LOOKING, LISTENING and THINKING

How Faith, Science and Human Thought relate to each other

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Introduction

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Chapter 1 Introduction: What is philosophy?

Philosophy is concerned with thinking. It is considering the world around us, ourselves, and our own thinking processes. It is asking questions and not taking things for granted, for it is part of human nature to be curious.

Professional philosophers may want a more precise definition, but that is essentially what they do. As an academic discipline, philosophy has an important role, looking at the thoughts of others, and thinking more deeply. Unfortunately the recent trend has been for professional philosophers to consider problems that are far removed from everyday life, and to express their thoughts in obscure language.

But they cannot claim a monopoly of thinking. We all have brains, and we need to use them. We speak of having a "philosophy of life" meaning our attitude to life based on our basic beliefs. Professional philosophers need to consider the questions asked by ordinary people as well as those asked by academics.

Some of the most basic questions that people ask are, What is the nature of the world? What makes everything happen? Where did everything come from? What is the purpose of everything? Who am I? Why am I here? Is there a world beyond what we see? Is there a God? What is the meaning of life?

Sometimes people want knowledge just for its own sake, to satisfy their intellectual curiosity. Others see it as a means of gaining control of our environment for our own benefit. The ancient Greeks were able to create engines of war to give them victory over their enemies, and this was the stimulus for some of the earliest scientific research. Another kind of question we may ask concerns what actions are right and what are wrong, which is what we call morality.

Having asked these questions, we must now consider where we can look to find answers, and there are three basic sources of knowledge that are available to us.

The first is *looking*, using our senses to *look at* the world around us. This is the source of information for the scientist.

The second method is *thinking*. This approach believes that the human mind has the ability to gain knowledge independently of the senses. The ancient Greeks believed it had. Of course their ideas were influenced by what they observed in the world around them, but they believed that human reason was the final judge of what was true and what was false.

The third approach is *listening*. This involves believing there is a God who has created the universe and who has the ability to communicate with us. If this is so, we can ask if he has revealed to us any answers to these questions.

Then having found an answer to a particular question, we need to ask how it fits in with the rest of our thinking and experience.

We must of course take note of the answers that have already been put forward to these questions. It is intellectual arrogance to ignore the thinking of others completely, and try to work out everything from the beginning for oneself. But it is also equally unwise to accept uncritically the views of others without asking from where they got their ideas. So in the next chapter we look at the ideas of some of the great thinkers of the past.

One of the important questions that needs to be considered is the relationship between the material world that we can see, and the non-material world of human thought.

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Are they two different realms? If so, what is the link between them? Some have concentrated on the world of thought and denied the reality of the material world (whatever that means!). Then after the advance of Science, others decided that it is meaningless to talk about anything which cannot be investigated by science (except maths and logic). Yet another approach by professional philosophers was to become concerned with language and meaning. And they use technical terms just as every other academic discipline has its own specialist vocabulary. So at the end of this chapter is a list of the technical terms used by professional philosophers and an attempt to translate them into everyday language.

The main problem facing us is that, as various specialities such as science and theology have become separate academic disciplines, the area of thought covered by the term "philosophy" has gradually shrunk. But as each subject has its own "philosophy", there is a real need to think about how the various aspects of our life relate to each other.

The ancient Greeks had some strange ideas about how they thought the material world should behave. It took a long time for people to see the need for careful observation, for even today science teachers find a gap between what children think should happen and what we actually see.

But gradually, as what we can call the "scientific method" became adopted, the laws governing events in the natural world became widely accepted. How this happened is described in chapter 3. This leads on to a survey of the present understanding of the nature of scientific theory in chapter 4.

One question that people think is very important is, How did it all begin? Where do we come from? Because scientific investigation has now produced a considerable number of clues as to past events, the basis of the current theories of the origin of all things is considered separately in chapter 5. Then in chapter 6 we consider the nature and limitations of scientific theory.

In chapter 7, human nature is considered, including those areas of our life which are outside the realm of scientific study: our creative ability, our moral behaviour and our religious beliefs.

A third historical survey is given in chapter 8, this time of views that have been held on morality and religion showing how these have been influenced by their fundamental outlook on life. Then the specifically Christian viewpoint as found in the Bible is put forward in chapter 9, considering what it has to say about God and ourselves.

With so many different approaches, conflict is inevitable. In chapter 10, three important areas are looked at in which there has been apparent conflict between scientific theory and the teaching of the Bible. An attempt is made to harmonize the two views.

In the last chapter, we consider the question as to whether or not there can be a specifically Christian philosophy.

Glossary of Philosophical terms

Professional philosophers tend to regard the definition of a word as summarising all that we understand by it. It is used more as the conclusion of a discussion than as the starting point. But because philosophers tend to give words a specialist meaning, it is necessary to start with some idea of what they mean by the word. What follows is therefore only a rough guide as to what philosophers mean by certain words.

Philosophy is thinking.

A **Philosopher** is somebody who thinks for himself.

Metaphysics. This is usually taken to mean the consideration of what is not observable by our senses.

Logic. The study of what is considered the correct way of reasoning.

Knowledge is what is believed to be true. Philosophers use the word "knowledge" to mean one of several things:

knowledge of facts,
acquaintance with a person or place,
a skill or ability to do something,
experience of pain, pleasure etc.

Scientific knowledge can also involve several aspects. There are simple facts, then we become acquainted with scientific laws, and we can gain the skill of manipulating scientific apparatus.
The notion of truth applies mainly to the first category.

Belief means something a person is less sure about, whereas if he says he knows something, it means he is more sure. But this is different from the everyday use where a person can have very strongly held beliefs. If I say I believe in God, it means I am sure that there is a God.

Accident. The secondary property of something which is not essential to it. Colour is a secondary property for a leaf may be green or yellow or red.

Reality A word impossible to define exactly. The opposite of what is real is something which is purely a product of a person's imagination. But it is difficult to draw a hard and fast line between illusion and reality. An optical illusions is still caused by something in the outside world. Reality for a philosopher is something to which he attaches importance.

Being and Existence are "buzz words" which some have taken to be properties that things can have, similar to the properties of wetness or hardness. But this is surely a misuse of words. If the chair on which I am sitting has Being or Existence, why not just say "I am sitting on a chair"? I know that it is there because it is what separates me from the floor.

Rationalist In its most extreme form, it means a person who thinks he can acquire knowledge simply by thinking. But it is also applied to a person who says that thinking is more important than looking if we want to find out about things. This means that he only believes what he thinks is reasonable.

Empiricist Somebody who learns from experience. In its specialist meaning, it is somebody who does not believe in anything that he cannot perceive by his senses.

Realist In its modern form, this means a person who believes that the things we see around us are real.

Idealist A person who says that the ultimate reality is mind and not matter. He may say that there is no such thing as a real world or that if there is, we cannot know anything about it. The difficulty with this position is knowing how to distinguish between fact and imagination.

Phenomenalist A person who says that physical objects exist so long as it is possible for somebody to perceive them.

Mediaeval Terms:
A *realist* said that Plato's Universal Forms existed separately from the everyday objects that partook of the nature of these forms. A *nominalist* denied that the Forms exist separately, they are simply names that we use.

An **analytic proposition** is a statement which defines or clarifies a word. An example of this is the statement, "A bachelor is an unmarried male".

A **synthetic proposition** is a statement which gives information about a situation where things could be different from what is being proposed. An example is "This hat is blue". I am saying this because not all hats are blue.

An **a priori proposition** is a statement which we consider must be true, e.g. the laws of logic. A priori knowledge is what some say that we are born with.

An **a postiori** proposition is a statement made as a result of experience, e.g. "I can see that your hat is blue".

A **contingent fact** (or truth) is something which happens to be true, but something which is only so because of circumstances. E.g. I may say, "The grass of my lawn is green". This is true because we have had a lot of rain recently.

A **necessary fact** is one which must always be so. E.g. "2 + 3 = 5" is true because of what the symbols 2,3, and 5 stand for.

A **judgment or proposition** is a statement which is put forward and which is believed to be true. E.g. "It is raining", or "God is just".

Chapter 2 Human thought throughout the ages

We do not know when humans first started asking fundamental questions about the meaning of life, but we do know that the form of writing known as Wisdom Literature dates back over 4000 years. The earliest examples of this were proverbs which covered both the moral and the practical side of life. Some of them are still relevant to life today.

The Greek Philosophers

The origins of Western philosophy can be traced back to the philosophers of ancient Greece. Their writings covered all aspects of life; science, religion, maths, politics etc. They wanted to find out the nature of things around them. Some of them made important scientific discoveries. But because they put great emphasis on the ability of the human mind to arrive at truth by reasoning, some of their ideas seem rather bizarre to us.

Plato (428-347 B.C.)

The Greek philosopher Plato is regarded by many as one of the greatest philosophers of all time, his influence is still felt today. He wrote about a wide range of topics from politics and education to poetry and morals.

Plato believed in the supreme importance of human reason. Thinkers were more important people than doers. A man's feelings had to be kept under strict control.

The basis of his outlook was his theory of Ideas or Forms (Greek: *arche*). A Form is an idea which exists independently of the thinking mind. For example, the particular chair I am sitting on is an image of the Form of "chair". There is a Form for all material objects as well as for abstract ideas. In his opinion, the three most important Forms are those of Goodness, Justice, and Beauty.

To Plato, all that we see around us are but fleeting images, for they can be destroyed; by contrast, only the Forms are real and eternal. We should therefore aim to acquire knowledge, not just of material things, but of these Forms.

His "world view" is best illustrated by his Allegory of the Cave. In this, there are people who are chained to the floor of a large cave with their backs to the light. Behind them is a fire, and because they cannot turn round, they can only see the flickering shadows cast on the wall of the cave by people and things which are between the fire and them.

These shadows represent everyday things; people, horses and chairs. The chains represent the ignorance of ordinary people, they are unable to turn round to see what is causing the shadows. By mental effort, a person can break free from these chains. But then there is a progression in knowledge; first they are able to see whatever casts the shadow, then they can move towards the mouth of the cave and see things in the light from outside, finally they can move outside the cave into the sunlight itself.

This corresponds to what he considered to be four levels of knowledge. At the lowest level, what we know about visible things (images) he called conjecture. Then we progress by philosophical contemplation through belief and judgment to reason, which is knowledge of the pure Forms.

He believed that human beings consist of a material body and an immaterial "soul" (Greek: psyche). Our soul is the whole of our non-material nature, the most important part of which he considered to be the mind. (The traditional idea of a spiritual soul did not originate till after the Christian era). Because our souls are immaterial, they have always

existed. Before we were born, they had knowledge of the Forms. This is called a priori knowledge, of innate ideas.

Similarly, the human soul will continue to exist after death, for it does not wear out as the body does, nor can it accept the Form of Death.

But in a human being, the soul is imprisoned in the body. Sickness and other distractions limit our powers of thought. So it is the task of education to "draw out" (the literal meaning of the word "educate") these ideas so that we become aware of them. He had quite a detailed programme of education, the main aim being to surround the student with things which embody the ideas and characteristics to be developed, as in his view the human mind tends to imitate what is around it. For he claimed that our minds have the ability to recognise goodness, beauty etc. when presented with an example.

Plato believed that the greatest Form was that of the Good because if a person is truly aware of this form, he will know how to act. Desire may lead a person astray, so a person has to exercise his mind in order to do what is right. People do wrong either because they are ignorant of the Good, or because they let their desires dominate over their reason.

Plato applied his ideas in practical realms such as politics, for he considered that it was the duty of a philosopher to give practical guidance to other people. He firmly believed that only those who had knowledge of the forms of Goodness and Justice were fit to govern - this is "timocracy", rule by those who are worthy to rule. They should not be allowed private wealth, for this would tempt them to put their own needs before those of others. Also, they should be specially educated for their tasks. It is interesting to note that out of the four possible forms of government, democracy was third best, only tyranny was worse!

Do Plato's views have any relevance for us today? His Forms are similar to our modern idea of a `concept', but these are man-made ideas present in our minds. One problem with Plato's view is that there is no limit to the number of possible Forms; new ideas are constantly being thought of, and new devices are being invented. In Plato's thinking, would he have said that the Forms of computer and car have always existed?

Also, the idea of absolute standards in the arts is not very popular today. I do not think that modern painters or musicians would subscribe to the idea of the Form of Beauty, for that word is not often mentioned when a modern painting or piece of music is evaluated. Even Plato himself could not say very much about the Form of the Good. The theory that bad behaviour is simply due to ignorance is disproved by the present crime statistics.

The important question that we need to ask is how do we come to know the Forms of Justice, Goodness etc in practice? He said that what was best for society was also best for the individual. But in our complex modern life, people disagree as to which of these two is to be put first. There are intelligent people who see nothing wrong with breaking the law if it brings benefit to them, even though it is at the expense of other people.

His theory that we are born with innate ideas can in principle be tested experimentally. What has been found out is that the experiences which a baby has in the first few months of its life are crucial for development of its brain and its understanding of the outside world. But it is difficult to discover how much has been learnt since birth, and how much was in the brain at birth.

Plato's ideas on subjects such as education and politics sound very good in theory, but there are certain facts about human nature which make his theories difficult to operate in practice. This shows the danger of relying more on thinking than on observation.

Plato was the dominant influence throughout the Middle Ages, and today there are still those who hold to some of his ideas.

Aristotle (385-322 B.C.)

Aristotle was for a time a pupil of Plato, and he has had almost as much influence on Western thought as Plato. By contrast he was much more practical in his outlook. His father was a doctor, so it is thought that he would have learnt both theoretical and practical medicine from him. He also spent some time dissecting animals in order to classify them according to their structure. This is probably the reason why his writings on scientific matters have a biological emphasis.

He said that everything consists of “substance”. And this in turn can be reduced to four elements; earth, air, fire and water (a theory first put forward by Pythagoras). But this substance needs form to make it into something recognisable, just as cloth can be made into clothing or curtains. But he disagreed with Plato because he did not believe in Forms which exist separately from material objects.

He divided the properties of things into those which are essential to it, part of its essence (e.g. sugar is always sweet); and accidents or non-essential properties (e.g. a person can be male or female).

Aristotle believed that everything has within it the potentiality to develop into its most perfect state, thus an acorn grows into an oak tree and a baby grows into a mature adult. It is obviously easier to understand how this applies in the realm of biology rather than in the physical sciences.

He also applied his belief in the importance of the potentiality of things to the realm of morals. A person should seek to develop his own potential, for he believed that virtue is inherent in human nature. He also said that true virtue is the mean between excess and deficiency, in other words he believed in moderation in all things.

He said that a person's ultimate purpose is happiness, and our main function is contemplation. So happiness is attained by the good performance of contemplation. If you believe that, you are a true philosopher!

The word "metaphysics" was coined by the editors of Aristotle's writings, for it literally means "After Physics", and it was used to describe his book on `First Philosophy' which came after his book on `Nature' (what we call Physics). `First Philosophy' is a study of the laws of thought, for like Plato, he believed that the Universe is governed by Universal Principles which to him constituted Reality. These principles included the laws of cause and effect, and the laws of logic. These were things we can be certain about, whereas in practical matters the skills needed to perform certain tasks must be acquired but may be lost again. He also claimed that at least some knowledge of metaphysics is known a priori.

Since then the word "metaphysics" has come to mean the consideration of anything that is not material.

Aristotle wrote extensively on logic, and the rules he put forward were accepted for the next 2000 years. Only recently have they been modified as logic has become more formal.

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The Medieval Period

The Greeks were conquered by the Romans in the first century B.C. On the whole, the Romans were practical people, not intellectual thinkers, so it was Greek ideas that dominated in the main centres of learning. For the next twelve centuries, Plato's ideas were more popular than those of Aristotle.

After the collapse of the Roman Empire, scholars retired to monasteries so that they could continue to study in safety. They mixed Greek philosophy and Christian ideas in varying proportions. The dominant view was that Christian ideas were built on the foundation of a rational philosophy.

Then as the organised Christian Church increased in political power, it came to acquire a monopoly of learning so the philosophers of that period were mostly churchmen and teachers. The church leaders began to claim authority in all matters of thought, and actively discouraged new ideas. The views of some of the philosophers of that period are given in chapter 8 as they are based on their religious beliefs.

