5 respectively) have since established that the processes involved in the acquisition of knowledge have a cognitive base which is readily examinable.

The recent publication of S. Stich's book, From Folk

Psychology to Cognitive Science,[112] makes a strong case in support of the extent to which experimental research in psychology is able to establish the structure of cognition. I have argued that such findings have important implications for both philosophy and logic. In particular, current psychological research has undermined previous assumptions concerning the nature of rationality. Far more comprehensive accounts of rationality are now necessary.

Hanson's study of the "patterns of discovery" (3.4) clearly indicated the extent to which theoretical presuppositions organize and affect observation and experiment, and, in turn, how observation and experiment lead to the continual refinement, and, at times, complete overthrow of our theories. Changes of paradigmatic proportions are required in some instances.

He has demonstrated the inextricability of theory and fact. However, having established that both sensory and rational procedures are involved in the acquisition of scientific knowledge, he did not discuss in any detail the extent to which that knowledge can still be counted as objective.

Some of the most recent research into cognition and cognitive psychology is particularly helpful. From these studies it is possible to establish several factors particularly in relation to the rational procedures involved in the acquisition of knowledge.

Brown (4.1.5) has shown that the psychological processes involved in scientific discovery are rational and the methods employed heuristic. Lesner and Hillman (4.1.6b) have gone beyond Brown to detail the nature of the rational steps involved in these processes. These complex relations have been examined in depth by Gillian Cohen (4.1.6d) and to an even greater extent by Johnson-Laird (4.1.6d and

f). Sanford (4.1.6e) and Johnson-Laird (4.1.6f) have argued cogently that our apprehension of reality is mainly represented in memory in the form of mental models. Through applying logical principles it is possible to revise or eliminate these models.

Further, Johnson-Laird has contended from his experimental studies that cognitive constraints, which are applied by our having learnt how to substitute truth values for propositions, enable us to reach solutions to problems.

The value of psychological research is that it is able to explicate the steps involved in respect of rational thought. In this way, it is possible to see the way in which logical principles are applied in scientific reasoning.

However, as we saw in the discussion in 4.1.6f, heuristic procedures cannot guarantee that their conclusions are free from error. This is because applying logical principles is only one aspect of the whole process by which objectivity is achieved. The application of empirical constraints is also essential.

In other words, because both rational and sensory procedures are involved in the making of scientific judgements, it follows that if these procedures are to be free from personal bias, then the constraints applicable to them must be observed.

The success of Galileo's methodology, discussed in 1.4, 1.6 and 2.1, which was directly related to the rise of modern science, can be attributed to the fact that his procedures embodied these very constraints and depended on their strict observation. Ultimately the skill and rigour with which these constraints are applied will be comparable to the level of objectivity that can be achieved.

In the next chapter, I shall discuss in detail how scientists

apply <u>both</u> rational and empirical principles, as they seek to gain access to knowledge of the world.

CHAPTER FIVE

EPISTEMIC ACCESS (1)

In the enquiry so far, I have endeavoured to identify the reasons why science has been able to achieve such enormous success by the advancement of knowledge, whilst theology has not enjoyed a similar advantage, but has increasingly lost respectability as an academic discipline.

I have argued that, in the past, it was wrongly assumed that the methods of science guaranteed that the knowledge it obtained was objective. In actuality objectivity is not guaranteed by the methods (i.e. the procedures and techniques) of science per se. On the contrary, our examination of the history of the practice of science has indicated that scientists have only considered that objectivity has been achieved if the methods they have employed have incorporated the skilful and rigorous application of both empirical and rational principles (4.3).

It is now necessary to examine all these matters in even greater detail in order, firstly, to identify in which specific ways rational and empirical principles are applied in the scientists' quest for objectivity, and, secondly, whether their claim can be sustained that as high a level of objectivity as is possible can and is being achieved by these principles, such that the knowledge obtained can be counted as genuine knowledge.

5.1 Empirical and Hermeneutic Methods: A Continuum.

In the past, a sharp dichotomy has been perceived between the methods of the natural sciences and those of the more traditional arts disciplines such as history, literature and theology. The methods of the sciences have been seen as empirical, involving observation, experimentation and measurement; the methods of the traditional arts disciplines have been categorized as necessarily non-empirical, involving interpretation and evaluative judgements. However, as will become clear in the discussion below, there are good grounds for holding that this sharp dichotomizing of the sciences from the traditional arts disciplines was mistaken.

As Mary Hesse has observed, and I have also noted in 3.1 above in discussing logical positivism, over the last fifty years, whilst their Continental counterparts have virtually ignored the technical analysis of science, Anglo-American philosophers of science have developed a view of natural science which has conformed to a logic based on empiricist criteria.[1] They have assumed that the practice of science consists fundamentally of the accumulation of a number of sensory measures, and have rejected the inclusion of rational procedures as an essential element in scientific decision-making.

In the post-war period, Hesse has noted that two traditions have developed in Continental thought, in the human sciences. These are, she says, "the mainly Protestant schools of biblical exegesis, and the Marxist-oriented schools of political and social philosophy."[2] In both traditions knowledge has been seen as <u>interpretation</u> and the term "hermeneutic" has been used to describe the type of method employed. These methods have been characterized by philosophical analysts as <u>circular</u>, but little detailed examination has been

made as to their credibility.

In the meantime, there have been radical changes in the historical and philosophical analyses of natural science itself. In this respect, Hesse has pointed out that -

> ...the imperialism previously claimed for natural science in the empiricist tradition has now turned in some quarters into its opposite, namely an assimilation of natural science itself to something approaching the hermeneutic critique.[3] [my emphasis]

As was brought out in our analysis of the history of the practice of science (see particularly 3.1, 4.2 and 4.3), philosophies of science which have represented science in terms of either of the above extremes, viz. as empiricist, (i.e. as solely accumulating sensory measures), or as hermeneutic, (i.e. as solely a function of theoretical interpretation), have given a grossly distorted account of the actual practice of science. Consequently, they have been unable to identify accurately the principles of science or the means it uses to achieve objectivity in its acquisition of knowledge.

In her article, entitled "In Defence of Objectivity,"[4] Hesse has argued that the natural sciences do not rely on one or other of the above methods, viz. the empirical or the hermeneutic, but rather on a continuum of both.[5] Also, from a slightly different viewpoint, I have argued in Chapter 3 that a study of the history of the practice of science clearly shows that both rational and sensory procedures are essential to the acquisition of knowledge.

Given that both rational and sensory procedures are essential to the practice of science, and that science does employ a continuum of empirical and hermeneutic methods (a matter which I shall defend in 5.2.1 below), can the objectivity of scientific

knowledge still be defended? Hesse maintains that it can be.

In delineating her argument, she begins by pointing out that three things can now be taken as established in regard to science -

(i) data and theory are inextricably related to one another;

(ii) the language of scientific theory is "irreducibly metaphorical and unformalizable;"[6] and

(iii) there is a circularity involved in scientific reasoning, viz. of "interpretation, reinterpretation, and self-correction of data in terms of theory, theory in terms of data."[7]

These three factors have already been identified as true of the actual practice of science in our discussion in 3.4.1, 4.1.6d and 3.4.2 respectively. However, it has been necessary to draw attention to them again here because some philosophers of science have maintained that the very fact that science can be shown to be theory-laden, its language irreducibly metaphorical, and its reasoning circular (i.e. points (i) - (iii) above), provides formidable reasons for rejecting the view that scientists are actually gaining access to knowledge of a real world.[8]

Hesse has vigorously attacked this position, particularly as it has been formulated in the critical theory of Jürgen Habermas, published in his controversial volume, Knowledge and Human Interests,[9] and further defended by him in his article "A Postscript to Knowledge and Human Interests" found in Philosophy of the Social Sciences.[10] In addition, there is a very acute critique of Habermas' theory in M. Lessnoff's article, "Technique, Critique and Social Science,"[11] which will help to clarify the difficulties in Habermas' position even further.

Habermas' view of science is somewhat different from what I

earlier referred to as the historical approaches to the philosophy of science (3.1 and 4.3). The historical approaches have seen science as viciously circular. Scientists, they maintain are mainly engaged in generating a large number of competing imaginative theories concerning the physical world which are ultimately self-reinforcing. This, they argue, is because the scientists' observations and experiments are conditioned by those self-same theories.[12] Hence, they are incapable of achieving objective knowledge.

Whilst Habermas has agreed in general with these criticisms of natural science, he has departed from such thinkers at the point at which he has maintained that the methods of the natural sciences nevertheless do still achieve an "objective form" of knowledge. For this reason he has called the methods of the natural sciences "empirical-analytic" or "positivist." However, he has insisted that what scientific knowledge actually consists of is technical control.[13] This is because the interest of the natural sciences is primarily technical. Their goals are the successful prediction and control of nature. Their methods are to generalize, test and, through feedback procedures, correct former theories in order to increase technical control.

The natural sciences, do not, therefore, gain access to knowledge of an external world. That is not, however, to deny that an external world exists.[14] What, he says, is being denied is that the methods of the natural sciences actually gain access to knowledge of it. Hence the objective form of scientific knowledge consists of knowing how to manipulate and control the natural world.[15]

The problem Habermas then saw was that if other disciplines, such as the human sciences, modelled their methods on the methods of natural

science, which they have been apt to do recently, they would then be in a position where they could exercize similar techniques of control, manipulation and prediction as the natural sciences. However, if such techniques were exercized in the sphere of the human sciences, they could lead to grotesque consequences. The inevitable and dreaded outcome would be the highly manipulative control and ultimate oppression of society. He therefore concluded that procedures such as these must be resisted at all costs.[16]

He further maintained that "historical-hermeneutic" (or interpretive) methods, which he clearly distinguished from the "empirical-analytic" methods of technical control in the natural sciences, were far more suitable for use in the human sciences. This was because, in situations which were not totalitarian, historical-hermeneutic methods permitted consensus to be reached through mutual communication and personal understanding.[17] Hence, the manipulation and oppression of society through technical control could thereby be avoided.

Moreover, he justified his stance further by arguing that the interest of the human sciences is very different from that of the natural sciences. The interest of the human sciences is participation by partners in dialogue.[18] Consequently, the goals, methods and "objective form" of the human sciences are also markedly different. The goals of the human sciences are social consensus, mutual communication and social organization. Their methods must therefore be "historical-hermeneutic." The objective form of knowledge in the human sciences consists of knowing how to participate in dialogue with one's partners.[19]

Now Habermas has touched on three crucial issues in the philosophy of science, each of which will have to be discussed individually if we are not to become enmeshed in the complex relations which exist between them. First of all, there is the question of the dichotomy which Habermas assumed existed between empirical and hermeneutic methods. Secondly, there is his argument for intersubjective communication and consensus (i.e. his consensus theory of truth) by which he endeavoured to answer the problem of "vicious" circularity raised by historical approaches to the philosophy of science. Thirdly, there is the question of whether he was correct in arguing that the form of knowledge, which scientists, or for that matter researchers in any other field of enquiry, acquire, is directly related to their respective interests. For example, is knowledge in the natural sciences, as he argued, knowledge of techniques and not knowledge of an external world per se?

It is important to foreshadow at this stage that these same matters will arise again in Chapters 8 and 9, since a number of current theological disputes, which relate to theological method and the status of theology's knowledge claims, and which will be dealt with in those chapters, are contingent upon them. Hence, it is necessary that these three issues raised by Habermas be settled first; otherwise it will not be possible for some of the deadlocks in current theological debate, which have arisen as a direct result of these conflicts, to be broken.

I shall, therefore, begin by dealing with the first objection to Habermas' theory, viz. his dichotomizing of the empirical and hermeneutic methods.

5.2 Objections to the Dichotomizing of Empirical and Hermeneutic Methods.

Hesse has pointed out that Habermas' view of the natural sciences rests on empiricist (or what have also been called "positivist") assumptions.[20] As a consequence, he was misled into thinking that technical control could be classed as the direct manipulation of material objects entirely independent of theoretical presuppositions. It is therefore easy to see why he dichotomized the methods of the natural sciences from the methods of the human sciences so sharply.

However, though it is conceded that sensory procedures can, in theory, be distinguished from rational procedures, nevertheless, as we saw in our discussion of Hanson's work in 3.4.1 and 3.4.2, in the practice of science itself both sensory and rational procedures are closely interlocked. Data are not independent of theory, any more than theory is independent of data. Hence, Habermas' demarcation of the methods of the natural sciences from those of the human sciences into the "empirical-analytic" and the "historical-hermeneutic" respectively cannot be sustained because of what we already know about the actual procedures which science employs.

The origin of Habermas' misunderstanding of the practice of science is twofold.

First of all, he has fixed his attention on one aspect of science, viz. technical control. He has called this the interest of science. However, as Lessnoff points out so clearly, "The technical applicability of...science is only one aspect of a more complex truth."[21] Also, as I have already observed above (3.4.1 and 3.4.2), the fact that a major proportion of the scientists' time may

have to be spent on devising and implementing appropriate techniques in an endeavour to gain access to knowledge of the natural world, cannot in itself be made the basis of a complete account of the practice of science without distorting that account seriously.

Secondly, since he restricted the interest of the natural sciences to technical control, he failed to understand why the techniques of the natural sciences are important to scientists. It is precisely because technical control provides scientists with the necessary instrumentation by which, through skilful manipulation, they can attempt to achieve the goal of their primary interest, viz. access to knowledge of the natural world, that technical interests feature so importantly in scientific method.

Habermas' incomplete understanding of the practice of science, led, inevitably, to a basically inadequate philosophy of science. Consequently, he did not appreciate that both sensory and rational procedures (i.e. the interlocking of experimentation and theorizing) have to be employed to achieve the scientists' aims. This, in turn, resulted in his thinking that the methods of the natural sciences could be sharply demarcated from those of the human sciences in terms of a dichotomy between the "empirical" and "hermeneutic" methods respectively.

In contrast to Habermas' position, Mary Hesse's argument that empirical and hermeneutic methods should be seen as on a continuum in respect of both the natural and human sciences is far more acceptable. There are compelling reasons for supporting this view.

5.2.1 The Empirical-Hermeneutic Continuum in the Natural Sciences.

Even though the methods of the natural sciences can be described as "more empirical" in type when compared with the methods of the human sciences, which are "more hermeneutical" in type, my analysis of the history of the practice of science has clearly shown that science employs both rational and sensory procedures, to which both rational and sensory constraints apply respectively. Hence Mary Hesse's model of an empirical-hermeneutic continuum is far more appropriate than Habermas' empirical-analytic or positivist model. This is because Hesse's model is the one which more correctly represents the actual procedures which are employed in scientific practice.

5.2.2 The Empirical-Hermeneutic Continuum in the Human Sciences.

In opposing Habermas' sharp dichotomizing of the natural sciences from the human sciences on the basis that they employ completely different methods, Hesse has argued that there is much shared in common methodologically by the natural and human sciences. She has pointed out that what Habermas has identified as typical of the natural sciences, viz. the "feedback loops" in which there is a "circular self-correction of theory by experience and experience by theory," is also typical of the human sciences, even though the interests of the human sciences are quite different from those of the natural sciences.[22] In fact she goes further to show that the human sciences also have to employ techniques which have been developed by the natural sciences, and they therefore "have as good a claim to objectivity" as the natural sciences. As examples of these techniques she cites the dating of archeological findings and of

manuscripts, and the reconstruction of historical events from circumstantial evidence.[23] One could also readily add to her list the experimental techniques devised recently by physiological psychologists and neuropsychologists in their attempts to establish mental facts.[24]

She therefore contends that since a degree of objectivity can be shown to apply to the methods of the human sciences, and that, as many aspects of these methods are shared in common with the natural sciences, there are good grounds not only for rejecting Habermas' dichotomy, but for thinking that the methods of the human sciences, like those of the natural sciences, should also be classified as belonging to an empirical-hermeneutic continuum.[25]

5.2.3 The Idea of an "Objective" Hermeneutic Method.

If Hesse is correct, several interesting considerations immediately arise. The most important one, to which I drew attention earlier, relates to whether, in view of the shift away from the old "positivist" conception of objectivity, it is appropriate any longer to say that science is objective. Also, in the light of this changed concept, how is the relation between science and the traditional arts subjects, such as history, literature and theology, now to be seen?

Some may think that, whilst re-categorizing the disciplines in terms of their methods, this is also the opportune moment at which theology should be re-categorized and no longer accorded its long-held status as an acceptable discipline. This last question is an altogether different issue about the defensibility of theology's procedures and techniques, which I shall take up in Chapters 8 and 9.

In the meantime, it is essential to examine the prior issue, viz. whether hermeneutic-type procedures can actually be shown to yield objective knowledge. Only then will we be in a position to answer the two further questions, viz. whether science can still be said to be objective, and, if so, the effects this will have on the traditional understanding of the Arts/Science relation.

Hesse has argued that it should be possible to establish that hermeneutic-type procedures can acquire knowledge which is objective through an analysis of their practice. She has pointed out, however, that her own examination is only "a beginning" towards achieving this end.[26] For this reason the discussion will need to move beyond Hesse's work, but a consideration of her preliminary analysis provides a useful starting-point for this enquiry.

Her position stands in direct contrast to Habermas'. Habermas held that hermeneutic (or interpretive) procedures are "viciously" circular. Hesse has maintained that the circularity is only "virtuous," not "vicious!"[27] In other words, it is possible to acquire knowledge of an external reality despite the obvious restraints imposed either by one's culture and historical context or by one's theoretical presuppositions.

She has based her argument on a number of factors. The mainstay of her position rests on her observation that, despite the instability of theory, in which successive theories "supersede and reinterpret their predecessors," as for instance in the case of the atom, these changes can occur without the rejection of "the empirical discoveries that they embody."[28] Thus, she argues:

> The table can still be said in some sense to be solid, and this assertion retains some of the implications it previously had: balls will bounce on it, heads will crack on it. But other implications of the previous matter theory are now

> false:... Moreover, the new theory does not just contradict parts of the old theory, it also explains why the old theory was as good as it was and what its limitations are: that it is a good approximation only in the case of macroscopic objects, moderate velocities, etc. This implies that something remains constant from theory to theory. What that something is can best be expressed by pointing to classifications of what count as similar systems subject to the same laws, and the forms of those laws or approximations to them. For example, that the planets, the earth, and stones falling on the earth are similar types of body and satisfy the same laws, was a discovery made in the seventeenth century which has been maintained through the revolution of modern physics, and so have the approximate forms of these laws within certain empirical limits. ...Lawlike structures and similarities of nature between physical systems have been maintained and are cumulative. Theoretical interpretations of what the natures of these systems absolutely are, are not. Hence, even on such a moderate interpretation of post-empiricism, science must still be said to yield phenomenal or instrumental rather than theoretical knowledge.29 [My emphases].

It has been necessary to include this very long quotation in order to encompass all the issues in Hesse's argument which are pertinent to this debate. Her overall argument can be summarized as follows. With Habermas, she has assumed the existence of an external world. She differs from Habermas in that she has maintained that the natural sciences are able to yield knowledge of that world. With Habermas, she has accepted that the data of the human sciences are not independent of cultural and contextual questions any more than the data of the natural sciences are entirely independent of theoretical presuppositions. However, she has disagreed with Habermas that these presuppositions make it impossible for scientists to acquire knowledge of an external reality on account of a vicious circle of reasoning, created by our inability to escape the effect of our theoretical presuppositions. She has argued that if scientists were not able to gain access to an external reality, they would be unable to explain why one theory is better than another, or in which ways a theory which is to be overthrown is deficient.

Her position not only challenges Habermas' rejection of a "realist" view of scientific knowledge, i.e. the view that science permits access to knowledge of an external world, but also his unwillingness to accept the fact that the very existence of an external world places a number of necessary constraints on the building up of any theory, or, as the case may be, the decision to overthrow any theory from time to time. She has rightly seen that the procedures involved in scientific decision-making are both rational and sensory, and has not only argued for an empirical-hermeneutic continuum as the appropriate model for representing the methods of the natural and human sciences, but has reasoned that scientific decisions can only be made in the first place because of the constraints which are exercized by the things which remain constant from theory to theory.

Now it is at this point of the discussion, with respect to the precise nature and function of the constraints which apply in scientific decision-making, that we must go beyond Hesse's work. From the ensuing discussion, it will be seen that it is these constraints which provide the linchpin on which objectivity in any particular methodological approach depends.

a. Sensory constraints. Sensory constraints are provided (i) by the empirical principles of scientific practice (e.g. that one's test tubes are clean, that one's measuring instruments are recording accurately, etc., and (ii) by sensory data relevant to the enquiry. These constraints represent two of the indispensable checks necessary in the scientist's quest for objectivity.

Firstly, they are the means by which it is ensured that empirical principles (i.e. the principles of experimentation and

quantification) are not violated in the gathering of sensory data. Secondly, they are the means by which it is ensured that full account has been taken of sensory information, and, in turn, that rational procedures (e.g. theorizing, the drawing of inferences, etc.) do not violate this information. Both checks must be applied if scientific reasoning is neither to violate empirical principles nor become detached from its empirical foundations.

As was shown in the discussion of Descartes' philosophy of science (2.1), he was prepared to ignore the vital function of sensory constraints, go beyond the strict limits of mathematics and experimentation insisted upon by Galileo, and construct an entire system of science on rational analysis alone. As I noted in that discussion, it was not that Descartes disregarded experimentation altogether. The problem was that he was unwilling to be restricted by the constraints of experimentation. He therefore went beyond those limits (i.e. he ignored the essential role of sensory constraints) and set out an account of the universe from premisses which he held could not be doubted rationally, making rigorous deductions from these.

What is crucially important to recognize from Descartes' approach is that in going beyond experimentation and relying on rational analysis alone, he bypassed the two checks which sensory constraints place on both sensory and rational procedures in the practice of science.

Now in addition to sensory constraints, rational constraints also have a vital function in the practice of science.

b. Rational constraints. These are provided by (i) the principles of logical reasoning and (ii) the truth values given by sensory data and any other sources of information. They function as

indispensable checks in the scientist's quest for objectivity in two important ways.

Firstly, they are the means by which it is ensured that logical principles (i.e. the rules of formal logic) have not been violated in scientific decision-making. In other words, they ensure that one has not been illogical. Secondly, they are the means by which it is ensured that scientific reasoning does not violate sensory information or knowledge from any other sources, all of which constitute the truth values with respect to which the rational procedures of scientific practice must operate. In other words they ensure that scientific thinking does not "fly in the face of facts." They therefore perform a complementary function to sensory constraints, ensuring that the rational procedures of science neither violate logical principles nor become detached from their empirical foundations.

c. The complementary relation of sensory and rational constraints. The functions of sensory and rational constraints complement one another in two ways. Firstly, together they ensure that neither empirical nor logical principles are violated. Secondly, and most importantly, their joint function prevents rational procedures from operating in isolation from sensory procedures, or vice versa.

Two recent events are particularly instructive in this regard. The first relates to the natural sciences; the second to the human sciences. From these examples it will be seen that, if sensory procedures and the constraints which they provide become detached from rational procedures and the constraints which they provide, the knowledge which is acquired will be unreliable.

The first instance concerns the Chernobyl nuclear-reactor accident. In an official report to the International Atomic Energy Agency, the Soviet Union disclosed that "the accident took place as a result of a whole series of gross violations of operating regulations by the workers."[30] John Maddox, reporting in Nature[31] on the technical meeting held in Vienna and attended by delegates from around the world, has pointed out that in spite of the technical defects of the reactor design, the accident can be explained just by "the catalogue of incomprehensible errors" which were made. Another article, also in Nature and entitled "Coping with the Human Factor,"[32] has indicated that the plan for the experiment, which was being conducted in conjunction with the shut-down of the No.4 reactor for routine maintenance, had not been thought through in respect of the dangers which could arise and the remedial steps that would be required. The planners had simply stated generally that if an emergency should arise, "staff should act 'in accordance with plant instructions.'"[33]

This was a clear case in which the experimenters, in not having thought through the plan carefully, were thereby not immediately conscious of the implications of their decision-making. Had the plan been thought through, the dangerous consequences of bypassing a number of safety measures as well as switching off the emergency cooling system (a part of the experiment) would have been obvious. In not thinking through the plan, the experimenters failed to take account of relevant rational and sensory constraints and the indispensable checks which these would have provided. They were thereby neither alerted to the inherent dangers in the plan as it stood, nor to the fact that the experiment, if executed, would violate crucial safety regulations set

down for operating the reactor which would inevitably result in a major disaster.

Their six fatal errors, which led to the worst nuclear-reactor accident in the world's history, were the result of errors of judgement in which vital checks dictated by essential rational and sensory constraints were either carelessly overlooked or deliberately bypassed as part of the experiment.

Analyzing the situation, it is possible to see, first of all, that rational procedures were undertaken without a full regard for rational constraints, (i.e. the plan for the experiment had been set up without thinking through its implications carefully). Secondly, sensory procedures had been undertaken without a full regard for sensory constraints, (i.e. the plan was executed without due regard for the safety rules and regulations, which, as with safety regulations generally, had been formulated in respect of the known dangers of the operation of a nuclear-reactor). Had the <u>full complement</u> of rational and sensory checks been brought to bear on the plan for the experiment, the experimenters could not have become so far removed from the dangers which were inherent in the plan as it stood. This is because sensory and rational constraints <u>complement</u> one another to prevent rational procedures (i.e. scientific reasoning and/or decision-making) from becoming detached from sensory procedures (i.e. experimentation).

If rational procedures become detached from sensory procedures, reasoning and/or decision-making will inevitably become detached from their empirical foundations.[34] Conversely, if sensory procedures become detached from rational procedures, the implications of an experiment will not have been thought through and the results could be

disastrous. Either way, the knowledge obtained will be unreliable, and the ensuing decisions will be inadequate, inappropriate or even catastrophic, since the principles of objectivity will have been violated.

On the Russian scientists' own admission, the tragic accident at Chernobyl could have been avoided had those vital checks been applied.[35] Because they were not, the experimenters saw no barrier to conducting the experiment. With a false sense of security, they went ahead. The consequences were tragic.[36]

The second instance in which rational procedures have become detached from sensory procedures with unfortunate, though less tragic consequences, has been the case of the so-called "Hitler Diaries." In this respect, even the noted historian and Hitler scholar, Hugh Trevor-Roper, after publicly staking his professional reputation on the genuineness of the diaries, was "caught out." During the controversy, Robert G. L. Waite, author of The Psychopathic God: Adolf Hitler,[37] had cautioned that important questions relating to empirical checks needed to be asked. Among the questions he proposed were: "Do physical characteristics check out? Are the paper, ink and handwriting authentic?"[38]

The pages which Stern magazine, the German publication which held the diaries, had submitted to handwriting experts were not in fact pages from the so-called "diaries."[39] The world's press waited while tests were carried out on pages actually from those "diaries." Waite had also pointed out that there were other inconsistencies in regard to known facts about Hitler's personality and life style which did not accord with either the writing of such an extended diary or with the brief excerpts from the "diaries" which had

to that date been made available to the general public.[40]

Eventually a simple, independent check of the paper established that it came from a much later period. It was obvious that the diaries could not have been written in Hitler's lifetime.[41]

Again, the rational procedures which are involved in enquiry had become detached from vital sensory information. Had the full complement of rational and sensory checks been applied, the fabrication of the "diaries" would have been discovered much earlier. Reputable scholars could have been saved from the unenviable task of having to retract faulty conclusions in the full publicity of the world's media.

Fortunately, in this instance, the only consequences were that the unhappy perpetrators were exposed and charged with fraud, whilst several leading figures, who appear to have been misled, suffered severe embarrassment.[42]

To summarize, in the quest for objectivity, it is important to understand that sensory constraints and the checks that they provide are as indispensable as rational constraints and the checks that they provide. Neglect in observing either of these constraints and the checks each provides will inevitably produce distortion in the information acquired and diminish the level of objectivity which can be achieved. Conversely, if the constraints are observed, they provide the means by which the objectivity of our knowledge can be grounded. That is, they eradicate personal bias and error in three ways -

(i) by ensuring that empirical principles are not violated;

(ii) by ensuring that logical principles also are not violated; and

(iii) by demarcating the parameters with which scientific reasoning must strictly conform, thereby ensuring that rational and sensory procedures are not pursued in isolation from each other.

d. The effect of sensory and rational constraints on hermeneutic-type methods. We are now in a position to return to the question which I have been endeavouring to settle in this section, viz. whether hermeneutic-type methods can actually be shown to yield knowledge which is independent of the knower and therefore be called "objective," as Hesse has argued.

Despite the fact that a number of interpretive judgements must be made in the practice of science, it is evident from the above discussion that, in the quest for objectivity, the limits within which these decisions must be made are determined by the application of both sensory and rational constraints. In this way, the principles of objectivity are applied as stringently to the interpretive/evaluative aspects of science (i.e. its hermeneutic procedures) as to the sensory aspects (i.e. its empirical procedures).

As a consequence, criticisms that hermeneutic-type methods are not able to acquire knowledge which is objective are undermined, for, as we have seen, since objectivity is given by observing both sensory and rational constraints stringently, then there are very good reasons for sustaining the argument that hermeneutic-type methods are just as capable of yielding knowledge that is objective as empirical-type methods.

A matter which has tended to complicate this debate has been the fact that the word "method" has been understood in three quite different ways. If these different uses are made clear, it will help to eradicate some of the confusions which continually occur. For

some, the phrase "the methods of science" has simply meant the kind of approach used by science, that is that its approach is "empirical" in type as distinct from "hermeneutic" in type. For others the phrase "the methods of science" refers to the procedures and techniques of science, which it is also thought guarantee objectivity. Yet others use the phrase "the methods of science" in a third way to refer to three aspects of the scientific method, viz. its principles, its procedures and its techniques. These people have considered that objectivity is achieved if the procedures and techniques of science adhere properly to its principles.

To prevent further unnecessary confusion, I shall from hereon only use the word "method" when discussing the type of approach which a discipline uses, i.e. whether its type of approach is "empirical," "hermeneutic" or "empirical-hermeneutic." However, when discussing a discipline's procedures and techniques, I shall refer to these as "procedures and techniques," and when discussing a discipline's principles I shall refer to these as "principles." Also, as it is clearly possible to apply the procedures and techniques of science but still violate the principles of objectivity (e.g. as was done at Chernobyl), I shall assume that the phrase "procedures and techniques" does not imply that objectivity is therefore guaranteed.

With these clarifications in mind, we must now return to the main debate. In 5.2.1 it was established that the empirical-type methods of the natural sciences really belong to an "empirical-hermeneutic" continuum. Further, in 5.2.2 we saw that the hermeneutic-type methods of the human sciences also rightly belong to an

"empirical-hermeneutic" continuum.

Now this is not to say that empirical-type methods and hermeneutic-type methods are the same. Nor am I denying that there is a vast difference between the procedures and techniques which each type of approach employs. On the contrary, the point of this argument has been to make clear that in spite of the vast differences between empirical-type and hermeneutic-type methods, each must adhere to the principles of objectivity if the knowledge that they acquire is to count as genuine knowledge.

What must therefore be understood is that just because empirical-type methods of the natural sciences are oriented more to the manipulation of physical matter, whereas, by contrast, hermeneutic-type methods of the human sciences are more involved in interpretive/evaluative procedures (e.g. of texts and documents or of social relations, personality and behaviour), this difference is not what affects the level of objectivity. Ultimately the level of objectivity achieved will be determined by the extent to which a discipline's procedures and techniques are made to adhere to all the relevant constraints, by the skilful, ingenious and rigorous efforts of researchers.

Thus Hesse's idea of an "objective" hermeneutic method can be sustained, for, as I have argued, hermeneutic-type methods are just as capable of adhering strictly to the principles of objectivity as are empirical-type methods.

Two points must now be noted before concluding this section. Firstly, at the beginning of this section the question was raised as to whether science could still be called objective, if its methods were classed as belonging to an empirical-hermeneutic continuum. As it

has now been shown that if the principles of objectivity are applied to hermeneutic-type methods, such methods are capable of achieving knowledge which is objective, the fact that Hesse has argued that the empirical-type methods of the natural sciences must still use interpretive judgements and are therefore best classified as belonging to an empirical-hermeneutic continuum, can be seen not to create any barrier to scientists' continuing to claim that the knowledge they acquire is objective.

Secondly, since hermeneutic-type (i.e. interpretive/evaluative) methods are just as capable as empirical-type (i.e. experimental) methods of obtaining knowledge which is objective, a number of implications follow in respect of the old conceptions of the Arts/Science relation.

5.2.4 Implications for the Arts/Science Relation.

Recapitulating, in the past it was wrongly thought that empirical-type methods per se guaranteed that the knowledge acquired was objective. It was then argued that, because the procedures and techniques of the traditional arts disciplines did not rely on experimentation and measurement, hermeneutic-type methods were "non-empirical," and therefore incapable of guaranteeing that the knowledge which they obtained was objective. These factors have now been shown to be based on gross misconceptions.

Accordingly, the former dichotomizing of the traditional arts disciplines from the sciences on the assumption that the methods of the arts were highly susceptible to personal bias whereas those of the sciences were not, is no longer acceptable.

In actuality, we have seen in discussing Polanyi's argument that,

in the final analysis, all disciplines are vulnerable (3.2). This is why it is essential that researchers in every field of enquiry must ensure that their methods observe the principles of objectivity stringently; otherwise they cannot have confidence that the knowledge they have acquired actually is objective.

However, it must be pointed out that even if the principles of objectivity are adhered to, objectivity can still not be automatically guaranteed to a discipline. This is because objectivity is a standard of enquiry which researchers must strive to achieve; it is not a condition which can be automatically conferred.

It could still be argued, however, that even if it is granted that hermeneutic-type methods are able to achieve objectivity just as empirical-type methods can, there is still a great difference between the levels of the confidence which one may have in the degree of objectivity which each is capable of obtaining. In other words, there will no doubt be some who will argue that the knowledge which scientists acquire (i.e. physical fact) is of a higher level of objectivity than knowledge in the arts (i.e. historical or social fact). For instance, John Polkinghorne has drawn attention to objections which could arise if knowledge in the sciences were contrasted with knowledge in a discipline such as theology.[43]

Though prima facie this may appear to be so, I shall argue in 8.5, 8.6 and 9.8 that on the whole such comparisons can be misleading. Only those who are still harking back to the problematical assumptions of empiricism are likely to raise objections.

We must now turn to another matter. If, as I have argued above, the old Arts/Science dichotomy is no longer tenable, to what extent will this changed conception of the methods of the traditional arts

subjects affect the way in which the study of theology is now to be conceived? As was noted earlier, Hesse has argued that the methods of the natural sciences and the methods of the human sciences both rightly belong to an empirical-hermeneutic continuum. Though she makes no attempt to discuss whether the methods of theology should also be classed on an empirical-hermeneutic continuum, she has pointed out that the very possibility of an "objective" hermeneutic indicates that the respectability of theology as an academic study may, after all, prove to be defensible along similar lines.[44]

In contending that a defence of theology is possible, Hesse has acknowledged the longstanding objection that the theologian's claim that there are "perennial truths"[45] conflicts with what we already know, viz. that historical and cultural contexts are relative. However, in taking her stance against those who would maintain that this conflict constitutes a major stumblingblock, she points out that the fact that language and thought are heavily impregnated with the changing ideas of different thought-worlds and different cultures is not itself an argument against the existence of theological facts or the possibility of establishing knowledge of them. She says, "a subject-matter...does not have to have invariant linguistic expression in order <u>to exist</u> and have certain <u>perennial characteristics</u>."[46] [My emphases]

Of course, two other objections could still be made. The first is that whilst one may concede that Hesse's argument for the human sciences is tenable, it is highly dubious whether some of the traditional arts disciplines, such as literature and theology, can be classified as human sciences.

The second objection which could be made is whether the study of

theology constitutes a body of knowledge (i.e. scientia) anyway. I shall have to leave this second issue until Chapter 8, where it will be possible to take it up in greater detail (8.1 and 8.2).

In answer to the first objection, as to whether theology can be classed as a human science anyway, it is important to note that the issue which is being raised here is similar in kind to the issue that has sometimes also been raised under the old Arts/Science classification, i.e. whether it was correct in the first place to class theology as an arts discipline in the past.[47] Nevertheless, to argue over whether theology should be classed as either a human science or an arts discipline is really not the fundamental matter at stake. Even if theology were found in the end to be neither a human science nor an arts discipline, will not affect this present debate to any great extent. For the primary problem confronting theologians at the moment is whether theology is even able to retain its credibility as an academic discipline. In order for that matter to be settled, it is first essential to establish the credentials of theology.

However, it is not my intention to dodge the issue. Suffice it to say that in any future attempt to classify academic disciplines, it should be clear from this discussion at least, that any proposed classification system would be much more appropriate if it were made along the lines of a discipline's subject matter rather than along the lines of the methods it uses. Thereby, a repetition of past mistakes in which it has been assumed by many that disciplines could be classified in terms of their so-called "methods" would be avoided. Moreover, since, as I have already indicated, I shall be endeavouring to show in Chapter 8 and 9 that theology's methods, like those of the

natural and human sciences, also belong to an empirical-hermeneutic continuum, it would be virtually pointless under those circumstances to attempt to make fine distinctions between the natural sciences, the human sciences and theology on the basis of their "methods."

5.2.5 Ethical Concerns.

Brief mention only can be made here of the alleged abuse of ethical standards by the practice of science. Habermas appeals to these abuses to defend his view that the human sciences should adhere to "hermeneutic" methods and avoid the "empirical" ones of the natural sciences.

Lessnoff's discussion of Habermas and other critical theorists is very illuminating. He says -

> Once again, science is seen as a grasping of reality from the viewpoint of the knowledge-constitutive interest in technical control....
>
> Natural science...is, according to critical theory, not value-free knowledge, but knowledge structured in accordance with a prior evaluation (conscious or not) in favour of control or mastery over nature.[48]

Lessnoff goes on to point out that it was not that the critical theorists thought that the "empirical" methods of the natural sciences could not be used effectively in the human sciences. In fact, their objection was precisely that such methods were so effective they could prove completely deleterious to society. Thus says Lessnoff -

> ...the critical theorists hold, not that such laws predicated of human beings must be untrue, but that they will be all too true, and thus afford to the powerful a weapon for oppressing the rest.[49] [My emphasis].

As far as Habermas was concerned, the dreaded outcome was not only the abusive use of those techniques by the psychological and

sociological sciences, but, worse still, control by intervention at the biological and genetic levels.[50]

In opposing Habermas' position it is important to identify where the real problem in his reasoning lies. Whilst it is true that the manner in which knowledge may ultimately be sought and used generally involves ethical concerns, it is important to distinguish the manner in which knowledge may be sought and used, from the procedures and techniques by which knowledge may be sought and used. The two are quite separate issues. Of course, it is conceivable that ethical abuses could also occur in the decision to use certain kinds of procedures and techniques which may have inbuilt inhumane factors, e.g. techniques of torture which, apart from being used to extort desired information from the victim, may also be used in those circumstances for running an experiment on levels of human survival. However, the possibility that inhumane factors could be built into the procedures and techniques of the natural sciences and turned to inhumane ends does not of itself render all the procedures and techniques of science inhumane. As Lessnoff has pointed out, "the couching of social knowledge in technically applicable lawlike form does not ipso facto make it immoral."[51] He goes on to argue -

> What was gained from the point of view of understanding the universe was the chance to use the technical interest, for the purpose of testing theoretical knowledge.[52]

In other words, there is nothing intrinsically immoral in the techniques of the natural sciences themselves as they stand. That does not prevent some malevolent individual(s) from abusing those techniques by adapting them to inhumane ends. However, because Habermas misunderstood the real aims and interests of the natural sciences, he failed to appreciate the ends to which scientific

techniques are actually directed, i.e. as the means by which researchers can attempt to gain access to knowledge of the external world. Further, his "empiricist" view of science prevented him from seeing that both rational and sensory procedures are involved in the practice of science and that stringent rational and sensory constraints apply to the practice of science and provide the vital checks at one of the points where research in science is most vulnerable, viz. at the point where checks are needed to ensure that the knowledge obtained is reliable knowledge. (Cf. the accounts of Chernobyl and the "Hitler" diaries in 5.2.3c above; also discussion on Sir Cyril Burt below).

A recapitulation of the discussion of Polanyi's work will prove illuminating at this point. The butt of his opposition to "positivism" (the position which Habermas assumes in his philosophy of science) was that adherents of that view overlooked the role of the personal participation of the knower in the acquisition of knowledge (3.2). His analysis was specifically directed to make the point that knowledge is not strictly impersonal and detached, but that the skilful comprehension of an agent is required before that which can be known is actually known. It is just because a knowing agent is necessary, thereby introducing a human factor, that scientific pursuits become vulnerable. As Polanyi argued, skills, connoisseurship, commitment, intellectual powers and passions are all integral components of the act of knowing. It is these which make science as vulnerable to personal bias and error as any other form of enquiry.

It is quite ironic that Habermas should commend that the means of overcoming vulnerability to error and abuse is through mutual

communication and discursive argument in an open society. For where the natural sciences or, for that matter, any other discipline, are most vulnerable, are, as I have argued, at the very point at which knowing agents must necessarily be involved and a human factor is introduced.

It is also enlightening to note that long before Habermas' work appeared, social scientists such as H. J. Eysenck writing in Uses and Abuses of Psychology[53], D. Huff in How to Lie with Statistics,[54] and statistician, W. J. Reichmann, in Use and Abuse of Statistics[55], had already drawn attention to major abuses of research techniques in the social sciences. It is clear from these discussions that the source of abuse could be traced directly to the researchers themselves, particularly in the way in which they used statistical techniques, conducted experimental studies and drew their conclusions with a complete disregard for the principles of their discipline. The problem does not exist in the research tools themselves. The problem is, in the last analysis, located in the decision-making of the researcher.

One of the ever-present problems of research is how one controls for the human factor. A primary function of the principles of objectivity is to guard against this particular abuse. To bypass the "empirical" aspects of enquiry is to discard one of the vital constraints which can prevent human error or flagrant deceit from creeping in unnoticed.

This is not to say that empirical-hermeneutic methods and the principles which they incorporate produce ethical standards. On the contrary, this argument is to show that they are at least the ally, if not the handmaiden, of a society's ethics. For they

provide the checks and constraints by which, as far as is possible, knowledge can be freed from personal bias, and as accurate an account of knowledge of the external world as can be achieved through the techniques of the natural sciences is obtained.

Ironically, it is when moral injunctions fail, as they are so often wont to do, falling as they can do upon "deaf" ears, that an empirical-hermeneutic enquiry comes into its own. For its task is to expose the facts. It thereby serves as one means of keeping researchers "honest," especially where, were it not for the embarrassing presence of facts which it is possible to establish, they might well be tempted, despite their best intentions, to act otherwise.

The saga surrounding Sir Cyril Burt, a man with enormous esteem who was described in his obituary as "Britain's most eminent educational psychologist" by The Times Educational Supplement[56] is instructive. No one at that time would have guessed that in a short time his work could be so severely and seriously criticized.

Less than a year after his death, damaging criticism was directed against his research on the inheritance of intelligence and his reported findings on twins.[57] His work on twins and other kinship relationships had been highly influential, though not always without considerable controversy. Despite this, his work and research findings had exercized an enormous effect on the establishment of selective education in Britain.[58] Dr. Leon Kamin of Princeton University had, in the interim, been examining the empirical foundations of Burt's work minutely. In April, 1972, Kamin exposed its unsoundness. As L. S. Hearnshaw notes in his book,

Cyril Burt, Psychologist,[59] Kamin's criticisms, though biased, "were extremely damaging, and, for the most part, wholly justified."[60] Hearnshaw goes on to say that of the most serious of Kamin's criticisms of Burt's empirical work were the "remarkable, and indeed wholly incredible, consistencies in correlation coefficients derived from changing sample sizes."[61]

Hearnshaw's discussion of the posthumous controversies surrounding Sir Cyril Burt's credibility as an educational research psychologist is tempered with a careful analysis of available documentary evidence. Whilst he maintains that a verdict of "total fraud" would not be consistent with all the facts that are available, (from Burt's diary, other documentary evidence and biographical detail), he acknowledges that there is clear evidence to establish that Burt was guilty of deception on three counts:-[62]

> He falsified the early history of factor analysis...; he produced spurious data on MZ twins; and he fabricated figures on declining levels of scholastic achievement.[63]

However, Hearnshaw also sounds a timely warning to those who would condemn Burt outright as a "fraudulent scientist" without taking into account other aspects of his life and work. He points out that:-

> ...it is as reprehensible to push aside historical facts that fail to fit in with simple theories as to fabricate scientific facts.[64]

In addition, in respect of the Burt case, Hearnshaw has pointed out that though in Burt's lifetime the opposition to his views was acrid, it was "...an indication of their [his critics'] incompetence that they were not able at the time to make out a much more damaging case against him."[65] This last point supports my argument that empirical-hermeneutic methods are the ally of a society's ethics, not its enemy. Had a minute dissection been made of Burt's

research findings during his lifetime, the highly questionable status of his data could have been directly exposed.[66]

However, the main purpose for the above account has been to emphasize that the seat of ethical abuse in science is not, as Habermas has thought, located in the procedures and techniques of science per se, but ultimately in the lack of moral integrity in researchers themselves.

Before concluding this section, it should also be pointed out that the grounding of ethics is a far more complex matter than Habermas appears to have realized. For, ethics are related to the nature and survival of mankind, and, in theology at least, to the nature of God and His relation to mankind. These factors need to be taken into full account in any analysis of ethical concerns.[67] Unfortunately, it is beyond the scope of this thesis for me to include a discussion of them here.

5.2.6 Reservations re the Term "Hermeneutic"; Replacing the Term with "Critical."

Before proceeding further with this enquiry, it is important to note that there is a difficulty which could result from our continuing to use the word "hermeneutic" in describing the empirical-hermeneutic continuum. In Continental thought, the term "hermeneutic" has been used most commonly to refer to "knowledge" as "interpretation." Associated with this usage is the idea of the "hermeneutic circle."[68] Those who hold to this concept maintain on the whole that there is an inescapable circularity in interpretation engendered by the fact that we must always use the language, thoughtforms, categories and frameworks of our own culture or society in order to

interpret and understand those of an alien culture or society.[69]

The difficulty is that the term "hermeneutic" has been understood in at least two different ways. Either it is assumed that interpretation is "viciously" circular, or interpretation is seen as circular, but not viciously so.[70]

When the term "hermeneutic" is used to signify "vicious" circularity, its assumptions certainly do not fit appropriately with the assumptions underlying Hesse's idea of an "objective hermeneutic."[71] [My emphasis]. On the other hand, when the term "hermeneutic" is used to signify a circularity which is not "vicious," then it is possible to include the concept of an "objective hermeneutic" within it.

Nevertheless, there are still problems in classifying an "objective hermeneutic" under the kind of circularity which is "non-vicious." This is because the very idea of an "objective hermeneutic" implies that its methods take full account of all the critical techniques of enquiry, e.g. the apparatus criticus of literary studies, the stringent critical procedures of scientific history and/or the statistical and experimental techniques of the social sciences etc. By contrast, those generally involved in the business of hermeneutics are, on the whole, basically opposed to the use of "empirical-analytical" techniques in interpretation, or, at best, they are only prepared to give them scant attention. The reasons are twofold.

Firstly, they are eager to avoid the search for "objective" truth, since, they argue that earlier attempts to do so led to what must now be seen as an arid and lifeless form of "objectivism," i.e. an analysis which completely disregarded the role and function of

social and cultural contexts in interpretation because of the bid to establish the "truth" or "falsity" of assertions. Secondly, and more importantly, they are sceptical of the value of "empirical-analytic" approaches because they consider that the interests of such methods are very far removed from the kinds of concerns which belong to "hermeneutic" procedures. The major goal of hermeneutics, as seen by its supporters, is to establish "meaning"; their main interest, therefore, is interpretation and evaluation. The aim of hermeneutics is to enter into relation with the domain of one's enquiry in order to achieve a level of interpretation which will lead to "fresh insights" and "new meanings."[72]

Though it is neither possible nor necessary to discuss these issues further here, a comprehensive analysis of the different theories on hermeneutics, covering the thinking of Martin Heidegger, the more recent "new" hermeneutics of Ernst Fuchs and Gerhard Ebeling, and the even more recent American variations of Robert Funk, can be found in A. C. Thiselton's book, The Two Horizons.[73]

In order to avoid further confusion over what is meant in an already complex debate, it will be far more helpful if an altogether different term, which can encompass the contribution of hermeneutics, is used as an alternative. For this reason, I shall replace Hesse's use of the term "hermeneutic" in the phrase "empirical-hermeneutic continuum" with the term "critical."

Thus, from hereon, when referring to the empirical-hermeneutic continuum, I shall use the term "empirico-critical" instead, to make it quite clear that a distinction is seen between the Continental use of the term "hermeneutic," (particularly the view which implies an inescapable circularity in interpretation), and Hesse's usage, (which

implies the view that it is possible to escape from this kind of circularity).

5.2.7 Summary.

It is now necessary to draw together all the disparate strands of the argument in this section, and summarize the main objections to Habermas' dichotomizing of the empirical and hermeneutic methods.

I have argued above that Habermas accepted the positivist philosophers such as Auguste Comte, whose views he considered typified science.[74] As a result he arrived at his view that science was only interested in technical control and manipulation. This technical frame of mind, he said, had become fixed in the social consciousness, resulting in what he called the "technocratic consciousness."[75]

It is important to make clear that the "technocratic consciousness" to which Habermas objects was a frame of reference adopted by the philosophers' philosophy of science in the form of empiricism. As we have noted above, the assumptions of scientific practice, as found in the scientists' philosophy of science, are at variance with the assumptions of empiricism to which Habermas objected. Hence his objections were really due to an understanding of science (i.e. the philosophers' philosophy of science) which, though it has dominated philosophy for several centuries, is neither in accord with nor true of science as it is actually practised. Consequently, his criticisms are of a philosophy of science from which the majority of scientists have parted company, particularly in the twentieth century.

What I have endeavoured to show in this section is that in the actual practice of science, the methods of the natural sciences (i.e.

their procedures and techniques) are empirico-critical (i.e. they use both rational and sensory procedures, adhere to the principles of objectivity and rightly belong to an empirical-hermeneutic continuum). They are therefore not accountable for the excesses of empiricism. On the contrary, their primary interest is to acquire knowledge of an external world, not the technical dominance of nature.

Further, I have argued in the section on ethical concerns (5.2.5) that the principles, procedures and techniques of science cannot be said to flout ethical concerns, as Habermas thought. On the contrary, because of their very adherence to the principles of objectivity, which make it imperative that they take account of the vital and indispensable role of rational and sensory constraints, they have a quite different effect. They are, in actuality, able to keep the researcher "more honest," since one of their primary tasks is to make the facts known. Had empirico-critical methods been followed fully, tragic accidents such as Chernobyl could have been avoided, frauds such as the so-called "Hitler Diaries" and the fabricated research findings of Sir Cyril Burt could have been quickly exposed.

The Achilles' heel of the natural sciences therefore should not be identified with their methods, procedures and techniques, as Habermas thought, but with the human factor which is necessarily introduced into research by the decision-making of researchers.

Hence, my objections to Habermas' position are twofold. Firstly, he holds a completely distorted view of the actual practice of science. Secondly, by rejecting the vital constraints provided by empirico-critical principles, and commending that we rely on consensus alone, he has left society even less defenceless against the exploitation, fraud and catastrophic disasters he so rightly fears.

The seriousness of the problems precipitated by a position such as Habermas' will become even more clear in the next section with respect to the objections which must be made to his consensus theory of truth.

5.3 Objections to Reliance on a Consensus Theory of Truth.

Scientists have never seriously been in doubt that the knowledge that they acquire is objective and constitutes knowledge of an external world. However most who follow a historical approach to the philosophy of science entirely disagree, e.g. T. Kuhn, S. Toulmin and P. K. Feyerabend,[76] arguing that the theory-ladenness of scientific reasoning restricts the practice of science solely to the process of formulating, refining and overthrowing theories of the natural world, and cannot afford it any access to knowledge of the natural world per se. Habermas was not prepared to hold so extreme a position. He adopted a stance which came midway between the view held by historical approaches to the philosophy of science and the view of science which is generally called realist, i.e. that the knowledge that scientists acquire is genuine knowledge.

These three positions can be put succinctly as follows -

(i) Historical approaches, e.g. Kuhn, Toulmin and Feyerabend, maintain that scientists cannot acquire objective knowledge of an external world.

(ii) Habermas was prepared to concede that scientists can acquire an "objective form" of knowledge but that the knowledge that they acquire does not constitute knowledge of an external world.

(iii) Scientific "realists," i.e. those who engage in the practice of science and consider that the knowledge that they acquire is real knowledge, argue that they do acquire knowledge that is objective and that they actually gain access to knowledge of the external

world.

Though I shall be discussing below whether scientists actually gain access to knowledge of the external world (5.4, 6.1, 6.5 and 6.6), it is important here to distinguish clearly between what Habermas understands as the "objective form" of knowledge and what is meant when scientists consider that they are achieving knowledge which is "objective." There is a vast gap between these two quite different conceptions of what constitutes "objectivity."

Earlier I pointed out that Habermas insisted that, contrary to the claims of scientists that they were gaining access to knowledge of the external world, they were in fact only acquiring knowledge of the technical control of nature. His view was that whilst the empirical methods of science enabled scientists to manipulate nature through technical control, their theoretical formulations about technical control and the effective manipulation of nature were reached by discursive argument.[77]

With respect to this latter function, viz. the formulating of theories, he argued that the methods of the natural sciences do not differ from the methods of the human sciences, for they, also, must use "argumentative reasoning."[78] Now it is crucial to understand the assumptions which underly Habermas' argument at this point in order to appreciate his understanding of what constitutes "objectivity."

In both his preface and appendix to Knowledge and Human Interests, he makes it quite clear that his main purpose has been to re-establish the philosophical tenets of German Idealism, such as is found in the thinking of Friedrich Schelling (1775-1854). Hence, he quotes from Schelling as follows -

> It is by studying a strictly theoretical philosophy that we become most immediately acquainted with Ideas, and only Ideas

provide action with energy and ethical significance.[79]

For Habermas, "Ideas" have a life and form of their own. We can know what these "Ideas" are by reflection. By so doing, we arrive at true knowledge, i.e. knowledge based on pure and immutable "Ideas." The function of theorizing is to mould and shape life and the conduct of life so that it conforms with these "Ideas."[80]

Positivism, says Habermas, abandoned the "experience of reflection," and, instead, created an ideology out of technology.[81] This is why knowledge in the natural sciences consists of an interest in technical control, manipulation and prediction. However, technical control is ultimately dehumanizing. On the other hand, the "Ideas" of reflection that "positivist" science has ignored embody <u>true knowledge</u> and are able to orient our action in the world such that it is both "enlightened" and "ethical."[82]

What positivism therefore abandoned, i.e. reflection, to the detriment of society, Habermas has endeavoured to restore. In his attempt to do so, he argued that there is a sharp separation between the domain of objects and the domain of "Ideas." The empirical techniques of the natural sciences, he maintained, are concerned with the domain of objects and experimentation. Questions of truth in the domain of objects can only be settled by further experimentation in the domain of objects. On the other hand, because scientific theories belong to the quite separate domain of "Ideas" and reason, their truth can only be established by the methods of that domain, i.e. by discursive argument.[83]

So the truth or untruth of scientific theories is not guaranteed by whether or not those theories correspond to objective experience. The truth or untruth of a theory can only be determined by whether it

is corroborated by the outcome of discursive argument. In other words, true knowledge, i.e. knowledge which can orient our actions such that they are both "enlightened" and "ethical," can ultimately only be established by the "Ideas" of reason.

In defence of his argument, Habermas cited as evidence of his position the clear distinction which can be made between the states of affairs which are presupposed in theoretical assertions and the events to which they refer. Having already maintained that an unbridgeable gap existed between the domain of reason and the domain of experience, he then reasoned that the events to which states of affairs referred could only be verified by objective experience, i.e. by the processes of happenings in the world. By contrast, as the states of affairs presupposed in theoretical assertions merely formed the content of a proposition and were not themselves the happenings to which they referred, they belonged quite definitely to the objects of discourse, not the objects of experience. As such, their truth could not, as in the case of the events to which they referred, be "corroborated by processes happening in the world."[84] Their truth could only be established by discursive argument in the same way as the truth of any other propositions had to be determined.

The attempt to determine the truth of propositions by seeking a correspondence with objective experience was, in Habermas' view, wrongheaded. Such attempts failed to recognize the gap which existed between the domain of objects and the domain of ideas. Claims within each domain, he maintained, could only be verified by the criteria of truth pertinent to that domain.

Thus, in attempting to establish the truth of a proposition, what is required is a process of reasoning between subjects, not

correspondence with objective experience. In that process, the truth claim concerning a state of affairs contained in the proposition is questioned, and an attempt is then made to resolve the issues raised in respect of that claim by "argumentative reasoning." Once a consensus is reached by this means, truth can be said to have been established.[85]

The difficulty with Habermas' view is that he has thought that theory and experimentation are two quite separate activities. He sees theory as related to reason and logic; as such, its truth is settled by reason and logic. Experimentation, for him, has to do solely with the domain of objects; its truth can only be settled by further experiments conducted in that domain.

However, as we have seen in the discussion of Hanson's work in 3.4, theory and experimentation are inextricably related and cannot be separated off in the way Habermas has assumed. Also, his argument that the truth of theoretical assertions cannot be tested by their correspondence with objective experience is belied by the fact that the success of modern science in resolving so many of its problems has been achieved with reference to just that kind of correspondence!

Nevertheless, by far the most serious problem in his position is his insistence that the truth of theoretical knowledge is settled by consensus through "argumentative reasoning" and that this justifies his claim that knowledge acquired in this way can be said to have an "objective form." The enormous difficulties created by relying on a consensus theory of truth have serious implications for the philosophy of science as well as for theology. At this point, I shall have to confine the discussion to the philosophy of science, in order to clarify the general epistemological concerns which arise out

of such a view, and leave the even more complex issues which emerge for theology till later.

Since for Habermas theoretical knowledge belongs to the domain of "Ideas," its truth must be determined by reason alone. Intersubjective communication provides the means, by which, through discursive argument, the truth of a claim can be established. So he argues -

> Truth qua justification of the truth claim inherent in a proposition does not reveal itself, like the objectivity of experience, in feed-back controlled action but only in a process of successful reasoning by which the truth claim is first rendered problematic and then redeemed.[86]

Discursive argument will eventually lead to a consensus. When consensus is reached in this way, truth is established. This is because one is "persuaded by reasons to recognize the truth claim of the statement as being justified."[87] The sheer logic of a discourse is what will ultimately convince people of its truth.

However, supposing that there is a disagreement over theoretical orientation, how would consensus be reached under these circumstances? This was what Habermas saw as the main value of the "ideal speech community,"[88] for consensus provides the way in which the "vicious" circularity, brought about by the inescapability of cultural/historical contexts in the human sciences and by the inescapability of theoretical presuppositions in the natural sciences, could be overcome. Intersubjective communication and argumentative reasoning served either as a "filtering" or "convergence" process. Theories that could not meet the norms, goals, interpretations, evaluations and meanings of a community would be abandoned, whereas those which converged with these norms would ultimately be retained.

Offered as a solution to the problem of "vicious" circularity, Habermas' argument for a consensus theory of truth could appear

enticing, were it not for the fact that so many incidents in our history have demonstrated again and again, particularly in the practice of science, the flaws in this kind of approach. By detaching reflection from sensory experience and bypassing the checks and constraints provided by that experience, Habermas effectively located truth in a form of "idealism" or "rationalism," i.e. the truth of scientific theory has been made to rest on reaching agreement through rational analysis alone.

However, as W. Whewell's study in his History of the Inductive Sciences has clearly indicated,[89] it was precisely because the ideas of the Greek philosophical schools were not distinct and appropriate to the facts, together with the fact that the natural philosophers of that time assumed a finite and static view of the universe on which they were all agreed, that an autonomous scientific tradition of thought was not generated. This was in spite of the many critics of the Aristotelian dynamics (1.2.3). As a result the rise of modern science came very much later.

In the area of the human sciences one could cite examples such as can be found in A. J. P. Taylor's English History 1914-1945 where professional men have been in agreement but, in historical hindsight, have shown that consensus was a "poor judge" of so-called "enlightened" action.[90]

As far as the Church's decisions have been concerned, consensus has time and again proved to be an unreliable index of truth, many examples of which can be found in Prof. M. Wiles' publication, The Making of Christian Doctrine.[91] Also, Galileo's conflicts with the Church, provide another clear instance of this failure. As can be seen from the discussion in 1.5 and 1.6 above,

the Church, lacking an adequate methodology with which to meet the challenges of the new science, resorted to bringing the full weight of its hierarchical authority to bear in preventing Galileo from disseminating his teachings. As a consequence, the Aristotelian world-view to which the Church's doctrines had become attached mainly through the work of St. Thomas Aquinas, and which was under challenge from Galileo's research, was upheld along with the Church's doctrines. Nevertheless, it is ironical to note that this was a world-view held by common agreement, whereas the challenge being brought had been reached by empirical enquiry!

Whilst disagreeing with Habermas' consensus theory of truth, it is not my intention to demean the important role of scientific, or for that matter, academic communities. There is no doubt that scientific enquiry is as much a function of a community of scientists as it is of the individuals who make up that community. Nor are the valuable roles of intersubjective communication and argumentative reasoning denied. In fact, only because an academic community adheres to accepted standards of work and agrees on the principles by which a discipline is practised is it possible for one researcher (or group of researchers) to communicate his/her/their knowledge or build upon another's research.

In this connection, the shared standards of the scientific community facilitate the development of scientific thought in several ways. Firstly, knowledge can be shared. Secondly, research can be replicated as a check against earlier findings. Thirdly, scientific knowledge can be expanded and developed, and previous work can be further researched. Fourthly, ongoing debate is made possible, since the standards of practice are held in common. Fifthly, it is possible

to see whether independent research projects, in which the relation of theory and fact are taken into full account, show signs of convergence, adding weight to previous knowledge.

In toto, the major beneficial effect of having a community of researchers is that research is generally advanced within a discipline simply because a number of minds, drawn from different backgrounds, contexts and theoretical orientations, are applied to similar and related questions of study. Later, I shall also discuss the value of interdisciplinary exchange between communities of quite different disciplines (6.6, 8.5.1 and 9.7). For the present, however, attention must be drawn again to the fact that agreement within a particular discipline cannot ever serve as the sole criterion of objective knowledge.

5.4 Objections to Equating Knowledge in the Natural Sciences with Knowledge of Technical Control.

Overall Habermas' position must be rejected because of the very serious flaws in his critique of science. Since he assumed that the "positivist" view of science represented a complete account of science, he took on board all the deficiencies of that philosophy of science, grossly distorting his own view of science. It can therefore be seen how he mistook the main interest of science as technical control.

Lessnoff has pointed out that it is ironical that thinkers such as Habermas, who have objected so strongly to positivism, should have failed to comprehend that it was a highly distorted account of science. This is even more surprising in view of the fact that, especially in the twentieth century, positivism has been disowned by a

large majority of those who practise science.

In making his point clear, Lessnoff has said -

> Physicists, in postulating such invisible entities as electrons or photons, are not seeking tools for prediction or manipulation but rather attempting to describe and understand reality.... The value-judgement embodied in the activity of scientific theorizing is less the desirability of controlling the environment than that of understanding the universe.[92]

In 6.1 below, when I discuss in more detail the distinctive role of sensory and rational constraints, the irreconcilability of Habermas' view with the actual interests of science will be even clearer. The essentially different assumptions of these two positions have been delineated explicitly by R. Bhaskar in his book, A Realist Theory of Science.[93]

In that volume, Bhaskar has made a distinction between what he calls "transcendental realism" and "transcendental idealism." The difference between these is that "transcendental realism" assumes that there is an order in nature which exists independently of man, whereas "transcendental idealism" argues that order is a function of cognitive activity which is "imposed" on nature. The implications of both positions are, of course, widely different.

Though no real order as such is thought to exist in the world by "transcendental idealists," it is not the case that they think that order is a figment of the imagination, (even if it is at times hard to see just how they can successfully defend their position against that criticism). However, unlike "transcendental realists," who assume that order exists in nature, "transcendental idealists" assume that order exists in the domain of ideas. For "transcendental realists," reality is ultimately located in the domain of nature. For "transcendental idealists," reality is ultimately

located in the domain of thought. Herein lies the vast disparity between the two positions.

Now Bhaskar argues that the weight of the evidence strongly supports the "transcendental realist's" view. Scientific enquiry, he maintains, need not occur. Given that it does occur, the world must be a certain way for science to be practised the way that it is.[94] Bhaskar's position is that if order was merely "imposed" on nature and not "implicit" in nature, scientific investigation could not proceed in the way it does and achieve the results it does through experimentation. For, in conducting their enquiry, scientists assume that order and intelligibility exist in nature. Their theories are constructed on this assumption. They then form and test hypotheses in respect of these theories, the results of which will confirm, vary, modify or necessitate the overthrow of the theories which they have postulated about that order. On the other hand, "transcendental idealism" is manifestly incapable of this kind of demonstration. Says Bhaskar, "...experience is in the last instance epistemically decisive...".[95]

It could be said that Bhaskar has simply returned to the old positivist stance, in which sensory facts were thought to "mirror" or be an exact representation of reality. This was not his intention at all. In fact he maintained that discoveries must be expressed in thought, though he hastened to add that what science discovered in nature, e.g. its structure or causal laws, was in no way dependent on thought.[96] In terms of direct physical dependence, Bhaskar was quite correct. Our thinking is not ever likely to alter the structures or laws of nature!

Despite this fact, there are still two other important issues

which arise from Bhaskar's argument and which need to be given a more comprehensive treatment if scientific "realism" is to be fully vindicated, viz. (i) the relation between thought and the external world and (ii) the trustworthiness of our knowledge of that world.

I shall take these issues up in the next chapter. In the meantime, it is necessary to conclude the present discussion by noting from both Lessnoff's and Bhaskar's arguments that scientific knowledge must be seen as involving far more than an expanding interest in the exploitation of technical control, a matter which Habermas so wrongly assumed to be true.

CHAPTER SIX

EPISTEMIC ACCESS (2)

6.1 Realism and the Essential Function of Sensory and Rational Constraints.

The two major philosophical problems for "realist" approaches to the philosophy of science are firstly, whether the gap can be bridged between thought about the external world and the external world *per se*, and, secondly, whether knowledge of that world can be indisputably established as *genuine* knowledge. The first problem concerns the relation between *thought and reality* and involves the issue of *reference*. The second concerns the function of *checks and constraints in establishing reality* and involves the issue of *epistemic access* (i.e. how through knowledge we gain access to an external world).