In the seventh century, the Arabs rapidly conquered North Africa, inspired by the new religion of Islam, and set up centres of learning in Spain. Their scholars brought with them manuscripts of Greek works in Syriac which they translated into Arabic. They also developed the ideas of the ancient Greeks, favouring Aristotle's views rather than those of Plato.

The Renaissance

The Renaissance started in Italy in the middle of the fourteenth century, when ancient Greek and Latin works were rediscovered. Their thinking turned back to pre-Christian traditions, emphasising more the value of man and his power of reason rather than the authority of the Church. Artists began to paint classical themes, no longer were they bound by religious tradition. Gradually this movement spread to France and the rest of Europe. The revival of interest in Greek literature was given a boost when the Turks captured Constantinople in 1453, and many of its scholars fled bringing with them the books and traditions of Greek scholarship. Until then, Western scholars had had to rely on Latin translations of many Greek authors.

The invention of the printing press made the knowledge of ancient Greek and Roman thought more accessible. No longer was learning the domain of an intellectual elite. As the smaller nations began to gain political independence from the Holy Roman Empire, so independent thinking developed. People began to disagree over the methods of philosophy.

The dominant philosophical outlook was rationalism, that the universe operates according to rational principles which are therefore grasped by reason. It was also possible for a scholar to find out all that could be known, the age of specialisation was yet in the future.

Descartes (1596-1650)

The Frenchman René Descartes was one of the great thinkers of that period. He was educated at a Jesuit college, and this gave him a good grounding in maths. He is as well known for the invention of analytic geometry as he is for his philosophical ideas.

He was a contemporary of Galileo. He heard how Galileo had fallen out of favour with the Pope when he published his reasons for believing that the earth goes round the sun and not vice versa. So Descartes was cautious and took care not to put forward any views that might be unacceptable to the Church.

He saw philosophy as the study of wisdom. It should cover all aspects of life; morals (for conduct), medicine (for health), and mechanics (for inventions). For him it was reason that decides what is true, and not our human senses, because these are easily deceived.

He considered the contrast between the certainty of mathematical reasoning and the uncertainty generated by the conflicting ideas of philosophers, and wondered if the same certainty be achieved in the realm of thought.

He first decided to discard all ideas that he was not certain of, and took note of the fact that it is easier to doubt than to believe! Then he would only accept ideas which were clear in his mind, and distinct from other perceptions.

He realised that he was most certain of his awareness of himself and his thoughts. So he took as the starting point for a philosophical system the statement that is often quoted (in Latin) "cogito, ergo sum;" (I think, therefore I exist). This meant that what he was most certain of was his awareness of himself, a thinking person.

Then because he had a clear and distinct idea of God in his mind, he decided that there must be such a God, as he could not conceive of a God deceiving people about himself.

He said that everything consists of two "substances", mind and matter. Both are real because God created them. God also created the laws of maths which we find by reason, and the laws of science which we find by experiment.

He said that in the world around us, what is real must be capable of being measured. So colour, sound and smell are not basic as they did not have a means of measuring them in those days. For him, nature was a system obeying rational mathematical laws. But human minds are outside nature; and sounds, colours and smells exist only in the mind.

This duality of mind and matter exists in us, for we have minds and bodies. He decided that the connecting link between the two must be the pineal gland which is at the base of the brain, as this is the only part of the brain which was found to be single. (They had already discovered that the brain has two hemispheres and all other structures are duplicated in each hemisphere). Our bodies are part of the material world which operates according to fixed laws, but our minds have a freedom independent of these laws. He said that we must have free will if we are to be considered morally responsible for our actions.

There are several problems with Descartes' views. First, his criterion of rejecting ideas that he is not sure of is purely subjective. Also his "cogito, ergo sum" means that he starts with his own self-consciousness, and this means he admits that he is aware of himself as a thinking "self". Yet he does not explain how this "self" fits into his system.

He followed Plato by saying that we have clear and distinct ideas, which therefore must be true. This may apply to things such as logic and maths. But it was this dependence on human reason and not on what our senses perceive which hindered progress in scientific theory at that time.

It is also unsatisfactory to have to introduce God into his system simply to give reality to the rest of the universe.

On the Continent, rationalistic philosophies continued throughout the seventeenth century. Two of the best-known names of that period were Spinoza and Leibniz.

Spinoza (1632-77)

Baruch Spinoza was born to Jewish parents who lived in Holland. (He changed his name to Benedict de Spinoza). He put forward a philosophical view which blurred the distinction between mind, matter, and God.

His basic idea was that there is only one Substance. This exists by itself, it can be regarded as both God and Nature. This view is what is known as Pantheism, that God is within Nature rather than outside it.

This Substance (i.e. what we would call Nature) does not act with any purpose in view: he said this to account for the apparent imperfections in the world. But, like Aristotle, he said that all natural things strive to realise their proper form.

He held that good and evil are only relative. What we desire is, by definition, good. We should not look for moral principles outside ourselves, but look to what is truly useful to ourselves, This, in the long run, is true knowledge.

We do not have free will, we only think we are free because we are ignorant of the causes of our actions.

This pantheistic view which brought God down to the level of nature was regarded as heretical at that time, but it has been revived recently.

Leibniz (1646-1716)

Gottfried Leibniz was another great philosopher-mathematician. He invented the system of infinitesimal calculus. He also put forward ideas on symbolic logic which have only recently been appreciated.

He distinguished between the truths of logic and maths which are true of necessity, and the propositions of science which are based on observation. In contrast to Spinoza, he emphasised the plural nature of the world. In his book `Monadology' he put forward the view that the universe consists of separate monads or simple substances.

Monads are units, each is like a soul. There are three kinds: base monads have a very low level of perception, this was the nearest he got to describing "matter". Then there are souls (in animals), and spirits (the reasoning aspect of man). Above all is God, the Monad of monads. But the monads do not interact with each other, it is God who harmonises their activity.

So we see that the use of human reasoning led Spinoza and Leibniz to two seemingly opposite views of the nature of the Universe. Leibnitz' view that everything is made up of separate entities is similar to the modern theory that everything is made up of fundamental particles. But we must also take account of the unity, as Spinoza did, we need to consider the interaction of the fundamental particles. We now realise the universe does not fit into a neat and rational philosophical system.

The Enlightenment to the Present Time

"The Enlightenment" is the name given to the great intellectual movement in Britain, France and Germany in the eighteenth century. It is generally considered to start in this country with Newton and Locke. At that time, traditional attitudes in religion and politics were being challenged. An even greater emphasis was being put on the power of human reason, buoyed up by the great advances that were being made in the physical sciences. Sadly, the period ended in political turmoil.

On the Continent, the prevailing philosophical tradition was still that of rationalism. But in Britain, a new idea, Empiricism was put forward. This is the belief that knowledge can only come to us through our senses. There was a trio whose names are associated with this line of thinking; the Englishman John Locke, the Irishman George Berkeley, and the Scot David Hume.

The empiricist philosopher is faced with a problem. He is aware primarily of his thoughts which are not material. But he is also aware of the fact that his senses suggest there is a material world. What is the connection between this material world and his non-material thoughts?

This problem does not exist for the rationalist, because he is mainly concerned with the world of thought. He believes that it is the mind which is the ultimate arbiter of truth. But the connection between mind and matter is a crucial question to consider in any philosophical system.

Locke (1632-1704)

John Locke rejected any kind of tradition or authority. He did not accept the idea that statements can be true simply because they are self-evident, he said that their truth depends on where they come from and how they are arrived at.

So where do our ideas come from, and what can we be sure about? His answer was that our knowledge can only come from our sense experiences. We are born with minds which are like a blank piece of paper. But the mind has no direct access to the outside world, its function is to reflect on what it receives from our senses, and combine individual sense experiences into complex concepts. As we perceive things with our senses, ideas come into our minds, and as these are associated with different ideas so they become what we call knowledge. In other words, knowledge is the collection of these ideas in our minds.

This means that we cannot really know what matter is, we only know how things are represented in our minds. We are not looking at reality, but at an image projected onto a mental screen. This may seem like Plato's Allegory of the Cave, but the difference is that Locke said that you cannot know what is causing the image.

He said that things consist of an unknown "substance" which is featureless. Particular things possess primary qualities such as size, shape and motion. Then when we perceive them, we perceive other properties such as colour, taste and smell. But these are not intrinsic to the objects, they are what our minds attribute to them. This is very similar to Aristotle's idea of primary and secondary qualities.

He also considered the use of words in making propositions. He said that words are the outward mark of internal ideas. But when we speak to somebody else, we do not know if a particular word creates the same idea in their mind. This suggestion anticipated the recent interest in the philosophy of language.

Locke was attempting to adopt what he took to be the outlook of practical scientists. But while these believe that they are discovering the nature of the material world, Locke was saying that we cannot really know anything about this world. Now it is true that our view of the outside world is coloured by the sort of people we are, but it is also generally accepted that scientific theory is objective and not dependent on a particular culture.

Also, can we isolate the human mind from the body? His theory of perception does not adequately deal with the connection between our thought and our sense perceptions.

Berkeley (1685-1753)

George Berkeley was a fellow of Trinity College, Dublin, who later became Bishop of Cloyne. He saw that Locke's system meant that material objects have no independent existence, they only exist in a mind. But this cannot be the mind of any one individual, for that means that the chair on which I am sitting will cease to exist if I stop thinking about it. So there must be a God in whose mind everything exists, it is his consciousness that maintains the existence of the Universe. He felt that Locke's views led to a complete denial of God, so he tried to find a secure place in his philosophical system for God.

He then said that it is God who puts the idea of material things into our minds, for he could not see any other way of explaining how we get such ideas. So to Berkeley, God had to maintain the world in existence and continually keep it operating. Also, there is no external necessity for the Universe to operate as it does, there are no fixed laws of science.

He did not believe in the reality of scientific terms such as "force", they are simply useful words to describe what we observe (there is a sense in which this agrees with the modern philosophy of science as put forward in chapter 4). He pointed out that scientific progress was being held back because people were still following Aristotle's ideas of causation which are described in the next chapter.

The logical conclusion to Berkeley's views is that if nothing exists apart from ideas in my mind, then when I meet another person, I cannot be sure that he exists. This position is called solipsism, somebody who follows it is an intellectual hermit, isolated in his own thoughts. In answer to this criticism, Berkeley said that the existence of ideas in my mind proves that there is a God. Then other human minds must also exist, for God would not make me aware of other people if they were not there. This is very similar to what Descartes had said.

Another difficulty with Berkeley's position is that it is so far removed from everyday life. How can a person distinguish between a roaring lion and the illusion of one? One difference between ideas and material things is that the former are much easier to manipulate, as philosophers are so fond of doing. Also, how can we know if the perception of things by an infinite God bears any resemblance to our perception of them?

Hume (1711-76)

David Hume was a man who had a varied career. He wrote books on history as well as philosophy. He had an even more critical and sceptical view of the world than Locke or Berkeley, his aim was to discover the limits of human reason.

He did not see the need to be completely consistent, for his aim was to show that we cannot be rational and consistent. So it is difficult to summarize his beliefs.

He said that we receive impressions from our senses, then as we think about these, our minds associate them to form ideas. This linking of ideas is similar to the force of gravity which causes things to attract each other. There are various ways in which we may associate ideas; because of resemblance, or because they are linked in time and space, or because one event appears to cause another.

He followed Berkeley in saying that the question of cause and effect is simply because two things are associated, not because there is some external necessity. The only link is that we observe one event to follow another.

He said that we cannot talk about a non-material self. What we call our "mind" is a continuous succession of separate sensations. It is passive, it associates ideas and does

not generate them. But he was not always consistent, for when he wrote about people thinking and feeling, this implies that we are "selves" who have these thoughts and feelings.

He admitted that he did not apply his philosophy to his everyday life, he was simply pointing out the result of saying that we do not have a thinking mind and that consciousness is simply a series of sensations.

Hume is considered to be the founder of the modern view that does not believe in anything that can be classified as abstract metaphysics. He said that the only knowledge that we can have which is not gained by experience is that concerning logic and mathematics. One of his best known quotations is his conclusion to his book Enquiry: "If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, `Does it contain any abstract reasoning concerning quantity or number?' `No.' `Does it contain any experimental reasoning concerning matter of fact and existence?' `No.' Commit it then to the flame; for it can contain nothing but sophistry and illusion."

Kant (1724-1804)

Immanuel Kant is one of the philosophers of the Enlightenment whose influence is still felt today. In his writings, he tried to take a fresh look at philosophy and reassess its nature and purpose. But basically he still followed the Continental tradition of rationalism.

He said that the purpose of philosophy was to determine what reason can and cannot do. He began by asking three questions:

What can I know?

How do I gain this knowledge?

How can I know if this knowledge is true?

He wanted to investigate Plato's view that we are born with innate ideas, and to reconcile it with the current scientific viewpoint. How much, if any, of our knowlege is a priori? Are we born with any knowledge of the outside world?

He first examined critically the views of past philosophers. He condemned the rationalists for ignoring facts by saying that the external world is like mathematics where truth is logically determined. They could accept that things are what they are for no logical reason.

He disagreed with the empiricists because they relied only on the experience of their senses to gain knowledge. He said that our knowledge begins with experience, but does not arise out of it. How can our minds arrive at rational laws? He decided that they must have the ability to order facts and form conceptions, they condition all that they encounter.

He said that our minds receive data from our senses, then they compare these with others received previously, and fit all into an orderly framework of relationships. The principles of thought which we exercise in processing our observations are there from birth, they are a priori. In other words we are born assuming that there are laws of science, that things happen in a regular way.

He divided these mental processes into two categories. First there are the Forms of Intuition. We are aware that we live in a three dimensional world, that things can be above or beside or behind other things. We are also aware of time, that events follow one another in sequence. These mental operations are necessary to connect our experiences

Secondly there are Categories. Examples of these are substance (matter does not just appear or disappear), and causality (the idea of cause and effect). By using these categories, we process our sense impressions to recognise things, they may tell us that we are smelling a rose, or greeting a friend.

He believed that the external world is real. He said that it is made up of `noumena' (it is thought that by this he meant "things in themselves"). But we only perceive this world as moulded by our minds, what we know are only phenomena. As we receive sense impressions, our minds bring these together to form knowledge. We are born with the ability to impose a framework on this knowledge.

He agreed with Berkeley by saying that the world of phenomena only exists in our minds. But we do not invent the notion of an outside world, rather this world reveals itself to us through our senses.

At first he approved of Hume's attack on metaphysics. But he came from a religious background, and did not want to deny the moral and religious side of life, so he said that we cannot rely only on our senses to gain knowledge. His views on this subject are given in chapter 8.

One obvious problem with Kant's position is that he separated what we call the real world from the world that we perceive through our senses. On his view, the more we think about what we perceive, the further we get from knowing about things as they are. So why talk about something if we have no means of knowing anything about it? The thoughts of philosophers were becoming increasingly separated from those of scientists.

Also, his suggestion that we are born with a priori principles is must be put to the test of psychological evidence, as must Plato's theory of a priori knowledge.

Hegel (1770-1831)

Georg Hegel was a professor of Philosophy at Heidelberg. His views were very abstract, as Kant's were, seemingly divorced from the everyday world.

Hegel's basic idea was that of `Geist'. This one word combines the idea of Mind, (rationality), and Spirit (the religious aspect of Reality). For him all reality is the outworking of Geist, whether in nature, history, or thought. Human knowledge is the Absolute Geist thinking through human minds. As we think, ideas enter our mind, and the sum total of human knowledge constitutes Reality.

Nature is ultimately spiritual, Geist is the principle of order which governs everything. It is an evolution of Mind from the nature of God. In the world of human experience, it is our idea of this order.

We experience Geist, rather than thinking about it. This means that his philosophy was more like a pantheistic religion.

He also emphasised the unity of everything. The whole is more important than the parts. We learn more about things by looking for associations. Thus we learn more about a person by looking at his background, his friends etc. Also we need to realise that everything is developing, eggs turn into chickens, and babies grow into adults. We need to consider where things come from and what they develop into, concentrating more on processes than things. It is interesting to note that this idea of evolution in the general sense was put forward 50 years before Darwin's theory of biological evolution.