6.1.1 Thought and Reality.

The relation between thought and reality has long presented a perplexing problem to the philosopher. In 4.1.6f above, I discussed Johnson-Laird's research on mental models. He has maintained that mental models can *symbolise* reality to a greater or lesser extent. They enable us to reflect on, communicate and reason about that reality.

The main value of current cognitive research such as Johnson-Laird's for philosophy is that it has opened up realistic

possibilities for resolving the age-old dilemmas concerning the relation between thought and reality. This is because the cognitive sciences are now able to specify to a far greater extent than before both the structure and function of the psychology of thinking and its relation to reality. A comprehensive historical account of the revolution which has taken place recently in this aspect of psychology can be found in H. Gardner's The Mind's New Science.[1]

In the light of these advances, an approach such as Habermas' to the philosophy of science, which has postulated an unbridgeable gap between the domain of thought and the domain of experience, is severely jeopardised.

In order to appreciate the full effect of recent cognitive research on philosophical reflection, it is important to consider the precise insights which these studies have provided in our understanding of how scientists gain access to knowledge of the external world. In this connection Johnson-Laird's emphasis on the symbolisation of thought in the form of mental models provides a comprehensive explanation of the relation of thought to reality in two particular ways. The first is concerned with the nature of the relation between thought and the external world. The second is concerned with the way in which further thought is generated and knowledge is expanded.

a. Thought and the external world. Johnson-Laird has maintained that though a mental model itself does not "mirror" reality or directly correspond with reality, its usefulness is that it encapsulates sufficient information for there still to be a connection between the model and the reality it models. However, as we saw in the discussion of Brown's study in 4.1.5, there is a problem in this

respect. The more vague our conceptualizations, the more open those conceptions will be to error. This is why it was made clear in the discussions on the principles of objectivity (4.3 and 5.2.3) that the checks and constraints which are relevant to a situation must be taken into account.

By these means it is possible to determine whether a mental model is adequate and/or appropriate. Checks and constraints are therefore indispensable. They ensure the grounding of the perceived connection between the model and the thing which is conceived, and that is what makes it possible for us to bridge the gap between thought and the external world. (Cf. further discussion on checks and constraints in 6.1.2b below).

However, enquiry consists of more than this. Once things of the external world are represented in thought, any number of mental operations becomes possible.

b. Thought and the expansion of knowledge. As we saw in the Lesner and Hillman study (4.1.6b), new information is absorbed and processed through the operations of organization, adaptation, assimilation and accommodation. Mental models lend themselves to these particular functions.

In order to understand this process more fully, it will be helpful to turn to a comparable discussion in R. Harré's most recent publication, Varieties of Realism.[2] In this volume, Harré has called higher order cognitive entities "theory-families."[3] He conceives of these "theory-families" as functionally very similar to Johnson-Laird's "mental models."

At the heart of a theory-family, says Harré, is an "ideal cognitive object,"[4] which underlies theorizing. Higher order

cognitive entities cluster around these objects, forming the so-called theory-family. Theory-families are themselves entirely open to revision. There is no "given" pattern as such. They may undergo considerable change, depending on new information culled. Consequently, theory-families can be said to "evolve"[5] as a function of reasoning and experimentation. Their role is -

> ...to provide the classificatory categories by means of which experienced reality is given texture, both as a patterned flow of phenomena and as differentiable into kinds.[6]

Further, there is a second important factor about theory-families. Each relates to a source analogue or analogues from which material is drawn for developing new concepts.[7] (Cf. Koestler's account of the function of analogues in the discoveries of Pasteur and Kekulé, 3.3). Herein is found the structure and operation of what has often been generally referred to as "the creative imagination." Says Harré -

> It is to remedy the lack of 'microscopal eyes (and ears)' that the controlled imagining of what those processes and beings might be begins. The role of source analogues is essential to this cognitive activity. It is from these that the community of scientists draws the images and the conceptual systems, with the help of which the cognitive work of pushing the imagination beyond experience is achieved in a disciplined way.[8]

In these ways, new kinds of beings have often been anticipated in thought long before instrumentation, technology or ingenious techniques have been devised for demonstrating their existence.[9] It has not been till much later that existence has successfully been established, as was the case in respect of Terra Australis when shipping was sufficiently improved to enable Abel Janzoon Tasman to venture that distance and land there; of bacteria when microscopes were invented; and of viruses with the

introduction of electron microscopy.[10] However, in some instances, the actual existence of such beings may remain somewhat uncertain, (as is the case presently with the particle physicists' neutrinos), or virtually impossible to establish, (as is the case currently with the astronomers' black holes).[11] The question of existence will be taken up more fully later in the discussion on scientific realism (6.5 and 6.6). For the moment, my intention in citing these examples has merely been to illustrate how new kinds of beings can be <u>anticipated in thought</u> through the symbolic functions of "mental models" or "theory-families."

Similarly to Johnson-Laird (4.1.6f), Harré has also maintained that the conceptual systems which underlie such thought and discourse are constituted of interconnected parts, but that their organization must be conceived of as <u>hierarchical</u>.[12] If not, it would be virtually impossible to account for how we are able to order or categorize thought, let alone revise it.

From the above it should now be clear why Johnson-Laird's emphasis on the central role of symbolisation in thought as a fundamental element in the acquisition of knowledge must be accepted as basically correct. For only through the instrumentality of a function such as that provided by mental models could information, formerly stored in memory, be continuously revised and new predictions formulated. As a consequence, his position is well able to account for how knowledge is refined and new knowledge is generated; in short, how knowledge is expanded. (Cf. also the fuller discussion on symbolisation and reference in 6.3 below).

However, herein lies the "sticking point" as far as <u>historical</u> approaches to the philosophy of science are concerned. Proponents of

this view argue that the very process of conceptualizing an object in terms of a particular theory renders that conception inescapably theory-laden. Thereafter, confirming one's theory from highly selective data which are already laden with those theories, and expanding one's thought by developing those symbols further, is not only circular, but viciously so.

Now in order to vindicate fully the scientists' claim that their methods are not "viciously" circular, it is necessary to understand how checks and constraints function so that scientific reasoning is put directly in touch with the external world.

6.1.2 Checks and Constraints in Establishing Reality.

In this section I shall first discuss a very important contribution to the debate made by I. Hacking in his book Representing and Intervening[13] concerning how we establish the existence of entities. I shall then deal with the more specific issue of checks and constraints. Also, as J. L. Aronson's publication A Realist Philosophy of Science[14] provides useful, related material which complements Hacking's work, I shall include an analysis of pertinent aspects of his thought as well.

a. Establishing the existence of entities. Aronson has opposed sociological and historical approaches to the philosophy of science which have mounted an attack on scientific objectivity. He has maintained that theories depict the nature of things and that this is why they are able to explain, predict and organize data.[15] They are, he says -

> ...metaphysical systems which are subject to empirical considerations....[16]

As an example, he has cited an instance from particle physics in which attempts were made to answer the perplexing question of how neutrons and protons were bound in the atomic nucleus. Originally a powerful nuclear force was thought to account for the binding. Details of the operation of such a force were not known. "The first clue," says Aronson, "came in the 1930's and 1940's when short-lived force-carrying particles, called mesons, were postulated and subsequently discovered as being responsible for nuclear binding."[17] As a result physicists were eventually able to answer the question of nuclear-binding: "...protons and neutrons are kept together within the nucleus by a quarky meson which is exchanged between individual quarks in each proton and neutron."[18]

Aronson has pointed out that because a "common ontology" was sought, it was possible for physicists to formulate a theoretical account of nuclear-binding. Further, "...the innovation of a quark ontology...provided a systematic way conceptually to handle the highly unexpected variety of particles that were discovered by the atomic physicists."[19] In order to appreciate his argument it is important to understand Aronson's notion of a "common ontology."

He has argued that if one takes the situation in which there are 10,000 particles, all differing from one another in terms of property and behaviour, there are still other properties such as charge, spin, momentum and energy which the particles possess in common. He therefore has defined his notion of a "common ontology" as follows -

> ...a common ontology, at the least, consists of a set of objects which share properties to an extent that any combination of many-bodied systems is covered by laws.[20]

By making this kind of assumption, it is possible to conceive of a large number of independent phenomena under a single concept. In

this respect, the particular problem of nuclear-binding was solved by first postulating the concept of a meson, thus introducing what Aronson has called "a quark ontology." As a consequence, it was possible to conceptualize a diverse variety of particles in a systematic way. So even though the physicists' ultimate hope of formulating a unified theory has proved elusive and is still "at a highly embryonic stage of development,"[21] Aronson has maintained that, conceptually, the postulating of a common ontology is essential before problems, such as nuclear-binding, can be solved.

In the long term, as Aronson has acknowledged, whether a theory is true or not is a matter which will be both subject to experimentation and relative to the ability of that theory to predict and explain. Nevertheless, he has argued that, as far as the realist is concerned, even if a theory is about entities which are not directly observable, e.g. atoms, the ability of that theory to predict and explain "in some sense" entails the existence of those entities.[22]

Whilst one can agree in general with Aronson's position, his argument for scientific realism, based as it is on a theory's ability to predict and explain, could have been considerably strengthened had he mentioned that there are several <u>other</u> essential factors in "empirical" practice which are also binding.

Ian Hacking, on insisting that experimentation is the means by which the "strongest evidence for scientific realism"[23] is secured, has recognized the full significance of these additional functions. He has therefore gone further than Aronson, arguing that the <u>genuineness</u> of scientific knowledge does not merely rest on the basis that a number of hypotheses have been successfully tested. On the contrary, the fundamental factor which helps ground that knowledge

is demonstrated by the fact that -

> ...entities that in principle cannot be 'observed' are regularly manipulated to produce a new phenomena [sic] and to investigate other aspects of nature.[24]

Hacking further argues -

> The more we come to understand some of the causal powers of electrons, the more we can build devices that achieve well-understood effects in other parts of nature. By the time that we can use the electron to manipulate other parts of nature in a systematic way, the electron has ceased to be something hypothetical, something inferred. It has ceased to be theoretical and has become experimental.[25] [My emphasis].

Now Hacking has identified an important principle which is operative. Scientific realism is not established simply by postulating an entity in respect of which a number of hypotheses are then generated and tested. In actuality, it is not until enough is known about these entities such that they can be regularly manipulated to produce new information or investigate other aspects of nature that their existence can be accepted.

It is experimentation which helps in this process. For, as Hacking has pointed out, the experimenter interferes in quite physical ways with a situation.[26] At this stage the existence of an entity ceases to be just a hypothesis or an inference. In experimentation, representing (i.e. thinking and theorizing) is interlocked with intervening (i.e. manipulating or pushing things around). This is how representing is grounded. Thus he argues -

> ...ability to explain carries little warrant of truth. Even from the time of J. J. Thomson it was the measurements that weighed in, more than the explanations.[27]

However, the fact that a representation is grounded in reality must not be taken to mean that the representation "mirrors" that reality. Hacking points out -

> Nobody in their right mind thinks that electrons 'really'

> are just little spinning orbs around which you could, with a small enough hand, wrap the fingers and find the direction of spin along the thumb. There is instead a family of causal properties in terms of which gifted experimenters describe and deploy electrons in order to investigate something else,....[28]

It is only when scientists can effect real changes in the world through acting upon their understanding of a postulated or inferred entity that they have been willing to accept that that entity actually exists.[29]

As Hacking has argued, it is precisely because, for the past three centuries, since the rise of modern science, philosophers have failed to recognize the important fact that in the natural sciences "reality as intervention" is meshed with "reality as representation"[30] and to consider the implications of this interlocking, that they have propounded "idealist" philosophies of science and rejected the scientists' claim that their knowledge is objective. He has recommended that it is time that such philosophers caught up with their past.[31]

We must now go beyond Hacking and examine a most vital matter which he does not particularly discuss, viz. the crucial role of checks and constraints in ensuring the <u>interlocking</u> of representation and intervention.

b. <u>The crucial function of checks and constraints</u>. Since Hacking has shown that the meshing of representation with intervention is fundamental to the grounding of scientific knowledge, it is now possible to see why the checks which sensory and rational constraints provide are so vital. <u>Without</u> these constraints, sensory and rational procedures (i.e. intervention and representation) in the practice of science could easily function in isolation from each

other. It is obvious that representation would then become detached from intervention or vice versa. The consequences could be adverse, as in the case of the Chernobyl disaster. However, with these constraints, sensory and rational procedures would be prevented from functioning in isolation from each other by the complex and complementary function of both sensory and rational constraints (5.2.3). In this situation, the consequences would be entirely different, for representation and intervention would be interlocked, and the knowledge acquired grounded.

We have now come full circle to see just how that grounding is made possible. By ensuring that sensory and rational procedures are not pursued in isolation from each other, sensory and rational constraints provide the instrumental means by which representation is interlocked with intervention. This is how thought is meshed with reality.

It is also now imperative that a further point be made as to why the full complement of these checks is so essential. Though Popper realized that empirical checks could quickly falsify a theory (fallibilism) and, similarly, the logical positivists rightly maintained that logical checks could distinguish true from false theory, in each case they had identified only one of the essential criteria for deciding what constituted true theory. Consequently their philosophies of science were inadequate. In actuality scientists use a complexity of procedures in their pursuit of knowledge. Accordingly, the inbuilt checks necessary for the proper use of these procedures are far more comprehensive than those promulgated by either Popper or the logical positivists. It has only been when all the relevant checks and constraints have been adhered to, that scientists have been

satisfied that their research has been sufficiently stringent for the knowledge yielded to be counted as reliable.

We may now summarize this section of the discussion by saying that genuine knowledge is obtained by the meshing of representation and intervention, which in turn is a direct result of adhering to the full complement of relevant sensory and rational constraints. As I have argued, these are the fundamental principles operative in an empirico-critical method, and it is these principles which actually enable scientists to achieve as high a level of objectivity as is possible.

6.1.3 Beliefs, Theory, Observation, Experimentation and Fact.

Despite all that has been said so far it could nevertheless be maintained that there is still an identifiable form of circularity in the procedures of science which the realist cannot categorically deny. Whilst it is true that scientific procedures may in themselves appear to be circular, as ostensibly they progress full circle from the holding of beliefs and theories, through experimentation to the establishment of fact, back to the development or overthrow of theory and onto further experimentation, a closer examination of the effect of the whole process clearly indicates that in actuality it is not circular at all. In fact success in scientific practice not only results in the resolution of problems but also the growth of knowledge. Under these circumstances it is far more appropriate to describe scientific procedures as cyclic, and not circular.

In reality all the philosophical problems which have arisen out of the debates concerning the circularity of scientific reasoning can be attributed to the way in which the acquisition of knowledge has

been conceived in the past. In hindsight, the approach to the whole question can be seen to have been wrongheaded from the start. Had the actual practice of science been taken into full account from the outset, an altogether different and far more comprehensive model of knowing would have been suggested. Since on the whole this has not been done, a serious oversight has occurred, viz. the general neglect of a proper consideration of the principles of science and the role of the knowing agent in carrying out those principles. To conceive of scientific enquiry mainly in terms of the techniques and procedures which the agent employs has been far too restrictive an approach. The result has led to a number of distorted views of how knowledge is acquired, all of which have been the bane of the philosophers' philosophy of science ever since.

6.2 The Agent as Knower.

It should now be possible to see why I have placed so much weight in this thesis on Polanyi's argument that the participation of the knowing agent must be taken into account in any analysis of the acquisition of knowledge. Though I pointed out earlier that one of the difficulties with Polanyi's work was that, to establish his position, he was prepared to use notions such as "inherent rationality" and "tacit powers" quite indiscriminately, I shall endeavour to show that if these two assumptions are considerably modified and discussed under the more general activities of apprehension and comprehension respectively, his argument from the perspective of the agent as "knower" can be used effectively to structure our understanding of how we actually gain access to knowledge of the external world.

Before the act of knowing is possible, something must be capable of being known and someone must be capable of knowing it. In addition, an act of comprehension is only possible if a knowing subject first has an apprehension of that which he/she seeks to comprehend. Otherwise, the need for comprehension is rendered superfluous, since there would be nothing requiring understanding.

For instance, R. W. Clark, whose biographical account of Einstein's discoveries was mentioned earlier, has cogently argued that the popular view that Einstein was an "inspired genius, working in an intellectual vacuum and drawing the Special Theory from his brain like the conjuror producing the rabbit from the hat"[32] is as unsatisfactory as Sir Edmund Whittaker's biographical memoir for the Royal Society in which he says that Einstein "adopted Poincaré's Principle of Relativity (using Poincaré's name for it) as a new basis of physics."[33] Says Clark -

> The truth appears to be different.... It is rather that Einstein, travelling from his own starting point to his own lonely destination, noted Lorentz' work as bearing on his own, different, problems. When light dawned, during that creative fortnight in 1905, what Einstein had already heard of the Michelson-Morley experiment fell into place. But it was no more than an interesting piece of evidence which gave comforting confirmation of the theory which he had already decided could provide a more accurate picture of the material world than that provided by Newtonian mechanics alone.[34]

Clark has also pointed out that Einstein always emphasized "...that the bulk of his work sprang directly and naturally from observed facts; the co-ordinating theory explaining them might arise from an inspired gleam of intuition, but the need for it arose only after observation."[35]

Now this account is highly illuminative. It converges with so many identifiable aspects in other accounts of scientific reasoning

throughout the History of Science, concerning how a research question was first apprehended and the need arose to resolve it.[36] The search for knowledge is not, as the "idealists" have thought, the pursuit of pure "Ideas." On the contrary, the need to enquire arises first from our experience of the world. Observing the world which we live in and its many features, we seek to understand our apprehensions of it, however vague, by attempting to identify its nature, structure and function. In other words, we seek to comprehend what we already apprehend.

Now it is in respect of these activities that the role of the agent as "knower" must be taken into full account. A knowing agent is not a passive participant in the whole process. Unfortunately, in the past, the role of the knowing agent has been treated, if at all, as a virtual appendage to the knowing process. Yet, in the act of knowing, the function of the creative imagination of the agent as knower is central. As we saw particularly in the discussion in 6.1.1a on thought and the external world, and in 6.1.1b on the expansion of knowledge, the creative imagination not only enables us to apprehend aspects of the external world but it also performs many of the symbolic functions by which our thought about the world is reflected upon, revised, developed or overthrown. This, however, is not to minimise the fact that in the acquisition of knowledge all our cognitive activity must be subject to the most stringent sensory and rational checks and constraints. I have already acknowledged above that this is how representing, thinking and theorizing are meshed with intervening, acting and experimenting, and how knowledge is ultimately grounded.

Nevertheless, the process of knowing must still be considered

primarily from the perspective of a knowing agent, otherwise vital information concerning the dual activities of apprehension and comprehension in the whole knowing process can, and have in fact, been distorted or overlooked. In the past, the failure to acknowledge the significance of the role of the agent as knower has meant that factors exercized by the agent, such as the careful making of judgements, the ingenious use of skills, the strict adherence to principles, the rigorous application of checks and constraints, which are all integral to the knowing process, have not been considered. Instead, science has been conceived of as basically an instrumental concern, i.e. the mere carrying out of techniques and procedures which automatically yield objective knowledge. Consequently, highly misleading accounts of scientific practice and the status of its knowledge claims have ensued. It is this kind of objectivity, as understood in these distorted accounts of science, which historical approaches to the philosophy of science have been so intent on undermining.

However, despite the fact that I have maintained that the objectivity of scientific knowledge can be defended, provided that the act of knowing is understood, as it should be, from the perspective of the knowing agent, who in turn must apply a number of stringent principles in his/her search to know, there is still a residual difficulty which needs to be tackled. This is the problem of the underdetermination of theory by fact.

As Hesse has pointed out, since at any one time a number of theories may be made to fit observed fact, it has now been generally accepted that all scientific theories are underdetermined by fact.[37] If this is so we are bound to ask, how reliable is our

knowledge after all?

I shall be arguing below that the underdetermination of theory by fact does not, in actuality, pose any serious threat to the realist. In order to appreciate why this is so, it is necessary that the specific functions of both symbolisation and reference, which are indispensable to the act of comprehension, be fully understood.

6.3 Symbolisation and Reference.

Firstly, the reason that symbolisation and its accompanying function, reference, must both be made so central a feature of this debate is because they are the main cognitive functions by which the gap between thought and the external world is bridged.

In the detailed analysis of symbolisation below it will become obvious that because thought does not and cannot "mirror" reality (i.e. it only symbolizes or represents reality to us), our thinking and theorizing will always be necessarily underdetermined by fact. However, this is not to say that no connection whatsoever exists between thought and reality. Nor am I suggesting that we are unable to make a choice between competing theories. On the contrary, as we shall see in the latter part of this discussion, it is not only quite possible to achieve successful reference between thought and the external world but also to establish the grounds on which a choice can be made between one theoretical position and another. We are not, therefore, left with total relativism, as some have thought in the past.

There is a second reason why both symbolisation and reference represent such crucial factors in this debate. Our understanding of

their function will help fill some of the gaps in our present knowledge of the nature of the relation between thought and reality, and enable us to answer one of the most perplexing questions about that relation, viz. how vehicles of thought, such as mental models, propositions and images, are able to represent complex experiences of the external world to us.

Our discussion of Johnson-Laird's work on mental models (4.1.6f and 6.1.1) has covered the important aspect of how it is possible for reality to be represented in thought in the first place. Additionally, in discussing Harré's "theory-families" (6.1.1b), we have seen how symbolisation operates productively in the development of scientific thought. It is now vital that these analyses be further extended by fleshing out the specific role that language plays in symbolisation and referencing. Moreover, it is crucial that the significance of the metaphoric/symbolic function of language be fully examined if we are to understand the vehicles of theological thought, especially in respect of the imagery and language found within the Biblical corpus. (See discussion in 7.3.1 and 7.3.2)

Though much has been written on both symbolisation and reference in general, the most recent definitive work on their function in science and theology can be found in Janet Martin Soskice's Metaphor and Religious Language.[38] There are two ways in which her analysis is significant. Firstly, she has argued cogently for a theory of interanimation as the basic function of metaphor, and shown that there is a close relation between metaphor and models. Secondly, she has located reference as a function of the speaker, and from this perspective has emphasized that it is not language which refers but the speakers who use

language. I shall expand on the implications of these two matters sequentially.

6.3.1 Interanimation.

Soskice's theory of interanimation, which draws to some extent on the thought of I. A. Richards,[39] considerably illuminates a very complex aspect of cognition. Her analysis helps structure our understanding of how language in general, and metaphor in particular, is able to serve as a vehicle of thought.

Whilst Max Black's well-known interactive theory of metaphor[40] has had much to commend it, Soskice's objection to his theory has been directed against his insistence that a metaphor has two distinct subjects.[41] She says, "...the 'two subjects' position invariably lapses into a comparison theory and ceases to merit the title 'interactive.'"[42] In contrast to Black's attempt, she has maintained instead that metaphor "...gives us 'two ideas for one,'" but does so by a process of interanimation.[43]

Interanimation, as first espoused by I. A. Richards, refers to the effect achieved by the interplay of all the contexts and associations made possible through the entirety of words contained in an utterance. As Soskice has pointed out, metaphor is "an intercourse of thoughts."[44] There is an underlying idea (the 'tenor') which is described by a combination of words (the 'vehicle'). The words are closely bound up with thoughts, but it is the thoughts which act together to give meaning to the subject-matter of the metaphor.[45] In turn, this meaning can be modified by further vehicles of thought used in combination with the original metaphor.[46]

It should now be possible to see how an associative network of

thought is made functional through language, and why language plays such a major role in the processing of thought. (Cf. Cohen's views on language and cognition, 4.1.6d; also Harré's position on networks and hierarchies in theory-families, 6.1.1b).

It is important to understand that metaphor is only one of the many tropes or figures of speech which are functional in thought. There are many others, such as metonymy, synecdoche and simile.[47] However, metaphor has been discussed here in particular, since it is of most interest in understanding the complex process by which networks of associations in thought operate.

It is necessary, however, to go still further and consider the relation between <u>metaphor</u> and <u>models</u>. Soskice argues that metaphor characteristically relies on one or more underlying model.[48]

Models, she says, are not always obvious but they form part of the associative network of a term. Her understanding of the function of models is very close to Johnson-Laird's (4.1.6f). Models have a representational role. They can encapsulate a state of affairs or a situation. As such, they not only convey a number of associations which enrich metaphorical thought but can themselves be modified, developed and rejected in terms of their appropriateness to the subject-matter.

The connection which Soskice has made between metaphor and model is particularly illuminative. Cognitive psychologists are agreed that cognition is a <u>multiple activity</u>. Their disagreement has been over the <u>form</u> of mental representation, viz. whether the form is mental models, propositions or images (4.1.6d and 4.1.6f). Since Soskice has shown that there is a <u>relation</u> between metaphor (a

linguistic device) and models, and we have already seen from our discussion of Cohen's work in 4.1.6d that verbal manipulation and visual information are at least two of the functions involved in mental representation, it could well be that there is a corresponding relation between the multiple activities of cognition and the form of their representation. If so, Johnson-Laird's position that all three forms of representation, i.e. mental models, propositions and images, are operative, is probably the correct one, though he has further insisted that mental models are the more dominant of the three (4.1.6d).

Turning now to Soskice's comparison of the types of models which are operative in science and religion, her analysis produces even more interesting insights concerning the general nature of cognition. Here she follows R. Harré and distinguishes the 'source' of the model (i.e. what it is based upon) from its 'subject' (i.e. what it represents). Thus, she says -

> The source of the cybernetic model...is the computer and its subject is the brain. On the basis of the relationship between model source and model subject, we can further distinguish two main types of models: homeomorphic models are those in which the subject of the model is also its source (e.g. a model aeroplane or a dummy used to teach life-saving skills), and paramorphic models are those where source and subject differ (e.g. the use of billiard balls to provide a model for discussion of the properties of gases).[49] [My emphases].

In theory construction, science primarily uses paramorphic models. One of the advantages of those models is that they can be used to assist enquiry into an aspect which has not yet been fully understood. The paramorphic model "suggests candidates for similarity and gives form to deliberation on unfamiliar subject matters...".[50] Similarly, other disciplines are also able to use paramorphic models in order to aid theorizing. Theology stands as one

of these disciplines.

In fact, a comparison of the function of paramorphic models in science and religion quickly demonstrates that these models are the instruments of general cognition, not the sole province of the sciences. As Soskice stresses, both science and religion must rely on a multiplicity of models;[51] both are realist in respect of their understanding of models;[52] the models of both are closely tied to theory, and are open to revision or replacement;[53] and in both science and religion models are "constrained by received experience...".[54] She concludes her discussion on this matter by emphasizing that the gap between the models of science and those of religion is not as sharp as religious apologists have supposed. We may further add that her analysis also serves to demonstrate the extent to which theologians too must rely on the instruments of general cognition in their conduct of enquiry, a matter which will be of paramount importance when I discuss the nature of "revelation" in Chapter 7.

Soskice, however, has rightly pointed out that the most contentious problem ultimately for the theologian is to settle the question of how theological models can be said to refer. Though the problem of reference has also recently been raised for scientists by such thinkers as Kuhn, Feyerabend and Habermas (5.1 and 5.3), on the basis of past practice alone, theology's predicament in this respect is by far the more serious. I shall, however, deal with the matter as it relates to science first and leave the resolution of the theological case to the next chapter.

6.3.2 Metaphor and Referring.

On this matter, Soskice has followed the thought of K. Donnellan[55] and J. Lyons,[56] two writers on reference and language. She has developed Lyons' position that it is the speaker who refers by using a "referring expression." She has also taken up Donnellan's point that it is still possible to refer successfully to a thing even though the referring expression may not fit the referent. What is fundamental in the act of referring is the way the speaker uses an expression in a context to make a reference.[57] The meaning of the utterance must be construed within the context of its occurrence; its reference is determined by ostension or by some other means not related to the terms of the utterance. She gives as an example Churchill's description of Mussolini as "that utensil."[58] In that case, the reference of the metaphor was fixed by description, but its significance was given by the associative network surrounding the term "utensil."

It is crucial to understand that though it is possible to refer successfully, successful reference does not entail that one knows <u>everything</u> that needs to be known about the reference nor even that what one presumes to be true of the referent is <u>actually</u> true. She cites Kripke's example -

> ...a speaker who knows of Columbus only that he was the man who discovered that the world was round or that he discovered America really refers when he mentions Columbus even though Columbus did neither of these things. The reason the speaker refers here, even though all his particular beliefs about Columbus are incorrect, is because the relevant linguistic competence does not involve an unequivocal knowledge, but rather depends on the fact that the speaker is a member of a linguistic community which has passed the name from link to link.[59]

Similarly in science, terms such as "gravity" or "phlogiston" are generally introduced with fixed senses. Whilst these terms will guide

investigations, they may also, as a result of investigations, either undergo change, as in the case of "gravity,"[60] or fail to refer, as in the case of "phlogiston."[61] Accordingly, the concepts associated with these terms will be modified or be no longer useful in the practice of science. (See fuller discussion of this matter in 6.4 and 6.5 below).

The main point to note is that terms do not have intrinsic meanings; they are given meanings by the way they are used and the contexts in which they are applied by those who use them to refer. Now this factor is vitally important. As Soskice has pointed out, it is "the vagueness of metaphorical terms" and the "lack of strict definitional stipulation" which makes them particularly suitable for the scientist's investigative enterprises.[62] (Cf. Brown's study on the early stages of enquiry, 4.1.5). Later, when we come to discuss contemporary theological disputes over the "revision" of Christian doctrine, this factor will be seen to be even more critical (9.4).

In any enquiry, terms and concepts enable one to fix a reference but also to gain access to knowledge. For a fuller discussion of these two important issues, we must now turn to the very significant contribution which has been made to this whole debate by Richard Boyd.

6.4 Fixing a Reference.

In a lengthy article entitled "Metaphor and Theory Change: What is 'Metaphor' a Metaphor for?",[63] Boyd makes a further helpful distinction between what he calls "literary interaction metaphors"

and "theory-constitutive" ones. [My emphases]. He says -

> Literary interaction metaphors display what might be termed conceptual open-endedness.... The function of literary metaphor is not typically to send the informed reader out on a research project.[64]

He goes on to say -

> Exactly the opposite is the case with theory-constitutive metaphors. They display what might be called inductive open-endedness.[65]
>
> Theory-constitutive metaphors...represent one strategy for the accommodation of language to as yet undiscovered causal features of the world.[66]

Boyd's proposal is that theory-constitutive metaphors have the potential of accomplishing non-definitional reference-fixing until such times as a more definitive theory can be specified.

Now reference-fixing of this kind has a twofold advantage. Firstly, by labelling an unspecific concept, it fixes an aspect of thought on which further reflection can take place. Secondly, the very lack of specificity of such a concept makes it possible for continual refinement to occur. Thus non-definitional reference-fixing of this kind provides an apt research device. By contrast, unrevisable definitional reference-fixing would constrict and eventually curtail productive enquiry.

Hence, Boyd has shown that, by fixing a reference that is fully revisable, theory-constitutive metaphors can open up research in two important ways. Firstly, a link (however tenuous) is set up between the world as it exists and our thought about it. Secondly, because of this link, we are afforded the possibility of grounding our conceptions of various features of the world by reference to that world, even though in the early stages of enquiry our knowledge of those features may still be relatively unspecifiable. Specificity will

only increase as various experimental efforts prove to be successful. This latter factor is not a function of terminology, but of scientific practice. Nevertheless, the vital function of scientific terminology (e.g. theory-constitutive metaphors) is that its capacity for fixing a reference which is fully revisable is what greatly facilitates scientific practice. For, as we have seen, theory-constitutive metaphors can function as crucial research devices, yielding knowledge of those features of the world which may have previously been quite opaque to us. This is because once researchers are afforded a means of connecting thought with a fixed, yet undefined, referent, it is then possible for them, skilfully and ingeniously, to devise ways to acquire whatever knowledge is obtainable in respect of that referent. Accordingly, a body of information concerning the referent is built up, revised or ultimately overthrown. (Cf. Hanson on organizing concepts, 3.4.2; Brown on conceptual structures, 4.1.5; and Johnson-Laird on compositional procedures, 4.1.6f).

This is why Boyd has maintained that the notion of reference is in essence an epistemological notion. He says -

> The central task of a theory of reference is to explain the role of language in the acquisition, assessment, improvement, and communication of knowledge, especially the role of language in making possible social cooperation and rational deliberation within these activities.[67]

As Gillian Cohen has emphasized, without language a thinker is cognitively disabled (4.1.6d). Failure at the cognitive level would inevitably result in a failure to apprehend, and, in turn, a failure to comprehend the features of the external world. Hence, in cognition, the role of language is very considerable. Studies in the philosophy of language, such as we have seen from analyses of

linguistic devices such as metaphor, have indicated that one of the reasons language is so vital in cognition is because of its symbolic and referential capacities. Not only is it a vehicle for developing and enriching thought (interanimation) but it also functions as a vehicle by which particular entities can be anticipated in thought (non-definitional reference-fixing).

So though it must be remembered that cognitive research to date has indicated that the forms of representation in thought are several, viz. mental models, propositions and/or images (4.1.6), the reason for discussing the symbolic and referential function of language at this point has been to detail how language facilitates the overall process by which the gap between thought and reality is bridged.