Because his philosophy was so abstract, having little connection with everyday life, it is not surprising that there was a reaction against it. If his view of the unity of everything is applied to society, there is a danger that we lose sight of the individual. It is right to emphasise the social aspect of our life, but not at the expense of the personal.

Pragmatism: Charles Pierce (1839-1914)

Charles Pierce was the first to use the word Pragmatism as a philosophical system of thought. But in time the word acquired a much wider meaning, so in the end he disowned it as describing his philosophy. The school of thought known as Pragmatism flourished in the U.S.A. at the beginning of the twentieth century. It was one of the many reactions against Idealism.

Pierce said that the test of the meaning of an assertion is how it affects our lives. He considered all knowledge to be like scientific knowledge where the criterion for something being accepted as true is if the scientific community as a whole accepts it.

William James (1842-1910

Many of Pierce's writings were unpublished in his lifetime. It was William James who made the ideas of Pragmatism more widely known.

James reacted against Hegel's Idealism, the idea of an infallible and impeccable Absolute, for this does not fit in with the imperfections and evil of the real world. Reality must not be divorced from actual experience. Also, against Hegel's emphasis on the unity of everything, he said we must accept apparent inconsistencies in the world. We must also leave room for individualism.

He objected to any kind of dogma or insistence on absolute standards of truth because we can neither prove nor disprove the existence of God. He said that the truth of an idea must be judged by the thoughts and actions it leads to. "The `true' is the name of whatever proves itself to be the good in the way of belief" (Principles of Psychology). If there is anything Absolute, it does not mean it is real, rather it is a goal we should aim at. For the scientific ideas which are accepted today may not be accepted tomorrow. So how can we talk of Absolute Truth?

He did not believe in a human "soul", rather he agreed with Hume that we are a collection of perceptions. Our consciousness is continuous, we are not aware of the end of perceiving one thing and the beginning of another perception. But our minds analyse our experience and break it up so that we are aware of individual objects around us and their relationships to each other. Also, when we perceive something outside us, we are not conscious of the various processes that go on, we simply see a flower, and feel it, and smell it. That makes it real enough.

Pragmatism can be regarded as a logical development from empiricism. If we only take account of what our senses perceive, it means that we are the final authority, we do not accept anything higher than human nature. James' criterion of truth is difficult to apply absolutely, for a belief which brings benefit to one person may be to the disadvantage of another. History has shown that individuals tend to exploit such ideas to their own advantage saying "might is right". The politician usually allies with the soldier rather than the philosopher or the preacher.

Kierkegaard (1813-55)

Søren Kierkegaard was another who reacted against the abstract philosophical views of that time, especially those of Hegel. He is considered to be the forerunner of the outlook known as existentialism.

It is difficult to summarise his views, as he deliberately set out to be obscure in what he wrote. For him, truth was not objective and plain to understand, it was subjective, discovered by long and sometimes painful self-analysis.

He saw the philosophy of people like Hegel as too impersonal. For him feeling and choosing were more important than thinking. We need to consider our destiny in life, the possibilities that lie ahead of us. What matters is commitment to a particular belief, and this requires faith rather than reason, staking one's life on a particular belief. Whether or not there are grounds for any one belief did not seem important to him.

So, like Pierce, he did not believe in Absolute Truth, the difference between the two was that Kierkegaard put more emphasis on feeling and commitment. Taken to extreme, this view seems to suggest that it does not matter what you believe so long as you are sincere about it!

The Twentieth Century

The Twentieth Century was a time of political and technological change. This is reflected in the different philosophical outlooks. Psychology was the last field of enquiry to move from the realm of philosophy to becoming a science. So what was there left for philosophers to consider? There was still the question of the relation of philosophy to religion. Could they finally do away with religion, or should philosophy become a pseudo-religion and absorb religious ideas into itself?

The two major systems of thought which arose at the beginning of the century were Existentialism and Logical Positivism.

Existentialism

This movement was more of a way of life than an abstract system of thought. It has been suggested that its origins are in the saying of Socrates, "Know thyself". The language of existentialism is full of ordinary words which are used as if they had a special meaning, though their exact significance is not always clear. So we read phrases such as the need to find "authentic being" which we find in "commitment", and being "open" to the world.

Two of the best known existentialists were Martin Heidigger and Jean-Paul Sartre.

Martin Heidigger (1889-1976)

His aim was to find a meaning for human existence, so his main emphasis was psychological. He believed that we arrive at truth not so much by thinking as feeling, and the attitude we should feel towards it is *Angst* (the nearest English word to this is "anxiety", but with no specific object that we should be anxious about).

One thing that is important in life is the awareness of Time, not just of chronological time, but seeing the present as giving us opportunities of choice. We need to show "care" (German: *sorge*) about this.

One of his more obscure ideas was that of "Nothing" (German: *das Nichtes*) writing about it as if it were an entity. It is something we feel rather than understand. He wanted to know why anything exists, rather than nothing, but could find no answer.

He applied this to human life by saying that just as everything that exists is bounded by Nothing, so human life is bounded by Death. This is what ultimately limits our opportunity for making choices. In view of this, we must seek to live "authentically", that is facing up to the finality of death.

Jean-Paul Sartre (1905-80)

Jean-Paul Sartre was openly atheistic, rejecting any external objective authority. He emphasised the freedom of the individual. Each one of us is on his own, each has to work out his own choices and values in life.

He also wrote about "Nothing" (French: *le néant*) as if it were an entity. It is this which releases us from any constraints so that we can make free choices. But we have to accept that this is a responsibility. We are not bound by absolute moral standards, but how we live shows how we expect others to live.

Death was also important to him, for it brings to nothing whatever high ideals a person may have.

He looked on other people as enemies in the sense that he felt the need to struggle to maintain his identity, and make his own decisions without other people dictating their standards to him.

Existentialism became fashionable as a way of life. It was a protest against the personal implications of modern technology and bureaucracy, and a challenge instead to individual thought. The idea of an irrational philosophy became popular because rationalism had proved sterile. But this made it a highly subjective outlook. It found relevance during World War 2 because of the mass material and spiritual destruction that was taking place.

Ludwig Wittgenstein (1889-1951)

Ludwig Wittgenstein was born in Vienna, and travelled around Europe in his lifetime, eventually settling in Cambridge, England. He had a keen intellect, and his ideas developed during his lifetime, so it is difficult to summarise them. He sowed seed ideas which others developed.

He considered that the main aim of philosophy is to clarify thought. This is an activity, not a theory. And the result is not so much the putting forward of propositions as clarifying them. Thus philosophy should be concerned with the meaning of words. He therefore considered the relationship between language and the external world, but his conclusions as to this relationship are not clear.

Logical Positivism

This is the name given to the philosophical movement which arose at the beginning of the Twentieth Century and grew out of a group of students and teachers at the University of Vienna who became known as the Vienna Circle. Many of them were scientists. They rejected Hegel's Idealism, wanting to put forward a scientific philosophy which would do away with metaphysical ideas. In this way, they followed Hume's outlook.

They shared the view of Wittgenstein that the truth of a proposition depends on the method by which it can be verified. They adopted as their basic tenet what they called the Verification Principle. This says that a statement is only meaningful and genuine if it can be verified in a way similar to that in which scientific hypotheses are tested by controlled experiments.

Their views were made known in this country by Alfred Ayer (1910-89). He modified the Verification Principle to say that a statement is only significant if we know how to verify it. So if I receive a parcel which feels as if it contains a book, I can say "This parcel contains a book". This means that a statement may be meaningful but not true.

Therefore all metaphysical statements are meaningless because there is no way of verifying them. Statements to do with morals and religion are basically about emotions. Thus if a person says that it is wrong to steal, it simply means that he disapproves of stealing. Thus Ayer rejected all idea of absolute moral values.

It must be realised that the Verification Principle is not something which can itself be verified, it is simply an assumption, a starting point. And assumptions are assessed by what they lead to.

This approach also sidesteps the idea of truth. You cannot prove that a statement is not true simply by claiming that it has no meaning, for it is impossible to disprove the existence of anything.

Instead we could ask the question the other way round. Is there any positive evidence for accepting the reality of anything that is not part of the material world studied by Science? This will be considered in chapter 9.

Alfred Whitehead (1861-1947)

With the growth of scientific knowledge, it has become increasingly rare for people to become a specialist in both science and philosophy. Alfred Whitehead was one who was in a position to do that, as he studied both maths and philosophy. But he is another whose writings are hard to understand.

Whitehead tried to solve the problem of the relation between mind and matter by saying that they are not different in nature, but are two interwoven threads in the universe. He said that all things have both a mental and a material aspect. The physical forces between different bodies exist because they "perceive" each other. Thus everything has life in one sense.

He emphasised the principle of unity in the universe. The whole imposes its character on the parts. He followed Aristotle by saying that everything has a purpose, a "subjective aim", This is useful when dealing with people, but not in objective scientific theory.

He also anticipated modern cosmology by saying that there is an infinite number of universes that might exist, it was God who determined which Universe actually came into existence. He also believed that God has guided evolution not just in the scientific sense, but more like Aristotle's idea that everything should achieve its full potential. It is the task of philosophy to guide us to a new understanding of our potentiality.

Others have followed Whitehead by bringing religious concepts into scientific theory. But we will see in the next chapter that science only made significant advances when it was able to develop a way of looking at the world independently of the religious view.

Recent Trends

Because we live in an age of specialisation, those who regard themselves as "pure" professional philosophers have tended to concentrate on topics not related to any other specialist discipline. There have been important studies on the relation of mathematics and also logic to philosophy.

Because there has been no general agreement as to the answers to at least some of the fundamental questions raised in chapter 1, many have given up trying to answer them. There have also been those who have merged scientific ideas with philosophical and religious ideas and sought to adopt a more uniform approach to life. This is like the approach of existentialism in that it is more of a way of life than an academic discipline. Some of these ideas are considered in chapter 6.

Another topic arising from logical positivism has been the study of language. This involves the analysis of sentences to see whether they contain statements of fact, intent, etc. This study has some value, for anybody who tries to convey ideas in writing, whether

scientific or historical must make sure that statements are meaningful in the sense that they can be easily understood by a person reading them. Indeed, we can say that philosophy performs a useful task if it gives to each subject the philosophical tools to understand its own function.

There are now such a variety of different views that claim to be a philosophy in the general sense that it is difficult to find a common factor. Most of them reject the idea of an external authority, or anything that can be regarded as Absolute or Reality. We have to decide for ourselves if things are morally right or wrong. It is little wonder that the prevailing mood is one of pessimism, the human mind has shown itself incapable of arriving unaided at anything which might be generally accepted as Truth.

In the next chapter we will investigate the development of science where by contrast there is now a vast body of knowledge and theory which is widely accepted.

Chapter 3 The Development of the Scientific Method

Science and Technology

People can be divided into "thinkers" and doers". Thinkers like to ask the question "Why?" Why does this happen? Why is the world as it is? These are the pure scientists. On the other hand, doers are those who make things happen. They are the technologists.

Technology can be said to have started with civilisation. Over 4000 years ago, people were contructing great buildings in different parts of the world, so they must have had means of moving and lifting heavy blocks of stone. They also constructed various "engines of war" such as large catapults to help them fight their enemies.

Until fairly recently, technologists have operated with very little knowledge of what we call "pure science". They knew that things worked, but they did not have theories which connected a wide number of different events. It is only in the last 200 years or so that technology has come to rely more on theoretical knowledge. As the complexity of things has multiplied, they can no longer afford to "cut and try".

Even today, what distinguishes a true engineer from a pure scientist is one of attitude. When an engineer is faced with a real life situation where many different factors are involved, they may rely more on "gut feeling" to solve a problem instead of thinking of all the abstract formulae that operate. They are satisfied when something works. A pure scientist wants to know why it works.

The roots of science

The roots of "pure science" lie in both ancient philosophy and religion, and we have seen that there was no rigid distinction between these two subjects until relatively recent times.

As early man tried to achieve some control over his environment, he became aware that there were many things that he could not control directly; the weather, fertility in man and animals etc. Instead they believed that such things were under the influence of one or more gods. Therefore they needed to persuade the appropriate god to act for their benefit.

There is evidence that astronomical observations were made in many different parts of the ancient world. By 2000 B.C., the Egyptians had discovered that the annual flooding of the Nile occurred when certain stars were in the same position. So they were able to predict the annual flooding of the river by observing the positions of these stars. Also, because they counted roughly 360 days in a year, they were the first to divide the circle into 360 degrees.

The main impetus in early astronomy was probably the belief that the position of the heavenly bodies influenced life on earth, what we now call astrology. So they tried to find regularities in the apparent motion of the sun, moon, planets and stars in order to predict their positions in the future.

The ancient Greeks believed that everything in nature conformed to a rational pattern. This meant that if a few simple observations were made, this pattern could be discovered. They had no idea of what we called "controlled experiments". Their theories were more what they thought should happen than what was actually seen to happen.

Aristotle's legacy

Aristotle believed that there may be up to four different causes for any particular event. First there is the immediate cause, what we would consider the cause as viewed by the scientist. But he said that it was more important to consider the final cause, or purpose of any event. For we saw in the previous chapter that he believed that everything has within

it the potentiality to develop into its most perfect state. There may also be two other intermediate causes.

This idea of causation is a projection of human ideas onto nature. A painter will have certain reasons why he paints a picture. Aristotle would have called this the final cause. But the immediate cause of the painting is when he dips a brush into paint and presses it onto the canvas. Aristotle put more emphasis on the final cause, as he believed it was more important to consider the purpose of events. But that idea only applies when considering events which are brought about by agents which have the ability to act with a purpose in view.

This emphasis on final causes set people off on a false trail for centuries. For example, Aristotle said that our skin is relatively tough so that it protects us, he was not interested in what made skin tough. Science did not advance far until people started looking for the immediate causes of events.

Another belief of his was that he did not think it right to perform what we would call a "controlled experiment" to investigate something, for he said that this interferes with nature. Instead we should simply observe what happens without interfering. This also shows his bias to biological science because it is easy to observe natural events. But controlled experiments are also needed to separate out all the factors influencing a situation before we can discover the effect of each factor separetely.

His views on motion were based on the normal experience that when you want to move something, you need to push it; then when you stop pushing, it stops moving. However, if you are travelling at speed on a motorway and your brakes fail, you suddenly discover that when the applied force is removed, the moving object does not immediately stop!

Also, he said that when a stone is thrown, it first travels in a straight line in the original direction, then it falls vertically down, as in some cartoon films. This view persisted till the fifteenth century when Leonardo da Vinci (1452-1519) observed the path of mortar bombs as they flew over enemy ramparts and found that Aristotle was wrong.

Religious Dogma

The ancient Hebrews attributed all natural events directly to the action of God. In the Bible we read that he sends rain and makes the sun rise. Therefore nature tells us something about God. These ideas were carried into Christian thinking, their religious views dominated their view of the world. But does this rule out immediate causes for rain and sunshine? Some people found it hard to cope with the idea of more than one cause for a particular event.

During the Middle Ages, books were written about animals and plants, called bestiaries and herbals. These were based on a small amount of observation and a large amount of tradition. Each description of a plant or animal was accompanied by a moralising sermon. This shows that at that time, people thought that the main purpose of nature was to provide a source of moral lessons.

It was the Arabs who brought Greek learning (based on Aristotle) to Europe, when they conquered Spain. They set up astronomical observatories. One example of their scientific studies is that in about 1000 A.D., the scholar Alhazen produced 7 books on topics such as optics and music. They also made considerable advances in maths, including the development of algebra which became a great help in formulating scientific theories.

During the twelfth century, Aristotle's works were rediscovered in Western Europe, and this led to a more practical outlook. One of the earliest people who could be considered to have a "scientific outlook" was Robert Grossetesste (1175-1253), Chancellor of Oxford University, who later became Bishop of Lincoln. He was one who found out about the learning that the Arabs had brought to the West. He stressed the need to make observations, then to put forward laws to account for them. These laws are thus obtained by a process of induction, a general statement is made summarising the results of several observations. Then, on the basis of this, predictions are made by a process of deduction. This is, in fact, the process by which scientists operate today, but it was not generally accepted at that time.

Another notable scholar of that period was Roger Bacon (c.1215-92). He learnt Arabic and so was able to study the discoveries made by the Arabs. He also said that in order to find out the secrets of nature we must first observe for ourselves, and not simply rely on what others have written. But when he let it be known that he considered the thinking of the Church to be behind the times, he was imprisoned, and his views were forgotten for more than a century.

At that time, there were three main driving forces for scientific experiments. Astronomy was still dominated by the ideas of astrology, even though there was no support for them in official Christianity.

In chemistry, the main goal was to make gold out of more common metals, what we call alchemy. The reason why they believed this should be possible was Aristotle's theory that everything was made out of the four elements of earth, air, fire and water. Therefore the only difference between gold and the more common metals must be the proportion in which the four elements are mixed. It is interesting to note that modern Physics has shown how it is possible to transform one element into another, because all elements are made up of different numbers of the same elementary particles. But it is not an economically viable proposition to make gold by this method.

In the biological sciences, medicine dominated. But progress in this was held back by false ideas about life in general and human nature in particular.

Technology was developing independently of any formal scientific theory. The mechanical clock had already been invented and was being improved. It provided a useful "model" to describe the Universe; they believed that it operated according to fixed principles like the workings of a clock.

The cosmological debate

We have seen that during the Renaissance, there was an increasing emphasis on human reason as opposed to religious tradition. Also, the experiments of the scientists were providing a new source of knowledge. There was bound to be tension as long cherished traditions were challenged. It was in the field of astronomy that the first major conflict occurred between scientific observation, religious dogma and philosophical tradition.

As people watched the sun rise in the morning, travel across the sky, then set in the evening, it was only natural to believe that the world was fixed and that the sun moved round it once a day. Also, the stars appear to move round the earth in just under 24 hours, so they said that these must fixed to a great "celestial sphere" which rotated slightly faster than the sun.

But behind this the theologians saw a more important principle. According to the Bible, man is the summit of God's creation, so the earth must be the centre of the Universe,

and all celestial bodies must move around the it. To this they added a quotation from the book of Psalms, "The world is firmly established; it cannot be moved" (Psalm 93:1).

Another principle they held was that, because heaven is the dwelling place of God, everything in "the heavens" (i.e. the sky) must be perfect. So the sun and stars are the perfect shape - spheres, and they all move in the perfect path - a circle. The phases of the moon and its dark markings were explained by saying that because it was so near the earth that it had become corrupted and so was not quite perfect!

Seen from the earth, the motion of the planets is quite complicated. During the middle ages, astrological predictions were made using a complicated mathematical model consisting of a series of interconnecting spheres that had been put forward in the second century A.D. by the Greek astronomer Ptolemy.

When the Polish lecturer Copernicus (1473-1543) was given the task of making predictions of the moon's phases so that the Church could fix the dates of Easter for a long time ahead, he decided to try to improve on the method of predicting the positions of the planets. He discovered that this became much easier if he assumed that the sun was fixed and that the earth and the planets move in circular orbits round the sun. Because he knew there would be opposition to this idea, he delayed publication of his theory till he was on his death bed. It did not achieve much publicity, probably it was suppressed by the church.

But this idea was revived when the Italian scientist Galileo (1564-1642) found more evidence to support it. The telescope had recently been invented, and Galileo was able to construct one which magnified things about 30 times. First he saw sunspots. Why was that a revolutionary discovery? Because the traditional view was that everything in "the heavens" was perfect, and so the sun's surface could not have blemishes on it!

Then he saw four moons circling round the planet Jupiter. This was clear evidence that the earth was not the centre of all motion. If these moons went round Jupiter, then it was possible for the earth and the planets to circle the sun.

He published his findings and his deductions in a book which he dedicated to the Pope in the hope that it would be looked on favourably. But the Pope took advice from others, and so at the age of 67 Galileo was forced to admit that he had been deceived. He was put under house arrest and he confined his investigations to less controversial topics. Recently the Polish Pope John Paul II has reinstated Galileo and has acknowledged that he did make an important contribution to scientific knowledge.

Galileo and the Laws of Motion

He also disproved Aristotle's law of motion. As a student, he attended services in the Cathedral of Pisa. It seems that he was distracted from the spiritual value of the services by the great lamp which hung from the ceiling. The slightest breeze set it moving, and then it continued to swing from side to side. He realised that motion can continue even when there is no driving force. Therefore just as a force is needed to produce motion, so a force in the opposite direction is needed to stop something moving. This was a significant step forward in the theory of dynamics.

But as yet they did not see the need to make accurate measurements. They considered that the purpose of experiments was to lead to a mathematical theory, they did not share the modern obsession with precision.

Universal Science

The story of the apple falling on the head of Isaac Newton (1642-1727) is probably fictitious. What we do know is that he was trying to find a theory to explain the motion of the

moon round the earth and the planets round the sun. Since Galileo had argued that no force was needed to keep the moon moving, what was needed was a force to prevent it from moving out into space. He realised that the curved path of the moon is similar to the curved path of a stone which is thrown sideways. The faster it is thrown, the further it travels before it hits the ground. Because the earth is a sphere, if the stone was thrown fast enough, it would circle the earth and return to its starting point (neglecting the resistance of the air). In this way he predicted the possibility of artificial satellites over 200 years before the first one was launched.

He therefore said that there exists a force which we call gravity which pulls everything towards the centre of the earth. This idea of a force between two objects which are not touching seemed very strange to the people of the day. So Newton said that it was God who caused this force.

Then knowing the strength of gravity on earth, the distance from the earth to the moon, and the time that the moon takes to go round the earth, he was able to find the mathematical formula giving the variation of the strength of gravity with the distance from the centre of the earth.

Newton's advances in mathematical theory enabled him to prove that his formula for gravity led to the prediction that planets would move round the sun in elliptical (oval-shaped) orbits. This agreed with the observations made by the German mathematician Kepler (1571-1630) of the paths of the known planets. So one simple formula was able to explain several different phenomena. The significance of this was that the laws of science were seen to apply, not just to things on earth, but throughout the universe. "The heavens" were no longer the exclusive province of theological dogma but were open to scientific observation.

Other Sciences

At the same time, radical advances in anatomy were being made. Throughout the Middle Ages, they accepted the writings of Galen who lived in the Second Century A.D. He had dissected animals and also humans (the corpses of criminals), and had made careful drawings and descriptions which were accepted as correct for the next 1500 years. But some of the details were shown to be incorrect by Andreas Vesalius, a Belgian surgeon, and a contemporary of Copernicus, who also dissected animals, and was able to steal the body of a recently executed criminal to examine. In 1543 he published the first accurate description of nerves, muscles and blood vessels.

But the most significant discovery of that period was made by William Harvey who published a book in 1628 in which he said that the heart is a pump which makes blood circulate throughout the body. In some ways, this view was as revolutionary for anatomy as Copernicus' theory was for astronomy. For up till then, the heart had been thought of as the centre of a person's thought and affections (we still use this meaning of the word "heart", but only in a symbolic sense). Now its function had been reduced to that of a mere mechanical pump. A wedge was being driven between our physical and our emotional natures.

Fortunately for Harvey, his theory did not cause such as stir as the theories in astronomy. It has only been the recent development of psychology as a science that has caused people to think more deeply as to how to regard the emotional and other non-material aspects of our nature in the light of scientific discovery. That question is returned to in chapter 7.

In Chemistry, many seemingly unconnected facts were being discovered and no theory was found to connect them. The search to make gold still went on. The Eighteenth Century saw the introduction of accurate measurements, no longer was it a merely descriptive subject. The careful measurements of Antoine Lavoisier (1743-94) led to the

discovery of oxygen. He weighed the substances involved in various chemical reactions, and this led to the discovery that substances combine chemically in fixed proportions.

The Triumph of Science

The nineteenth century saw the peak of science as a rational system. Mathematical theory had also developed, so that in the physical sciences, many of the laws could be put forward in a mathematical form. This encouraged the making of careful measurements in order that a precise formula could be put forward.

Up till then, Physics had many branches with no apparent connection - electricity, magnetism, light etc. But by the end of the nineteenth century, Faraday and others had shown the connections between magnetism and electricity, and James Clerk Maxwell had predicted that it was possible to have electromagnetic waves travelling with the speed of light (light is one form of electromagnetic waves). They thought that there were only a few loose ends to tie up, and then whole of Physics would be demonstrated to be a unified rational system.

In Chemistry, John Dalton (1766-1844) put forward the theory that everything was made up of atoms, and these can link up to form molecules. When a chemical reaction takes place, atoms separate and recombine in a different pattern. This explains why substances combine in fixed proportions. In 1869, D.I. Mendeleyev, a Russian chemist, showed that all the different elements (substances made up of only one kind of atom) could be grouped according to their chemical similarity, so forming what is known as the Periodic Table. Since then, atomic Physics has provided the explanation for this; the position of an element in the Periodic Table is due to the arrangement of the electrons round the nucleus of each element. There were only one or two small anomalies that needed clearing up.

In Biology, they had discovered that substances which occurred in living matter could also be made artificially. Therefore the processes which occur in plants and animals are chemical reactions similar to those which can be performed in a laboratory. No longer was there a rigid barrier between Chemistry and Biology.

The nineteenth century also saw a controversy between Biology and Theology which has proved even greater than that over Copernicus' view of the Universe. In 1859, Charles Darwin published The Origin of the Species in which he put forward the theory that all living things had gradually developed from a very simple form of life. Immediately this was seen as attacking the dignity of man. If we have descended from monkeys, then we are no longer unique among living creatures. Once again the question was raised, can discoveries in Science have implications for religious belief?

From the start, Darwin's intention was to put forward a purely scientific theory describing how life forms could develop by the process of natural selection. He says in The Origin of the Species that he did not think his theory disproved the existence of a Creator God. But his friend T.H. Huxley immediately saw that if we can explain the origin of living creatures scientifically, then we do not need to believe in God. Also, many Christians looked on Darwin's theory of Evolution as directly contradicting the biblical account of the creation of the world.

The most celebrated encounter between the scientists and the theologians was the one organised in Oxford by the British Association for the Advancement of Science. Huxley was chosen to promote Darwin's theory, and he was opposed by Bishop Wilberforce. Unfortunately the latter resorted to mockery, with the celebrated remark asking Huxley if he was descended from an ape on his father's or mother's side. At least Huxley's reply was restrained, that he would prefer an ape for an ancestor than somebody who resorted to ridicule.

This controversy continues, showing that it is important to consider if scientific theories have any philosophical or religious implications. This question will be looked at later.

The main difficulty with the theory of evolution from the scientific point of view was that Darwin was not able to provide a mechanism to explain how simpler forms of life could evolve to more complex forms. A hundred years passed before this was found.

Apart from that, the nineteenth century ended on a triumphal note, scientists had achieved great success in understanding the workings of the Universe. They thought that only a few minor problems remained to be solved. The twentieth century brought revolutionary discoveries which have radically altered our view of the nature of scientific theory.

Chapter 4 The Revolution in Science

The structure of the atom

During the first thirty years of the twentieth century, discoveries were made which have radically altered our views of the philosophical status of the laws of science.

It had been known for some time that electricity can pass through a gas if the pressure is reduced. If the pressure is very low, the glass containing the gas is seen to glow. In 1897, the scientist Joseph ("J.J") Thomson found that these "cathode rays" which make the glass glow are streams of particles with a negative electric charge which became known as electrons. (This discovery led to the invention of the T.V. tube). So it was suggested that all atoms contain electrons, no longer can we think of them simply as hard particles (the word "atom" means literally that it cannot be divided), they have a structure.

Other particles can also come out of atoms. In 1896, Henri Becquerel found that photographic plates became fogged if they were stored near a compound containing uranium. The uranium must have given off particles which penetrated the wrapping round the plates. Later, Pierre and Marie Curie found that other substances, including radium, give off similar particles. They called these substances "radioactive".

These radioactive particles helped scientists to discover more about the structure of the atom. In 1909, Hans Geiger and Ernest Marsden studied what happened when a beam of alpha particles from a radioactive substance was aimed at a thin metal foil. Most of the particles passed straight through the foil, but a few were scattered in all directions. In a classic paper published in 1911, Ernest Rutherford explained these results by showing mathematically that the atoms in the foil must consist of a small nucleus with a positive electric charge, surrounded by negatively charged electrons.

In 1913, the Danish physicist Niels Bohr put forward the suggestion that the atom is a miniature solar system with the electrons orbiting the nucleus as the planets orbit the sun, and the force that keeps them in orbit is the electrostatic attraction between the electrons and the nucleus.

This means that most of the atom is empty space, the chair on which I am sitting is not as solid as it might seem. But more worrying discoveries were yet to be made.

There is an important objection to Bohr's theory of the atom. When electric particles move in a circle, they radiate energy. This is seen in the large particle accelerators which nuclear scientists build to study the nucleus of the atom; x-rays are given off as the particles hurtle round. So in an atom, what stops the electrons from losing their energy in this way?

This problem was solved after an even more startling discovery had been made. If a lump of metal is heated, it eventually glows red then white hot. But this fact was difficult to explain using the existing theories; what determines the wavelengths (colours) of light that are given off? In 1901, Max Planck showed that the results can be explained if the light from the hot metal is not given off in continuous waves, but in little "bits" of waves which became known as photons.

It was also found that when light shines on certain substances, they give off electrons, this is called the photo-electric effect. When Albert Einstein published his famous paper on Special Relativity in 1905, he included a section in which he suggested mathematical formulae for energy passing from matter to light and vice versa, based on what Planck had suggested. His formulae were found to agree with the results of experiments on the photo-electric effect. This confirmed that we must regard a beam of light as being made up of separate packets of energy called photons.

But how do we reconcile this with other properties of light? In Newton's time, there was a debate; does light consist of particles or waves? During the nineteenth century, it was found that waves spread out (diffract) when passing through a thin slit. This is similar to what happens when sea waves enter a harbour through a small gap in the harbour wall. Surely this proved that light consists of waves, since particles do not diffract? But how can we reconcile this with Einstein's theory that light consists of indivisible photons?

An even more surprising paradox was suggested by Louis de Broglie in 1923 when he said that matter should also show this dual nature, based on the belief that "nature loves symmetry". In other words, atomic particles such as electrons and neutrons have a wave nature. The chair I am sitting on now seems even less solid!

Direct proof of de Broglie's suggestion came in 1927 when Clinton Davisson and Lester Germer published a paper in which they described what happened when they directed a beam of electrons at certain crystals, and measured the number of electrons that were reflected at different angles. They found that more electrons were reflected at some angles than others. The same result happens when X-rays reflect off crystals, and is explained by the laws of diffraction, since crystals consist of particles (in this case ions) arranged in regular patterns. Now x-rays are similar to light except that their wavelength is shorter. So this experiment proves that what we call "particles" behave like waves when they travel. The main difference between photons and other particles such as electrons is that the former can only travel at one speed in a vacuum, the latter can travel at different speeds.

These experiments show that we cannot simply say that electrons and photons are particles or that they are waves. Instead we have to accept that they both travel according to the laws of wave motion, but when they interact with other "particles", we have to consider them as separate entities, each with a particular amount of energy. So we represent our knowledge of them by a mathematical formula called a "wave function". This represents what we know about the electron, its speed, position etc. It is not the electron, it is a "model" of the electron.

Scientific Models

When we are studying things which can be seen, such as the path of a golf ball after it has been hit, there are simple mathematical equations to predict its flight. But when we want a theory to account for the behaviour of particles which are too small to see, or a situation where there are large numbers of particles, we have to set up what is called a "model". This is a description of the situation possibly with a set of mathematical equations. We may obtain the model by making certain assumptions about the properties of these particles. The purpose of a model is to be able to make predictions as to what will happen in a given situation.

A simple example of a model is that which we use to account for the change in the pressure of a gas when it is compressed or heated. We know that a gas consists of molecules which are moving round at high speeds, colliding with each other. The pressure of the gas, for instance in a car tyre, is caused by the force exerted by the air molecules as they continually hit the walls of the tyre. Each molecule is very light, but because so many billions hit the tyre wall every second, and because they are moving so fast, they provide enough force to support the weight of the car. This explanation of air pressure is called the "kinetic theory of gases".