From the above discussion, in which I have delineated the open-endedness of symbolisation and reference, it should now be clear why it is impossible to hold the naïve realist view that thought "mirrors" reality (an assumption which underlay the old positivist ideals of objectivity). Despite this fact, I have maintained that the gap between thought and reality is nevertheless bridgeable through the central functions of symbolisation and reference. Hence, the case for scientific realism is not undermined by the situation that all theory is underdetermined by fact. On the contrary, underdetermination supports the position of Johnson-Laird and others who have maintained that reality is essentially symbolised in thought; we do not have an exact representation of it.

Having said this, a problem still remains. Granted that it is possible for reality to be symbolised in thought and for us to fix a reference for our representations, does not the very existence of a

number of theories at any one time, all of which can be made to fit observed fact, indicate that scientific realism is, in the end, only an illusion?

6.5 Reference and Realism.

In order to answer this and other questions which could still be raised against the case for realism, it will be necessary to discuss three further issues, viz. (i) the effects of theory change on reference, (ii) the effects of the growth of knowledge on reference, and (iii) the kind of realism which is ultimately defensible.

6.5.1 Theory Change and Reference.

There is always the nagging doubt that whilst there are conflicting theories or whilst accepted theory is still capable of being revised, we are not in a position to call the information we have obtained "knowledge." However, such reasoning tends only to confuse the issue, and often rests on the assumption that knowledge, to count as knowledge, must be absolute (i.e. non-revisable).

Knowing what we do now know about the inextricable relation of theory and fact (see discussion in 3.4, 4.1.6, 5.2 and 6.1 above), it would be foolhardy for anyone to attempt to claim this kind of "absoluteness" for their knowledge. In fact, the burden of this thesis has been to show that a claim of that sort rests on the old positivist (or empiricist) view of knowledge which was basically a misconception (3.1 and 3.4).

Our analysis has shown that scientific knowledge consists of both rational and sensory elements (Chapters 3, 4 and 5). Both

conception and perception are involved in comprehension. Knowledge is not the mere accumulation of a number of sensory measures. What ultimately grounds knowledge is not some "guarantee" of objectivity, but the meshing of both the rational and sensory aspects of enquiry (5.2.3, 6.1 and 6.2). This interlocking of representation with intervention is achieved by the rigorous and skilful application of all the constraints and checks of empirico-critical enquiry (5.2.3 and 6.1.2). It is only at this stage that scientists are ever confident that they have achieved as high a level of objectivity as is possible. Even so, the knowledge acquired is still not judged "absolute" or non-revisable. In the scientists' quest for knowledge, enquiry is never closed off. Consequently, there is always the possibility that our knowledge will either evolve even further (as in the case of particle physics (6.1.2a)) or suffer a temporary setback should it become obvious that a number of beliefs which we have held about the world will have to be overthrown or discarded (as in the case of Aristotelian physics (1.2, 1.3 and 1.4)).

Hence claims to know "absolutely" cannot be sustained. They are ultimately misleading. Now this is not a factor to bemoan. For if the whole process of knowing is to be fully understood, it must be accepted that not only is our knowledge always open to revision, but also that the quest to know is actually fuelled by this very factor. On the other hand, claims to know "absolutely" inevitably lead to the unwarranted and premature closure of enquiry.

Later, when I come to discuss the status of theological knowledge, it will be seen that these conclusions will inevitably raise perplexing questions as to the revisability of Christian doctrine and the truth or falsity of theological claims (8.5.3, 9.4 and 9.6).

6.5.2 The Growth of Knowledge and Reference.

Whilst accepting that acquired knowledge may, on the one hand, be considerably developed or, on the other, radically revised as a result of enquiry, we must now ask the question, do such changes imply a change in reference? If so, are we left with a total relativism instead of the realism which I have been proposing?

Boyd has pointed out that when the use of language must be changed in order to accommodate conceptual modifications, this does not entail changes of reference.[68] As we saw earlier (6.3.2), speakers can use terms to pinpoint a reference whether the concept concerned is well-specified or basically still in its raw, undefined state. The actual purpose of fixing a reference is to afford the researcher the means of organizing enquiry. (Cf. Hanson, 3.4.2). Concepts are built up and refined later from the results of experimentation and analysis. Though concepts will necessarily undergo change during such a process, the object of reference does not change. What does change and/or evolve is a researcher's knowledge of a particular referent, which in turn could open up or give access to other areas of enquiry.

Hence, Boyd has argued that even if a series of theory changes may occur during an enquiry into various features of the external world, this by no means entails that a corresponding change also occurs in the referent itself. The features of the world into which we are enquiring will hardly change simply because we are enquiring into them. Our understanding of them, of course, will undergo change.

There is a further observation which we should also make at this

point. If the external world was completely in flux, successful reference would be impossible. Enough of it must remain constant for enquiry to be possible in the first place. Moreover, the fact that we can replicate research is what convinces us of the comparative invariance of the external world.

Boyd has said that at the stage at which enough is known about a referent to advance our understanding, we have achieved "successful reference." "Successful reference" affords the researcher "epistemic access," i.e. access to information not previously known.[69]

Here, however, we must recall our discussion both of Hacking and the indispensable role of checks and constraints (6.1.2a and 6.1.2b). For, though the achieving of successful reference may prove highly informative, the information culled cannot be counted as reliable unless it is grounded. In order for this to occur, representation must be interlocked with intervention, and, as we saw in our discussion in 6.1.2b, the full complement of sensory and rational constraints and checks is indispensable in achieving this end.

In the final analysis, it is the extent to which our beliefs and theories can be grounded that will determine their epistemological status.

6.5.3 What Kind of Realism?

Granted that researchers do gain access to knowledge which is grounded and that the relation between our representations and reality is not one-to-one but symbolic, what kind of realism can legitimately be ascribed to that kind of knowledge?

Scientific realism has been defended in a number of ways, many of which have been basically unsatisfactory because they do not reflect

the criteria which scientists actually use when they judge that the knowledge they have acquired is reliable. A comprehensive discussion of most of these can be found in Harré's Varieties of Realism, (particularly Chapters 2 and 3). His own commendation, which identifies scientific realism with "a triadic theory of science,"[70] offers a potentially more fruitful structure for understanding how thought and reality are enmeshed.

His position marks a clear departure from the kind of realism espoused by many currently, who have defined the goals of scientific practice in terms of the bivalence principle, i.e. that the theoretical statements of science are true or false in respect of the way that the world is.[71] Whereas a thinker such as W. Newton-Smith has maintained that the principle of bivalence provides us with a minimum form of realism,[72] Harré contends that the principle is unacceptable, since it redefines realism in terms that are neither attainable nor applicable to scientific practice.[73] Such thinkers, he says, commit the philosopher's fallacy of high redefinition.

This, however, is not to say that the truth or falsity of scientific statements is not a concern of scientists.[74] What it does challenge is the kind of relation which the bivalence school claims is functional between the discourse of scientists and the way the world is. As Harré has pointed out -

> Since, in the end, all our current theories are likely to be abandoned or modified there can be no place in science for a sure catalogue of facts of the matter fixed for ever by the way the world is.[75]

I should stress at this juncture that this is also the reason why I shall be adopting the position through the remainder of this thesis

that our knowledge of the world is necessarily partial. We do not have direct access to reality.

From the particular interest of the theologian, it is possible to align this observation with a comparable Biblical situation in which the partiality of our knowledge is also acknowledged in the well-known Pauline saying in 1Corinthians 13, "For our knowledge is imperfect [ἐκ μέρους γὰρ γινώσκομεν] and our prophecy is imperfect; but when the perfect comes, the imperfect will pass away.... For now we see in a mirror dimly, but then face to face. Now I know in part [ἄρτι γινώσκω ἐκ μέρους]; then I shall understand fully...".[76] The full significance of this notion of "knowing" (γινώσκειν) for theology will be made explicit in Chapter 7, especially when I discuss the theology of Austin Farrer.

The partiality of our knowledge is central to Farrer's understanding of the form of divine revelation, discussed extensively by him in The Glass of Vision.[77] In that volume, Farrer has emphasized that, in the case of revealed images, the theologian cannot criticize the images (i.e. mental representations) from acquaintance with their object of reference, since the object of reference is the one thing of which we do not have complete knowledge, which accounts in the first place for the need of enquiry.[78]

Now this problem is not only the theologian's. Though the subject matters of both theology and science are vastly different, one of the things they share in common, as I have been arguing, is that neither has direct access to reality. Hence the need for the skill and ingenuity of researchers in both theology and science to gain access to a knowledge of reality.

Bearing in mind the fact that enquiry is always the activity of a

knowing agent in search of reality (6.2), and that the task itself consists of the application of a number of skills (3.2 and 3.3) and a number of principles (4.3 and 5.2.3), it will be seen from the following discussion that the model which Harré has proposed for scientific realism provides a far more appropriate and realistic structure within which the kind of knowledge which scientists obtain may be fruitfully considered. Moreover, his model also offers a workable framework within which the acquisition of theological knowledge can be understood.

In Chapter 7 and 8 I shall show how Harré's model can be made applicable to the questions specific to theology (7.3, 8.5.2 and 8.6). Meanwhile, it is necessary to understand the basic structure of his "triadic" model, in order firstly to extricate philosophical thought from the backwaters of the philosophers' philosophy of science, and secondly to challenge certain branches of theology, which, having modelled themselves on that line of philosophy, have also foundered.

6.5.4 Scientific Realism - A Triadic Theory.

As it is not possible within the limited confines of this thesis to do justice to Harré's comprehensive argument, I shall only discuss those aspects of his thought in regard to science which are particularly relevant for establishing the case for theological realism.

The importance of Harré's "triadic" model for theologians is that it can resolve some of the barriers which have always been thought to exist between material existence and theological realism. The model assumes that though there is only one world, the world cannot be exhaustively described in physical terms.

It is particularly interesting that Prof. J. Polkinghorne, has expressed a comparable position in his most recent publication, One World - The Interaction of Science and Theology.[79] Polkinghorne has challenged the long-held conception that science deals with the real world whereas religion is concerned with subjective feeling and illusion. He argues that science and theology are complementary pursuits, each exploring aspects of the one reality.

The potential of Harré's "triadic" model is that it can underpin a position such as Polkinghorne's. This is because in his triadic theory of science he postulates three distinct "epistemic realms," viz. "the realm of common perception, the realm of beings which could be observed given certain historical and technical contingencies, and the realm of beings which, for a variety of reasons," it is "beyond" our human capacities to observe.[80] Harré maintains that three different scientific methodologies have emerged, each of which is appropriate to the domain of beings found in one of these three epistemic realms.

He has classified the theories to which these realms give rise according to their cognitive status. Hence, Type 1 Theories are concerned with cognitive objects with pragmatic properties, Type 2 Theories are concerned with cognitive objects with iconic properties and Type 3 Theories are concerned with cognitive objects with mathematical properties.[81]

What is most important to understand in regard to his triadic theory is that the denizens of Realm 1 are different from but related to those of Realm 2, but the denizens of Realm 3 cannot be related ontologically to those of Realms 1 and 2. There is very good reason why he has made these distinctions. Whilst it is possible for us to

conceive of the denizens of Realms 1, 2 and 3, it is on the whole not possible for us to have perceptual experience of the denizens of Realm 3. The explanation for these differences is to be found in understanding the natural kinds which fall under each realm.

For instance, Realm 1 beings are those beings of actual human experience which form part of the natural world. As examples of these Harré cites the moon, the Grand Canyon, the tongue and the portal vein.[82] Realm 2 beings are those beings of possible experience, given the appropriate technical means of extending sense. As examples of these he cites micro-organisms, capillaries and X-ray stars.[83] Realm 3 beings are those beings, which, however technically well equipped we are, will not be available to direct detection. As examples of these he cites quantum states, naked singularities, social structure and Freudian complexes.[84] Though Harré himself has not cited particular theological examples, I shall propose that theological concepts such as Trinity, Incarnation and Resurrection be added to the examples of Realm 3 beings.

The boundaries between these realms are seen by Harré as relatively ill-defined. In the practical situation, for example, technical advance could make quite a considerable difference, as was the case with viruses when electron microscopy was introduced. A shift of the boundary between Realms 2 and 3 occurred in that instance. Nevertheless, it is much less likely for shifts to occur between the boundary which demarcates Realm 3 beings than the boundary between Realms 1 and 2. This, says Harré, is explained as follows -

> Realm 3 is a heterogeneous domain. Beings may be beyond all possible experience because we lack the senses to observe them... They may be beyond all possible experience because they belong to a natural kind of whose mode of manifestation we could form no clear idea, for instance social structure (an abstract system of human relations), or energy states, the most

> important of which are to be described in the dispositional language of potentials.[85]

There is also a difficulty in grounding Realm 3 beings. They cannot be the objects of a material search, as can be achieved in the case of Realm 1 and Realm 2 beings, since they cannot be experienced by perception. Thus, other ways must be devised if their existence is to be established. Harré has noted that despite the fact that the grounding of Realm 3 beings is problematic, "physicists talk in policy realist ways [i.e. ways for locating or revealing beings] about at least some of the denizens of Realm 3."[86] Hence, he has proposed that one fruitful way of identifying the kind of realism which can be ascribed to the denizens of Realm 3 would be to evaluate "the force" of the physicists' talk. This is a task he undertakes in all its complexity, showing how the mathematical constraints of covariance and conservation, together with the postulation of cognitive entities of the Realm 3 type, have enabled physicists "to complete a causal story" and arrive at a conception of the kind of realism which could justifiably be ascribed to a Realm 3 cause.[87]

I shall be arguing in Chapter 7 that the principles for grounding theological concepts such as Incarnation and Resurrection, which I have proposed as Realm 3 beings, are very similar to those applied in the sciences. In other words, the differences to be found between the practice of theology and the practice of science will be located in the procedures and devices that each must use and not in the basic principles of either discipline.

Whereas the physical sciences rely on mathematics and physical theory to probe material existence, theologians, because of the

subject-matter of their enquiry and the particular data available for their study, must use procedures and devices largely appropriate to the analysis and interpretation of texts. Despite these differences, I shall contend that the basic principles for practising either discipline are essentially the same, viz. empirico-critical.

However, before embarking on that task it is first necessary for me to complete the argument as to how science achieves epistemic access. I shall do so by discussing in general the way in which techniques and procedures are employed to conform with empirico-critical principles and so achieve "epistemic success."

6.6 Epistemic Access and Epistemic Success.

Harré has maintained that for scientists to ground their knowledge they must use a "blend of mathematical ingenuity, metaphysical assumptions and material practices."[88] This is because scientific practice involves both cognitive and material practices.[89] It is therefore not surprising that, at times, scientists have had to employ ingenious strategies to gain access to the external world. For whichever strategies they finally deploy to achieve the grounding of their beliefs and theories, they must be ones which are capable of ensuring that both cognitive and material practice are enjoined. If the two are not interlocked, representation will not be meshed with intervention and knowledge will not be grounded (6.1.2).

In the case of Realm 3 beings, the elusive properties of these make it even more imperative that a great deal of ingenuity must be exercized in their grounding. Harré has pointed out that it is not

possible to demonstrate the existence of Realm 3 beings by identifying them with those of Realms 1 and 2, since no such identity exists. Nor is it possible to ground them by referring to their effects in Realm 1, since a direct causal relation does not exist between Realms 3 and 1. In practice Realm 3 beings are first located by reference to the constraints and checks provided by the beings of Realms 1 and 2. Realm 3 causes are then pinpointed by a process of extrapolation.[90]

Precisely how does this come about? In order to understand the process, we must trace it step by step. It is not the case that one begins with a notion of a Realm 3 being, then hunts for evidences of it. In scientific enquiry the reverse situation is true. The behaviour and function of beings from Realms 1 and 2 require some kind of causal account. Through postulating Realm 3 beings, it is possible to complete the causal story. However, fixing a causal reference is not sufficient. It is still necessary to extrapolate from evidences observed in Realms 1 and 2 to the causal reference located in Realm 3 in order to give content to that reference.

In Chapter 3 I noted that Hanson called this process "retroduction," i.e. the reasoning back from observations to formulae (3.4.2). He argued that this was the way by which we found a set of concepts which would either unify data or account for surprizing or anomolous data. We seek, he said, not to describe what we observe, but a general "conceptual pattern" which is capable of organizing phenomena into an intelligible whole. It will be remembered that he then went on to point out that the formulae arrived at by "retroduction" must in turn be tested. In so doing, concepts are refined or ultimately overthrown.

Now it is precisely by this process of retroduction that Realm 3 causes are located and our understanding of them refined. An attempt can then be made to delineate their existential relation to beings in Realms 1 and 2. (Cf. Brown's study on identifying a dark spot in the distance, 4.1.5). Moreover, as we are able to improve our techniques and/or devise more ingenious procedures in manipulating Realms 1 and 2 beings to reveal Realm 3 beings, our understanding of Realm 3 beings is either further refined or eventually overthrown.

However, should such concepts be overthrown, this need not necessarily impair the level of confidence that we have in their existence. It could simply indicate that an entirely different conceptual model from the one being tested would need to be sought. For in the last analysis the status of our knowledge is determined by the success with which we have been able to find ways of skilfully and ingeniously meshing representation with intervention. The devising of effective means to achieve such interlocking is what Harré has called "policy realism."[91]

His narration of the discovery of Terra Australis is instructive of one of the means by which Realm 3 beings are first anticipated in thought, later located and then refined conceptually by "policy realist" ways. Terra Australis, he notes, was unobservable at the time that it was proposed. With improvements in the technical ability of shipping, Tasman landed in Van Dieman's land. It was then discovered that most of what was believed about Australia was false. "But," says Harré, "Australia is not rendered any the less real by the revision of much that was once thought to be true of it."[92] He goes on to argue how this same kind of strategy can be employed in respect of other aspects of enquiry.

> We can refine policy realism to include explorations to decide whether there is a lost continent of Atlantis, whether diseases are caused by micro-organisms, whether there is cavitation in the vicinity of a spinning propeller, whether whales can sing, and so on.[93]

In order to appreciate just how complex the strategies in policy realism can be, it is worthwhile considering a more recent typical example. In 1962, Sir John Kendrew, the British molecular biologist, shared the Nobel Prize for Chemistry for his discovery of the structure of the myoglobin molecule with Max Perutz.[94] (Perutz's work was concerned with the molecular structure of haemoglobin). Using the technique of X-Ray crystallography and analysing his results with the largest high-speed computers available, Kendrew was able to determine the arrangement in space of all the atoms of the myoglobin molecule. It is very important to understand some of the specific details of his discovery if the strategies which he employed are to be fully appreciated.

Recapitulating, Sir John Kendrew has pointed out that the particular revolution in biology which came about as a result of advances in molecular biology was no more accidental than his own contribution to it. Further, it was largely brought about by the skilful work of physicists, chemists and mathematicians, not biologists.[95] In this respect, Sir John, who was trained as a chemist, gives an illuminative account of the steps and stages of his own research.

As a schoolboy he was surprized by the very existence of the order which could be seen in the X-ray photograph of a human hair of the type photographed by Prof. W. T. Astbury. He also recounts a conversation with Astbury in which Astbury, passionately fond of music, related his excitement when, on being lent a lock of Mozart's

hair, he took an X-ray photograph of it and discovered that it revealed precisely the same pattern as that of an ordinary mortal's hair. It was not until some thirty years later that it was possible to explain what those patterns represented in molecular terms.[96]

In regard to Kendrew's own specific research into the structure of the protein molecule, myoglobin, the process of unravelling that structure had to pass through a number of successive stages. First, by using X-ray analysis it was possible to derive a model of the myoglobin molecule.[97] Second, by looking at that model, most of the amino-acids so identified could be compared with the sequence derived from separate chemical studies (made by another group in New York).[98] Third, it was crucial to ascertain how the polypeptide chains, of which the protein was made up, were folded to form a three-dimensional structure. Otherwise, vital information relating to the structure of the protein could not have been pinpointed.[99]

The study by the New York biochemists, done simultaneously to Kendrew's X-ray study, and using careful, meticulous and ingenious chemical analysis together with the skilled application of the technique of chromatography, found that the myoglobin molecule consisted of 153 amino-acids.[100] A comparison showed that Kendrew's X-ray model gave independent confirmation of the New York chemical work.

Amino-acids are strung together in a single long polypeptide chain. Says Sir John, "Attached to the chain is the haem group..., a flat group of atoms with an iron atom at its centre, and it is to this iron atom that the oxygen molecule is attached."[101] Because myoglobin has the power of combining reversibly with oxygen in muscle cells, it performs one of the most important life-giving functions in

the human and other living organisms.[102]

As the X-ray photograph of a myoglobin crystal revealed an X-ray diffraction pattern of about 50,000 reflections, the tedious task of measuring up all these spots had then to be undertaken. Lengthy calculations also had to be made from these measurements, which accounts for why the largest high-speed electronic computers available at the time had to be used.[103]

However, before these complex mathematical manoeuvres could be undertaken, the skill of the physicists was needed to provide a technique for studying large molecules (of which myoglobin is one) in three dimensions. In this way the crucial folding of the protein chain would ultimately be identified. In his description of the stages of this task, Sir John points out how, working at low resolution, a three-dimensional contour map of the molecule was drawn. On close examination, it was possible to identify the polypeptide chain winding irregularly. At this level of resolution, individual atoms could not be seen, though the iron atom, a very dense mass, could be made out. A model of the molecule was then constructed.[104]

The next stage was to increase the resolution so that a more detailed observation could be made. In order to complete this stage, measurements of many thousands more of the reflections together with elaborate calculations by fast computers were necessary. The resulting three-dimensional contour map revealed far more complexity. The chain spiralling round a central axis, once measured up carefully, was found to be the alpha helix, which had originally been deduced as the structural basis of human hair. It was thus now seen to be an element in the molecular structure of myoglobin, which is a very different

kind of protein.[105]

A detailed study of the whole molecule at high resolution enabled the position of most of the individual atoms to be pinpointed. The molecule was found to consist of 2,500 atoms, each in a clearly defined place. A model was then constructed, on which it was possible to show the location of every atom and to trace the course of the polypeptide chain; the position of the iron atom and the position at which the oxygen molecule would be taken up when myoglobin is oxygenated were also indicated.[106]

As it turns out, the structure of the single chain in the myoglobin protein bears a marked resemblance to the individual chains (there are four) of the haemoglobin alpha chains and beta chains. This indicated that the structure of protein is a key to the way it behaves biologically and was the next obvious step in the chemist's enquiry. In addition, once this relation is known, it should be possible to explain abnormalities in the function of substances such as haemoglobin, the blood protein, which have led to such serious diseases as sickle cell anaemia.[107]

The details of the above research are vitally important to consider in our present analysis. It will be recalled that we have been discussing the principles by which Realm 3 beings are grounded. Sir John Kendrew's research has been cited as a typical example in which complex strategies have had to be ingeniously devised and meticulously and skilfully applied (policy realism). In his work the skills of a number of disciplines other than biology had to be employed. In addition, highly improved techniques over the years, particularly in X-ray diffraction and computing, made the whole project technically possible. Great skill and care had to be

exercized before the structure of myoglobin could be plotted and pinpointed, as the above account indicates. The discovery was no more accidental than the structure of the protein being examined.

What is clearly obvious from the above is that the establishing of the existence of Realm 3 beings and their nature, though complex, is achieved by employing all the cognitive functions of the human imagination which we have been examining so far (e.g. symbolization and referencing) in conjunction with ingeniously devised techniques and procedures for revealing evidences of such causal beings (intervening).

In the case of Sir John Kendrew's research, the boundary between his Realm 3 being, the unknown structure of myoglobin, actually shifts in the course of his research, revealing a Realm 2 being, the plotted structure of myoglobin. However, it must be emphasized that it is the principles of the grounding of that knowledge which has been of most importance to our discussion. For, as I shall be arguing in the following chapters, theologians also must employ the skills of related disciplines, avail themselves of the most recently improved techniques, and undertake meticulous and ingenious procedures for analysing textual and other data in order to ground their knowledge. In other words, though the theologian's task is procedurally very different from the scientist's, if theological knowledge is to be grounded, then theologians are bound to employ the same rigorous principles as are necessary in scientific enquiry.

There is now one other issue to make clear before bringing this section of the discussion to a close. In a small volume entitled Intimations of Reality[108] A. Peacocke has listed a number of scientific concepts ranging from the circulation of blood, molecules,

atomic nuclei, black holes, spin, "charm" through to phlogiston and caloric fluid, the last two of which have now been discarded by scientists.[109] His purpose has been to indicate that there are <u>different levels of confidence</u> with which scientists hold whether an entity exists or not. Peacocke's view is that the practising scientist generally adopts "a skeptical and qualified realism"[110] in regard to scientific entities. He argues as follows-

> <u>What</u> they [scientists] believe about electrons may well, and has in fact, undergone many changes, but it is electrons to which they still refer.... So physicists are committed to 'believing in' the existence of electrons but remain hesitant about saying what electrons 'are' and are always open to new ways of thinking about them that will enhance the reliability of their predictions...[111]

Though I have already discussed the revisability of scientific concepts (6.3, 6.4 and 6.5), it is important to draw attention to Peacocke's observations here for two reasons. Firstly, the question of level of confidence in an entity's existence will be an issue which will have to be taken up in Chapter 8 as it also relates to an analogous argument of Prof. E. Sanders that there are levels of confidence with which historical evidence can be held in respect of New Testament Studies (8.5.1a, 8.5.2 and 8.6). Secondly, I have, up to this point, only analysed the <u>principles</u> by which scientists achieve as high a level of objectivity as is possible for the knowledge they acquire, but not examined in any detail the variations in the <u>levels of confidence</u> with which the existence of different entities can be held.

For instance, the level of confidence with which scientists can believe in the existence and nature of Harré's Realm 1 beings, e.g. the moon, the grand canyon etc. varies very considerably from the level of confidence with which they can believe in the existence and

nature of Harré's Realm 3 beings, e.g. quantum states, Freudian complexes etc.

That there are these important differences in level of confidence, is a matter which must not be overlooked. However, as it is an issue which affects the knowledge claims of both theology and science, I shall leave the detailed discussion of the matter to a more appropriate place in the following chapter.

The main concern in this section of the debate has been to establish (i) that scientists are able to gain access to knowledge of so-called "unobservable" aspects of the external world (Realm 3 beings); (ii) that beings from this epistemic realm are necessary to complete the causal story of those "observable" aspects of the world (Realms 1 and 2 beings); and (iii) that a qualified realism (i.e. "epistemic success") can be revealed for Realm 3 beings by the conjunction of cognitive and material practices.

So contrary to the criticisms of the social/historical theorists (e.g. Kuhn, Feyerabend and Habermas) who say that science is constituted merely of social constructions, our analysis has indicated an opposite position. Though scientific knowledge cannot be said to be unrevisable, there are compelling reasons for holding that its knowledge is capable of being grounded.

6.7 Redefining "Knowing."

It is now possible very briefly to summarize the whole discussion so far by saying that the analysis of "knowing," particularly as an activity of the sciences, has indicated that "knowing" is best redefined as a function of a knowing agent. As such, the

principles, techniques and procedures of material practice can be placed in their proper context and assessed appropriately, viz. as closely related to cognition and the human imagination.

Once this is acknowledged, past misconceptions in respect of the nature and status of scientific knowledge can be overthrown and the ground cleared for identifying the precise principles by which scientists actually decide that the knowledge they have acquired is "objective." These principles, I have argued, are empirico-critical and consist of a number of checks and constraints which ensure that neither empirical nor logical principles are violated and that sensory and rational procedures are not pursued in isolation from each other. In these ways representation is interlocked with intervention and knowledge is grounded.

We must now discuss whether these principles of knowing are, as I have suggested, applicable to theology, and, if so, how they are made functional in respect of that particular discipline.

CHAPTER SEVEN

THE PROCESSES AND PRINCIPLES OF KNOWING IN SCIENCE AND THEOLOGY (1)

7.1 Summary of Empirico-Critical Procedures.

In Chapters 1 and 2 of this thesis I endeavoured to show from an analysis of relevant aspects of the history of science that theology's loss of credibility in an increasingly science-oriented age can be attributed to unresolved disputes from the past over metaphysical, epistemological and methodological issues. I argued that if the two most commonly cited conflicts between science and theology involving Galileo and Darwin were studied in their proper historical contexts, it could be shown that these disputes were not due to a straightforward incompatibility between the claims of science and those of theology. The causes were deeper. They were basic disagreements over three closely related issues about (i) the concepts that were most adequate for viewing the world, (ii) the criteria of trustworthy knowledge and (iii) the method of approach that could yield knowledge that was reliable.

These three issues were in turn shown to be related to the ongoing quest for the principles of knowing shared by all disciplines. Their source can be traced to basic metaphysical, epistemological and methodological changes which were instituted at the rise of modern science. The shifts were of such magnitude that they challenged the

principles of all branches of knowing. Disputes over these principles have still not been adequately settled in the present day.

The initial task of the research was to endeavour to identify the actual principles of trustworthy knowing. It was thought that if these principles could be specified and if they were found to be fully applicable to theology, the validity of that discipline as a source of trustworthy knowing should no longer be in doubt.

An attempt was therefore undertaken in Chapters 3 to 6 of the thesis to examine the processes by which we acquire knowledge as the means of identifying these principles. They were found to be the empirico-critical principles of the practice of science. These principles can be stated as follows -

(i) All relevant rational constraints must be observed so that logical principles are not violated.

(ii) All relevant sensory constraints must be observed so that the principles of experimentation are not violated.

(iii) The full complement of rational and sensory constraints must be observed in conjunction with each other so that reasoning is kept in the closest possible relation to fact.

These principles have been called <u>empirico-critical</u> precisely because they place checks on the empirical and critical procedures which are both required in research. The complementary function of both sensory and rational constraints on one's reasoning when empirico-critical principles are adhered to is the crucial means by which thought is meshed with reality. Without this complementary relation, objectivity would be lost.

In addition these principles are not the special property of science. They are also used in the humanities and are the means by which as high a level of objectivity as is possible is achieved for

all knowledge.

7.2 A More Comprehensive Model of Knowing is Required.

Overall, the research has indicated that a more comprehensive model of knowing than has been consciously acknowledged in the past is required if a full account is to be given of all the processes and principles involved in the act of knowing. Such a model would need to incorporate the following findings: -

(i) that knowing is the act of an agent who is the decision-maker;

(ii) that imaginative/creative activities of cognition are as indispensable to the act of knowing as are the procedures and techniques of sensory perception;

(iii) that imaginative/creative thought is rational and enables us through its symbolic/metaphoric functions to apprehend the world;

(iv) that the crucial meshing of our apprehensions with the external world accounts for how knowledge is grounded;

(v) that the crucial meshing of thought and reality is achieved by ensuring that one's procedures and techniques adhere strictly to empirico-critical principles.

If this more comprehensive model of knowing is accepted, the criteria of trustworthy knowledge, proposed by various schools of philosophical thought (for example, positivism, verificationism and fallibilism), and to which theologians have endeavoured to respond, will be seen for what they are: criteria based on very inadequate accounts of the process of knowing. As our search has shown, the substantive questions for theology are not those raised by these philosophies and others like them, which I have called the philosophers' philosophy of science. The main issue confronting

theologians is whether theology is capable of meeting the demands of empirico-critical enquiry. These, I have argued are the principles that undergird the philosophy of the practice of science, which I have called the scientists' philosophy of science.

A central aim of this thesis has been to show that the demands of empirico-critical enquiry do not constitute an insurmountable problem for theology. In defence of this view, I shall, in the following discussion, endeavour to show that the same processes and principles of knowing as are applicable to the sciences and the humanities are also fully applicable to theology.

7.3 The Processes of Theological Knowing.

The suggestion that the processes of theological knowing are the same as those used in the sciences and the humanities is bound, at first, to cause some disquiet. Because it is possible to distinguish experiences of God from, say, the experience of bumping into a table, it has often been assumed that the processes of theological knowing must be different from the processes of other forms of knowing.

Different experiences do not, however, entail that different processes of knowing are involved. Though differences in subject matter undoubtedly will lead to different perceptions, claimed experiences of God, whether mistaken or not, are still basically perceptual claims. This being the case, there is no obvious reason why we should postulate that processes other than those normally used in our perception of the external world are involved in experiences of God, should such experiences be possible.

An even more compelling reason for accepting that the processes

of theological knowing are the same processes as those for general knowing would be if the notion of revelation itself could be adequately accounted for by these processes. Just such a proposal was undertaken by Austin Farrer in his examination of the form of our apprehension of God in his Bampton lectures, published in The Glass of Vision in 1948.

7.3.1 Apprehending God.

One of the primary reasons for devoting two of the chapters of this thesis to discussing the role of imaginative/creative thought in the acquisition of knowledge and another two chapters to identifying the principles of knowing was to see -

(i) whether our apprehension of God could be accounted for by the same processes of knowing;

(ii) whether our apprehension of God could be made subject to the same principles of objectivity as other disciplines.

Farrer's understanding of how we apprehend God provides important insights for enquiring into these two issues. By introducing the notions of "image" and "imagination" to his theology, he anticipated the model of knowing delineated above (7.2). Assuming the functions of the creative imagination, such as insight, creativity and discovery, he endeavoured to give an account of how knowledge of God is possible.

It should be noted, however, that Farrer did not develop his understanding of the processes of imaginative/creative thought to any great extent. Despite this fact it is possible to extend his ideas in the light of current research to show how an empirico-critical theology can be defended.