Although there are many molecules, all moving in different directions, it is possible to derive a fairly simple mathematical formula telling us how the pressure changes if the gas is compressed or heated. This formula is derived by assuming that the molecules of the gas

are small, hard, spheres. The formula is found to agree with the experimental evidence so long as the gas is not near the tempterature where it liquefies or when the pressure is not too great.

Models are used in other areas of life as well. Economists make models of a country's economy to try to predict the results of a certain economic policy. These are mathematical equations which can be fed into a computer, together with the financial situation at a certain time. The "truth" of the model is then judged by its ability to make accurate forcasts of the future financial situation.

So a model may not be real in the philosophical sense, but its usefulness is judged by the number of situations it applies to. This is pure pragmatism!

Models for the atom

The theory of the atom put forward by Niels Bohr, that the atom consists of a nucleus round which the electrons circilate is a useful model for introducing atomic theory, and for explaining certain physical and chemical properties of atoms. But as we have already seen, we cannot take it as a complete understanding of the nature of the atom.

When de Broglie put forward his theory of the wave nature of atomic particles, it enabled a new model of the atom to be constructed. This was done by the Austrian Erwin Schrodinger. He assumed that the behaviour of electrons in an atom is similar to that of a wave when it is confined to a limited space, such as that on a guitar string when it is plucked. Here, a wave travels along the string, rebounding from each end. We say that a standing wave has been set up, there is a mathematical formula for such a wave. Shrodinger derived an equation from which it is possible in principle to derive a formula which represents the electrons in an atom by a three dimensional standing wave.

This "wave model" of the atom has been successful in predicting the many different phenomena including the chemical properties of atoms, and the behaviour of electrons in the many new ultra-small electronic devices which are now being produced.

The nucleus of the atom

At the moment, there is not the same certainty about the correct model for the nucleus of an atom. Fifty years ago, we believed that the nucleus was made up of neutrons and protons because these are observed to come out of the nucleus when it is hit by a fast moving particle.

Since then, scientists have been building machines which fire particles at high speed at the nucleus of atoms to see what new particles are produced. They have observed quite a profusion of particles which are very short lived. These rapidly decay into others which live longer. At the time of writing, scientists are not satisfied that the particles which have been observed are the ultimate “building blocks”. The situation may be rather like Russian dolls, where inside each doll is a smaller one. Will we ever be able to prove that we have found the ultimate building blocks of which everything is made? The answer is most likely to be "No". I believe we should be content with a model which can "explain" all known experimental results.

Then there is the question which philosophers have always asked, will we ever be able to get behind the various models of the atom to the "reality"? Before we can answer that question, we have to decide what we mean by reality.

Uncertainty

There are other puzzles that modern physics has produced which are important for understanding what exactly we mean by scientific theory. One is a problem bound up with the fact that light and matter both have wave and particle properties.

Suppose we want to "see" an electron. We need a super-microscope and we must place an electron in the field of view. Then we must shine photons of light onto that electron to reflect off it and into the microscope. But when a photon hits anything, it exerts a minute force on it. This force can be demonstrated by a device called a Crookes' Radiometer, which is a set of small paddles, black on one side and shiny on the other, mounted inside a glass bulb from which most of the air has been taken out. When a bright light shines on the paddles, they turn round because the photons exert pressure on them, just as water turns a water-wheel. So when a photon in our super microscope hits the electron, it is pushed away. Our effort to locate the electron has made it move in an unknown direction.

We find that certain physical properties occur in pairs, and the more precisely we try to measure one property, the less certain the other becomes. This fact is called the Uncertainty Principle. It can be shown to follow from the "wave model" which we use to represent our knowledge of photons, electrons etc. We represent them as "wave packets", waves which have only a few ripples, and certain features of the wave packet describe this uncertainty in our knowledge.

One application of the Uncertainty Principle is to electrons in a atom. This principle says that the smaller the space in which we seek to confine the electron, the more energy is needed. A crude illustration of this is catching a mouse in a mouse trap. At night time, you may hear the mouse scurrying around, keeping you awake. But until it actually springs your trap, you are not certain where it is. Once it is caught, you are certain of its position, but it is in a very distressed state if it is still alive. There are humane traps which confine the mouse without harming it, but the smaller the trap, the more agitated it will be.

In an atom, the electrons are confined to a region whose diameter is approximately 10^{-7} (one ten-millionth) of a millimetre. We also know the energy of its apparent motion in the atom. But the nucleus of an atom is about one ten-thousandth of the diameter of the space occupied by the electrons. Also the particles inside the nucleus have much more energy, about a million times more than the energy which binds the electrons which surround the atom. These figures agree with the predictions of the Uncertainty Principle.

However this uncertainty is not normally detectable when dealing with large numbers of atoms. And even if it were, we cannot draw any philosophical conclusions from it about the nature of “reality” as some are trying. Most of us are content with accepting the world around us as real, even if we cannot fit what goes on into a neat scientific theory.

Randomness

Another phenomenon which people find difficult to understand is that certain events occur at random; there is no known law to predict such events. The best-known example of this is when an atom of a radioactive substance gives off a particle. When a geiger counter is put near some plutonium, it can count the individual alpha particles which are emitted, and it is noticed that they do not come off at a steady rate, but are detected at random intervals. However, the average rate of emission is the same for a given number of plutonium atoms and is found not to depend on any outside influence such as temperature, pressure or the presence of other atoms. The emission of radioactive particles is found to obey the laws of statistics which apply to any event which is purely random.

Some people believe that there are factors which govern exactly when an atom will give off a radioactive particle. If there are, we will find them sooner or later, but at present, our theory must include this basic uncertainty.

But this does not present a problem when dealing with large numbers of atoms such as in nuclear weapons or nuclear power stations. The operation of these is certainly no less predictable than devices which depend on chemical reactions.

This random effect can have useful applications. It could easily be made the basis of a Random Number Generator for things like Prize Draws.

Chaos and complexity

Chaos Theory is a word which has recently come into the scientific vocabulary. It describes a set of mathematical equations which apply to situations where the outcome may not be immediately obvious. When a cake is mixed in a blender, the motion of an individual grain of flour may not be predictable, but we can find out the overall result. Chaos theory can predict the outcome of certain events much more simply than other theories. We discover by experiment the sort of situations it can deal with.

But the use of the word "chaos" does not necessarily mean that the situation is chaotic in the sense that the outcome cannot be predicted. The term Chaos Theory refers to the mathematical treatment which has been devised to deal with the situation, it cannot be taken in a philosophical sense.

Complexity is another new mathematical technique which in some sense is the opposite of Chaos theory. Here, regularities may be observed in situations where many different factors are operating. If a certain event keeps on occurring, such as a Stock Market crash, it may be possible to predict it if we can find that a similar chain of events always lead up to it.

This approach has enabled people to describe events as various as biological evolution, the weather, and the human brain. These may be very different situations, but because there are similarities in their behaviour, they can be analysed by a smililar mathematical process. This shows that the laws of mathematics can be applied to situations which are otherwise very different, so the fact that they obey similar mathematical laws does not prove there is any other link.

But it is important to realise that the ideas of chaos and complexity are not new discoveries, they are ways of analysing certain situations. They do not tell us anything new about the world.

The implications of all these ideas on the nature of scientific theory will be discussed in chapter 6. But first we need to consider one other area of scientific study, the question as to how everything began. And this is a major area where people are drawing philosophical and religious conclusions from scientific theories.

Chapter 5 Origins: how did it all begin?

The fascination of origins

All around us are clues to past events; broken pottery, old bones, paintings in caves. There are also clues to a more distant past, fossils of creatures long since extinct, weathered rock formations, and the debris from stars which have exploded.

We can use our present scientific theories to try and find out what events led to these clues. But whereas a laboratory experiment can be repeated many times to check a particular theory, the clues we find are the result of unique events, and we can never be 100% sure as to what happened, we can only look for a sequence of events which best fits the evidence we have before us. A footprint in the sand may have been caused by any number of different situations. True detective work consists of deciding what clues are significant, and making a suggestion as to what happened to produce those clues.

One important reason why people want to study the past history of the universe in general and mankind in particular is because they think it is relevant to the question as to whether or not there is a God who created everything, and that leads us on to the question as to what is the meaning and purpose of life.

And it is important to separate out three distinct issues when we consider this subject. First, what are the facts, the evidence of past events? Then we must ask what sequence of events best fits these facts? Finally we can consider if this sequence of events has any philosophical or religious significance.

In this chapter we will only look at the first two, we will look at the currently accepted theories, together with a summary of the evidence on which they are based. A consideration of their religious significance is given in later chapters.

There are three main areas of the past which have been studied, astronomy (or cosmology), geology and biology.

Cosmological Evolution

On a clear night in winter, many stars can be seen. Almost all are mere points of light, seemingly of no great interest. A good pair of binoculars enables us to see the phases of Venus, the rings of Saturn, and the features of the moon's surface. But there is little else to capture the attention of anybody other than the keen astronomer.

However, when more powerful telescopes were invented, the universe was found to be populated with many different kinds of objects. Nearest to us are the planets that orbit our sun, these are seen because they reflect the sun's light. The ordinary stars are similar to our sun and give off light because they are very hot. The nearest stars are grouped in what is called our galaxy. This is shaped rather like what a "flying saucer" is imagined to look like, and is about a hundred thousand light years in diameter (a light year is the distance light travels in a year). The Milky Way is made up of the stars which are nearest the centre of our galaxy. Also in our galaxy are dust clouds which hide some stars from our view, and spiral arms of hydrogen gas.

Beyond our galaxy are millions of other galaxies, the nearest being about a million light years away. Each is surrounded by a halo of hydrogen gas detected by the faint glow of light that it gives out. Most are grouped in clusters. Some galaxies are colliding with others.

Some stars occur in pairs, rotating round each other. Others are whirling round very quickly so that they appear to flash like the blue light on a police car. In these, the force of

gravity is squashing the matter in the star so that it is ultra dense. Eventually it is thought that these stars will collapse and become a black hole. We have also detected other radiations from stars and galaxies; radio waves, x-rays, indeed the whole of what is called the electromagnetic spectrum. Astronomy has made some spectacular discoveries about the nature of our universe since observations of these other radiations began about seventy years ago.

The Big Bang

The study of the history of the universe began in 1929 when the astronomer Edwin Hubble announced that the galaxies were all moving away from each other. The hydrogen gas in the different galaxies gives out light of particular wavelengths (colours), and it was already known that the light from the hydrogen in other galaxies was more red than from hydrogen observed on earth. This "red shift" can be explained by saying that it is due to the Doppler effect. This is the name given to the change in pitch of the note from a police-car siren as it comes towards you then goes away. Hubble found that certain stars, called Cepheids, whose brightness varies with time, can be used as distance markers, for the time for one cycle of variation depends on its absolute brightness (actually there are two groups). So if a Cepheid is seen in another galaxy, by measuring the time of one cycle of variation, and the apparent brightness, the distance of that galaxy can be calculated.

Hubble then found that the more distant galaxies are moving away faster than the ones which are nearer, which means that the whole universe is expanding. Working backwards in time, he suggested that there was once a time when all the matter in the universe was concentrated in a small region of space, and was suddenly flung out at great speed. This event was called the "Big Bang" by the astronomer-mathematician Fred Hoyle in mockery. But the name has stuck as the evidence for this theory has grown. From the speed at which the galaxies are moving apart, Hubble calculated that the Big Bang was approximately ten billion years ago.

If the universe originated in a ball of very dense matter, as it expanded, galaxies and stars could only be formed if there was a variation in density of the matter. Where the density was greater, the force of gravity would draw the atoms still closer together and eventually galaxies and then stars would condense out of the surrounding gas.

One important piece of evidence for the Big Bang theory was found in 1965. If the initial density was very great, radiation would not be able to escape. But as the universe expanded, the particles would give off radiation because any hot object glows. This radiation would then become progressively red-shifted towards the microwave end of the spectrum as it was constantly being reflected from the expanding matter.

This radiation was first detected by chance by Arno Penzias and Robert Wilson when they were setting up a microwave satellite communications system. They detected a constant "background noise" of microwaves which they eventually found was coming from outer space, and it was coming evenly from all directions. They turned to the astronomers for an explanation, and these realised that it was the evidence they needed - here was the faint glow from the initial Big Bang that was still wandering round the universe.

However there was a problem; the fact that the intensity of this "microwave background" radiation was found to be uniform, there were no brighter or fainter regions. This could only mean that the original ball of matter was very uniform. But if there was no variation in density, no "lumps", how could stars and galaxies condense out?

In 1992, measurements made with the COBE satellite showed variations in the intensity of this background radiation of about 0.01 percent. The media hailed this as

conclusive proof of the Big Bang theory, but surely this must rate as the hype of the century. However, more surveys have shown enough variation to satisfy people working in that field.

There is also uncertainty about the rate of expansion. But at least we can say that the available evidence of cosmological evolution points to an age which is measured in billions of years.

Link with nuclear physics

An important link has been made between nuclear physics and cosmology. If in the early stages of the Big Bang, matter was very hot and very dense, it could only have existed as the most basic particles. Then as the energy density gradually decreased, the particles grouped together to form the protons electrons and neutrons, which form the atoms which we see today.

It is estimated that about 75% of the matter in stars is hydrogen, nearly 25% is helium, and the rest of the elements occur only in relatively small quantities. This can be explained theoretically because the nuclei of the different elements could only form when their protons and neutrons had enough energy to come together, but not so much that they would fly apart again. This fits in with the rate of expansion needed to form the families of particles which we observe today.

It is interesting to see that one reason being given for doing further research into nuclear physics has been to tap into this public interest in the early history of the universe. But we can only guess at past events using our present theories. And personally I do not see that what happened a long time ago has any philosophical or religious significance.

Geological Evolution

The cliffs overlooking the sea in places like the Dorset coast show remarkable rock formations. They are seen to be made up of many layers, and sometimes these are folded in remarkable ways. It was the study of such rock strata that led geologists to suggest that they had been laid down by natural processes over a long period of time.

This view was first given prominence when the geologist William Buckland published his "Bridgewater Treatise" in 1830. He was violently attacked by certain Christians because they thought that this contradicted the account of creation and of the early history of man in which we find in the Bible. Taking the account in Genesis literally, they believed that the earth has only existed for a few thousand years. But this controversy was overtaken by that over Darwin's theory of biological evolution.

There are two main processes occurring in geology. The first is when rivers carry sediments which are deposited on the river bed. As these accumulate, they become compressed and form sedimentary rocks. Digging down we find evidence of the past. By examining the stones and particles in detail, we can tell if the sediment was laid down quickly or slowly.

The other process involves rocks which were once molten deep inside the earth, called igneous rocks. Those which remained below the surface cooled slowly, others were thrown up by volcanic eruptions and cooled quickly. The first process can form large crystals, as when crystals are grown from a solution of a salt in water. The latter produces only small crystals. So by examining rocks closely, we can get an idea as to what process produced a particular rock formation.

Some rock formations show evidence that they have been bent or folded. Whatever force caused this must have acted slowly, over a long period of time. For if a force is suddenly applied to a rock it breaks, forming "faults" or "thrusts".

Weather erodes rocks. Glaciers carry boulders great distances. On the edge of the Scottish Highlands are thick deposits of rubble, evidence that they have been eroded over a long period of time, while sediments on the edge of the Alps show that they are much younger.

One of the most interesting geological discoveries of the last century was that the earth's surface is not static, all the land masses are moving around like gigantic walkways. Europe is moving away from North America, and India and Russia are moving closer. The speed is slow, only a few centimetres a year, but it is enough to open subterranean trenches in the Atlantic Ocean and to cause rock falls in the Himalayas. Earthquakes are caused by the different "crustal plates" moving relative to each other.

All this evidence has enabled geologists to date the different strata of rocks so we can say that there is strong evidence that the present shape of the earth's surface is the result of processes which have been acting over a period of time which is measured in millions of years.

If there are radioactive substances in a particular rock formation, we can get an independent estimate of its age by measuring the relative abundance of those original elements and the elements which are produced as a result of the radioactive emission. Such measurements usually give results consistent with the relative age as determined by the methods already mentioned. The oldest rocks appear to be a few billion years old. This agrees approximately with the age of the universe as obtained from the astronomical observations already mentioned.