The processes of imaginative/creative thought are extremely difficult to exhibit in action. Nevertheless, if the nature of theological apprehension is to be understood, this activity needs to be fully appreciated. What I have attempted to do in this thesis is map the rational structure and function of imaginative/creative thought in general as a means of at least pinpointing the action.

As these factors are very important for the defence of theological apprehension, I shall briefly summarize them again here. In the past, insight, creativity and discovery were thought to arise from the unconscious and not to have any direct relation to rational thought. I have argued that they are in fact integral to general cognition. (See comparison of Koestler and Bruner, 4.1, 4.1.1 and 4.1.2, and Vernon's collection of investigatory studies on creativity, 4.1.4). These functions have a rational base that is examinable. (See current psychological research on the rationality of creative thought, 4.1.5). Also they operate predominantly in frontier thinking where concepts often are radically revised and overthrown. (See discussions of Hanson on patterns of discovery, 3.4.2 and Chapter 4, and of Lesner and Hillman on how new information is absorbed and processed, and concepts revised, 4.1.6b).

The rational structure of creative thinking is what enables us to go beyond the information, extending and developing our knowledge. (See Bruner on the cognitive structure of creativity, 4.1.1d). The type of thinking employed is both analytical and analogical. (See discussion of Poze, 4.1.5). Though such thinking is susceptible to error, error can be minimized by strictly adhering to all the relevant rational and sensory constraints. (See Brown on heuristic procedures, 4.1.5, Sanford on applying logical principles, 4.1.6e, and

Johnson-Laird on mental representation and cognitive constraints, 4.1.6f). As a consequence, thought about the external world, which is generally encapsulated in the form of mental models, is brought into the closest possible relation with reality, and knowledge is grounded. (See Johnson-Laird on mental models and compositional procedures, 4.1.6f, discussion on bridging the gap between thought and reality, 6.1.1, and Hacking on the interlocking of representation and intervention, 6.1.2).

Thought, therefore, does not "mirror" the external world. Thought is meshed with our perceptions of the world to give us knowledge of it. Because the form of thought is basically symbolic/metaphoric, we are enabled to engage in a number of mental operations, making connections between ideas where none have been made before. (See Koestler on the creative act, 3.3, Johnson-Laird on mental models, 4.1.6f and Soskice on interanimation, 6.3.1). We are thereby often able to anticipate knowledge of our world in thought prior to experimentation. (See Polanyi on the priority of apprehension to experimentation, 3.2, Boyd on non-definitional reference-fixing, 6.4, and Harré on the anticipation of knowledge in thought, 6.6). Such anticipations have been variously described as apprehensions of reality. (See Polanyi's argument on the "rational powers" of apprehension, 3.2). From our apprehensions of the world a number of beliefs and theories arise. In turn, these beliefs and theories stimulate enquiry. (See Hanson on the importance of conceptual organization and the formulating of new hypotheses in research, 3.4.2).

In the following analysis of Farrer's thought, I shall endeavour to show how our apprehension of God can be accounted for by these same

processes.

Farrer began from the position that theological knowing, like other forms of knowing, is a function of imaginative/creative thought. Though he acknowledged that some aspects of imaginative/creative thought can be entirely "weird" and uncontrolled, he argued that "weird phenomena" could be distinguished from inspired thought.[1] Inspired thinking was rational thinking at its best and in its most creative form. "The excellence of the mind," he said, "consists of conscious intelligence, but of a conscious intelligence based always upon acute senses and riding upon a vigorous imagination."[2]

The rationality of imaginative/creative thought can, as we saw in Chapter 4, be substantiated by current research in the cognitive sciences. The issue that confronts theologians is whether the inspired thought of revelation can be classed as an aspect of imaginative/creative thought. Farrer was confident that it could be.

That inspired thinking should be about God rather than some other subject matter did not constitute a serious stumblingblock for Farrer. In highly creative thinking, reason and imagination were conjoined, regardless of the subject matter. Thus he argued -

> ...what springs up through wit and inspiration is not the gratuitous gift of the imagination to the intelligence: the previous labour of the intelligence is thrown down into the imagination as into a cauldron, from which it emerges again fused into new figures.... Newton's hypothesis and Shakespeare's tragedy were the product of acute and lively intelligence exercised in the appropriate fields.[3]

This was not to say that our apprehension of God was of the same kind as our apprehension of scientific or other realities. His point simply was that the processes of apprehension were the same.[4]

How was this claim to be substantiated? By returning to first principles, said Farrer, and examining the nature of inspired thought

when revelation is said to take place. He therefore sought to construct an account of how the early followers of Jesus came to apprehend the significance of Jesus' relation to God and to proclaim him as Lord (κύριος) and Christ (χριστός).

Apprehension is essentially an act of mind by which the actions and teachings of Jesus, together with the events of his life, death and resurrection, were understood by the early disciples.[5] The "seeds of revelation,"[6] he argued, are located in those happenings. What was initially apprehended in those events needed to be comprehended. Through going over and over the events, the disciples sought to make sense of them. Gradually their understanding developed and the full significance of Jesus' life and actions began to dawn in their minds.[7] (Cf. discussions of Koestler, Hanson and Bruner on discovery and insight, 3.3, 3.4.2 and 4.1 respectively).

What precisely did they apprehend? They apprehended God and Jesus' relation to him. They recognized that in Jesus the profound mystery of God's love for mankind was revealed as never before. By accepting and believing this revelation, they entered into a new and life-transforming relation with God. This relation was described as being "in Christ" (ἐν χριστῷ).[8]

What were the processes that made such an apprehension possible? They were the processes of symbolic/metaphoric thought.[9] These functions provided the cognitive structures by which Jesus' relation to God, indicated in his teachings and actions, could be encapsulated in thought in the form of "living images."[10]

Can this form of apprehension be fully defended as the form of theological apprehension? Farrer endeavoured to show that it could be by introducing his concept of "images" as the mode of revelatory

thought.

7.3.2 The Importance of the Role of "Images".

Farrer's defence of his notion of "images" as the mode of revelatory thought is extremely important. He argued that if the inspirational process is understood in terms of "images" as the symbolic form of imaginative/creative thought, a rational route could be mapped for our apprehension of God.[11]

Unfortunately, the vital contribution which Farrer made to theological thought was either misunderstood or not fully appreciated in his day. For instance, J. Baillie thought that he was merely substituting some form of archetypal images for propositions but still retaining a mechanical view of inspiration.[12] H. D. Lewis criticized Farrer for having lapsed into "faculty psychology," thinking he had separated images and imagination off from other aspects of rational thought.[13]

These misunderstandings arose partly because it was not realised that Farrer was using his term "images" to refer to the symbolic structures of rational thought. The tendency was to confuse his notion of "images" with the "visual imagery" of creative thinking. (See discussion in 4.1.6c and d). In the context of his writings it is clear that Farrer was using the word "images" to refer to the predominant form of symbolic/metaphoric thought.[14] His notion of "images" is akin to Johnson-Laird's understanding of "mental models" (4.1.6f).

In the light of current research on the symbolic character of thought (4.1.5 and 4.1.6), the significance of Farrer's understanding of "images" as the form of our apprehension of God needs to be

reconsidered. As will be seen below, the crucial insight which his concept provides for solving the problems of contemporary theology should not be underestimated.

If, as Farrer argued, the "images" of revelation are none other than the symbolic/metaphoric structures of imaginative/creative thought, are they distinguishable from other forms of thought? He maintained that they were distinguishable, but that the differences were to be found in the subject matter.[15] Thoughts about God were obviously different in orientation and interest from thoughts about other things. However, such distinctions did not ipso facto entail that the processes of apprehension were different.

To justify his stance, Farrer undertook an analysis of the structure and function of the "images" of revelation. He argued that just as the concepts of imaginative/creative thought which encapsulate other interests are not passively received by the mind, neither are the "images" of revelation. As we saw in 6.1.1 above, apprehension and comprehension are the active functions of mind by which aspects of reality are symbolised in thought and reflected on. Farrer held that what occurs in revelation is that aspects of reality, which he called "image-materials,"[16] are assimilated into thought under major organizing concepts. These he called the "dominant images" of revelation.[17]

In the revelatory process, the minds of the disciples were enabled, through the structure and function of "images," to encapsulate the "image-materials" provided by all the events surrounding Jesus' life and actions.[18] The content of the "images" was theological, since they conveyed an understanding of God and Jesus' relation to him. They were therefore distinguishable from other forms of thought.

The processes involved, however, were the same as those used in apprehending other realities. For just as our concepts generally enable us to apprehend the object of our reference, the "images" of revelation enabled the early disciples to apprehend the object of their reference, God.[19]

The symbolic/metaphoric role of "images" in the revelatory process was seen by Farrer as threefold. Firstly, the images of revelation set forth what was apprehended by assimilating "image-material" from the external world. Secondly, there was a continual interplay between the images and events of the external world, by which new insights concerning God were revealed. Thirdly, the images of revelation lived with an "inexpressible creative force" in the disciples' minds and grew together into "fresh unities."[20]

In the following detailed discussion of each of these roles, I shall endeavour to show that Farrer's "images" of revelation are in fact comparable in structure and function to the general processes of imaginative/creative thought used in the acquisition of knowledge.

a. Assimilating "image-materials" from the external world.

Farrer's position was that the "images" of revelation were not themselves the revelation.[21] Just as we use concepts to structure our thought about the world, the "images" of revelation are the structures by which the events of Jesus' life and actions were represented in thought. (Cf. discussion of Cohen, 4.1.6d). The process which makes this possible is the process of assimilation. (Cf. Bruner's work on coding information, 4.1.1d, Brown's study on assimilation, 4.1.5 and Lesner and Hillman's study on organization, adaptation, assimilation and accommodation, 4.1.6b). In revelation, the process of assimilation can be accounted for as follows.

Details related to Jesus, such as that he existed, that Herod existed, that there were Roman soldiers in Jerusalem in 30-33 A.D. (Harré's Realm 1 beings), and other details that would have been known to the disciples, such as Jesus' teachings, his understanding of God and God's relation to man, his sayings about God's kingdom and a coming new age, his beliefs about his own role and the role of his disciples in the kingdom, his action in the temple and his thoughts and actions as he approached death, his arrest, his trial and his crucifixion (all possible Realm 2 beings), constitute the "image-materials" of revelation. These details and others like them were drawn from the external world and assimilated into thought in the same way as we assimilate other details of the world into thought.

As noted earlier, the mind is not passive in apprehension. It actively organizes, adapts, assimilates and accommodates material into thought (3.4, 4.1.1d, 4.1.5 and 4.1.6b). Similarly, in revelation, Farrer maintained that the mind actively assimilates "image-materials" into distinct images in thought. In turn, the "images" are capable of combining with each other to form richer concepts.[22] Thereby, basic theological motifs (i.e. the "dominant images" of revelation) are symbolized in thought.

In assimilating material into thought, former concepts are generally modified, radically revised or overthrown. For instance, our discussion of Brown's study (4.1.5) has shown how new material is generally subsumed under existing concepts but if existing concepts continually resist assimilation, the concepts themselves may have to be modified or overthrown. Farrer also was conscious of this factor. He pointed out that initially concepts of Jewish theology, such as the Kingdom of God, Messiah, Son of Man, Israel, Sacrifice and Covenant,

which were current in first century Judaism, were the concepts used by Jesus to convey his understanding of his life and actions to his disciples.[23] In the light of subsequent events, such as his last meal with his disciples, his crucifixion and its aftermath, the concepts of Jewish theology applied to Jesus underwent radical change. Former concepts could no longer adequately account for the disciples' understanding of him.[24] Greatly revised images of him and his relation to God emerged.[25]

It is important to reiterate that the procedures used in assimilating material into thought are heuristic. (See discussion of Brown's study, 4.1.5). In heuristic procedures, reasoning is kept as closely aligned as is possible to factual knowledge. The form of reasoning employed is rational, in that logical principles are adhered to, but it ranges wider than the making of strict inferences. (See Poze's study of the use of both analytical and analogical thinking in creative thought, 4.1.5, Sanford's discussion of intuitive procedures and mapping, 4.1.6e and Johnson-Laird's account of compositional procedures, 4.1.6f).

Farrer argued that the procedures used in the apprehension of God are of the type which Brown has called "heuristic." Concepts of God cannot be directly inferred from the events surrounding Jesus' life, death and resurrection. Rather these "image-materials" are assimilated into thought. The disciples, in seeking to make sense of these events, extrapolated from them. Just as Hanson has argued that scientists reason back from their observations to formulae (3.4.2), Farrer maintained that the disciples reached their concepts of God by "backward extrapolation."[26]

The form of reasoning which is used in apprehension generally is

important to note. The imaginative/creative capacities of thought are the means by which it is possible to assimilate materials into thought and perform a number of rational operations by which research can be advanced further. (See discussion on thought and the extension of knowledge, 6.1.1b). In theology, the symbolic capacities of imaginative/creative thought are also central, for they enable us to extrapolate from those things which are related to Jesus' life and actions (Realms 1 and 2 beings), to theological concepts such as Resurrection, Incarnation and Trinity (Realm 3 beings).

In the following example of the development of resurrection belief, I shall attempt to show that by assuming the processes of symbolisation, it is possible to account for -

(i) how the inchoate "images" of resurrection belief arose from the assimilation into thought of "image-materials" related to events in Jesus' life; and

(ii) how those "images" were developed in the context of the ongoing life of the early church, giving birth to a full exposition of resurrection belief.

Prior to Jesus' crucifixion and death, surrounded by the events of his arrest and trial, there was the realization of impending doom.[27] Then came the horror of the crucifixion itself, the ensuing grief of those who had been closest to him, his burial and the visit of the women to the tomb to anoint the body of Jesus with spices.[28] The series of events which then followed conflicted with all that had gone before. There were reports of an empty tomb, of sightings of Jesus in a form recognizable but distinctly different from normal physical life, of his appearances to his followers gathered in the upper room and of his presence with the two on the road to Emmaus. In the shadow of death and mourning, a complete reversal was signified by all these happenings. What had made the

difference? The difference was to be found in the disciples' relationship to Jesus. They were no longer related to a being who was physically present to them but to one whom they could only describe as "risen."[29]

From the "image-materials" of the events of Jesus' life came the undeveloped but distinct "images" of resurrection belief. How these "images" were to be understood was not worked out until much later in tension with first century Judaism. (Cf. Pasteur's discovery of attenuation. It was not till after much experimentation that the logical steps of attenuation were demonstrated, 3.3).

Historically, the first generation of Christians were largely Jews, who constituted a messianic sect within Judaism. Initially they attempted to establish their identity within Judaism. Hence the continuity of their beliefs with Judaism was stressed.[30] As the Christian communities increased in size and spread, they became more Gentile in membership. Accordingly, strict adherence to the Torah diminished. With the lessening of Jewish practices, the tolerance of Christian communities within Judaism became more tenuous as tensions and conflicts increased over the place of Torah in Christian belief.[31] Eventually the Christian communities were expelled from the synagogues.[32]

Under these changed circumstances, the early Christians were bound to justify their existence as a viable religious community outside of Judaism. In the process of establishing their identity, their distinction from Judaism had to be explained. What was different was their belief in Jesus as Lord and Christ.[33] Since their trust in him was motivated by their belief in his resurrection, their new-found relationship with him had to be worked out in terms of that belief.

Consequently, the concept of resurrection developed.[34]

We can summarize the early development of resurrection belief as follows. Initial understandings of the resurrection were expressed in inchoate "images": Jesus was risen; God had raised him; his followers were the witnesses and could testify to the new relationship they had with him.[35] In the face of opposition and the need to justify their beliefs, their new-found relationship was put to the test. As a consequence, the inchoate "images" were developed and resurrection belief was enunciated more fully in terms of who Jesus was: this Jesus, whom God had raised, had also been made both Lord and Christ. To trust in him was to enter into a new and transforming relation with God. This new relation was incorruptible, even by death. Death was vanquished through Christ's resurrection. Thus, as Jesus was raised, they also would be raised.[36]

These later developments of the "image" of resurrection can be seen in St. Paul's exposition of the belief in 1Corinthians -

> But in fact Christ has been raised from the dead, the first fruits of those who have fallen asleep. For as by a man came death, by a man has come also the resurrection of the dead. For as in Adam all die, so also in Christ shall all be made alive.... Lo! I tell you a mystery. We shall not all sleep, but we shall all be changed...the dead will be raised imperishable.... For this perishable nature must put on the imperishable, and this mortal nature must put on immortality...then shall come to pass the saying that is written: 'Death is swallowed up in victory.'[37]

Still later, writing to the Romans, the "images" of Christ's death and resurrection were developed even further by St. Paul into theological motifs (or "dominant images") within which the early church's transformed relation to God through Christ was understood -

> For if we have been united with him in a death like his, we shall certainly be united with him in a resurrection like his.... The death he died he died to sin, once for all, but the life he lives he lives to God. So you also must consider

yourselves dead to sin and alive to God in Christ Jesus.[38]

Very much later, possibly towards the end of the first century, the belief extended further still to encompass anticipations of the nature of resurrection life, as we find expressed in Revelation -

> Then I saw a new heaven and a new earth...and God himself will be with them; he will wipe away every tear from their eyes, and death shall be no more, neither shall there be mourning nor crying nor pain any more...[39]

In the above example of the development of resurrection belief, I have endeavoured to show how "image-materials" drawn from the events of Jesus' life, death and its aftermath were assimilated into thought in the form of "living images." These were developed by other "image-materials" drawn from the ongoing life and experiences of the early church, and the distinct "images" were combined with each other to produce the "dominant image" of resurrection belief. The processes involved in the development of this belief can be seen to be comparable to those operative generally when materials are assimilated from the external world into thought by using heuristic procedures. (See discussions of Bruner, 4.1.1d, Brown, 4.1.5 and Lesner and Hillman, 4.1.6b).

What of the revelatory process itself? Are the processes by which God is revealed to mankind comparable to those involved in discovering other realities in the world? This brings us to a discussion of the second role which "images" fulfil in the revelatory process.

b. <u>The interplay of images and events in revelation</u>. In this section I shall attempt to show that though the mind is active in apprehension and comprehension, the "images" of revelation are not the result of mere speculation. They are comparable to other forms of

thought which arise from and are developed in close interaction with our experience of the external world. In endeavouring to make this same point, Farrer argued that revelation was the product of the continual interplay of the images of imagination and the events of Jesus' life, death and resurrection.[40]

The revelatory process can be briefly described as follows. The apprehension of God, like the apprehension of other realities, does not take place in an intellectual vacuum but in the context of previous knowledge and understanding.[41] Hence, the unexpected turn of events following Jesus' crucifixion inevitably challenged the disciples' earlier understanding of him. No longer could he be thought of as simply Mary's son, the carpenter from Nazareth, their master and teacher. Their relationship to him was now entirely different; their understanding of him utterly transformed. The events around them had revealed the full import of Jesus' relation to God. Hence, they concluded, he was God's Son. He had come on earth to dwell amongst men. He was now glorified and at God's right hand.[42]

How are theological thoughts such as these disclosed? Farrer's explanation was that the continual interplay of the disciples' former views of Jesus with all the perplexing and confusing events happening around them, led to a crisis in thought.[43] To resolve the crisis, the disciples' former "images" of Jesus had to be radically revised. The effect of these revisions was to produce new insights into who Jesus was and the significance of his relation to God.[44]

There are two aspects in this process which are comparable to the processes generally involved in the making of discoveries. Firstly, there is the insight itself, in which the life and actions of Jesus

were recognized as significant. Secondly, there is the form of the insight and how it is communicated.

Farrer's description of the disciples' crisis in thought, which he called the "crisis of images,"[45] is an account of the first of these phases. As we saw in discussing Koestler's account of creative thinking, when one is intellectually frustrated by a seemingly irresolvable problem, there is a period of incubation in which the mind actively seeks a solution (3.3). Bruner's studies of creativity, in which he delineated the rational steps involved in resolving such crises, is also helpful in understanding this process. He pointed out that in problem-solving, those who assume that there is a real pattern to be found, institute a systematic search for it. Through rigorous, organized and skilful processing of information, an overall pattern is generally found (4.1.2). This process is very complex. (See discussion 4.1.1c and d). It involves combining previously unrelated ideas, before entirely new insights can be reached.

In order to understand how these insights are gained, it will be helpful to refer again to Hanson's analysis of how the significance of phenomena is generally recognized (3.4.2). Phenomena will either (i) fit or almost fit a set of concepts, thereby confirming and extending those concepts, or (ii) differ so markedly as to require a radical change, sometimes of paradigmatic proportions.

Farrer's account of the crisis in thought which confronted the disciples after the resurrection of Jesus can be understood in the framework of the above processes. Through the continual interplay of image and event, there was a "crisis of images" in which the disciples' former concepts of Jesus had to be radically revised. As the emerging concepts brought new and deeper insights, the full

significance of Jesus' life and actions began to dawn in the disciples' minds. Thus says Farrer -

> The great images interpreted the events of Christ's ministry, death and resurrection, and the events interpreted the images; the interplay of the two is revelation.... The events by themselves are not revelation, for they do not by themselves reveal the divine work which is accomplished in them: the martyrdom of a virtuous Rabbi and his miraculous return are not of themselves the redemption of the world.[46]

The interplay of image and event is crucially important in the revelatory process. The "crisis of images" which results from the interplay is what necessitates the radical revision of former concepts. In turn, the insights which such revisions disclose are what constitute the revelation. Neither the "images" themselves nor the events are the revelation. This is why theological realities cannot be inferred directly from either the "images" or the events. (See discussion on heuristic procedures above in 7.3.2a). Revelation is a function of the interplay of the two. What is revealed is the object of reference, God.[47] The images, in close interaction with the events, signify that reality. They are not themselves the reality.[48]

What then is the form of the revelation and how is it communicated? This brings us to the second aspect of how revelation takes place. As we saw in our discussion of scientific realism (6.5.4 and 6.6), Realm 3 beings are revealed by Realms 1 and 2 beings by reasoning back from the evidences given by Realms 1 and 2 beings.

The revelation of theological realities can be accounted for in much the same way. Like Realm 3 beings, theological realities are not directly accessible to the senses or to sense extending instruments. They cannot therefore be inferred directly from Realms 1 and 2 beings. However, the events of Jesus' life and actions (Realms 1 and 2 beings)

provide the "clues" to revelation. By reflecting on these "clues" the early disciples revised their former concepts of Jesus in terms of them (i.e. by the interplay of image and event). New insights (revelation) emerged from the revised concepts, disclosing the significance of Jesus' relation to God (a Realm 3 being).

The form of the revelation can be seen to be conveyed by the functions of imaginative/creative thought, viz. insight, discovery and the creative act. The processes involved in the disclosure are none other than those involved in symbolic thought generally. That the disciples' apprehensions of God should be accompanied by awe, wonder, amazement and even ecstasy, as reported in the New Testament,[49] should be no surprise. As noted much earlier, these factors generally accompany discovery and insight. (See discussion of Bruner on affective aspects of the creative act, 4.1.1 and 4.1.2; compare Koestler's account also, 3.3).

Assuming these symbolic functions of thought, Farrer described the revelatory process as follows -

> When finite objects happen to have been brought into such a mental focus that they are capable of acting as symbols of the infinite, then the mind's power to know the infinite leaps into actualization, seeing the finite in the infinite, and the infinite in the finite.[50]

In the following example of the development of incarnational belief, I shall endeavour to show how, through the continual interplay of images and events, the early disciples came to apprehend Jesus as Lord and Christ.

Though historically the full doctrine of incarnation was a later development of the fifth century Church, formulated by the Council of Chalcedon in 451 A.D., Farrer held that the "image" of divine/human coincidence in the person of Christ was revealed in the life and

actions of Jesus himself.[51] He stated his position as follows -

> The revelation which has won our acceptance has not been concerned with mere disclosures of things invisible or systems of supersensible being, but always with what has happened, is happening, or will happen; events in which the prophet claims to trace the hand and purpose of God.... In Christ Himself the duality between supernatural understanding and the fact to which it refers appears to be bridged, in so far as His teaching reveals the significance of what is accomplished through Himself; for He who declares the interpretation makes the fact.[52]

For Farrer, the "images" of incarnational belief are not a figment of the imagination. They arise out of an interplay of image and event in which thought and reality are enmeshed. (Cf. discussion on Hacking and the interlocking of thought and reality, 6.1.2). This is how the "images" of incarnational belief can be said to arise out of the happenings surrounding Jesus' life and actions. They are the symbolic manifestation of events which have actually occurred -

> Christ does not save us by acting a parable of divine love; he acts the parable of divine love by saving us.[53]

How is divine/human coincidence recognized? For Farrer, the "image" of incarnation, which symbolized the early disciples' apprehension of who Jesus was, arose out of judgements which were made after wrestling with the perplexing events following Jesus' death and their new-found relationship with him. Thus he said -

> There is no major premiss which lays it down that every child virginally born, or every good man making divine claims, or every crucified man raised from the dead, is a Person of Godhead....
>
> We can nevertheless speak of criteria, and list them as preparatory, intrinsic and relative.[54]

Preparatory criteria are the canons of critical thinking employed in formal enquiry. Intrinsic criteria arise from scrutinizing the phenomena as they are in themselves. Relative criteria are those

factors in the experience of life with which an insight coheres.[55]

In the interplay of image and event, argued Farrer, as the disciples went over and over the events to make sense of them, they would have used criteria of this kind, though in an informal way, to reach their judgements. The theologian, as we will see below, must employ these canons formally if theological enquiry is to be vindicated. (See 8.5 and 8.6 below).

Thus an incarnational-type belief arose as the endpoint of the continual interplay of the disciples' former concepts of Jesus with later events. In the context of their new-found relation with Jesus and all these events, "images" of Jesus' life, death and resurrection were conjoined with "images" of the purposes and actions of God. Entirely new insights of Jesus' relation to God were disclosed as a consequence.[56]

We may account for the details of the insight which gave rise to an incarnational-type belief as follows. Initially, the disciples' concepts of Jesus would have been formulated from their daily encounters with him, his teachings about their relationship with each other and with God, his sayings about himself, his frequent references to God and the coming of God's kingdom, his calling of disciples and his talk of a new age.[57] Then came all the happenings which led up to his death: his last meal with his disciples, his reflections on his approaching death, his perceptions of his role and his disciples' role in the coming kingdom, his arrest and trial, his crucifixion and the tragic finality of his death.[58] In the midst of events such as these, the disciples' understanding of Jesus was deepened, only to be overturned by subsequent events. Their recognition that he was risen and present to them in an entirely different way could no longer

be incorporated into former concepts of him.[59] This "crisis of images" brought new insights of Jesus and his relation to God in which the life, death and resurrection of Jesus were seen to coincide with the redeeming purposes and action of God for which they had long waited.[60]

As they gathered together in communities constantly to share a common fellowship meal at which their relationship with Jesus was renewed, their apprehension of his relation to God developed even further, giving birth to the realization that in the life, death and resurrection of Jesus, God had been reconciling mankind to himself.[61] What terms could adequately express this profound insight other than to proclaim Jesus, Son of God (υἱὸς τοῦ θεοῦ), Lord (κύριος) and Christ (χριστός)?

As Morna Hooker has pointed out, these were not existing titles conferred on Jesus. The terms were given meaning and considerably developed in the midst of the early church's struggle to maintain their identity. They were the endpoint of all their deliberations.[62]

For instance, circumstances in the early church, in which their identity had to be established at first within Judaism, and later in distinction from Judaism, resulted in their continued reflection on and explication of their apprehension of God through their faith in Jesus as God's Christ.[63] In addition, as conflicts and dissensions arose within the early communities themselves and threatened their common faith in Christ, their relationship to Christ had to be articulated even more fully. Thus St. Paul, in dealing with dissensions in the community at Corinth, reminds them of their common belief "in Christ" (ἐν χριστῷ) -

> I appeal to you, brethren, by the name of our Lord Jesus Christ, that all of you agree and that there be no dissensions among you, but that you be united in the same mind and the same judgement.... Is Christ divided?.... For Christ did not send me to baptize but to preach the gospel, and not with eloquent wisdom, lest the cross of Christ be emptied of its power. For the word of the cross is folly to those who are perishing, but to us who are being saved it is the power of God.... For Jews demand signs and Greeks seek wisdom, but we preach Christ crucified.... Christ the power of God and the wisdom of God.... He is the source of your life in Christ Jesus, whom God made our wisdom, our righteousness and sanctification and redemption;...[64]

In units such as these, full expositions of the early church's apprehensions of Jesus as Lord and Christ were given in an attempt to remind the early Christian communities of all that was fundamental to their beliefs. Jesus is God's Christ. Through Christ's death on the cross, mankind is now reconciled to God. To accept the revelation by faith one enters into a new relation with God which can be described as being "in Christ Jesus" (ἐν χριστῷ Ιησοῦ). In the life of Christ, God has acted for mankind's benefit.

As their understanding of Christ's salvific work developed, so also did their understanding of his particular relation to God. The work is Christ's, but the initiative is God's. In the person of Christ, both coincide.[65] Divine/human coincidence is encapsulated in the "image" of incarnational belief and expressed as God's action in Christ.[66] Explicit statements, such as those below from St. Paul's letter to the Philippians, indicate the emergence of this "image" -

> Have this mind among yourselves, which is yours in Christ Jesus, who, though he was in the form of God, did not count equality with God a thing to be grasped, but emptied himself, taking the form of a servant, being born in the likeness of men. And being found in human form he humbled himself and became obedient unto death, even death on a cross. Therefore God has highly exalted him and bestowed on him the name which is above every

> name, that at the name of Jesus every knee should bow, in heaven and on earth and under the earth, and every tongue confess that Jesus Christ is Lord, to the glory of God the Father.[67]

Similar explications of the early church's apprehensions of Jesus are found in their efforts to legitimize their existence as a religious movement amidst growing tensions with Judaism. Hence, in the Galatians, the freedom which Christ gives is expounded in tension with the practice of circumcision and the strict keeping of Jewish food laws, in Romans St. Paul wrestles with major theological concepts such as the place of the Jews in God's plan of salvation and the relation of the Law to Christ, in Hebrews the writer deals with how Christ replaces all Jewish sacrifices, and in St. John's Gospel the close relation of Christ to God is defended.[68]

In the context of these conflicts and tensions, the "image" of Jesus as Lord and Christ is given content. Though incarnational belief is not stated explicitly as a doctrine, the juxtaposition of the early church's concepts of God and Christ make it clear that the "dominant image" of divine/human coincidence is being supposed. In units such as the following, and others like them, scattered throughout the New Testament, the "image" of Jesus as God's Christ is assumed -

> Grace to you and peace from God the Father and our Lord Jesus Christ (Gal.1:3)
>
> God is faithful, by whom you were called into the fellowship of his Son, Jesus Christ our Lord" (1Cor.1:9)
>
> But thanks be to God, who in Christ always leads us in triumph (2 Cor.2:14).
>
> ...seek the things that are above, where Christ is, seated at the right hand of God. (Col.3:1)
>
> But God shows his love for us in that while we were yet sinners Christ died for us.... we also rejoice in God through our

> Lord Jesus Christ, through whom we have now received our reconciliation. (Rom.5:8,11).

If, as Farrer argued, the "image" of incarnational belief is basically a function of symbolic thought, this would explain how divine/human coincidence can be encapsulated in thought and the significance of Jesus' relation to God apprehended.

How does this act of symbolization take place? To deal with this matter, it will be necessary to discuss the third role which Farrer ascribed to the "images" of revelation.

c. <u>The creative force of the "images" of revelation</u>. Farrer argued that the "images" of revelation, like the symbolic form of other branches of thought, were able to combine with each other to form new unities.[69]

In our discussion of the cognitive sciences, we noted that scientists and other researchers rely on the symbolic functions of thought to extend and develop knowledge. In the process, information is organized under existing codes or schema and these codes are combined with other systems into new unities (4.1.1c and d). The effect of these new unities is to provide an overall conceptual pattern which is capable of organizing phenomena into an intelligible whole (3.4.2). The organizing patterns are then tested in relation to known facts, and refined, revised or overthrown accordingly.

As we have seen in the discussion above (7.3.2a and b), Farrer's understanding of the "dominant images" of revelation, such as Resurrection and Incarnation, are reached in the same way. They are the patterns which emerge from and are capable of organizing all the "image-materials" drawn from the events of Jesus' life.

This background to the emergence of the "images" of revelation is

crucial if we are to understand the symbolic character of these forms. Farrer has argued that, because the Fathers of the Church did not appreciate the nature and form of revelatory thought, they violated many of its principles.[70] Their metaphysical speculations on the persons and relations in the Trinity only served to distort the "image" of Trinitarian belief and produce an unintelligible doctrine.[71] He held that later attempts to establish the scriptural authority of the doctrine of the Trinity were also fraught with difficulties because of a similar failure.

The old scholastic approach hunted for propositions which either "declared" or "implied" the doctrine "in its philosophical form."[72] The new scholastic way sought to count and classify all the texts in which Father, Son and Holy Spirit were mentioned either individually or in connection with each other, assuming Trinity was delineated as a "single scheme" by St. Paul or St. John.[73] Both methods were inadequate as they failed to take account of the nature of the "images" of revelation. Farrer comments as follow -

> It is obvious...that St. Paul's several imagery statements speak of personal divine action in the Father, the Son, and the Holy Ghost, and further, that St. Paul was not a polytheist. But whether he regards the Son and the Spirit as instrumental modes of the Father's action, or as divine Persons in their own right, can be determined only by a subtle and risky construction of inferences. Just because St. Paul writes in images, we fall into absurdity at the first inferential step.[74]

The important point being made here by Farrer is that theological judgements require a great deal of skill in the sheer handling of the "images" of revelation, a matter which I shall take up in greater detail in 8.5.2 below.