Biological Evolution

In the eighteenth century, when coal mines were being developed and tunnels for canals were being dug, they began to discover fossils, forms of life which existed long ago. Some of these were similar to forms alive today, others were completely different. Here was clear evidence that biological species were not fixed, at least some change has taken place.

The French biologist Jean Lamarck was the first to attempt to trace a gradual development in the fossils of both plants and animals. He suggested that the changes which had occurred were due to changes in the environment.

Fifty years later, Charles Darwin put forward his theory of biological evolution. What led him to this was his study of the birds and plants on some islands in the South Pacific. He noticed that they were populated by the same species of plants and animals, but those on adjacent islands had small but distinct differences. He suggested that there must be a mechanism for causing such change, a change which must pass to the offspring after it occurred. He said that the forms of any one species on the different islands must have had common ancestors, and the differences developed after the islands became isolated geologically.

He then considered the fact that there is a struggle for survival in the natural world. Many individual plants and animals fail to reproduce. In this struggle, those with certain characteristics may have a better chance of reproducing, so causing that characteristic to survive. This is the celebrated idea of "survival of the fittest". If there is a change in the environment, those forms which are able to change in such a way as to adapt to the new environment will be more likely to survive.

He then made the bold suggestion that all living things had developed in this way from a very simple form of life.

What Darwin was not able to do was to discover a mechanism to explain how the variations in individuals occurred, nor how these variations were passed on to the offspring. This has only come about in the last 50 years, beginning with the discovery of the giant molecule D.N.A. This occurs in all living matter, and it is its ability to divide and replicate itself which is the mechanism whereby living things grow and reproduce.

Within a D.N.A. molecule are regions called genes. It is these that determine the characteristics of the living material. When sexual reproduction takes place, the genetic material of the offspring is a mixture of that of its parents; similar, but not identical. Occasionally, larger changes in the D.N.A. occur called mutations. These changes are then passed on according to the laws of inheritance.

Most plants and animals produce a very large number of offspring. Because of genetic variation, not all those will be identical. The ones which are most likely to survive are those whose characteristics make them best suited to their environment.

The study of genetics is the key to all biological change. An individual eventually dies, but if it reproduces, it passes on its genes. Those genes which survive are those within the bodies of organisms which are best adapted to their environment.

The study of evolution has come a long way since Darwin. We now have many examples of life forms which have been able to adapt to changes in the environment. Geology provides us with information about the great climatic changes which have occurred in the past, since life began on earth, and the fact that life has survived such great changes shows how significant are the processes of adaptation to change.

Macro- and Micro-Evolution

The small changes which have been mentioned so far are called micro-evolution. In the years since the publication of Origin of the Species, the micro-evolution of many different life forms has been studied. There have been many changes in the environment, some due to industrialisation, and some due to climate change. Some species have been able to make small changes which has enabled them to survive and flourish. Sadly those species which have not changed have died out. Nobody disputes the occurrence of micro-evolution.

Macro-evolution is the name given to the large scale changes which are needed for birds, fish and mammals to have developed from simpler forms of life. Proponents of macro-evolution say that it is caused by micro-evolution acting over a long period of time. The main experimental evidence for macro-evolution is the unity of the biochemical processes that occur in living organisms, in particular the division of DNA whenever there is growth or reproduction. So one way of tracing the possible development of different species is by comparing their genetic make-up.

Another useful piece of evidence is the difference between life forms on different islands. This is what led Darwin to his theory in the first place. Islands such as Australia have certain unique life forms. These must have developed after it became separated from other land masses. Thus it has several different kinds of marsupials which exist nowhere else, while placental mammals developed elsewhere in the world.

But there are many difficulties in tracing the development in detail. The fossil record shows few intermediate forms between the main groupings. It also shows that there were long periods when few changes took place, then in a relatively short space of time completely different forms emerged; this is called "punctuated equilibrium". Sometimes there were mass extinctions as for example that of the dinosaurs. Some of these, but not all, coincided with considerable change in the climate.

Critics of this theory are emphasize the gaps in the evidence, and the existence of complicated structures which would appear to have no survival value in a partially developed form. Now it is very difficult to argue from lack of evidence. We can continue to look for evidence of intermediate forms. At all times we need to ask what is the best scientific account of the development of the different forms of life that we observe today.

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Evaluation of the theories

We have seen that evidence from three different branches of science suggests that, starting from a cosmic explosion several billion years ago, the universe in general and life on planet earth in particular has reached its present state by the operation of the known laws of science.

Now there are some Christians who consider that this view contradicts the account of the creation of the world as found in the book of Genesis in two respects. They think that the Bible requires us to believe that the universe began only a few thousand years ago, and that each species of plant and animal life was created separately by God.

There are three distinct questions for such people to consider. First, we must consider the scientific evidence. Is there is a radically new way of interpreting the evidence which does not require supernatural intervention? If there is, then a Nobel Prize awaits the person who can put forward a theory which fits the evidence better.

Meanwhile we must then ask if a scientific description of the development of the universe has any philosophical or religious significance. This will be discussed in the next chapter.

Finally, we need to ask, is there any possibility of interpreting the Bible account of creation so that it fits the scientific account, not dismissing it as myth, but accepting that it conveys important spiritual truth. This will be considered in chapter 10.

Chapter 6 What is Science?

The success of Science

The application of our scientific knowledge has brought many advantages, as well as disadvantages to our lives. We have a multitude of labour-saving devices in our homes, we can travel at speeds not dreamt of 200 years ago, and computers give us access to vast quantities of information at the touch of a button.

These inventions have made many look on science as replacing religion because it has given us so much control over our environment. Many feel that we no longer need a supernatural God to look after us. Also, because science has been able to answer so many questions, there is the tendency to science to "explain" everything.

But we now need to consider what exactly is a law of science, in what sense does science "explain" anything?

What is a Law of Science?

A law of science is a connection between different events at the material level. It does not "explain" anything in the sense that it gives the purpose of any event. The law of gravity connects the fall of an apple and the orbit of the moon. The same mathematical formula (worked out by Newton) applies to an apple falling from a tree, and the moon orbiting the earth. We cannot say why gravity exists. We may be able to connect the strength of the force with other properties of the fundamental particles, but in the end, it is only a man-made name to connect many different phenomena.

We saw in the last chapter that sometimes the laws of science are not as precise as some would want. We cannot predict the moment when a particular atom will emit a particle, we can only state the probability of the atom emitting a particle in a given time. Theory has been able to connect this probability with the energy that binds the particles together inside the nucleus of that atom. Scientific theory has been able to describe the situation and make predictions of future events.

Cause and effect

Care must be taken in science when using the language of cause and effect. In dynamics, we say that when a force is applied to something, it causes that object to accelerate. But that force has resulted from some other event which had a cause, and so we can go backwards indefinitely. So in snooker, there may be a sequence of collisions. This is a large scale picture of what is happening to the particles of which everything is composed, we have seen that they are continually moving and interacting with each other.

We can also say that sunlight causes plants to grow. But sunlight is just one of many different factors which are needed, it is impossible to isolate a single cause for the growth of living organisms.

We saw in chapter 3 that Aristotle realised that we can think of cause and effect at several levels, and that science only made significant progress when people confined themselves to looking for the immediate or material causes of events. This may not always be the same as what people mean when they look for the cause of some tragedy. In a road accident, the immediate cause concerns the positions and speed of the vehicles at the moment of impact. But far more important is the state of mind of the drivers, were they driving without due care and attention? Had they had too much alcohol to drink? Science only deals with sequences of events at the material level. For the more human factors, we must consider other aspects of human nature which are the subject of the next chapter.

The language of science

Science has had to develop a specialised vocabulary because it analyses events in terms of what we call scientific concepts. These are things such as force, energy, and power which have precise mathematical formulae to define them. These are internationally accepted definitions. Sometimes words in common usage such as stress and strain are given specialist meanings, sometimes new words such as entropy have to be invented. Part of understanding science is understanding the specialist meanings of these words.

A scientific investigation then starts by analysing events in terms of these concepts, and the laws of science must be stated in such terms. To bring in other levels of language only causes confusion.

This does not mean that a scientist ignores other approaches, simply that, as a scientist, he must only think on one level. If he makes a discovery such as that of atomic energy, and then thinks of the social consequences, he is no longer thinking as a scientist but as a responsible citizen.

Are the laws of science fixed?

The daily life of many people now depends on technological devices such as cars, washing machines and computers. These are not infallible, but when they do break down, we use a logical procedure to locate the fault based on our knowledge of how they work, we do not assume that the laws of science have suddenly changed.

However, we must add that our understanding of any particular law is not fixed, time and again well-established laws have had to be modified in the light of new experimental evidence.

One well-known example is the law of gravity. Newton put forward a formula which successfully predicted the orbits of all the planets except that of Mercury. Then when Einstein put forward his law of Universal Gravitation, it gave an orbit for Mercury which fitted the observations more precisely. So Newton's law of gravity is good enough when describing the fall of an apple, but not adequate for describing the motions of planets.

Another basic law which is still being tested concerns the observation which Galileo made that when two objects of different weight are dropped, they fall together (we say they have the same acceleration). His experiments were not accurate. Air resistance makes a difference, a feather falls slower than a stone. But in a vacuum, there seems to be no difference. However, scientists are still testing the theory as accurately as possible to see if the acceleration is exactly the same. Meanwhile the present law will be accepted till a satisfactory alternative is found.

So we assume that the laws of science are fixed, but our statements of the laws of science are provisional, valid only as far as the evidence justifies. Then if a law is modified to fit new experimental evidence, we assume that the previous experiments were not accurate enough, or that our interpretation of the results was inadequate, we do not say that the law had changed.

Are the Laws of Science rational?

At the end of the nineteenth century, many of the laws of Physics could be stated as simple mathematical formulae. This is why some claimed that "God is a mathematician"! But now it is not possible to say this after the discoveries in modern physics mentioned in the last chapter.

Both light and matter have particle and wave properties. We cannot describe this fact in a simple mathematical equation. Also, nuclear physicists are having even greater

difficulty in understanding the properties of the particles that make up the nucleus of an atom. We need to be humble and admit that out human brains may not be able to comprehend everything about the operation of the universe.

How is a law arrived at?

Some scientists work hard for years, and are able to derive a logical conclusion from the results of their experiments. Others are faced with results for which there is no obvious explanation. They then have to do some "lateral thinking", they may have to put forward a radically new theory, as when Einstein put forward his theory of special relativity. Occasionally somebody starts by thinking of a possible theory, then he has to devise an experiment to test it. In practise, there are many different ways in which new theories are arrived at.

A law is accepted by the scientific community if is tested by experiments performed with different apparatus in different places. If the same result is obtained, the theory is then regarded as a law. In philosophical language, we say we arrive at a law by the method of induction, which means that we say that we assume the result will always be the same if the conditions are identical. This is what we mean be saying that there are fixed laws of science. We have not proved this logically, rather we accept it as an assumption, a kind of act of faith.

The law can be further tested by seeing if we can use it to predict the outcome of a completely different experiment. Then if a law be shown to apply to many different situations, this is further confirmation of its validity. This is called deduction. So science progresses by both induction and deduction.

Then once a theory has been generally accepted, a good teacher will be able to decide which experiments most clearly lead to the new law by a logical progression, eliminating all the blind alleys that the original researcher may have gone down, and simplifying his original thought processes.

The Law of “the survival of the fittest"

In these days, people all over the world may be engaged in research into any particular topic, and competition is fierce to be the first to discover something new. Once a new idea is put forward, it is subject to remorseless scrutiny by others working in the same field. Any flaw in the argument, or glossing over of an awkward detail is soon spotted. Some discoveries are trivial and become consigned to the dustbin of oblivion. If a discovery is significant, the theory is refined by constant scrutiny. Only the "fittest" discoveries survive, for "selection pressure" is as great in the world of scientific research as it is in the biological world. The approach of those working in academic disciplines outside the sciences might be very different if the same critical attitude to new ideas was adopted!

One modern example of a claim which proved to be spurious was the apparent discovery of what is known as "cold nuclear fusion". On March 23, 1989, two American research scientists Martin Fleischmann and Stanley Pons called a press conference to announce that they been able to achieve nuclear fusion with very simple apparatus. If this had been true, it would have led to a relatively cheap source of seemingly limitless energy. Within a very short time and before the result was thoroughly tested, large amounts of money were being distributed to support further research in the hope that the process would lead to a viable source of energy. However, when others repeated the experiment, they found no evidence that significant amounts of energy were being produced by nuclear fusion. Now the whole affair has become history.

The implications of scientific theories

Many people are not satisfied with only being told what happens, they also want to know why?. This question is important, but it cannot be answered using the methods of science.

When Darwin first put forward his theory of biological evolution, people tried to apply it to other realms such as social life. They thought that it gave them justification for a fiercely competitive spirit. Now, people are drawing similar lessons from modern science. Does the Uncertainty Principle mean that we can never be certain about anything? Does the success of chaos theory mean that there is no order in the universe? Such a suggestion seems like an excuse for having chaos in one's personal affairs!

There is no justification for applying scientific principles to any situation other than the ones they claim to cover. It is very important to realise that the laws of science only apply in the material realm. We shall see in the next chapter that human life is too complex to require only one level of understanding.

This is why it there is no justification for applying the Verification Principle to the whole of life. It is an assumption, one which on reflection rules out a wide variety of human experience.

The Anthropic Principle

One question which people ask in cosmology is "Could the universe have been any different from what it is now?" or as some have put it, "Did God have any choice when he made the universe?"

It has been realised for some time that the existence of human life on a relatively friendly planet is due to a very large number of features of the universe being "just right". If the original expansion of the universe had been much faster or slower, stars would either not have condensed out of the original ball of matter, or they would have evolved too quickly before human life could develop on earth. If the properties of the various fundamental particles had been slightly different, the elements that are considered vital for life as we it know would not exist. If our planet was much nearer or further from the sun, most of the forms of life which are found on earth could not exist. All these considerations have become known collectively as the Anthropic Principle.

A stronger way of stating this principle is that there may be an infinite number of universes, all slightly different. We happen to be in this one because this is the only one where life as we know it is possible; life which has enabled us to develop, to find out about our universe, and ask such questions as "Why are we here?" Will we ever be able to found out if there are other universes. I do not see that this approach leads us anywhere.

It is important to realise that the Anthropic Principle is really not a Law of Science in the accepted meaning of the word. It is more a way of looking at a general situation, that we are here because of a number of factors which could either be regarded as improbable coincidences or due to the designs of a Creator God. The scientific approach does not force us to adopt one of these views to the exclusion of the other.

So when we ask "What if things had been different?" the answer is simply that we would not be here.

Another problem connected with the Big Bang theory is the question, did it start suddenly or gradually? The scientific language for that is "Was there a singularity at the beginning?" Stephen Hawking developed a complicated mathematical approach which describes a beginning in which there are "no boundary conditions", nothing which had to be

"just right" at the beginning. But did he adopt this approach to stop people saying that they want to find some place for God in the theory? From a strictly scientific point of view, the only way of assessing the various theories is to see which best fits the evidence. But even if Hawking was right, his theory does not disprove the existence of a Creator God.

Some have appealed to the Uncertainty Principle of Quantum Physics saying that everything was random at the beginning. It is pure chance that things developed as they have, they could have developed another way. All we can say is that this is how things developed. The fact that they happened in the way they did does not prove or disprove anything. It is not a convenient gap in the theory which we must take as evidence for the existence of God.

Theories of Everything

Another idea that has received publicity recently has been the search for a Theory of Everything, a theory which would lay the foundation for the whole of science. Now this is nothing new. The philosophers of ancient Greece such as Plato and Aristotle each had their own Theory of Everything, a philosophical principle describing how they viewed the world. But we have seen that the universe cannot be fitted into one simple rational framework.

In fundamental physics, there are two goals. The first concerns forces. All the forces known to science can be reduced to four basic ones; gravity, electric and magnetic (these are known to be closely linked), and two forces which only operate within the nucleus of the atom.

Scientists are fairly certain that there is a link between the last three forces, it is only gravity that is the "odd man out". It has been suggested that in the first fraction of a second after the Big Bang, the fundamental particles only interacted through one force which then eventually became differentiated into the four that we recognise. So the search is on to find the link between gravity and the other three forces.

Closely connected with this unifying force is the search to find the "ultimate particles". But here there is an even greater problem. Even if they find the particles they are looking for at present, we will be no nearer to giving a philosophical answer to the question What is matter? We will only be able to say that we believe it is made of certain particles which are found to have certain properties.

Even if a Theory of Everything is put forward which becomes generally accepted, it will only be the end of research in nuclear physics and cosmology. We may also be able to "explain" the laws of chemistry in terms of this theory by saying that atoms and molecules interact in the way they do because of this Theory. But this does not explain anything in absolute terms. It will not mean that science has proved that there is no meaning to life. It means that we have to look elsewhere for meaning.

We may not be able to find a Theory of Everything. At the moment, the more discoveries are made in cosmology and nuclear physics, the more complicated things seem to be. This should make us humble, the universe does not operate according to neat principles that fit in with the workings of our human brain. There is more to life than mathematical formulae.

Another important point that physicists have to realise is that physics is not the only branch of science. The main reason why we divide science into different branches is that they need different approaches. Chemistry involves looking at processes. Biology considers organisms, and these are more than simply a collection of atoms. We need to consider the organism as a whole, and not just concentrate only on the biochemical

processes which go on inside it. A Theory of Everything which deals with fundamental particles will not be much use to the biological sciences.

Scientism

The name scientism has been coined to stand for the belief that science can answer questions concerning purpose and destiny etc. Scientism is science made into a religion.

One form of scientism is when scientific concepts are given a higher status. An example of this is the question that arises in biological evolution, is there a supernatural force driving it? We saw in chapter 2 that Alfred Whitehead thought that this driving force existed in all matter. Some supporters of the Green Movement have resurrected the nature goddess Gaia of the ancient Greeks and say that she represents the "life force" which is controlling evolution.

Biologists may speak loosely using words such as Nature or Evolution when they consider the development of a particular life form. But what they mean is that selection pressure has influenced this development. They still need to find the mechanism by which these organisms developed.

There is also the question as to whether or not Planet Earth can be considered to be an organism. There is a strictly scientific element in this. We are now very aware that pollution in one part of the earth can have global consequences. But the mechanisms that cause this are simply the application of known scientific principles on a global scale. Also, there are many factors affecting our weather, and it is impossible to isolate any one and study its effect separately. We have to see how all the factors combine in their effect on us. This is why it is difficult to make predictions about the phenomenon of "Global Warming" with any degree of certainty.

These considerations are completely different from the ideas of certain people in the conservation movement who give to the earth a personality and say that "she" is acting to protect herself, or to invoke a supernatural Gaia who will bring about physical changes. This language suggests that they are introducing other forces or sources of energy which affect the material world around us. If that sort of thinking spreads into the scientific community, it will mean a return to the sort of thinking that existed in the middle ages when there was uncertainty as to the relation between scientific and religious principles. It will be a damaging diversion, a great hindrance to advance in our understanding of ecology at a time when it is so important that we halt the accelerating pollution of our planet.

Another example of non-scientific thinking is in homeopathic medicine. There has been great controversy over this. One problem in understanding their ideas is that the advocates of homeopathy use certain words such as "force" and "energy" to mean different things from their generally accepted scientific meanings. Because they do not use scientific terminology, it is impossible for conventional scientists to understand their explanations. The important question is, have there been any objective, controlled medical tests to prove the efficacy or otherwise of the medicines they prescribe? If they do prove to have a beneficial effect, then we need to look for an explanation using the terminology of accepted science.

It is very important to realise that science only made progress when it was separated from religion. These attempts to bring pseudo-religious ideas back into science will only hinder its progress. I wonder if believers in "life force" use it to repair cars or washing machines? If there is a place for religion in human life, it is not at the scientific level.

Other approaches to life

There are other ways of looking at life than the scientific way. We live in a world of colour and beauty. We live in a world full of music from the song of birds to the cries of

whales. If we see colour and sound only in terms of its evolutionary value, life is very dull. Also, beauty is not something that can be analysed scientifically, it is appreciated with our aesthetic sense, not by logical analysis. The danger of too much emphasis on physical science is that we lose sight of the fact that we are alive. A Theory of Everything will not cover all aspects of human life.

Most scientists remain sane by making sure that their work is not allowed to interfere too much with their social life. There is a story that James Joule, whose work laid the foundation for the modern idea of energy, spent part of his Swiss honeymoon measuring the temperature of the water at the top and bottom of a waterfall to see what happened to the energy of the water as it fell. I wonder what the new Mrs Joule thought of this!

There is also the opposite danger that we separate life into completely watertight compartments, with no communication between them. In the next chapter we consider other aspects of human life and then ask what is the unifying factor.

Chapter 7 What is man (and also woman)?

We are part of the physical world because our bodies are made up of atoms and molecules. The biochemical reactions which occur in us are similar to those which occur in other living creatures. From the biological point of view, each of us is a living organism, able to move, grow and reproduce by processes which are similar to those which occur in a very large number of different forms of life.

But I am also aware of myself as a unique person. I can reflect on the world around me, and think of abstract ideas such as truth, beauty and goodness. Humans have a highly developed form of communication known as speech, and using this I find out that other people also have this self-awareness, and the ability to think similar thoughts.

Unfortunately, we also differ from animals in our inability to live together in social harmony. Some creatures live in groups in mutual cooperation, e.g. a herd of elephants or a hive of bees. Others such as spiders live in complete isolation, associating with others of the same species only to mate. From the evolutionary point of view, if any other species had showed the same antisocial behaviour that we do, it would soon have become extinct in the struggle for survival.

Brains and minds

A detailed study of the workings of the human brain has only become possible since techniques have been found for investigating its activity without seriously disturbing those processes.

Neurologists have found out that the brain consists of millions of units called neurons, and these communicate with other neurons by electrochemical means. Some parts of the brain have specific functions such as receiving message from our senses or controlling specific muscles. Damage to these parts may cause the loss of that function. But a large part of the brain (called the cerebrum) is thought to be concerned with co-ordinating our senses, with memory, and thought in general. Even if part of the cerebrum is removed, there seems to be no obvious alteration in the ability to think.

But when I read a book, or play a game of chess, I am not aware of these neurons working, what I am aware of is thoughts in my mind. I talk to other people, and I find that they have similar thoughts. We consider thinking to be an activity of the mind, not of the brain.

In chapter 2, it was noted that there have been considerable differences of opinion in the past as to the relationship between the mind and the body. Most people do not regard the mind as another organ, it is the brain which is the physical organ. So what is the connection between the mind and the brain?

We cannot say with Descartes that the mind consists of a separate "substance", for in these days, we use the word "substance" to mean something material.

Nor can we say that the two words are identical in meaning but differ in the context in which they are used. We speak of the mind when talking about thinking or remembering, but this also involves physical activity in the brain. We saw in chapter 2 that Hume tried to say that self-consciousness is simply a stream of sensations. Gilbert Ryle (in The Concept of Mind) has followed a similar line of thinking. He accepts that a person is aware of thoughts, and also has self-consciousness, but fails to put forward a clear, positive statement as to the nature of the self that is conscious of its own thoughts.

One answer to the problem is to say that we are using language at different levels when talking about our mind and our brain. The latter is part of the physical world. Great advances have recently been made in our knowledge of its workings. When speaking of the brain, we use "observer language" because we can stand back and talk about the physical processes which occur. But when I think, I am aware of myself as a person, this is called "actor language". It is the same person who is thinking who is also aware that he is thinking.

Another way of looking at the question is that the mind involves a separate dimension to life, different from the physical dimension. One analogy which might be helpful is that of printing on paper. If the page of this book that you are reading is analysed chemically, it will be found to consist of paper and ink and nothing more. But the way the black ink is arranged on the paper is conveying words which I hope mean something to you, and this meaning will not be found by chemical analysis. Similarly a neurologist will say that my brain activity is nothing but electrochemical processes. But what I am aware of is thoughts, feelings, or sensations.

There is no doubt that the brain and the mind are very closely connected. Drugs and bodily ill health both affect our powers of thought. Some illnesses used to be labelled as "psychosomatic" meaning that they were purely imaginary. But now it is realised that if a person thinks he is unwell, this thought has an adverse effect on the body, and this produces a physical disorder. The eating disorder anorexia nervosa is an example of a mental condition which has very obvious physical effects. Conversely, it is now recognised that if a person has the "will to live", they are much more likely to recover from serious illness. Also, there are those who have developed a remarkable degree of control over bodily sensations by a supreme effort of will. This is evidence that mind can affect matter as well as matter affecting mind.

Psychology

Psychology is generally regarded as the study of the mind and how it affects our behaviour. It has just as much right to be called a science along with Physics and Chemistry, provided the same objective approach is adopted. Historically, it was the last branch of science to be separated from Philosophy. It was not until the nineteenth century that the human brain was studied in any detail, and the science of neurology developed. But it was nearly a hundred years later before psychology developed as an objective, scientific study.

One problem in psychology is that no two people are identical, so any "laws" that are formulated will not be as exact as a law of Physics. All electrons are the same, they all have identical properties. The potato plants in my garden are similar, so their response to drought, light and fertiliser can be predicted with some certainty. But the pupils in a classroom are all individuals, differing in many ways. Indeed it is surprising that the behaviour of a group of children is so predictable!

It is difficult to perform controlled experiments on human behaviour. There are so many factors influencing any given situation, most of them impossible to control. So when making any study of individual behaviour, it is necessary to investigate a large number of people before any firm conclusion can be drawn. And even then the result can only be expressed as a probability, for no two people's reactions may be identical in a given situation. However it can be argued that psychology is the most important branch of science as it is the only one which deals with us as people. To the other branches, we are simply machines or organisms.

Another difficulty is defining what is to be regarded as "normal" behaviour. Many people, especially children have a fear of being regarded in any way as abnormal, so they try to conform to the pattern of behaviour shown by their peers. A child who is different may

be treated with great cruelty. Even with adults, insanity is something greatly feared. It takes courage to be eccentric! Also, it is difficult to draw the line between an eccentricity which can be tolerated and an abnormality which needs correcting.

There is also the consideration of whether an action is morally right or wrong. A psychologist's own views on moral standards are bound to influence his judgment. Questions of morality affect psychology more than any other branch of science. But a psychologist can only point out the consequences of a particular action, it is difficult to go on to make a judgement as to whether that particular behaviour is right or wrong in an absolute sense.

The factors influencing a person's behaviour can be divided into three groups. The first is heredity, what we receive from our parents. The second is our environment, for it has been proved that the experiences of the first few months of a baby's life are crucial to both its physical and mental development. However if a person really wants to change, he can overcome at least some of the disadvantages of both a genetic defect and deprivation in his upbringing.

The third influence is that of chemicals or drugs. These affect the physical workings of the brain. In the treatment of psychiatric disorders, drugs are a very convenient way of controlling behaviour. But other methods may be more helpful in the long run.

Psychology and neurology together have proved their worth in improving the quality of life. Many psychological disorders such as shell shock and post-traumatic stress are now accepted as genuine disorders which can be treated. Mental illness is not as much of a social stigma as it used to be, the lunatic asylums of the last century have now been replaced by psychiatric units in general hospitals.

The social aspect of our human nature is also very important. We cannot live in isolation, we benefit from each other's company. One application of this is the need for the mentally ill and the mentally handicapped to have people around them to whom they can relate and who can help support them. The worst possible environment for such was the isolation in which such people used to be kept.

One of the barriers to the development of psychology as a science was the belief that mental behaviour was influenced by supernatural forces. The mentally ill were accused of witchcraft or being possessed by demons. Although many of the superstitions of the past can be discounted, there are some today who claim that we can be subject to supernatural influences. Under this heading, we can group subjects as diverse as witchcraft and water divining. Both these involve the possibility of non physical forces. There are tests which can be performed to see if a phenomenon is due to internal or external causes. A true scientist should approach such topics with an open mind and consider the evidence.

Other dimensions of human experience

There are other aspects of life where the scientific approach is not the right one. While Maths, science and philosophy are logical subjects, the various subjects that are covered by "the arts" are more creative. And even if we lack this creative ability, most of us are able to appreciate works of art, music or poetry that others have created.

In the appreciation of this sort of thing, we all have our likes and dislikes. We may not be able to give a reason for these, for we go by feeling in these situations, not by thinking. Nobody has been able to explain in purely mathematical or scientific terms the inspiration in a Beethoven symphony or a Michelangelo painting. We can regard this appreciation as involving a completely separate dimension of our life.

In the past, rules were formulated for musical and artistic composition, but it is generally accepted that the greatest composers or painters were those who broke those rules and yet produced masterpieces. Today, the idea of rules to guide the assessment of a work of art is not popular, though guidelines can be given to a beginner. There has always been a strong subjective element in the appreciation of any work of art. What is considered by one to have great inspiration is unspeakably boring to another.

What we enjoy is partly influenced by our culture. We now have access to art forms from all over the world. We can see the great variety of art forms that exist, and we can appreciate the best in these. This demonstrates that creative ability is an essential part of human nature, and also the ability to appreciate what others have created. This aspect of our nature cannot be understood in purely scientific terms.

The Moral Dimension

Most people accept that everybody has an awareness that certain actions are right and acceptable, while others are wrong or unacceptable. The detailed criteria of what is considered right or wrong may depend on our culture, though in most societies, loyalty to the immediate family or social group is paramount. So lying, stealing and murder within this group are wrong, even if it is legitimate to steal from, or murder members of another group.

Also, some are more concerned than others about the effects of their actions on other people. Some parents are very concerned to teach their children the standards they believe to be right, while others do not seem to care how their children behave. But most people accept that there should be objective standards of right and wrong. In other words, we have a moral awareness that is separate from the logical and the creative dimensions of our lives.

Some psychologists have suggested that human behaviour can be completely explained by a combination of the genetic makeup of a person, their past history, and their present environment. If this is so, then there is no such thing as moral responsibility. If a person cannot be held to be morally responsible for his actions, the whole basis of our legal system is undermined. This is clearly unsatisfactory.

Philosophers have tried unsuccessfully to find a rational basis for moral standards. Plato believed that the Form of the Good was the highest of the forms, and our reason must guide us to know what is right and wrong. Kant said we should follow our sense of duty. Others have suggested hedonism, the belief that what is right is what achieves the greatest good for the greatest number of people, but it is not always easy to apply this in a given situation.

Science is not much help either in formulating moral laws. We can study the effect of certain actions. But some actions benefit one person at the expense of others. How do we balance the needs of the individual and society? One person may consider it legitimate to try to evade paying as much tax as he should. This brings benefit to the individual at the expense of the other taxpayers, it is an extension of the competitive society in which we live. Also, if it is legitimate for an athlete to win a race, what is wrong with a businessman getting as much profit from a sale even though it harms the purse of the buyer?

It is a sad fact that not every human being wants to fit in with the rules of the group to which he belongs. This is nothing to do with education and intelligence. Many believe that there is nothing wrong with breaking the law so long as one can get away with it. This is not just a question of environment, for there is social unrest and crime among the wealthy as well as among the socially deprived.

Free will

Morality is about choice, choosing to do what we believe to be right. So we can only be held to be morally responsible for our actions if we are free to choose between right and wrong. In Britain, the law is tolerant in cases where a person has committed a crime, but is judged to have acted with diminished responsibility because he was mentally ill or mentally handicapped.

So we can only speak of moral responsibility if we are free to choose between right and wrong. But in what sense are we free?

Free will can be defined as the awareness of being able to choose between two courses of action which are both physically possible.

There are normally many factors affecting any decision we may make, such as personal preference, cultural background, or external circumstances. But free will is our ability to choose independently of these.

We are faced every day with choices. I have a number of different ties that I can choose to wear. In my kitchen is a choice of breakfast cereals. These choices may be trivial, but they are only different in degree from the choice to exceed the speed limit deliberately when I am driving my car, or to make a false entry on my income tax form intentionally.

This freedom of choice cannot have a basis in the laws of science as these predict a determined outcome given a certain set of circumstances. Yet we are aware of a freedom to act within certain limits. This is a paradox of our nature which we have to accept as part of human consciousness. It is also what distinguishes us from animals, for we do not apply moral categories to animal behaviour except when they imitate our behaviour.

Is there a spiritual dimension to life?