Other errors in attempting to establish the doctrine of the Trinity were either to argue from religious experience, which only

produced a "triform experience of God" and not an "experience of a triune deity,"[75] or to look for formulae in which the triad of Father, Son and Holy Ghost appeared, which left researchers with little that could be said about Godhead.[76] These methods also failed to illuminate the concept of Trinity because the symbolic character of revelation was not taken into account.

> If we want to find the Divine Trinity in the New Testament we must look for the image of the Divine Trinity.... When we have isolated the image of the Trinity, and studied it in itself, we can then proceed to ask what place it occupies in the world of New Testament images.... After that we can, if we like, go on to ask what metaphysical comment the New Testament image of the Trinity provokes, and which subsequent theological conceptualizations do least violence to it.[77]

If the symbolic form and nature of the "images" of revelation are not respected, gross distortions of the revelation will result. Since the "dominant images" of revelation are none other than the organizing patterns or mental models of symbolic thought, they must be treated as such.

How are the "dominant images" pinpointed? Since the early church set down their apprehensions in their writings, the "images" were encapsulated in those writings. It was therefore possible for the "images" of revelation to be conveyed to the scattered communities of Christians and made accessible to later generations as well. In order to understand how the "images" of revelation were encapsulated in language and conveyed from generation to generation, it will be helpful to recall our earlier discussion of the role of language in symbolisation and reference.

In that section, we noted from Soskice's theory of interanimation that language functions as the vehicle of cognition (6.3.1). As words are closely bound up with thoughts, and thoughts are capable of acting

together to give meaning to the subject matter of metaphor, it is possible for thought to be encapsulated in language. The underlying idea (the 'tenor') which is given meaning by a combination of words (the 'vehicle'), can be communicated by this means to other language users. In addition, in the process of interanimation, vehicles of thought, of which metaphor is only one, are capable of combining with other vehicles of thought, modifying the ideas conveyed. As a result, networks of association are set up in thought.

In the same way, the processes of interanimation can account for how Christian revelation is conveyed from one generation to another. Since words are closely bound up with thoughts, and words are capable of acting together to give meaning to linguistic forms such as metaphor, it is possible for the "images" of revelation to be encapsulated in language. The underlying idea or "image" (the 'tenor') is communicated by a combination of words (the 'vehicle'). Just as a vehicle of thought such as metaphor is capable of being combined with other vehicles of thought, modifying the initial ideas conveyed, so also it can be seen how the distinct "images" of revelation, encapsulated in linguistic form, can be combined with each other to modify our understanding of God. In this way a network of associated "images," which cluster around a single idea (i.e. a "dominant image") can be conveyed in linguistic form to subsequent readers. Thus says Farrer -

> The theologian may confuse the images, and the metaphysician may speculate about them; but the Bible-reader will immerse himself in the single image on the page before him, and find life-giving power in it, taken as it stands. He reads how we were bondmen until God 'sent forth his Son, born of a woman...that we might receive the adoption of sons': and how, to confirm our sonship, there was a second mission: 'God sent forth the Spirit of his Son into our hearts, crying Abba, Father.'[78]

For Farrer, the "dominant image" of Trinity was encapsulated in written form as a single "image" (or organizing pattern). In order to understand the structure of "dominant images," it will be helpful at this point to refer again to Harré's account of "theory-families," which, he says, are made up of interconnected parts and relate to a source analogue (6.1.1b). Such a framework helps explain how, in the process of interanimation, distinct "images" conveyed by a number of words may be connected with each other to form a network of ideas, which relate to a source analogue or a single "dominant image."

It should be reiterated that the process by which networks are set up is interanimation and not interaction. (See Soskice's distinction, 6.3.1). Whilst distinct "images" of revelation (e.g. of Jesus' action or of God's action) may enliven one another to reveal the "dominant images" of revelation (e.g. divine/human coincidence), they are still identifiable as distinct "images" in their written form. Accordingly, though the distinct "images" of Father, Son and Holy Spirit can be identified in linguistic forms, the combination of these "images" through the interanimation of those thoughts accounts for how the single "dominant image" of Trinity is signified.

The words encapsulating the "dominant image" neither define nor delineate Trinity. The thoughts which are bound up with the words intercourse with one another, signifying the single "dominant image" of God as Trinity.

The same could also be said for the "dominant image" of Incarnation. Words conveying "images" of God's action and Jesus' action are combined to signify the "dominant image" of divine/human coincidence (i.e. incarnation).

It is therefore possible to defend Farrer's argument for the

"dominant images" of revelation by a theory of interanimation. Also, as "images" can be encapsulated in words, it is possible to account for how the "images" of revelation are conveyed from one generation to another in written form. Those reading the words later, can through the interanimation of the thoughts bound up with them, gain epistemic access to the object to which the words refer. In this way, later generations are enabled to apprehend God through the significance of the events of Jesus' life, death and resurrection.

Thus, in passages such as the following exchange in St. John's Gospel, though the idea of Trinity is not expounded, the words in the passage are only intelligible if it is recognized that the "dominant image" of Trinity is presupposed by the Gospel writer -

> Philip said to him, "Lord, show us the Father, and we shall be satisfied." Jesus said to him, "Have I been with you so long, and yet you do not know me, Philip? He who has seen me has seen the Father; how can you say, 'Show us the Father?' Do you not believe that I am in the Father and the Father in me? The words that I say to you I do not speak on my own authority; but the Father who dwells in me does his works.... If you love me, you will keep my commandments. And I will pray the Father, and he will give you another Counselor, to be with you for ever, even the Spirit of truth...[79]

It was along the lines delineated above that Farrer argued for the creative force of the "images" of revelation which, he said, "fuse[d]"[80] and "grew together into fresh unities,"[81] producing the "dominant images" of revelation such as Trinity.

How the "dominant images" of Resurrection, Incarnation and Trinity are to be understood is a task for theologians to deliberate. As far as the apprehension of God <u>per se</u> is concerned, the substance of the revelation is best explained as having been encapsulated in the form of "images" and set down in linguistic forms in the writings of the early church. Because most of these writings

are still extant, it has been possible for later generations to apprehend the significance of Jesus and his relation to God through the "images" of revelation encapsulated in them.

This is not to say, however, that the truth of theological knowledge is "guaranteed" in written form to successive generations. It is merely to point out that the early church's apprehensions of God through the life and actions of Jesus are also accessible to later generations through the symbolic/metaphoric functions of language. As we will see later in this chapter, how these are to be interpreted by later generations and incorporated into our own apprehensions of God requires skilled judgements not only of the "images" of revelation but also of their relation to present-day knowledge and our experience of personal life.

7.3.3 Summary.

The purpose of this long discussion of the role and function of "images" in the revelatory process has been to show that theological concepts such as Resurrection, Incarnation and Trinity which signify the reality of God's action in the world are apprehended through the symbolic/metaphoric processes of thought. In the analysis I have attempted to show how a rational route can be mapped for theological apprehension which is comparable to that delineated for the functions of imaginative/creative thought in the sciences and the humanities.

In knowing generally, an agent apprehends a reality from which a number of beliefs arise, which are then subject to rigorous examination (6.2). I have endeavoured to argue that the situation is no different in theological knowing. Theological apprehension arises, as do other forms of apprehension, from informal observations of the

external world (Realms 1 and 2 beings). These give rise to a number of beliefs (Realm 3 beings). Whether those beliefs are correct or not can only be determined by critical enquiry.

Just as in other disciplines our apprehensions and the beliefs to which they give rise cannot be accepted uncritically, neither can theological apprehension and the beliefs to which they give rise.

We have already seen that as high a level of objectivity as is possible is achieved for knowledge in the sciences and the humanities through adhering to the principles of empirico-critical enquiry. The issue which still remains is whether theology is capable of adhering to those principles also. I have argued that if it can, then the credibility of theology as a source of trustworthy knowing need no longer be held in doubt. Further, since recent research has already been moving in this direction, particularly in the field of biblical studies,[82] it would appear that empirico-critical principles can be applied effectively to the doing of theology.

There have been some thinkers (e.g. D. Cupitt[83] and D. Z. Phillips[84]) who have objected in principle to such an undertaking. There have been others (e.g. M. Goulder[85] and A. J. Kenny[86]) who, though in principle in favour of doing theology empirico-critically, have been sceptical that it can ever be achieved. In the discussion below, I shall endeavour to show that empirico-critical theology is not only possible but also essential if theology is to retain its credibility as a source of trustworthy knowing in an increasingly science-oriented world.

CHAPTER EIGHT

THE PROCESSES AND PRINCIPLES OF KNOWING IN SCIENCE AND THEOLOGY (2)

8.1 The Principles of Knowing in Theology.

Over a decade ago, in 1976, the German theologian, Wolfhart Pannenberg, acknowledged the serious plight of theology as an academic discipline. In his book Theology and the Philosophy of Science[1] he wrote -

> The institutional base of theology in the university is extremely precarious when it rests on no more than existing practice. This institutional position is derived ultimately from the medieval view of the university and the system of the sciences. Even then the existence of theology in the university depended on the fact that it could be shown to have a place in the totality of the sciences. Since the medieval arguments for that position have since become obsolete, the continued existence of theological faculties in the universities of secular states has become a mere matter of fact.[2]

Though Farrer's major philosophical/theological works, from his Finite and Infinite[3] in 1943 to his Faith and Speculation[4] in 1967, span an earlier period than Pannenberg's writings, the need to approach theology empirico-critically was in the forefront of his mind throughout his long years of writing.[5] Whilst, therefore, he expounded the form of our apprehension of God in The Glass of Vision in 1948, he was equally conscious of the critical task which still lay ahead of the theologian to establish the validity of that apprehension.[6] This issue continued to engage

him, and in 1966 he published A Science of God?[7] which deals specifically with the possibility of an empirico-critical theology.

Unfortunately the volume was severely criticized.[8] This was partly because Farrer used the terms "science" and "scientific" in two different senses without clearly distinguishing which was meant.[9] He employed the word "science" (i) to refer to science as a discipline, incorporating knowledge of the physical world, vis à vis theology as knowledge of God; and (ii) to refer to science as the formal knowledge of any subject matter, i.e. scientia.

If these distinctions are made clear, Farrer's defence that theology is capable of standing as an independent enquiry has a great deal to commend it. His argument rests on several factors. Upon closer analysis it will be obvious that the principles of enquiry which he enunciated for theology are no different from those in any other discipline, least of all the sciences.

8.2 Same Principles of Enquiry Required in Theology as in Science.

In 7.3.3 above I noted that theological apprehension, like the apprehension of other subject matters, gives rise to a number of beliefs. The task of empirico-critical enquiry is to determine the status of those beliefs.

Before proceeding further, a clear distinction needs to be made between two senses of the term "belief," which are often conflated in theological discussion -

(i) A belief may simply mean something which has not yet been established but which we assume, or

(ii) A belief may mean something in which we place considerable trust because we accept it as trustworthy.

I shall discuss the matters of trust and commitment in 9.5. below, but for the purposes of clarity shall only use the term "belief" to refer to the first of these possible senses.

Farrer acknowledged that the beliefs which arise out of our apprehensions of God are essentially only beliefs. Whether or not they can be substantiated is, as with all other disciplines, a matter of skilful investigation.[10] In defence of this view he said -

> God's being, like second-sight, is a matter of common belief. It seems to call for scientific investigation, for if it is a fact it is not an obvious fact.[11]

What kind of search should be instituted? The same kind as is mounted in other enquiries. One must examine all the evidence, whether the evidence appears to be for or against the beliefs one holds.[12] However, because the subject matter of theology is very different from the subject matter of science, Farrer made clear that entirely different procedures and techniques were required for establishing the reality of God as compared with those for establishing physical fact.[13] Nevertheless, the principles applicable to science, which had enabled science to achieve impartial results, were also necessarily applicable to theology.[14] Thus clear beginnings of an empirico-critical approach to theology can be found in Farrer's writings.

If empirico-critical principles are to be made applicable to theology, spiritual realities must be accessible to enquiry. Where are these to be located? As far as Farrer was concerned, they were located in the world we experience, as are other realities. In order to understand his stance, it is necessary to appreciate the relation that he saw between physical fact and spiritual realities.

8.3 Science and Theology Not in Conflict.

For Farrer, physical and spiritual entities co-existed in the world. He stated his position as follows -

> The universe is a physical system, and nothing that is not physical can hold a place in it.... There is a fly, now, crawling across my paper. The little wiry legs are real, and so is their action in crawling; if the legs weren't real, the fly could not crawl with them; and if the crawling were not real, the legs would be at rest. The crawling isn't the legs, neither are the legs the crawling. Yet the crawling is not separate from the legs; and no more are the surprising activities of imagination and thought separate from the bodily person, so long as this life endures.[15]

Since, for Farrer, spiritual realities were apprehended by imaginative/creative thought,[16] the unity of thought and bodily existence presented an apt analogy of the kind of unity which obtains between spiritual and physical reality. His understanding of this relation becomes most significant when we consider how theological realities in particular are to be grounded in the external world. If, as I have argued, theological realities such as Incarnation and Resurrection are rightly designated Realm 3 beings (6.5.4), and Realm 3 beings are located by extrapolating from Realms 1 and 2 beings (6.6), then the kind of relation which Farrer said existed between physical fact and spiritual realities would appear to be quite possible.

In addition, there are two other implications if such a relation holds between physical fact and spiritual realities. Firstly, if physical and spiritual realities are not in conflict, past arguments that a basic incompatibility exists between the subject matter of science and that of theology would be rendered vacuous. Secondly, if physical and spiritual realities are actually compatible, the reality

of Incarnation, as Farrer understood it, should no longer be precluded on the grounds that divine/human coincidence entails the violation of physical law.

Farrer's concepts of "double personal agency"[17] and "the causal joint,"[18] in which he endeavoured to defend the possibility of the coincidence of natural and supernatural existence within the life of Jesus, was based on the assumption that an interaction and not a dichotomy obtained between physical and spiritual entities.[19]

We may usefully refer again to Polkinghorne's argument that there is one reality, and that science and theology are complementary pursuits in the study of aspects of it (6.5.4). His defence, which, among other things, draws on his own considerable knowledge of the physical world, lends support to Farrer's position that physical and spiritual realities are compatible.

Assuming this relation, Farrer argued that the major difficulty confronting theologians was the need to specify an adequate set of procedures and techniques by which spiritual realities could be pinpointed.[20] As part of that quest, in A Science of God? he began by examining one of the possible routes to acquiring an understanding of God, viz. through reflecting on nature. He concentrated particularly on two basic topics, the origin of the universe and creation. His purpose in these discussions was twofold.

Firstly, he attempted to show that whilst scientific knowledge could illuminate theological enquiry, it was a mistake for theologians to think that knowledge of God could be established by pursuing that pathway solely.[21] If there is a God at all, Farrer contended, he will be known by "practical" evidence, i.e. by his activity in the world.[22]

Secondly, as knowledge of the natural world can inform theological reflection, it must be taken into account.[23] Not to do so would be to disregard fact and court ignorance.[24] Farrer argued that if we were to understand the way the world functioned and God's activity in it, we were bound to study natural processes, rather than make guesses about God's providence and purposes.

> Those who start from a rash confidence in such guesses, instead of starting from a patient study of natural processes, land themselves in that terrible morass of muddled thinking which goes by the name 'the problem of suffering.' If an earthquake shakes down a city, an urgent practical problem arises - how to rescue, feed, house and console the survivors, rehabilitate the injured, and commend the dead to the mercy of God; less immediately, how to reconstruct in a way which will minimise the effects of another such disaster. But no theological problem arises. The will of God expressed in the event is his will for the physical elements in the earth's crust or under it: his will that they should go on being themselves and acting in accordance with their natures.[25]

Farrer, of course, was well aware of other perplexing problems for Christian theology with regard to reconciling the presence of evil in the world with a belief in the love of God, but he quite rightly identified that many of the dilemmas within theological reflection have been created by ungrounded claims about God which are impossible to square with knowledge of the natural world. The claims which he considered most needed jettisoning were those postulating a crude form of interventionism, in which God was supposed to suspend the natural order at will in order to bring about divine ends.

This was not to say that God was inactive in the world. What Farrer insisted was that the natural order was not violated by the activity of God. Nature pursues its course whether or not human ends are served by it.[26] Hence, he argued -

> It cannot be disputed that such sorts of good [e.g. heroic virtue, moral triumph] are born out of disaster; but the disaster is a disaster still. Healthy and useful lives are lost to the earth.[27]

Thus natural order and divine activity are distinct aspects of the world. They are, however, interlocked.[28] Therefore, the theologians' interest should not be pursued in ignorance of the natural order. At the same time, as divine activity is distinct from the natural order, it needs to be studied accordingly. Like scientists, theologians are bound to examine their beliefs in respect of all the evidence and to indicate whether there is any foundation for them.[29]

8.4 Locating the Evidences For and Against Theological Realities.

Where are these evidences to be found? Farrer maintained that there were three sources, which provided the evidences for theological enquiry, all of which must be tapped if a fully comprehensive understanding of Christian belief was to be obtained. The first is the knowledge we have of the natural world. The second is the knowledge which we possess of a number of religiously significant events in the development of Christian belief. The third is the knowledge we have of ourselves.[30]

In order not to be party to any theological question-begging, we are bound at this point to go beyond Farrer and give a defence of these three sources. Their importance will be seen if we digress temporarily to examine how, in the present-day world, we apprehend God. Also, bearing in mind that I have confined my analysis in the thesis specifically to Christian theology, I shall address myself to that particular understanding of God.

As we saw in 7.3.2c above, though historically we are almost two millenia away from first century Christianity, the "images" of

revelation encapsulated in the writings of the early church are able to give us epistemic access to the events of Jesus' life, death and resurrection. Further, because the "images" can be combined into networks of association, it is possible for the "dominant images" of revelation (e.g. Resurrection, Incarnation and Trinity) to be conveyed to later generations.

It will also be recalled that Soskice argued that in scientific enquiry metaphors rely on paramorphic models, and that paramorphic models aid theorizing (6.3.1). Similarly, we may contend that the "images" of Jesus' life and actions rely on the "dominant images" of revelation (e.g. Resurrection, Incarnation and Trinity) and, in turn, the "dominant images" of revelation aid "theologizing" (i.e. our reflection on the nature and character of God.

Through processes such as these, it is possible for the "images" of Christian revelation to be conveyed to later generations and aid the apprehension of God. Since the "images" are not the revelation itself, they can in no way "guarantee" a true knowledge of God to us. They are, however, able to aid the apprehension of God, because of the roles of symbolization and reference that "images" perform in language. Speakers or writers, employing linguistic forms which are able to signify "images," can make use of networks of those "images" to refer to the object of their reference. The early church were thereby able to refer to the object of their reference, God, through the "images" of revelation, signified in their writings. Others, reading those words later, were thus enabled to apprehend the object of the early church's reference, God, through those "images."

Since our belief is in the same object of reference, God, this is how the biblical writings are able to aid or illuminate our

apprehension of God. Even though the terms used to refer to God in first century Christianity are from a different thoughtworld and differ culturally, socially and historically from the terms used to refer to God in the twentieth century, this need make no difference to the object of reference, God, that the terms fix. For as we saw in discussing the effects of theory change and the growth of knowledge on reference in 6.5.1 and 6.5.2, such changes do not entail changes in the object of reference.

However, our present-day apprehensions of God are not dependent only on the biblical documents. As in apprehension generally, we assume a reality and then seek to comprehend what we apprehend, the same applies in our apprehension of God. Assuming the existence of God, we seek to comprehend what we apprehend of Him. The task of critical enquiry, however, is to test the status of these apprehensions.

Our apprehensions of God, like our apprehensions of other aspects of reality, arise from our experiences of the world, whether that experience comes from what we read in the biblical documents, obtain from immersing ourselves in the Christian tradition, hear in sermons, derive from participating in the life and worship of the Christian community, encounter in relating to other human beings, observe in nature or gain from studying the world. Not only do the biblical documents and our participation in the Christian tradition of worship and practice aid our apprehension of God, but all our other experiences from personal existence and from our knowledge of the world very often aid and develop our understanding of God as well.

For the sake of clarity, these diverse experiences may be organized into three groups -

(i) those which provide details of the religiously significant events in the development of Christian belief,

(ii) those which relate to present knowledge of the natural world, and

(iii) those which relate to our experience of personal life.

As these three groups represent the sources from which our present-day apprehensions of God arise, it is to these three sources (which, incidentally, align with the three sources Farrer named) to which we must now turn to seek the evidences for and against belief in God.

For this task, theologians require appropriate and adequate procedures and techniques.

8.5 The Procedures and Techniques of Theological Enquiry.

The matter still outstanding is whether theology's procedures and techniques are able to meet the demands of empirico-critical enquiry.

In 5.2.3d above, I argued that because of a discipline's particular subject matter, one's method of approach may be required to be more hermeneutical than experimental, as, for instance, in the humanities. Despite this difference, I endeavoured to show that both types of approaches belong to an empirico-critical continuum and are capable of adhering to empirico-critical principles (5.1 and 5.2).

In 8.4 above, I argued that our present-day apprehensions of God derive from three sources, viz. our participation in personal, social and religious life, our knowledge of the world, and significant religious events related to Christian belief. In order for the status of our present-day beliefs to be assessed, it is necessary to examine

all the evidences available from these sources. Since these evidences are in the main located in the form of extant documents and personal existence, more hermeneutical-type procedures are required for the study of theology as compared with the more experimental type procedures of the physical sciences.

If, as I have argued, hermeneutical type procedures are capable of adhering to empirico-critical principles, the task that remains is to show that the procedures and techniques of theology also are capable of adhering to these principles.

Before doing so, there are two further points to note. Firstly, as with other disciplines where access to one's area of research is difficult and resists enquiry, one's research may have to be conducted in several phases.[31] This will also be seen to be true in theological enquiry. Secondly, as was shown in Sir John Kendrew's account of how revolutions in biology were brought about by using the techniques and knowledge of chemistry and physics (6.6), theologians too are dependent on the techniques and knowledge of other fields to advance their enquiries.[32]

8.5.1 Using the Techniques and Knowledge of Other Disciplines.

In specifying the kind of procedures and techniques which theologians must use, Farrer noted that theologians are partly dependent on the techniques of disciplines such as history,[33] literature,[34] psychology,[35] physiology,[36] biology,[37] the physical sciences,[38] and philosophy,[39] for their tasks of gathering data, examining evidence and subsequently making appropriate theological judgements. As we shall see below, since Farrer's time, additional disciplines such as sociology and political theory have

also been shown to be important in the study of theology (8.5.1c).

However, in acknowledging that theology must make use of the techniques and knowledge of other disciplines, Farrer was not suggesting that theology could be reduced to any of these disciplines.[40] The interests of theology, for instance, are not to be equated with subjects such as psychology or history, though there may be considerable overlap at times in their respective pursuits. In his article "Revelation and History,"[41] he argued that the subject matters of theology and history are clearly distinguishable. Nevertheless, historical interpretation is a fundamental element of theological enquiry since it provides important constraints within which theological judgements are made. Similarly, constraints are also provided through the knowledge and techniques of other disciplines.

The two benefits of availing oneself of the knowledge and techniques of other disciplines are that -

(i) they afford access to new areas of knowledge previously inaccessible to the conventionally established techniques and procedures of one's own discipline; and

(ii) they enable the constraints of the knowledge and critical procedures of those other disciplines to be brought to bear on one's own area of research.

As far as theology is concerned, the second of these two benefits is of the greater importance. It enables theological beliefs to be checked against current knowledge and does so by using the empirico-critical techniques of related disciplines.

In the following examples, I shall endeavour to give an account of how these techniques are applied to theological beliefs. In doing so, I shall refer to the writings of a number of contemporary scholars.

a. Historical criticism. In theological enquiry, historical research is fundamental. It imposes a vital constraint on theological reflection as it can indicate the level of confidence which can be legitimately placed in the historical grounding of Christian belief.

For instance, E. P. Sanders' research, detailed in his Jesus and Judaism,[42] has shown how previously held views on Jesus' teachings and activities are untenable once they are subject to the scrutiny of historical investigation.[43] Conversely, Sanders has also indicated that because certain factors which relate to Jesus' life and ministry can be grounded historically (e.g. that Jesus had an inner circle of disciples referred to as "the twelve"), it is impossible to argue in respect of these factors, as some have done, that they were fabrications of the later church.[44]

Sanders' study has enabled him to specify the different levels of confidence which can be placed in a number of factors relating to Jesus and to the Christian movement which sprang up after Jesus' death. He has ranked these from "certain" or "virtually certain," through "highly probable" or "probable" down to "possible," "conceivable" or "incredible."[45]

In order to understand just how significant historical information is for theology, we must turn to Van Austin Harvey's volume, The Historian and the Believer.[46] Most importantly, Van Harvey has shown that historical research can cast doubt on a belief.[47] For instance, if it were established that Jesus never lived or was not crucified, this information would quite obviously undermine a major proportion of the claims of Christian belief. There are also more complex problems for which historical research is needed. They are ones which relate to Jesus' intentions and actions

and which involve the skilful judgement of extant texts. These judgements are crucial as they provide information which is often determinative in making decisions on controversial aspects of Christian doctrine. (See discussion of "The Myth of God Incarnate" debate, 9.4. below).

As Farrer has argued "...the facts, whatever they are, need careful sifting."[48] As the biblical sources represent one of the major areas from which present-day apprehensions of God arise (8.4), it is imperative that these are studied critically. An important first step in this overall task is the historical assessment of both biblical and relevant non-biblical sources (e.g. Rabbinic literature such as Mishnah and the Talmuds, the Dead Sea Scrolls, the Apocrypha and Pseudepigrapha, the works of other ancient authors such as Josephus' Antiquitates Judaicae and Bellum Judaicum and Philo's Legatio ad Gaium, and extra-canonical works such as the New Testament Apocrypha, the Shepherd of Hermas, the Epistle of Barnabas, the Clementine Literature and the Didache).

A useful model has been delineated by Van Harvey to show how historical principles apply in the theological case. His model consists of -

(i) the data,

(ii) the warrants and the backing for warrants, which lend support to the data, and

(iii) the conclusion which may be reached, given a number of qualifiers and/or rebuttals.

Each of the above, he argues, serves a different logical function. (Cf. Johnson-Laird's compositional procedures in which a problem is reduced into manageable components, and truth values are substituted,

4.1.6f).

Hence, given the raw data that Jesus was crucified, a warrant and backings for the warrant may be sought, e.g. crucifixion was reserved for political enemies by Rome (warrant); the chief priests were the intermediaries between the Jewish people and the Romans, and were in a position to inform the Romans of the activities of an insurgent (backing for warrant); and many were offended by Jesus' actions and teachings, especially after the incident in the temple when he overturned the tables, (further backing for warrant). Qualifiers could then be attached to the conclusion, depending on the weight of the evidence found in the warrants. A qualifier would consist of the addition of terms such as "necessarily," "probably," "presumably" or "possibly" to the conclusion. Finally come the rebuttals. Rebuttals consist simply of objections to the use of a warrant. Hence the outcome of this particular analysis concerning Jesus might appear as follows: presumably (qualifier), Jesus was judged to be a political enemy (conclusion), unless an exception was made in his case to please the Jewish authorities (rebuttal).[49]

Thus, says Van Harvey, the historian's analysis should be able to indicate the "degree of force" which can be given to any particular conclusion.[50]

In more complex analyses, the conclusion reached may contradict present knowledge, that is, it may contradict what may have been taken as well-established warrants. In such cases, Van Harvey has said, the rebuttals must be far stronger and capable of overthrowing such warrants. If, for example, empirical research should indisputably indicate a contrary state of affairs (rebuttal), warrants which have previously been taken to be well-established may have to be radically

revised or overthrown.[51]

The above is an example of how the constraints of historical techniques and procedures can be used on biblical and non-biblical literature to establish the historical status of theological data. However, the historical status of the sources is only one of the determinative factors in assessing documentary evidence. Literary and textual judgements also provide crucial assessments.

b. Literary and textual criticism. The proper and accurate exegesis of both biblical and non-biblical texts is a crucial and central aspect of theology's task. J. Barton's Reading the Old Testament - Method in Biblical Study[52] provides a valuable appraisal of the different literary approaches which have been attempted in the task of exegeting biblical texts. He has shown that it is necessary to proceed in this field with "literary competence."[53]

By "literary competence" he means possessing the necessary skills and techniques which will aid the person handling biblical materials to understand the meaning of such texts.[54] Without these skills, many texts, particularly those of the Old Testament, would remain opaque or would simply be misread.[55]

"Literary competence" enables one to approach texts in two very productive ways -

(i) it is possible through formal characteristics and content to recognize the "genre" of a text, i.e. its type (e.g. wisdom literature as compared with an apocalypse) and the kind of questions which it is appropriate to ask of such a text,[56] and

(ii) it is possible to use linguistic and exegetical techniques effectively to elucidate the meaning of a text.[57]

Unless full cognizance is taken of literary issues in the exegesis and

interpretation of texts, serious misjudgements could result.[58] Conversely, as Barton has noted, with increasing sophistication in techniques for recognizing genres, a great deal more information about the biblical texts and improved levels of understanding have been achieved.[59]

Though for many years it has been thought that approaches in biblical studies were producing only negative and atomistic results, Barton's analysis has shown that there has also been a positive outcome. In the past, when scholars tried to extend the use of various techniques such as source criticism, form criticism, redaction criticism and most recently structural criticism, and designate them as "the" method for biblical research, negative findings resulted. If, however, these are regarded as techniques (some obviously better than others) for making important literary and textual judgements, their value for theological enquiry is considerable. Just as historical techniques and knowledge place crucial constraints on theological reasoning, so also do the results of literary and textual criticism.

There are other valuable judgements of the documentary evidence which can be provided by the knowledge and techniques of various aspects of the physical, human and social sciences.

c. Sociological, social psychological and other empirical techniques. Though the techniques and knowledge of these disciplines are not as central to textual studies, to ignore them could result in limiting the breadth and comprehensiveness of theological reflection or even distorting it.

This factor has been particularly demonstrated in attempts by W. Meeks in The First Urban Christians,[60] J. Gager in Kingdom and Community[61] and G. Theissen in

The Social Setting of Pauline Christianity[62] to bring sociological and social psychological techniques to bear on New Testament studies. Theissen's work especially has proven most fruitful, bringing much depth and vitality to aspects of New Testament understanding. Previous studies in this area have tended to overlook the direct bearing of socio-political, socio-economic, socio-cultural and socio-ecological factors on the concerns of the early Christian communities.[63] Also, recent study of the belief patterns, rituals and social practices of these communities have provided a more adequate understanding of the contextual background out of which the letters of St. Paul and other later New Testament writings arose.[64] In no way am I suggesting, however, that these approaches in themselves constitute an adequate method for theology.

It should also be noted that as ancient manuscripts have been recovered and other archaelogical finds have been unearthed,[65] empirical work, both on the dating of papyri and in analysing the significance of these materials, has led to the building up of a body of resource information on which biblical studies has been able to draw.

The above discussions account for the first phase of theological research in which the techniques and knowledge of historical, literary, sociological and other empirical disciplines are employed to establish the status of the documentary evidence. The findings of this research can be used to establish -

(i) The level of confidence which can be placed in the details surrounding Jesus' life and actions and the ongoing life of the early church;

(ii) The nature and development of the beliefs of the early church; and

(iii) The historical, literary, social and other empirical

constraints which are applicable to the interpretation of the early church's beliefs.

In the following analysis of the second phase of theological enquiry, I shall attempt to show how the concepts of early Christian belief are located and assessed, using the above research findings.

8.5.2 Locating the Concepts of Early Christian Belief.

In the second phase of theological enquiry, the critical findings of biblical research are used to identify the basic concepts of early Christian belief (i.e. the "images" of revelation). Part of that task also is to assess the grounding for early Christian belief. There are three steps involved.

a. Identifying events and states of affairs. Firstly, as biblical research is able to establish the level of confidence which can be placed in the details surrounding Jesus' life and actions and the ongoing life of the early church, the status of our knowledge of what Harré has called Realms 1 and 2 beings can be assessed, making clear the level of confidence which can be placed in further reflection which depends on them.

An example of this can be seen in Sanders' use of historical studies to give an account of the sources of conflict which led to Jesus' death. He has shown the degree of confidence which can be placed in the following: that Jesus caused offence by his attack on the temple (certain), that he taught that God was bringing in a kingdom (indisputable), that he held that he (Jesus) would have some special role in it, superior to others (almost certain), and that he taught that his disciples would have some role in it (almost certain).[66] On the basis of this analysis and other critical

details,[67] Sanders has proposed that the more obvious explanation of the betrayal of Jesus is that Judas conveyed Jesus' pretensions to the chief priests.

> It was the final weapon they needed: a specific charge to present to Pilate, more certain to have fatal effect than the general charge "troublemaker."[68]

From the above it can be seen that by fixing the details of a situation by critical studies (Realms 1 and 2 beings) it is possible to extrapolate from those details to a conclusion (Realm 3 being). The degree of confidence that can be placed in the conclusion (Realm 3 being) is ultimately judged in relation to the status of the evidence (Realms 1 and 2 beings).

b. Locating the beliefs held. The second step in locating the concepts of early Christian belief is to make use of the techniques of critical analysis which can afford access to those beliefs. This step is achieved as follows. Since the beliefs of the early church are expressed in writing on vellum and papyri (Realm 1 being), empirical tests can be mounted to test for details of the dating of the documents. Further, as these documents are accessible to historical, literary and socio-psychological analysis, it is possible to study the writings of the early church using those techniques, and map the background, ideas and contexts from which those beliefs arose (Realm 2 beings). On the basis of these findings (Realms 1 and 2 beings), it is possible to identify the nature of the early disciples' concepts of God (Realm 3 beings). Through further critical analysis, the development of these concepts can be traced as well.

For instance, as was shown in our example of the informal way in which the early disciples came to recognize that Jesus was risen

(7.3.2.a) and how that belief developed, through literary and historical studies of the texts it is possible formally to locate the background which gave rise to resurrection belief, examine the nature of the concept and trace its development.

Another example can be seen in Hooker's analysis of the early church's proclamation of Jesus as Christ and Lord. Through literary and socio-historical studies, Hooker has shown that the terms Christ (χριστός) and Lord (κύριος) were not existing titles which were conferred on Jesus. They were terms which were given content and defined through their use in the life of the early church.[69]

As with all concepts, our understanding of present events is referred back to models built from past knowledge. This, Hooker argues, is what the writers of the New Testament documents can be seen to do. All four gospels, she says, emphasize that Jesus' life and action (present experience) can only be understood in relation to God's activity in the past (models of Israel's past experience).[70] In this way they were able to work through established theological concepts, e.g. models of God's mercy (חֶסֶד) and God's truth (אֱמֶת), and justify the fulfilment of these in Jesus. The new insight that this understanding brought enabled the early church to account for their changed relation with God through their belief in Christ. Their new relation to God is referred to by St. Paul as being "in Christ" (ἐν χριστῷ), "justified" (ἐδικαιώθητε) and "redeemed" (ἐλυτρώθητε).

Whilst literary and historical studies can be used to identify the changing concepts of the early church, socio-historical studies are able to show their background and context. Hooker has pointed out that christological expressions emerged as the early church had to make clear its distinction from Judaism.[71] In the midst of those

tensions, christological belief was expounded fully, since Jesus was the distinguishing factor which needed explaining (7.3.2b).

In this way, it can be seen how the findings of critical studies can be used to identify the nature and development of the beliefs of the early church, and to afford us access to the early disciples' concepts of God (Realm 3 beings). The level of confidence which can be placed in these concepts will be in proportion to the status of the evidences (Realms 1 and 2 beings).

c. Checking beliefs with happenings. The third step in locating and assessing the concepts of Christian belief is to use the findings of biblical studies in relation to each other. By relating our assessment of the details of Jesus' life and actions (Realms 1 and 2 beings) to our assessment of the beliefs of the early church (Realm 3 beings), it is possible to check those beliefs (Realm 3 beings) against the evidences for them (Realms 1 and 2 beings). This step is crucially important because it completes the empirico-critical analysis of early Christian belief by relating the early disciples' beliefs to the reality of the happenings around them. In this way, it is possible to judge the extent to which the beliefs of the early church are underpinned by the states of affairs and events surrounding Jesus' life, death and resurrection.

In our discussion of scientific realism, we noted that Harré identified the beings of Realms 1 and 2 as those of which we can have perceptual experience, whereas those of Realm 3 are on the whole not open to perceptual experience. The level of confidence which we can place in Realm 3 beings will be dependent on two factors -

(i) the extent to which our conceptions (Realm 3 beings) are found to mesh with our perceptions (Realms 1 and 2 beings), and

(ii) the extent to which that knowledge can be used to produce new information or investigate other entities (6.1.2).

If the level of confidence that we have in our knowledge of Realms 1 and 2 beings is low, other knowledge dependent on those denizens, e.g. Realm 3 beings which have been extrapolated from them, will be affected. Conversely, if our level of confidence of the knowledge that we have of them is high, our extrapolation from them to Realm 3 beings may be assumed to be far better grounded.

This third step enables us to see the level of confidence which we can place in the beliefs of the early disciples (i.e. the "images" of revelation). If the early church's beliefs are well-grounded, they will provide us with vital indices of the revelation (or insights) which came in and through the states of affairs and events of Jesus' life, death and resurrection. In turn, well-grounded beliefs will place crucial constraints on any later interpretations of the "images" of revelation. If these constraints are not taken fully into account, serious distortions of one's understanding of the concepts of early Christian belief could result. (See discussion of the constraints which apply to an "objective" hermeneutic method, 5.2.3 and 5.2.6).

One of the most serious dismissals of empirico-critical constraints in interpreting biblical literature can be found in the Continental schools of thought, in Rudolf Bultmann's writings.[72] Despite the ferment Bultmann has brought to New Testament theology, his sharp demarcation of the historical life of Jesus from the early Church's faith in Jesus as Lord and Christ has resulted in two adverse effects. Firstly, his New Testament work, which separates the Jesus of History (i.e. the events of Jesus' earthly life) from the Christ of Faith (i.e. the proclamation of the early church), is at complete

variance with the findings of critical studies.[73] Secondly, his method of approach has effectively cut theology adrift from its historical grounding.

Contrary to Bultmann's position, recent biblical scholarship has indicated that historical continuity as well as discontinuity exists in the relations of first century Judaism, the teachings of Jesus, and the later beliefs of the Christian communities.[74] Sanders, for instance, has shown that much in Jesus' teaching was in agreement with Jewish beliefs, such as of a coming restoration, of love, mercy, grace, repentance and the forgiveness of sins.[75] However, he has also pointed out that a number of beliefs and teachings of the early church, though continuous with those taught or claimed by Jesus, are discontinuous with Judaism and therefore distinguish the early church from Judaism.[76]

The fact that Sanders has, through historical studies, been able to show the links between Jesus' actions and teachings and the rise of the Christian movement demonstrates that the early church's beliefs were not a later appendage to Jesus' message. They are connected in important ways to his life, teachings and actions, and represent the insights of the early disciples which developed out of those situations.

This is not to say that the linking of the teaching and actions of Jesus with those of the Christian movement are to be treated straightforwardly as a simple continuation of Jesus' teachings and actions by the disciples. Nor is it to claim that the "images" of revelation are "guaranteed" to be true because of their link with Jesus' life. On the contrary, the fact that historical studies have been used to trace the causal links between the events of Jesus'

life and the beliefs of the early church shows that the origins of those beliefs have been established by critical examination. Further, because these links can be established, the beliefs of the early church can be seen to be grounded in the events of Jesus' life and actions. The extent to which those beliefs (Realm 3 beings) mesh with all the evidences (Realms 1 and 2 beings) is what ultimately determines the level of confidence which can be placed in the grounding of those beliefs.

From Sanders' work, we have already seen that the disciples' understanding of God's kingdom, of Jesus' role in that kingdom and their function in it are well-grounded beliefs. However, locating the origins of Christian belief in the actions and teachings of Jesus forms only part of the overall judgement of the extent to which the beliefs of the early church (Realm 3 beings) mesh with the events and states of affairs of that time (Realms 1 and 2 beings). There are many other findings from critical studies which must also be used to test the grounding of those beliefs.

For instance, as the events following Jesus' death profoundly influenced the disciples' understanding of who he was, these require analysis. Sanders has noted that it is indisputable that the resurrection was the motivation of the Christian movement and was unique in its effect.[77] Claims of resurrection itself were not unique in the first century. Apollonius of Tyana is said to have appeared after his death (Philostratus, Life of Apollonius VIII.31).[78] However, as Sanders has pointed out, "...one does not receive from the pages of Philostratus the impression of burning conviction that, in Apollonius, God spoke and acted decisively."[79]

Though the task of assessing the effect of the resurrection on

the disciples' apprehension of Jesus and his relation to God involves complex theological judgements, I shall attempt to show how this task is approached empirico-critically.

From this point on, we must go beyond Sanders, since his study is primarily concerned with identifying the historical roots of Christianity, and not with examining the complex relationships between history and theology.[80]

Whilst theological entities cannot be directly inferred from the results of historical research, I argued in 7.3.2 above that, as is true in the discovery of scientific realities, theological realities can be revealed by retroduction or by extrapolating from the evidences. In the following analysis I shall endeavour to show that, by using heuristic procedures, it is possible to assess whether a theological judgement, such as Farrer's, that the early church held an incarnational-type belief in proclaiming Jesus, Lord and Christ, can be sustained by an examination of the evidences. (See discussion 7.3.2b).

Two points, however, should first be noted. As it is not possible in a work of this size to present all the evidence in detail, especially where such complex and controversial issues are involved, I shall at this stage only discuss those points of incarnational belief that are central to this thesis. Also, as the main concern of theologians to-day is the <u>way</u> in which the term "incarnation" is to be understood in a science-oriented world, I shall take that matter up at a more appropriate place in 9.4.5 below. For the present, I shall confine the discussion to the principles by which we can assess the christological claims of the early church.

Since Hooker has studied the socio-historical background of

the christological expressions in the New Testament, I shall use her research findings to help illustrate -

(i) how empirico-critical principles are applied in this aspect of the enquiry, and

(ii) how one may assess whether a judgement, such as Farrer's that the early church held an incarnational-type belief in proclaiming Jesus, Lord and Christ, can be grounded in the evidences.

The importance of drawing attention to the resurrection experiences above was because of the influence that they had on the early church's concepts of who Jesus was. As noted, the effect of the resurrection, rather than the claim of a resurrection, is what is historically unique. How are these influences assessed empirico-critically?

First of all, a close textual study of the resurrection accounts in the Gospels and the writings of St. Paul makes it clear that the relation of Jesus to his disciples after resurrection was very different from his relation to them before. He was no longer present to them physically but was present in a way which they could only describe as his being "risen." (See discussion 7.3.2a). This is not to claim, however, that there was not also diversity in the early disciples' experiences of resurrection. Nevertheless, in the light of these apprehensions, their understanding of Jesus, his teachings, his actions and his relation to God had to be revised. As their concepts were revised, new insights arose that God had acted decisively in and through the life of Jesus. The following excerpt from Romans is a typical enunciation of this kind of belief -

> What then shall we say to this? If God is for us, who is against us? He who did not spare his own Son but gave him up for us all, will he not also give us all things with him? Who shall bring any charge against God's elect? It is God who justifies; who is to condemn? Is it Christ Jesus, who died, yes, who was raised from the dead, who is at the right

> hand of God, who indeed intercedes for us? Who shall separate us from the love of Christ? Shall tribulation, or distress, or persecution, or famine, or nakedness, or peril, of sword? ... No, in all these things we are more than conquerors through him who loved us.[81]

Later, as they gathered together regularly in communities for fellowship and renewal of their new relationship with Jesus, dissensions arose within those communities, (e.g. in the Corinthian, Ephesian and Philippian churches). In exhorting one another to adhere firmly to their common belief in Christ, their apprehensions of Jesus as Lord and Christ were expounded more fully.[82] Passages such as the following explicitly express the understanding that the fullness of God indwells Christ, through whom we are reconciled to God -

> He is the image of the invisible God, the first-born of all creation; for in him all things were created, in heaven and on earth, visible and invisible,...-all things were created through him and for him. He is before all things, and in him all things hold together. ... For in him all the fullness of God was pleased to dwell, and through him to reconcile to himself all things, whether on earth or in heaven, making peace by the blood of his cross.[83]

In addition, as there were growing tensions both as to their place within Judaism, and later in separation from Judaism, their distinction from Judaism was made clear in terms of who Christ was. Through him mankind is now made righteous; the law is therefore rendered obsolete. To know Christ and the power of his resurrection is what is distinctive in Christian belief: -

> Look out for the dogs, look out for the evil-workers, look out for those who mutilate the flesh. For we are the true circumcision, who worship God in spirit, and glory in Christ Jesus, and put no confidence in the flesh. ... For his sake I have suffered the loss of all things,...in order that I may gain Christ and be found in him, not having a righteousness of my own, based on law, but that which is through faith in Christ, the righteousness from God that depends on faith; that I may know him and the power of his resurrection...[84]

Precisely because there were disputes in which the identity of

the Christian movement had to be defended, a great deal of information regarding the experiences and beliefs of the early church about Jesus was generated. Much of this information is accessible to us in those sources. From these it is possible to see that the early church's concepts of Jesus are enunciated in terms of their resurrection experiences and the new relationship they now have with him in the ongoing life of the church. Under conflict and pressure, their apprehensions of Jesus and their relation to him are expressed fully.

We may summarize these as follows. God has acted decisively in and through Jesus; through Christ Jesus they are reconciled to God; their faith in him maintains their new relation with him; they are made righteous through him by God; he replaces the old religion, for the fullness of God dwells in him; he is the image of the invisible God, in whom God's action for man's benefit has been accomplished. His resurrection, which they experience, confirms these beliefs about him.

From the above, it can be seen that the early church's apprehensions of God and Jesus' relation to Him were undergirded by an incarnational-type belief of God's action and indwelling in Christ.[85] Though empirico-critical studies cannot recover the resurrection experiences of the early disciples, careful analysis of the extant texts can show that resurrection was the motivating factor of the early church. Also, though we cannot recover the disciples' actual apprehensions of God, we can, from textual studies, identify the substance of those beliefs and assess them in relation to all the circumstances known to be existing at that time. From these it is possible to see that the incarnational-type belief of the early church arose out of an attempt to delineate their apprehension of God in an often hostile environment.

As Hooker has pointed out, the proclamation of Jesus as Lord (κύριος) and Christ (χριστός), Son of God (ὁ υἱὸς τοῦ θεοῦ) and Saviour (σωτήρ) represents the climax of their struggle to justify and explain their beliefs. Their understanding was reached by reasoning back from their experiences. Though their beliefs were an expression of their understanding of their changed relationship to Jesus after his resurrection, the value of critical studies is that they can provide us with evidences of the cultural, social, historical and religious factors of that period. Using heuristic procedures, it is possible then to assess those beliefs in relation to the evidences from (i) the events surrounding Jesus' life, death and resurrection and (ii) the events and life of the ongoing church, to see whether or not the causal account of all those events and experiences (i.e. God's action in Christ, a Realm 3 being) meshes with the evidences (Realms 1 and 2 beings). This is the way in which the theological claims of the early church can be assessed by empirico-critical procedures.

The significance of contextual studies is that they provide crucial evidences, which relate to the substance of those beliefs and allow us to assess the level of confidence we can place in their grounding. If the contextual evidences are not taken fully into account, our interpretation of the beliefs of the early church, particularly as they relate to christological concerns, could well be unreliable.

Hooker has argued that where contextual evidences have not been fully considered, procedures, as, for example, the attempt to prove basic metaphysical beliefs that Jesus was God by studying titles such as Messiah (χριστός), Son of God (ὁ υἱὸς τοῦ θεοῦ) and Lord (κύριος), have only led to a distorted understanding of these concepts. The

practice of studying the use of these terms in the New Testament and exploring their background in the Old Testament and the intertestamental literature has been wrongheaded. This is because such a procedure incorrectly assumed that these titles already represented established concepts in the first century.[86] (Cf. Farrer's objection to the adoption of similar procedures for examining the concept of Trinity, 7.3.2c).

In the following analysis of Hooker's studies, it will be seen that contextual studies not only place constraints on our interpretation of the "images" of revelation but also illuminate our understanding as to why particular terms and ideas were emphasized.

As we have seen, the christological concepts in those early times were, in the main, an expression of the early church's apprehensions of Jesus and his relation to God, forged in the midst of an identity struggle. They were not straightforward claims about Jesus. Ironically they arose mostly as the by-product of disputes concerning the Gentiles who had embraced the beliefs of the new messianic sect within Judaism. The main point of conflict was over whether Gentiles entering Judaism through the new messianic sect should be required to conform with Jewish Law and practice. Should Gentiles be required to be circumcized, to offer sacrifices in the temple, to adhere to ritual purity? If not, was it possible to share in the common fellowship meal with Gentiles? Further, what implications would this have with regard to respect for the Law? Were the Gentiles members of the true Israel? Was their God the same God as the God of Abraham, Isaac and Jacob? Above all, what was intrinsically different in this new messianic sect that altered the generally accepted situation regarding the entry of Gentiles to Judaism?[87]

Now as Hooker has emphasized, it was this last question which most required an answer. The new factor which needed explaining was Jesus' actions and teachings. It is clear that a process of justification was necessary. Continuity with Judaism had to be stressed; a defence had also to be given for what was distinct and operative in the new movement, to justify the practices of a sect, which was becoming increasingly more Gentile as the Christian movement expanded.[88]

Once the context of the conflict between new and old in first century Judaism is understood, a great deal more light is cast as to why particular christological terms and concepts emerged. For instance, from the contextual background, it is possible to understand why particular concepts such as Law, Sacrifice and Atonement[89] became so central in the early church's defence of its belief in Christ. These factors account for passages such as the following in the Hebrews -

> For since the law has but a shadow of the good things to come instead of the true form of these realities, it can never, by the same sacrifices which are continually offered year after year, make perfect those who draw near.[90]

> Therefore, brethren, since we have confidence to enter the sanctuary by the blood of Jesus, by the new and living way which he opened for us through the curtain, that is, through his flesh, and since we have a great priest over the house of God, let us draw near with a true heart in full assurance of faith....[91]

Socio-historical analysis enables the theologian to unearth these contexts. What must be borne in mind is that the contexts in which christological beliefs were enunciated do not themselves account for the substance of those beliefs. The substance, as we saw above, arose from the effect of the disciples' resurrection experiences. Insights of Jesus and his relation to God were gained as they endeavoured to

come to terms with those effects. The findings of critical research, however, provide vital evidences of the nature, development and contexts of those concepts, which, in turn, serve as vital constraints on the interpretation of the concepts.

As pointed out above, by using heuristic procedures, it is possible to align the concepts of the early church as closely as is possible against all the evidences in order to test the extent to which the two interlock. (Cf. discussion on the meshing of thought and reality, 6.1.2b). In this way we are able to establish whether those concepts are grounded or not, and the level of confidence which can be placed in their grounding.

To understand the nature of these judgements, Hooker has made an important distinction. In historico-critical studies, in which one assesses the status of the evidences, a researcher essentially moves forward. However, in explaining and justifying a situation, one normally works backwards. (Cf. discussion on retroduction and backward extrapolation, 6.6 and 7.3.2).

This is a crucially vital distinction. In the former case, we have a straightforward description of the form of reasoning involved in establishing the status of the evidences. In the second case, we have a description of the form of reasoning involved for acquiring knowledge by extrapolating from the evidences, such as the historical grounding for Jesus' actions and teachings to beliefs that Jesus was Christ and Lord.

The latter instance of the form of reasoning involved in acquiring knowledge can be seen to be operative in an informal way with the early disciples. (See discussion of Farrer's account in 7.3.2b above). The early followers extrapolated informally from the

teachings and life of Jesus and effects of their resurrection experiences (Realms 1 and 2 beings) to their view that Jesus was Christ and Lord (Realm 3 being). The theologian has not only to identify the concepts of Christian belief in a formal way by critical studies but also to complete the task of empirico-critical enquiry by checking whether, in reasoning to those beliefs, the early believers have justifiable grounds for making their claims. In other words, does our understanding of the concepts and beliefs of the early church (Realm 3 beings) mesh with the evidences which can be established for them (Realms 1 and 2 beings)?

From the above analysis it can be seen that, though the early church's claims that Jesus was Lord and Christ were forged in the midst of polemical struggles, their substance was not a direct consequence of those struggles. The substance of the early church's beliefs were insights which arose as they sought to come to terms with their resurrection experiences. Their christological concepts, as Hooker has shown, were the endpoint of the attempt to express those experiences within the context of their social, cultural and religious struggles.[92] In the light of the resurrection experiences, earlier concepts of Jesus, his teachings, actions and relation to God, were revised. In the midst of pressures both from within the early Christian communities (e.g. dissension amongst members, such as is seen in the Corinthian church) and from without (e.g. Judaism), their apprehensions of God and Jesus' relation to God were developed and expounded fully. In this way, the early church fixed the object of their reference, God, in the terms we find in the biblical documents.

In tracing the development of these beliefs and by careful exegesis, it is possible to explain how terms such as "Christ" and

"Lord" came to be used. However, the content of those concepts, as we have seen, are a function of three factors, viz. the events of Jesus' life and teachings, the effects of the early disciples' resurrection experiences, and the ongoing life of the early church as they met to renew their trust in God, in and through their belief in Jesus as Lord and Christ. Examining these three factors, I have argued that critical studies are able to establish that -

(i) The origin of the early church's beliefs can be traced to the symbolic actions of Jesus and his teachings about God's Kingdom, his role within it, and the place of his disciples in it. (See discussion 8.5.2a)

(ii) The disciples' resurrection experiences were unique in their effect. Consequently the disciples' former understanding of Jesus was completely revised. Their changed relation to Jesus was expressed in terms of resurrection belief, in which God's action and indwelling were understood as fully operative in Jesus. Thus, their beliefs about Jesus can be seen to be incarnational in type, as Farrer claimed. (See discussions 8.5.2b and this section).

(iii) In the ongoing life of the church and under the pressure of an identity struggle in which their relation to Jesus had to be expressed fully, christological concepts were expounded, in which the implications of incarnational belief (i.e. of God's indwelling and acting in and through Christ) were expressed in terms relative to the situation, such as Law, Sacrifice and Atonement. (See discussion immediately above).

Since it is possible to use the findings of critical studies to map the rational route of the origin and development of the concepts of early Christian belief, showing their connection with the events of Jesus' life, death and resurrection and the events of the early church, it can be seen that empirico-critical principles can be applied to biblical sources to assess the grounding of those beliefs. This is not to say that such issues are no longer open to debate. As with all other branches of research, further enquiry could well lead to a revision of these judgements. The point of the above analysis,

however, has been to show that empirico-critical procedures can be used effectively in the field of biblical research to identify and assess the concepts of early Christian belief. The belief in Jesus as Lord and Christ has provided us with an apt example.

This last point will be particularly important when we consider contemporary debates over the revision of Christian doctrine (9.4). For the present, if, as I have argued in 8.4 above, our apprehensions of God are of the same God as the early disciples', the grounded beliefs of the early church serve as important indices of whether or not the claimed continuity actually exists.

To summarize: the above three steps in the second phase of theological enquiry show how the procedures and knowledge of other disciplines can be used to assess evidences in the biblical and non-biblical documentary sources of Christian belief and to test the status of those beliefs in relation to the evidences. These, in turn, provide basic constraints for interpreting and revising biblical materials. In this way, the principles of empirico-critical enquiry are brought to bear on the "images" of revelation. This enables us to assess their status.

As the "images" of revelation constitute one of the major sources of evidence for assessing our present-day apprehensions of God (8.4), their examination, using empirico-critical principles, is essential if our interpretation of those "images" is to be reliable.

8.5.3 The Development and Revision of Christian Tradition.

Just as we have shown above that early Christian belief developed under the pressure of having to identify its credentials at first within Judaism and later in distinction from Judaism, in the later

patristic period, when pressures and conflicts of a different kind arose, the need to wrestle with the concepts of Christian belief arose once more. As a consequence, the church's beliefs developed further, becoming embedded in a tradition of thought of which there are extant documents. The significance of these writings for judging our present-day apprehensions of God brings us to a discussion of the third phase of theological enquiry.

In the past, the tradition of Christian thought has been taken by some as a "received" system of doctrines from which strict deductions could then be made.[93] A historical study of the reception and transmission of Christian revelation demonstrates, however, that the circumstances were very different.

Prof. M. Wiles has rightly pointed out that formerly held beliefs that development in the Christian tradition represents the mere logical unfolding of an implicit truth must be discounted.[94] His analysis of the role of apologetics, the threat of heresy and the attempts to make the implications of Christian faith explicit, particularly in the patristic period, shows the manifold influences which have significantly affected the direction in which Christian faith has developed.[95] It also explains the presence of a number of ideas within the tradition which have caused considerable consternation for theologians in a later period.[96]

For instance, the Church's later struggles with several metaphysical concepts can be traced to various origins. The Greek term ousia (substance), for example, was introduced by Arius, resulting in the Church's use of the unscriptural term homoousios (one substance) to exclude Arianism by stating that the Son was of one substance with the Father. Debates concerning the Person of the Son,

Wiles notes, were brought into the open with the Arian controversy.[97] Similarly, the doctrine of the Holy Spirit did not emerge until the fourth century,[98] and can be shown to be directly linked to the use of the three-fold baptismal formula in liturgical practice.[99] Again, Wiles has argued, study of the effects of Platonism on theological thought reveals how Greek metaphysics ultimately "coloured" the approach of so many of the Fathers.[100] (Cf. similar types of influence and their effects in a much later period from the Aristotelian thoughtworld, 1.2 and 1.6).

The force of Wiles' historical analysis is that he has indicated why some aspects of the major doctrines in theological thought which still hold in the present day must, in hindsight, be regarded as no longer binding, and that there are sound reasons for revising the tradition which has incorporated them. Cases in point would be the revision of the traditionally held doctrines of Incarnation, the Resurrection and the Trinity.[101] As the extent to which these doctrines should be revised has become a vibrant issue in contemporary debate, I shall discuss it more fully in 9.4.3 below.

That Wiles has made a clear argument for the revision of Christian doctrine cannot be disputed. He has maintained that this requirement is no different from that of researchers in all other branches of knowledge, who must also continually refine and revise their concepts.[102] Indeed, as we have seen in our discussions above (3.4.2, 4.1.5, 6.1 and 6.5), there are many instances in which the only appropriate decision left to researchers has been the rejection or replacement of a concept with other more adequate concepts. As in the case of a concept such as "phlogiston,"[103] the attempt to locate and ground the concept had to be abandoned when

the object of reference itself was ultimately shown not to exist. In principle, this should also apply to theological concepts if empirico-critical enquiry should show that such concepts are no longer tenable.

For many theologians, the possibility that Christian dogma will always be open to revision represents a major dilemma. Some have seen it as the first step onto the "slippery slope" and have rejected the approach altogether.[104] Others, for the sake of intellectual honesty, have considered that there is no alternative but to take that step. An extraordinary outcome of the decision to follow this latter course of action has been the further undermining of theology's credibility as a wide variety of conflicting positions have emerged with no obvious means of resolving them.[105]

However, I have argued that if the principles of empirico-critical enquiry are to be applied adequately (5.2.3), one of the conditions is that all the relevant constraints must be observed. In the concluding chapter of this thesis, I shall endeavour to show that when these are not observed fully, conflicts inevitably arise. Conversely, if empirico-critical principles are adhered to, in principle it is possible for theologians to decide between conflicting viewpoints.

The objection could still be raised that my argument begs the most perplexing of all theological questions to-day, viz. how does one determine the constraints which should apply to theological reflection?

In 8.5.1 and 8.5.2 I proposed that by using the techniques and knowledge of other disciplines, the theologian is able to establish the grounding of one of the sources of Christian thought, i.e. the

biblical ones, and to identify the constraints which apply in interpreting the early church's apprehensions of God. Since the tradition of Christian thought represents the thought of the Church in later generations, those apprehensions of theological realities must also be subject to empirico-critical principles if we are to assess them reliably. One of the constraints will be those from biblical analysis, since in assessing our apprehensions of God at any one time, it will be necessary for us to take account of the origins of Christian belief.

Nevertheless, in 8.4 above, I noted that our apprehensions of God, like our apprehensions of other aspects of reality, arise from our experiences of the world. The sources of these experiences, for the sake of clarity, have been classified under three sections, viz. our knowledge of and participation in Christian belief, our present knowledge of the world and our experience of personal existence. I suggested that it was to these three sources that we must turn to seek the evidences for and against belief in God. If the evidences from these sources are well-grounded, they will place constraints on our reflection about God.

So far we have identified the form of the constraints which arise from the biblical documents and have argued that in revising Christian tradition, biblical constraints must be taken into account. In the next section, I shall attempt to identify other constraints which are applicable and indicate how these enable us to assess present-day apprehensions of God empirico-critically.

8.6 Applying Empirico-critical Principles to Our Apprehensions of God.

In order to test our present-day apprehensions of God

empirico-critically against the three sources mentioned above, our apprehensions need to be brought into the closest possible relation with those evidences. We may well refer to this stage as the fourth phase of theological enquiry, when the empirico-critical assessment of the biblical evidences and of the tradition are balanced with other evidences from our knowledge of the world and personal existence.

Though our interests in theological enquiry are primarily concerned with assessing the concepts of Christian belief, if, as I have argued in 8.3 above, there is only one reality and theological interests represent one aspect of that reality, the findings of other areas of research will be significant to that assessment. This is not to say that if there is a conflict between the interests of theology and, say, those of science, theological concepts must automatically be adjusted accordingly. It could well be that our knowledge in other areas requires revision. On the other hand, if research in other fields is well-grounded, theological concepts which violate those findings could be the ones requiring the revision.

Hence, insofar as the interests of theology are related to other aspects of learning, present knowledge in areas such as the physical sciences (e.g. natural law), the human sciences (e.g. evolution or genetic engineering), the social sciences (e.g. social, political or personal relations) and other religions (e.g. Buddhism, Hinduism and Islam), needs to be taken into account.

In addition, since from our experience of personal existence we are able to apprehend the world around us, we would expect that if theological entities are part of that reality, any knowledge of them must at least converge with, if not be integral to, that experience. Hence, one would expect that our theological understanding should make

sense of personal existence and even illuminate that existence. On the other hand, should it make nonsense of that existence, revision of one's theological apprehensions may again be necessary.

In this way, our present-day apprehensions of God (Realm 3 beings) can be brought into the closest possible relation to all the evidences obtained from the documentary evidence, from present knowledge of the world and from knowledge of personal existence (Realms 1 and 2 beings). This is how concepts of God in theological enquiry are tested, refined, revised and in some cases rejected.

These complex analyses enable theologians to "sift" through data that is available and make theological judgements (i.e. judgements about God and his relation to man) which do not violate any of the constraints gathered, both rational and empirical. At the same time, those very constraints (i.e. Realms 1 and 2 beings) provide the parameters by which a causal account is completed and Realm 3 beings (i.e. concepts of God) are located. Since a Realm 3 being is initially detected and grounded by the evidences given by Realms 1 and 2 beings, the level of confidence which may be placed in that Realm 3 concept will, to an extent, be dependent on the status of the evidences from Realms 1 and 2. That level of confidence would, of course, be further increased, if it is found that the Realm 3 being can then be used effectively to investigate and illuminate other areas of theological thought.

Finer details of the canons of theological decision-making will be seen in the following chapter when I discuss the settling of controversial issues such as those currently related to christology. In that discussion it will be seen that if empirico-critical principles are not applied comprehensively and stringently, objectivity is bound

to be lost and conflicting viewpoints will inevitably arise. Even so, it by no means follows, as some have mistakenly thought, that such conflicts cannot in principle be settled by the methods of empirico-critical enquiry.

In concluding this section, it is now possible to see how a defence can be given for the central argument of this thesis, viz. that the same processes and principles of knowing which apply in scientific research are also applicable to theological enquiry. It has also been argued that if theological knowing is to be reliable, empirico-critical procedures are essential.

CHAPTER NINE

SCIENTIFIC AND THEOLOGICAL DECISION-MAKING

9.1 Summary of Empirico-Critical Theology.

In defending the position that empirico-critical theology is possible, I have argued that our apprehensions of God, which are arrived at informally, are capable of being assessed formally, using the same principles of empirico-critical enquiry as other disciplines. Though one's procedures and techniques will vary according to one's subject matter, the principles will remain the same. By observing all relevant constraints, one's concepts can be brought into the closest possible relation with one's percepts. One's concepts are thereby refined or revised (and in some cases may even have to be rejected) in respect of the evidences.

As far as the apprehension of God is concerned, our concepts are refined in respect of the constraints derived from three sources: (i) the religiously significant events of Christian belief; (ii) present knowledge of the natural world; and (iii) our knowledge of personal existence.

In the previous chapter I endeavoured to show how these constraints are identified. The major objective in particularly Christian theology is to locate the concepts of Christian belief. These, I argued, are mainly in documentary sources. The initial task is to specify the origins of that belief and to trace their development through later generations. By using empirico-critical procedures, it

is possible first of all to locate and ground the beliefs of the early church (i.e. the "images" of revelation). Secondly, it is possible to examine the "images" of revelation as they developed later in particular social, cultural, historical and religious contexts. The results of this documentary research enable us to locate the concepts of Christian belief. These concepts constitute the constraints of the religiously significant events of Christian belief. They can therefore be used as one of the necessary constraints on our present-day apprehensions of God, since it is assumed that the object of our reference, God, is the same God to whom the early and later church also refer.

Since empirico-critical research done in other fields can equip us with knowledge of the world, for example from the natural and human sciences, and since from the constant experience of living in the world it is possible to be cognizant of the general canons of personal existence which make sense of our world and our living, these provide us with constraints from the other two sources mentioned above. In bringing our apprehension of God into the closest possible relation with all these constraints, our beliefs are refined and revised in respect of our knowledge of the external world. The meshing of theological thought with reality enables us to ensure that as high a level of objectivity as is possible is obtained for our knowledge of God.

Inevitably, as with all research, theological disputes will arise. However, if, as I have argued, empirico-critical principles are fully applicable to theology, in principle it should be possible to make a rational choice between conflicting theological viewpoints. The only difficulty is that the present state of theological debate

suggests that the contrary may be true. For instance, current conflicts over the revision of Christian doctrine, such as are found in "The Myth of God Incarnate" debate,[1] do not appear to have an obvious solution.

In the discussion below I shall attempt to show that conflicts such as these often arise from inadequacies in the procedures and techniques of theology. Further, as there are criteria of judgement which can be specified for theology, a rational choice between conflicting viewpoints should, in principle, be possible.

9.2 Rational Decision-Making Between Rival Theological Positions Possible.

The problem of making a rational choice between rival theories has long been a contentious one in fields other than theology. Kuhn,[2] for instance, has argued that in the long-term conflicting scientific theories or paradigm shifts are attributable to sociological factors. In 5.3 above, I argued that whilst sociological aspects such as consensus are an element of scientific decision-making, they are by no means determinative.

As far as theological decision-making is concerned, rational judgements are made on the basis of several criteria, to which sociological factors contribute only one part. These criteria have been stated fully by B. Mitchell in his Justification of Religious Belief.[3] I shall briefly summarize them below.

Firstly, as rival theories possess different presuppositions, it is essential that these are examined in the light of all the relevant evidence.[4]

Secondly, in order that facts are not suppressed, distorted or disregarded, each piece of evidence must be given its full weight. It

is essential, therefore, that the evidences are studied in their proper context and background.[5]

Thirdly, since the general principles of consistency, coherence, simplicity, elegance, explanatory power and fertility are not affected by one's theoretical commitment, they are able to provide independent checks of one's decision-making.[6]

Fourthly, since decision-making is always open to error, trained judgement is essential.[7]

Fifthly, though social consensus is generally integral to the process of decision-making, it is misleading to cite it as the sole criterion of rational choice.[8]

Mitchell has proposed the above as the criteria by which rational decisions can be made between conflicting viewpoints in the sciences as well as history, literary studies and theology.[9] (Cf. 5.2.4 on Arts/Science relation and 5.2.3 on the idea of an "objective" hermeneutic method).

Now there are two vital points to be noted from the above which apply directly to theology. Firstly, it has often been argued that since theology is incapable of making a choice between rival claims, its credibility is seriously undermined. The situation has been further exacerbated by a number of theologians who have attempted to respond to these criticisms by maintaining that theology's concerns are not with settling questions of truth or falsity. Its task is to provide a coherent and consistent account of religious belief. They therefore maintain that if an argument achieves these ends, it should be accorded as good a standing as any other established view.[10] Mitchell, however, has clearly indicated that theologians are not left with this line of retreat. For, as with other disciplines, there are

criteria for judging between rival viewpoints.

The second implication of his argument relates to the emphasis he has placed on the training and skill of the researcher in the making of decisions. Though the criteria of any decision-making in science or theology will be determined by the principles of critical enquiry and the weight of the evidence, such criteria must still be applied skilfully and scrupulously. Otherwise, any number of errors could occur. (Cf. discussion on the vulnerability of research in 3.2, 4.3, 5.2.3, 5.2.5, 5.3, 6.5, 6.6, 8.5.2, 8.5.3 and 8.6). Hence in scientific and theological decision-making complex judgements, requiring skill and training, are involved.

As far as theology is concerned, the ferment in biblical studies alone in this century[11] indicates just how complex and difficult these judgements are. In the face of such perplexities, the temptation, not only for theologians but also for other academics (for example P. W. Atkins, the theoretical chemist),[12] has been to pre-empt research by making grand metaphysical claims for their discipline before they have adequately examined whether these can be substantiated. The deleterious effect of such claims is that, in the very making of them, one is also liable unthinkingly to assume their truth and thereby close off research prematurely. I shall argue below that this is one of the tendencies which has led to current christological debates (9.3).

In the next two sections I shall endeavour to show that if the procedures and techniques of theology adhere to empirico-critical principles, a rational choice between rival positions is possible.

9.3 Adequacy Conditions in Rational Decision-Making.

Though theology's procedures and techniques will differ from other disciplines because of its subject matter, as with all other fields of research, the level of objectivity achieved will be dependent at least on researchers having devised effective techniques and procedures. As we noted in discussing Barton's analysis of literary criticism in biblical studies, some techniques and procedures are more effective in locating information than others (8.5.1b). Also, it is instructive to compare analogous research procedures in another quite different discipline such as say atmospheric physics. In the latter case the skill and ingenuity of the physicist in devising procedures and techniques, together with the rigour with which these are applied, will very much affect the success or otherwise of any research project.[13]

In theory, new and improved procedures and techniques should offer us the possibility of increasing our knowledge; in practice, a poor knowledge yield or the unearthing of even greater problems may well be an indication of inadequacies in the procedures and techniques themselves or their improper application. In either case, conflicting findings could result. Problems in both these areas have continually impeded theological research.

One of the difficulties which has constantly beset biblical studies and which has re-surfaced with renewed vigour recently is the search for "infallible dogma."[14] J. Barton has pointed out that the desire for certainty has led to uncritical appeals to the Bible without any attempt to examine the basis of those appeals. Such an approach begs one of the chief questions, viz. whether or not such beliefs are capable of defence. The difficulty with uncritical

appeals to creeds, doctrines or scriptural authority is that they mask a host of vital issues, and thereby seriously distort research.

This is not to say that creeds, doctrines and scripture are not in themselves authoritative. The point of the objection is that one cannot appeal to their authority in theological decision-making before the credibility of those claimed authorities has been firmly established.

Where then should enquiry begin? I have argued that in empirico-critical theology one could begin with a search for the origins of Christian belief, trace their development, and assess whether the authority vested in them is justified. This search requires a careful analysis of the main sources. As Barton has pointed out, "We have more than enough reasons for using and valuing the Bible, without needing to embrace the idolatry of worshipping it."[15] We may also add that the same applies in respect of the creeds and Christian doctrine.

The critical assessment of other documentary sources is also necessary since the traditions of Christian belief are embedded in them (8.5.3). This task cannot, however, be achieved by a straightforward comparison of earlier forms with later forms, on the assumption that any deviations from earlier forms must be treated as "false" developments. Such a procedure would be misleading, since, as Wiles has clearly demonstrated,[16] the concepts of Christian belief developed over time and were adapted to particular social, cultural and religious situations. They therefore need to be assessed in the context of those circumstances as well as in relation to the beliefs of the early church.

The importance of identifying these key concepts of Christian

belief is that they provide an index of how believers have fixed the object of their reference, God. They therefore constitute significant resource materials in enquiring into the origins and understanding of God within Christian tradition. By examining the evidences for such concepts and claims, it is possible to see whether the references can actually be grounded (6.5, 6.6, 8.5.2c, 8.5.3 and 8.6). However, as pointed out earlier, the theologian's enquiry is by no means restricted to the areas of documentary research. The results of that analysis must also be balanced with other constraints from our knowledge of the world and personal existence.

In the past, because these constraints were not all observed in the procedures and techniques of theology, irresolvable conflicts have resulted. If theological conflicts are to be settled, one's presuppositions must be assessed against the evidence.

Unless the procedures and techniques used take all these constraints into account, debates are likely to be at cross-purposes, with little hope of resolution. The adequacy of one's procedures and techniques are therefore crucial in theological decision-making.

Even if one's procedures and techniques are adequate, it is still possible to overlook their proper application. For instance, one's examination of the evidences may not be sufficiently comprehensive. As a result vital sources of information may go unexamined or decisions may be made prematurely, closing off further research. Also, if theological enquiry is not pursued with the utmost rigour, there could be errors of judgement, as has occurred in other forms of enquiry, (e.g. the Chernobyl disaster, 5.2.3c).

In the following discussion of current christological conflicts, it will be seen that many of these problems can be traced to

inadequacies in either the procedures and techniques used or their application. I shall also attempt to show that if empirico-critical principles are applied stringently, a rational choice between conflicting christological viewpoints is possible.

9.4 Current Christological Conflicts and Rational Decision-Making.

Possibly the most controversial of recent theological debates has been over the publication of The Myth of God Incarnate in 1977. The issues raised have been diverse and complex. The central doctrine in question has been Incarnation. On the whole the positions held on the doctrine are wide and varied.[17] However, there are basically two parties to the dispute. These can be described very generally as the "traditionalists" and the "mythologists."

The distinction between these two theological positions can probably best be represented by the theology of Farrer and that of Wiles.

In many respects Wiles' position can be said to be very close to Farrer's. They both hold in common many factors which are essential to empirico-critical theology. For instance, both have insisted on the importance of matters such as intelligibility,[18] the non-violation of rational and empirical constraints,[19] the use of adequate critical procedures and techniques and the necessity of taking account of present knowledge and present experience.[20] Both thinkers have been convinced of the metaphorical/symbolic nature of theological thought,[21] the revisability of theological concepts[22] and the importance of establishing criteria of judgement.[23]

There is, however, a substantive difference in their theological judgements. Farrer considered that traditional belief in Resurrection, Incarnation and Trinity was tenable in the light of the evidences.[24] Wiles has questioned whether these traditionally held doctrines should not be radically revised.[25]

One of the temptations in theological debate, as noted in 9.2, is to close off enquiry prematurely by claiming too much (or too little) too soon, thereby inhibiting the search for knowledge. "The Myth of God Incarnate" debate was a case in point in which positions hardened very quickly, stifling much needed further research and reflection.[26] A colloquy, held later in 1978 on the issue, recognized this need. Mitchell, commenting on the colloquy said -

> If one thing emerged from our discussions it is that the problems which confront contemporary Christian theologians are of enormous difficulty and complexity. In this respect they resemble those that exercise the practitioners of every serious academic discipline today. There is not one of them that does not, if it has any vitality at all, face questions of a daunting kind about its methods, presuppositions and fundamental concepts.[27]

In the calmer setting of later reflection, issues were discussed in greater detail, and the complexity of the problems involved, more fully appreciated. It was realised that much ground-clearing still had to be done. Accordingly, assumptions were examined, ideas clarified and the issues at stake specified. Since the 1980's it has been recognized that the terms of enquiry need to be cast much wider.[28]

As can be seen from the above, the premature closure of debate and the lack of sufficiently comprehensive enquiry constituted two of the problems in this conflict. There were also basic disagreements over acceptable procedures and techniques for the doing of

theology.[29]

The matter of concern in this thesis, however, is whether perplexing issues, such as "The Myth of God Incarnate" conflict, are an indication that rational decision-making is not possible between rival viewpoints. I have argued against this. The "Myth of God" conflict, as we have seen, was seriously exacerbated by a problem which could befall enquiry in any discipline, viz. inadequacies in the procedures and techniques themselves and their application.

In the following discussion, I shall attempt to show how rational decision-making is possible in one of the most perplexing areas of theological debate, viz. incarnational belief. Since the issues are very diverse, I shall confine the analysis to five questions which have been pinpointed as fundamental to the debate[30] -

1. Has the term "Incarnation," as understood traditionally, changed its meaning in the contemporary debate?
2. Is the Doctrine of Incarnation, as traditionally understood, logically coherent?
3. Do all Christian doctrines stand and fall together?
4. Is the New Testament evidence of the incarnation clear or ambiguous?
5. Given the effects of cultural conditioning on our beliefs, is incarnational belief tenable in a science-oriented world?

9.4.1 The Term "Incarnation."

As Wiles has noted, in the midst of debate, the word "incarnation" has become a "slippery" term.[31] The respective positions of the "traditionalists" and the "mythologists" can be stated very generally as -

(i) those who hold the belief that God, without ceasing to be God, fully indwelt Christ (Farrer's position)[32], and

(ii) those who believe that Jesus "symbolizes and expresses

God's action towards the world"[33] (Wiles' position).

Theologically, there is a substantive matter at stake. However, it is important to pinpoint where the crux of the problem lies. Earlier I noted that the main christological conflict in contemporary theology is over how Jesus is related to God, not that there is a relation between God and Jesus (8.5.2c).

Once this is made clear, it is much easier to identify what is actually at issue. The matter to be decided is how the relation between Jesus and God is to be conceived.

9.4.2 The Logical Coherence of the Doctrine of Incarnation.

One of the major stumblingblocks for contemporary theologians has been the unintelligibility of doctrines such as Incarnation. In the doctrine of Incarnation, the idea that Godhead and Manhood should indwell the same person has proved problematical. The concept itself has been thought to be logically incoherent. Though Farrer proposed that incarnational belief should be understood as divine/human coincidence, this has not been seen to relieve earlier difficulties of Christ's divinity defeating his manhood or vice versa.[34] There is no question that past defences of incarnation have terminated in emphasizing one aspect of the two natures of Christ to the detriment of the other.[35]

Farrer was well aware of these difficulties, but considered that the basic problem was to give an intelligible account of the nexus of physical and spiritual entities.[36] He saw this as the major challenge, since it raised the issue of the possibility of doing theology at all. Thus, defending the tenability of divine/human coincidence, he said -

> Upon this double personal agency in our one activity turns the verbally insoluble riddle of grace and freewill, or of Godhead and Manhood in Christ's One Person, or of the efficacy of human prayer; indeed there is no issue theologians discuss which is not conditioned by it.[37]

Though the matter of an intelligible account of divine/human coincidence is still far from settled, Farrer's observations help illustrate more sharply that the current "Myth of God" debate over the relation between Jesus and God is actually concerned with a far deeper theological issue, viz. the relation between physical and spiritual realities. This difficulty, as we will see below, is also related to the problem of defending theology's viability in an age which has been dominated by successful material practice in the physical sciences (9.4.5).

There is however, a positive side to these present dilemmas. In other fields of research, such problems are often a sign that far more research is required, and more comprehensive concepts are necessary for conceiving of the object of reference. As we saw in discussing Koestler's understanding of the creative act in 3.3, intellectually puzzling phenomena are very often the cause of situations in which creative thinking takes place.

A typical example from the medical sciences is Fleming's recognition of penicillin. It was not till some ten years after his initial observation and testing of penicillin that its full significance was identified through the meticulous studies of Howard Florey.[36]

Just as it would be unthinkable for a scientist to jettison data which is puzzling, so also the perplexities within theological reflection must be wrestled with.

Thus, in dealing with the question of the logical incoherence of

the traditional doctrine of incarnation, before that problem is judged insurmountable and the doctrine radically revised, important constraints need to be taken into account. The theologian's concern here is with how concepts such as Incarnation, Resurrection and Trinity, which encapsulate a particular apprehension of God and Jesus' significance in that relation, are to be comprehended.

As we saw above (3.3), in establishing many ground-breaking concepts at the so-called "growing edges" of knowledge, our understanding generally has to be worked through step by step. Many comparable paradoxes occur in science, as for example with the wave-particle theory of light. In these instances, it can be seen that coherence has not been made the sole criterion of trustworthy knowledge. Incoherence is therefore not a sufficient reason for discarding perplexing concepts. In fact it is often incoherence which alerts us to the incompleteness of our knowledge.

In the light of more mature reflection, scholars such as J.A.T. Robinson have suggested more helpful concepts by which the problems of incoherence could be overcome. Robinson's study of St. John's Gospel has led him to the view that statements about the person of Christ are best regarded as ones of equivalence rather than as ones of identification -

> Everything about him bespoke God; to have seen him was to have seen the Father. Yet he was not simply God, nor God he. ... They are not merely interchangeable. ... So, to be true to John, we should say the Word of God subsisted in the man Jesus, utterly and completely, that he was totus deus, God all through, his perfect reflection and image, but not that he was totum dei, all there is to God. Yet this last is not what catholic Christianity has ever meant, but rather that God was fully incarnate in him.[38]

Also, as we will see in the discussion of the interaction between theology and science (9.4.5), the argument, that there is only one

reality, and that theology and science are aspects of it, suggests a view of the world which lends support to the above concepts.

9.4.3 The Relatedness of Christian Doctrines.

On the issue of whether all Christian doctrines stand and fall together, Wiles has argued that as a "domino" effect does not exist, it is possible to revise the doctrine of incarnation without impairing the overall structure of Christian belief.[39] Whilst agreeing in principle with this, I have also noted above that the extent to which revision takes place is the matter which has been most contentious amongst theologians (8.5.3). If empirico-critical principles are fully applicable to theology, are there criteria of judgement for settling disputes such as these?

Though the issue of revision is controversial, the problems are not insoluble. For, as I argued above, in empirico-critical theology the criteria of judgement for our apprehensions of God are derived from three sources of our experiences of the external world. These consist of the concepts of Christian belief which can be grounded from the documentary evidence, the constraints from our present knowledge of the natural world and the constraints from our experience of personal existence (8.6). In revising our concepts of God, these constraints need to be applied if our knowledge is to be grounded.

There is a second matter also which must be taken into account by theologians in assessing our apprehension of God. Though it is true that Christian belief is not dependent on any one particular doctrine, nevertheless the early church's resurrection experiences, their understanding of Jesus and his relation to the Godhead are very closely bound together. (See discussion of Hooker, 8.5.2c above).

Once that belief was challenged at a single point (e.g. the entry of the Christian Gentiles to Judaism) a large number of complex issues arose. Since the different aspects of Christian belief are so closely interrelated, this places a constraint also on the way that theological judgements are made.

9.4.4 The New Testament Evidence.

In the past, attempts to settle christological debates on the basis of the New Testament evidence have proved controversial mainly because of assumptions which were made about the New Testament and its contents. (See discussions of Farrer on the Fathers' approach to the Trinity, 7.3.2c, and Hooker on past New Testament studies of christological titles, 8.2.5c).

Recent improved procedures in biblical studies, which have taken full account of both the nature of biblical literature and its contexts, have resulted in more profound and illuminating interpretations of the biblical sources.[40] As we have seen, these findings enable the theologian to locate and assess the status of the "images" of revelation (8.5.1 and 8.5.2).

Though I have argued that the early disciples held an incarnational-type belief about Jesus, several things need to be noted. Early disputes over the place of the Gentiles in Judaism in the first century resulted in specific, though relatively undeveloped statements, concerning Jesus and his relation to God. As Farrer has contended, the "image" of incarnation is present in early thought as an "image." The concept was affirmed as the end-point of the early disciples' experiences and struggles, not as a metaphysical theory.[41] Much later, in the Arian controversies over the two natures of Christ,

fuller articulations of incarnation emerged.[42] As Farrer saw it, the error of the Fathers was to speculate metaphysically on the relations of Godhead. They therefore failed to appreciate the nature of the "images" of revelation.[43]

There is an important distinction to note, however. Farrer's understanding of the symbolic function of the "images" of revelation was primarily that they disclosed insights of the reality of God and Jesus' relation to Him. The "images" of revelation arose out of the events and happenings of Jesus' life, death and resurrection. They were not mere constructs of the imagination. Nevertheless, an empirico-critical assessment of them is necessary to determine the nature of the concepts and the constraints that they place on any later interpretations of those "images." I have argued that such an analysis indicates that an incarnational-type belief was presupposed in the early church's understanding of Jesus (8.5.2c). As such, it forms an important part of the evidence by which our apprehensions of God are assessed.

If the principles of empirico-critical theology are to be applied effectively, the biblical sources cannot be ignored. However, though it can be seen that the early church affirmed an incarnational-type belief, and in the patristic period, in the face of controversy, belief in incarnation was extended and developed into a full doctrine, (e.g. Chalcedon) these claims cannot be accepted uncritically by the contemporary theologian. They must, with all the data, be sifted carefully and balanced against all relevant constraints.

In conflicts such as "The Myth of God" debate, where the source of conflict is over revisions which contravene New Testament beliefs, empirico-critical assessment of the New Testament evidence is crucial

as it provides one of the important criteria of judgement. This is because the biblical evidence forms one vital aspect of the three sources by which our apprehensions of God are assessed. Thus, if revisions are to contravene New Testament beliefs, there must be very sound reasons for justifying such a decision.

One of the reasons proposed by the "mythologists" is that first-century incarnational belief is unintelligible in the science-oriented world of the twentieth century. Radical revisions are therefore necessary.

In the following section I shall attempt to show that there are criteria of judgement which can enable us to make a rational decision even on this very controversial aspect of the dispute.

9.4.5 Incarnational Belief in a Science-Oriented World.

In determining whether, in to-day's science-oriented world, incarnational belief is still credible, we will need to take account of the findings of socio-historical studies.

By comparing the cultural outlook and world-view of the early church, subsequent centuries and the present day, very substantial differences can be identified. In turn, these differences have influenced the terms and concepts in which incarnational belief have been expressed. For instance, the New Testament "images" of incarnational belief, expressed in terms of the fullness of God dwelling in Christ, were, in later centuries, expressed in the quite different terms of "nature" and "substance."[44]

In the twentieth century, two questions arise for theology. Firstly, is incarnational belief credible in a science-oriented world? If so, what revisions are necessary so that it can be expressed

intelligibly?

The first, as to whether incarnational belief is credible in a science-oriented world, is concerned with the deeper issue of the relation between physical and spiritual realities. Whereas, in the past, the interests of the physical sciences was thought to be incompatible with those of theology, I have attempted to show that there are now good grounds for holding that an interaction exists between the two. Once past misunderstandings about the nature of knowing are removed (e.g. the ideals of objectivity propounded by the philosophers' philosophy of science), and it is recognized that the principles of science are empirico-critical as are those in the humanities, the sharp dichotomising of the sciences from the humanities can be shown to rest on false assumptions. Further, as scientific and theological research has advanced, points of interaction between science and theology have now been identified.[45]

These factors support Farrer's argument that an interaction exists between spiritual and physical realities. Though Farrer endeavoured to give a defence of how divine and human realities can be related in this way, his analysis is complex and cannot be entered into here.[46] The main point of importance to note is that if an interaction exists between physical and spiritual realities, incarnational belief in a science-oriented world need no longer be thought to be either incredible or unintelligible. The precise relation that exists between physical and spiritual realities is still a matter for further enquiry.

This is the first of the two problems confronting theologians in the contemporary world. The second is, if incarnational belief is

credible in a science-oriented world, what terms are the most appropriate for expressing that belief? For instance, can the idea of an interventionist God still be maintained?

In 8.3 above, I pointed out that Farrer was opposed to a crude form of interventionism, which conceived of God as violating the natural order to bring about divine ends. He nevertheless insisted that God is active in the world. Thus some form of non-crude interventionism would still be required if, as I have argued, the reality of divine action is grounded in the natural world and we are to give a causal account of it.

Terms reflecting a first century view of the physical world will hardly be suitable for expressing an understanding of God's relation to the physical world in the twentieth century. Despite this, the difference in terms does not necessarily entail a change in the object of reference. Thus, it should still be possible to refer to the reality of incarnation whether that belief is expressed in the terms of the first century thoughtworld or our twentieth century thoughtworld. We may well recall Hesse's argument in 5.2.3. Despite theory changes in respect of the atom, there was no need to reject the discoveries embodied in those concepts.

Given the above, previous perplexities of incarnational belief in a science-oriented world should not constitute the major stumblingblock which they have in the past. This is not to say that theologians will not still be faced with very complex issues. The main point of this argument, however, has been to show that, faced with perplexing christological problems, theological decision-making is still possible, provided that all relevant constraints which constitute the criteria of judgement are taken into account. For even

if empirico-critical principles are used, the procedures and techniques of theology must also be adequate for the task and applied with skill and rigour. Otherwise irresolvable conflicts could result.

The research issues which will be opened up as a consequence of empirico-critical enquiry will still be considerable. These cannot be evaded without serious consequences for the viability of theology.

The complexity of the theologian's task and the seriousness with which Farrer regarded it, is reflected in the following observation -

> Give our metaphysical bent its head, and it will engage us with a cluster of the most daunting questions...but if we admit the validity of the metaphysical quest, must we not wrestle with them? Whereas if we deny its validity, must we not surrender to the positivist argument and reduce our theology to an insipid myth about the way the world goes?[47]

If, as I have argued, rational decision-making in theology is possible, even in the most perplexing areas of enquiry, then it would appear that empirico-critical principles can be applied as effectively to theological enquiry as to any other discipline.

9.5 Belief and Trust.

Before concluding this section of the discussion, brief mention should be made of the distinction which exists between notions of belief and trust. So far I have examined how beliefs in theology function in the same way as the beliefs or assumptions of other disciplines (8.2). I have not discussed the place of trust or commitment in theology itself.

Though it is true that trust in God is integral to embracing Christian belief, trust in God is not in itself necessary to theological enquiry. One may examine the truth or falsity of theological claims whether one is committed to them or not. As

Mitchell has pointed out, though there is a tension present which must be "recognized and regulated"[48] because of a believer's commitment to God, openness and critical debate make independence of judgement possible. Whether, in the light of the results of theological enquiry one may decide to revise one's commitments (or lack of them) is, of course, another issue altogether.

9.6 Scientific and Theological Decision-Making.

It is now necessary to draw together the threads of this whole debate. The purpose of discussing the making of theological judgements at such length has been to show that despite the complexity of research in this area, it is possible to make a rational choice between conflicting theological viewpoints by using an empirico-critical approach.

As with scientific decision-making, the fixing and grounding of a reference may still leave many questions unanswered. This, however, does not provide us with a warrant to overthrow those concepts. On the contrary, perplexing problems are characteristic of the "growing edges" of knowledge. The potential reward of skilful and rigorous enquiry is that we will advance our knowledge even further.

In a very detailed and complex study of the principle of complementarity in the physics of Niels Bohr and the theology of Karl Rahner, J. Honner has indicated how in retaining two corresponding yet paradoxical concepts of phenomena, researchers are thereby faced with having to widen their frame of reference or abandon it. Hence, it is not the presence of contradictories in science, (e.g. the wave-particle theory of light) which entails that these concepts be

discarded. Their awkward presence may have to be tolerated as one of the "dissonances" (3.3) inherent to the research process.

Though theological contradictories are, admittedly, of a different kind, related as they are to a very different subject matter, the analogy still holds true. Honner has shown how in Rahner's theology the principle of complementarity enabled Rahner to accept Incarnation as a mystery, reflecting on the paradoxes generated in that concept by the God-creature relation.[49] Similarly, Rahner's use of this form of reasoning to explain the possibility of Trinity indicates how it is possible to deal productively with intellectually frustrating situations as one seeks to fathom out a more intelligible account of the reality which is under investigation.

In this way, theological judgements are possible on controversial issues, though research will still continue and further revisions may well be necessary.

9.7 Interdisciplinary Exchange.

The perplexities one faces in research may not always be a function of one's procedures or techniques. Research is very often dependent on the knowledge and skills of other disciplines before further advances can be achieved. The revolutions in biology during the earlier part of this century provide a most apt example. A willingness to accept changes in the boundaries, often unconsciously assumed around a discipline, provided the potential means for looking at old problems in new ways. A cursory survey of those who ultimately contributed to the substantial advances in molecular biology indicates that each originally began in disciplines other than the field of

their later expertise.

For instance, Astbury began as a crystallographer, as did Bernal. Perutz was a chemist, Crick was a physicist, Kendrew a chemist and Wilkins a physicist. Not only was their earlier search blocked by lack of technical facilities (i.e. high speed computers and high intensity X-rays) but though it was known that molecular structure had a crucial role in the function of living organisms, just how important that structure was had not been clearly analysed. As it turned out, structure proved to be far more complicated than originally supposed.

In the case of theology, recent ferment, particularly in the field of biblical studies, which has made use of the techniques of other related disciplines, has produced some valuable new insights and procedures which have made an empirico-critical approach to theology possible. In addition to the obvious advantage of using the techniques and knowledge of other disciplines to further theological research, if Polkinghorne's argument (6.5.4) that there is only one world is accepted, as I believe it can be, it could well be that in the long-term it will be shown that an interaction exists between the realities of all branches of knowledge.

This being the case, disciplines cannot afford to ignore the implications of the findings and research of other branches of learning. Accordingly, theology will not be able to isolate itself from the findings of either the physical sciences or the human and social sciences without severely limiting its own understanding. Nor, for that matter should the implications of theological thinking be neglected in studying issues which relate to ethics and the nature of man in the social and human sciences or in formulating the cosmologies which scientists and philosophers from time to time propose.

9.8 Conclusion.

In concluding this thesis, there are several observations which would appear to follow from the research undertaken. Many of the perceived conflicts between science and theology can now be seen to result from a series of misconceptions concerning objectivity, rationality and the process of knowing itself. Further, theology's previous lack of adequate procedures and techniques added to its own problems, seriously undermining its capacity to establish its credibility as an academic discipline, particularly in the twentieth century. However, with improved procedures and techniques recently, especially in biblical studies, it is now possible to approach theology empirico-critically.

Despite the difficulties which theology has had in establishing its basis as a viable discipline, I have endeavoured to show that the most serious problem of all is one which has affected every discipline since the rise of modern science. This has been the overall lack of a comprehensive model for knowing which could adequately encompass all the factors that are involved in the process of knowing itself. I have suggested that a comprehensive model must at least incorporate the agent as knower and the fact that knowing involves both rational and empirical procedures. Since I have also argued that objectivity is achieved by adhering strictly to a number of principles, these would need to be built into the model as well.

In the long term, the level of confidence which we will be able to place in our knowledge claims will be dependent on the skill, ingenuity and rigour with which these principles have been applied in

the judgements of any particular discipline.

It could still be argued that theological realism has not yet achieved the level of success which is attributable to scientific realism. Nevertheless, it must be said that an objection of this kind misses the main point at issue, viz. whether in research in general it is possible to gain access to knowledge of an external reality, and if so, whether as high a level of objectivity as is possible can be achieved for that knowledge. The fact that a subject matter may prove highly resistant to enquiry is ultimately not the issue. The crucial factor in all research is whether one's methods are adequate.

In this regard I have endeavoured to identify the processes and principles involved in the acquisition of knowledge. I have argued that the same processes and principles are not only applicable to the study of theology but also capable of establishing that discipline on a basis which is viable. Given that this is so, the respectability of theology as a source of trustworthy knowing need no longer be held in doubt.

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6. Though the term empirico-critical was first used by Avenarius in the 19th Century to refer to positivist ideals, in this thesis it is being used to refer to a quite opposite meaning, viz. to indicate a procedure which takes full account of relevant empirical and critical questions. For a fuller understanding of how empirico-critical is being used in this thesis, see discussions in Chapters 5, 7 and 8 on the matter.

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20. Crombie (1), p.75.

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24. ibid. p.76.

25. ibid. pp.76-77.

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37. ibid.

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42. ibid. p.65.

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45. ibid. p.36.

46. ibid. p.61.

47. ibid. p.36.

48. Crombie (1), pp.62-63; O.D.C.C., pp.113-114.

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54. Whewell, pp.55-65.

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57. ibid. p.79.

58. See discussion in 4.3, 5.2.3 and 6.1.

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61. ibid. p.29.

62. ibid. pp.20-21.

63. Crombie (2), pp.135-166.

64. Harré, R., Matter and Method, California: Ridgeview, 1964, pp.31, 76, 85.

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68. ibid. pp.135f and 156; cf. also P. Feyerabend's account in Against Method, London: Verso, 1978 (1975), pp.69-92, of how Galileo changed the conception of what was taken to be natural.

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70. Crombie (2), p.142.

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73. For example Joshua 10^{12-13}: Joshua's command, that the sun stand still on the eve of the battle of Gibeon, was taken to imply that the sun was normally in motion; also Psalm 93^{1} was taken to imply that the earth did not move. Therefore, both were taken as contradicting the Copernican theory about the nature of the physical world. Since the Bible was authoritative, the Copernican system must be incorrect.

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80. Thorndike, Vol.6 p.427.

81. Crombie (2), pp.207-208.

82. ibid. pp.213-215.

83. ibid. p.216.

84. ibid. pp.124, 135, 165 and 318.

85. Harré, R., Great Scientific Experiments, Oxford: Phaidon Press, 1981, p.92ff. Theodoric of Freibourg used glass globes

to simulate the role which raindrops play in the formation of the rainbow. The advantage of such models is that they can be manipulated in order to understand corresponding processes in the things which they model.

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are fundamentally speculative.

13. I am indebted to Gary Davis, doctoral student in Atmospheric Physics, who has provided me with the following references. These illustrate the series of research skills deployed over a period of time on the SAMS programme. (SAMS refers to the Stratospheric and Mesospheric Sounder, a satellite instrument for measuring the concentration of constituents of the stratosphere and mesosphere). Measurements, e.g. of water vapour, are acquired by "remote sensing," that is by sending instruments up on balloons and satellites. The measurements are then analysed. Skill, ingenuity and technical expertise are all required. J. R. Drummond, J. T. Houghton, F.R.S., G. D. Peskett, C. D. Rodgers, M. J. Wale, J. Whitney and E. J. Williamson, "The Stratospheric and Mesospheric Sounder on Nimbus 7," Phil. Trans. R. Soc., London, v.4296, pp.219-241, 1980, describes the instrument and preliminary results; M. J. Wale and G. D. Peskett, "Some aspects of the design and behaviour of the Stratospheric and Mesospheric Sounder," J. Geophys. Res., v.89, pp.5287-5293, 1984, gives an evaluation of the instrument's performance; R. L. Jones and J. A. Pyle, "Observations of CH4 and N2O by the NIMBUS 7 SAMS: A comparison with in situ data and two-dimensional numerical model calculations," J. Geophys. Res., v.89, pp.5263-5279, 1984, reports results; C. D. Rodgers, R. L. Jones and J. J. Barnett, "Retrieval of Temperature and composition from NIMBUS 7 SAMS measurements," J. Geophys. Res., v.89, pp.5280-5286, 1984, is an account of the mathematics of data analysis; J. J. Barnett, M. Corney, A. K. Murphy, R. L. Jones, C. D. Rodgers, F. W. Taylor, E. J. Williamson, N. M. Vyas, "Global and seasonal variability of the temperature and composition of the middle atmosphere," Nature, v.313, pp.439-443, 1985, discusses implications of the results.

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