Many people these days consider religion to be the Great Delusion. However, it is a fact that religion is almost universal. In the next chapter, we shall consider how religious beliefs have developed along with the wider philosophical views of certain people. But first it must be established that if there is a God, we become aware of him through a completely separate dimension of life.

Belief in God is partly a thought process. Also, if we perform religious devotions, that involves the body. These should be prompted by a feeling of awe and reverence. But awareness of God is not only mental, physical and emotional, it requires something extra which can be called faith.

People have given different names to this dimension. Perhaps "spirit" is the best. The word "soul" is not suitable because the ancient Greeks used it to mean what we call the "mind", And the traditional Christian use of the word "soul" is different from its meaning when used in the Bible. We should not think of people as having a soul or a spirit, but as having a spiritual dimension to life. Then faith is an activity of this spiritual dimension.

The unity of human nature - the self

Finally we need to consider the question, if life has so many dimensions, is there any connection between them? If we divide life into a series of watertight compartments, how do the different dimensions communicate with each other? We need to find a unity among the diversity.

The question is partly one of language. This unity can be called the self, the person, or the individual. Grammatically, if I say "I think", "I walk" etc., the self is what the "I" refers

to. It is not part of the physical world, but is an entity which has a physical, a mental, and other dimensions.

There is also the fact of self-consciousness. I am aware of myself as an individual person with different abilities, and separate from the world around me. Memory plays a part in this. I am the same person that once went to school as a child. I have both pleasant and unpleasant memories. Although most of the parts of my body are constantly regenerating themselves, there must be something that continues. It is not simply memory, for if I lose my memory completely, I hope others will continue to treat me as the same person. It is the self that continues despite the changes that may take place both in the body and the mind.

I am also aware that there are other "selves" in this world. I find that they are similar to me in many ways, and this helps me understand myself. I can communicate with these on different levels. I can touch another person. I can talk and communicate the thoughts of my mind. I can talk about my likes and dislikes. To a certain extent I depend on them for my physical, mental and emotional well-being. But they are all individuals as I am. I must respect their individuality, and not try to manipulate them solely for my benefit. An important part of life is balancing my separate identity against my need to interact with others.

Eastern philosophies and religions have a very different view of the individual. Those who believe in re-incarnation lose the sense of personal identity, for part of my identity is my uniqueness. If I had another existence in which I was a different person or even an animal, I lose my individuality. The ultimate aim of Buddhism is the state of Nirvana where the individual is lost in a sea of universal consciousness. This is the complete negation of individuality.

Chapter 8 The Development of Religious Thought

Philosophy and Religion

We saw in chapter 2 that, until recently, religious ideas were closely connected with philosophical thought. They only became separated when atheism became intellectually respectable. Those philosophers who believed in a non-material realm of thought believed that God occupied the same realm. The rationalists who believed that the human mind could acquire knowledge apart from the senses believed that knowledge of God could therefore come directly to the human mind.

But the Bible and the writings of some other religions claim to have come by supernatural revelation. How do we relate the thoughts of our minds, the knowledge that comes though our senses, and the claims made by those who said that what they wrote was inspired by God? We shall examine first the various ideas that have been put forward in the past.

Plato and Aristotle

In the time of Plato, there were many legends of the deeds of the various Greek gods. Some of these expressed ideals of thought and behaviour. But others portrayed the gods as immortal beings with supernatural power, but whose moral behaviour was far from perfect, more like that of immature adolescents. There was no close connection between the moral ideals put forward by the philosophers, and the rituals prescribed by the priests who were guardians of their religion. Also, these priests were not renowned as profound thinkers. So it is not surprising that Plato kept religion at arm's length, saying that it was for "the ignorant masses".

But Plato did believe in a Craftsman-God who created the world (he used the Greek word "demiurge" which means a craftsman). This God worked on previously existing matter, fashioning it in the likeness of the Forms which already existed. He was the "best soul" because he had the greatest knowledge of the Forms. Plato also said that it was necessary to believe in one supreme God to provide unity among all the many Forms.

By contrast Aristotle said that the world has always existed. God was the first cause, to awaken in everything the "desire" to achieve its potentiality. So his was an impersonal God, pure intellect. This view comes close to pantheism, the view that identifies God with Nature.

The early Christian era

When the Greeks and later the Romans conquered the Middle East, Many Jewish leaders strongly resisted any attempt to alter either their culture or their religion, for they considered that the two were inseparable. This attitude is seen in the Pharisees of the Gospel stories, who refused to mix socially with any who did not share their outlook. But some more liberally minded Jews did attempt to absorb some of Plato's ideas into their religious views.

The early Christians were similarly divided in their attitude to Greek thought. Some considered that the ideas of the Greeks were completely different from the teaching of the Bible. Others tried to find a synthesis between the newly emerging Christian beliefs and Plato's view of the world.

One of the most outstanding thinkers of the emerging church was Augustine, Bishop of Hippo (354-430). In his early life he investigated all the different philosophies of the day. Later he became a Christian and from then on, the dominant influence on his thinking was the teaching of the Bible.

He is known for his writings on two important subjects which were being debated at that time. There was a sect known as the Manichaeans who held the dualistic view that the universe is under the control of two separate forces, God, and an eternal evil principle. Against this, Augustine asserted that God was the creator of all, evil only exists because we have misused the freedom we originally had. According to the story in Genesis, man disobeyed God, and therefore we cannot do good by ourselves, it is only the grace of God in us that gives us the power to do what is right.

He also brought some of Plato's philosophical language into Christian theology. He imported the Greek idea of an immortal thinking soul or mind and fused it with the biblical idea of "spirit", that part of our nature which responds to God. This has led to the traditional belief that man has an "immortal soul", but this use of the word "soul" is different from its meaning both in Hebrew and Greek thought.

Augustine also had a surprisingly modern idea of time, he said that God created time when he created the Universe. So it is meaningless to ask what God was doing before he created the world. When asked that question, he replied that God was preparing hell for people who pry into mysteries! He said that time is subjective, it is our impression of events as they happen.

After Rome had been sacked by the Goths, he wrote a book called The City of God in which he asserted his belief that God is at work in all human history. Each state exists as God's instrument for the welfare of human society. But Christians are members of that spiritual community which he called the City of God, and they should seek to bring the benefit of mutual harmony to the secular society in which they live.

The medieval period

During the medieval period the main aim of the scholars was to build a rational foundation for Christian belief by trying to find philosophical proofs for the existence of God. If the ancient Greeks were right in believing that the mind has the ability to gain knowledge, then we can arrive at the knowledge of God simply by reasoning. In other words we can prove the existence of God by rational argument.

Anselm (c.1033-1109)

One of the first to do this was Anselm, Archbishop of Canterbury. He said that God is "that than which no greater can be conceived". This is called the ontological proof since it argues from the idea of Being. It means that of all the beings that exist, God is the greatest or most perfect.

The main objection to this view is that to have an idea of something does not automatically bring it into existence. It does not prove that there is any Being greater than any human. Also, it is not clear how the "greatness" of beings is assessed. Perhaps we should rather look on this statement as telling us what sort of God Anselm believed in.

Thomas Aquinas (1225-74)

He was a scholar and teacher who wrote prolifically. Many of his ideas still form a vital part of official Roman Catholic teaching today. He tried to synthesise the views of Aristotle (recently rediscovered), the teaching of the Bible, and Christian tradition.

He is perhaps best known for putting forward five proofs of the existence of God. Four of these correspond to Aristotle's four possible causes of an event, and at least two of them can be restated in modern terms.

The first proof is that there must have been a First Cause of all events in the Universe. This is called the *cosmological proof*.

Another is based on Aristotle's idea that everything tends to its purpose, he said that the Universe must have had a designer who gave to everything its particular purpose. This is called the *teleological proof*.

Because Aquinas put forward five separate proofs, we can ask how these five can lead to only one God?. But, as with Anselm and the ontological argument, it is possible to regard them as telling us five separate things about the nature of God, for each proof ends with the phrase "and this is what we all understand by God".

These "proofs" have been revived in different forms since then. But the idea of God being the result of a purely rational argument is not very satisfactory. Orthodox Christians do not want God reduced to a mere force which set the atoms of our Universe in motion, nor even a Master Designer. However, a thinking person who believes in God should be able to give a reason for this belief, for every system of thought must have a starting point.

The Reformation

During the middle ages, the Roman Catholic Church claimed to be the only body authorised to pronounce on what was to be accepted as official Christian doctrine, as well as all other branches of learning. The Renaissance marked the beginnings of independent thought in religious matters as well in science and the arts.

Among the Greek manuscripts brought to Western Europe when Constantinople was sacked were Greek translations of the Bible. This led to a renewed interest in studying the Bible in its original languages of Hebrew and Greek. In 1516, the Dutch scholar Erasmus compiled an edition of the Greek New Testament from the available manuscripts. Because printing had recently been invented, copies of this and also Latin versions of the complete Bible were widely distributed. Erasmus also wrote a Latin paraphrase of the New Testament which made its message considerably clearer. People were able to read the Bible for themselves, and not rely on the interpretations put on its teachings by the clergy.

One of the most outspoken critics of the Roman Catholic church was Martin Luther, a German theologian. As he studied the Bible, he found that it contradicted the official teaching in many important doctrinal matters. When the church leaders challenged him, he told them that he preferred to accept the authority of the Bible rather than their dogmas, so he was excommunicated.

Others agreed with his beliefs, and so the religious Reformation began. Several leaders in Western Europe decided to accept his religious views, and used this as an opportunity to break free from the political control of the Holy Roman Empire.

For these Protestants, the teaching of the Bible was the final authority in all matters concerning religion and morals. Human reason could not be relied on as a source of knowledge because man was sinful, he had rebelled against God, and so his thinking processes were corrupted.

Others preferred to return to the philosophical approach of the ancient Greeks, based on the power of human reason, what we call rationalism.

Rationalism and Empiricism

Rene Descartes (1596-1650).

We saw in chapter 2 that Descartes believed that it was necessary to believe in God in order to link the world of thought with the material world. This was a revival of the ontological proof of the existence of God. But his was not a personal God, instead he was rather like the deus ex machina of ancient Greek plays, a God who had to be brought into the plot to untangle it. The modern term for this is "God of the gaps", the belief that there must be a gap in our knowledge where God can be fitted in. The problem with this sort of approach is that when a philosophical or scientific system is put forward which does not have any gaps, then God is no longer needed.

Descartes also said that we must have free will, for this is necessary if there are to be moral standards of right and wrong. We get satisfaction from always doing what we believe to be right.

In England, the rationalist viewpoint was held by men such as the Cambridge Platonists, a group of Anglicans who were prominent from about 1633-1688. They revived Plato's emphasis on the importance of ideas, and the power of human reason, believing that human reason is a gift of God. So our knowledge of God comes from a combination of rational thought (God gives us intuition of Ideas), and the revelation of God recorded in the Bible.

The scientists of that period had a similar outlook. Isaac Newton said that we can believe in an intelligent God because of the order that scientists were discovering in nature.

William Paley (1743-1805) became famous for his writings which set out to prove the existence of God from a scientific observation of nature. He may be considered the eighteenth century version of Thomas Aquinas. His arguments may not be considered valid from the point of view of modern science. But they show that scientific and religious thought were still closely connected at that time.

There are two main problems with the rationalistic approach to religion. First, it is not the approach of the scientist; for him reason must take second place to scientific observation. Then there is the problem of evil; a good God would not allow physical suffering or moral evil. The biblical answer to this problem is considered in the next chapter.

We also saw in chapter 2 how the trio of Empiricists, Locke, Berkeley and Hume abandoned altogether the idea that we can gain any true knowledge by reason alone. But they were not atheists. Locke believed in God because he said that matter could not be eternal, there could never have been a time when there was nothing. So there must be a Mind that has always existed, and that is God.

He put religious knowledge in a different category from knowledge which comes from experience. He said that the truth about God is discovered by revelation, and this is received by faith and not reason. He also considered the miracle stories in the Bible to be evidences of the truth of the Christian faith, they were to be believed because they were above reason, which is not the same as being contrary to reason.

Berkeley saw that it was necessary to believe in God for two reasons. First, God is the cause of ideas in our minds. Also it is God who keeps the world in existence, by continually perceiving it.

Hume said that we believe in God on the basis of pure faith, by revelation and not reason, for reason can always be countered by opposite arguments. However, he did not accept the miracle stories of the Bible, for he said they were a denial of the laws of nature.

This attitude marks the beginning of the undermining of traditional Christian belief. By denying the miracle stories he was rejecting at least in part the authority of the Bible. Also when he dismissed the whole of metaphysics as pure imagination, this led to a rejection of anything that might be called "supernatural".

Thus the way was paved for more atheistic systems of thought, for he implied that human reason was able to select only those parts of the Bible which were acceptable. Others at that time also wrote books attacking the miracle stories and saying that we cannot believe the predictive prophecies of the Old Testament.

By contrast, that period also saw the Evangelical Revival led by John Wesley and George Whitefield. This led many people to a faith in God based firmly on the teaching of the Bible. But as with the Reformation, this revival had no great influence on the philosophy of the day.

The Enlightenment

The period known as the Enlightenment saw further rejection of traditional Christianity, it was replaced by what was considered to be a more enlightened view of knowledge, conduct and religion. Several men stand out in the influence they had on thinking on the Continent.

Jean-Jacques Rousseau (1712-78) was a well-known French writer. He rejected the idea that the State had a divine right to rule. Instead he advocated secular democracy.

He rejected both the authority of the church and also any theology which is based on reason. For him, religion should be a matter of feeling rather than thinking. He said that the less he understood God, the more he adored him. This marked a tendency to move from a rational to an emotional approach to religion.

Voltaire (Francois-Marie Arouet) 1694-1778 popularised Locke's views on the Continent. He was a prolific playwright who attacked the Roman Catholic Church for what he considered to be its deceit and corruption. He believed in a Creator God who was good and powerful. He believed that the proper way to worship God was to do good, so identifying religion with morality.

Gotthold Lessing (1729-81) was a German playwright. His contribution was to try to divorce Christian belief from the Bible narrative, simply because he was aware that the historical accuracy of any particular document cannot be determined with the same certainty as the accuracy of a mathematical statement. His hope was that the three monotheistic religions, Judaism, Christianity and Islam should one day unite in a universal religion of love.

This view goes against any idea of God working in human history. For if God was not behind the events recorded in the Bible, how can we experience God in our lives now?

Immanuel Kant (1724-1804) In Kant's system of thought, there were three areas which do not seem to bear much relation to each other, the rational, moral and religious aspects of life.

In the moral realm, he did not see the need to believe in God or any other external authority to tell us what is right and what is wrong. He believed that a truly enlightened

person should know these intuitively, we have a conscience as our moral guide. This is a higher faculty than reason, for the latter can be contradicted, but our conscience cannot. He also spoke of this as a sense of duty.

This view is demonstrated by the very disciplined way of life he led, which probably resulted from his strict pietistic background.

He also wrote about what he called the "categorical imperative", a person should act as if there was a principle which could be regarded as a universal law. This seems to be the same as the Bible maxim that we should do to others what we would like them to do to us.

He said that we must have free will, for in moral considerations, we are under an obligation, we ought to do right. So we must have the freedom to choose to do right or wrong, otherwise we cannot be held responsible for our actions.

But when he said that we are under an obligation to do right, this means that there are moral standards external to us. Yet he has already rejected this idea, so in this he is not consistent.

In his religious views, Kant believed in God as a holy and moral Being. But he rejected much of the Bible, saying that the stories in it were simply for the "ignorant masses", though it was the best means of instructing people in a truly moral religion.

Therefore his God cannot have been the God of the Bible, instead he was simply a shadowy ideal. Indeed, in Kant's system of thought there does not seem to have been any need to believe in God at all, since he believed that "Enlightened Man" does not need a God to tell him what is right and wrong.

The Nineteenth Century

During the nineteenth century the gulf between science and Christian theology widened. Scientists were making such rapid progress that philosophers could not keep up with the new ideas. Also people like Kant were trying to dispense with the biblical teaching about God.

Friedrich Schleiermacher (1768-1834) agreed with Rousseau by saying that the essence of religion is not thought but experience, so Christian doctrine must be re-interpreted in terms of this. The essence of religious experience is that we should have a sense of absolute dependence upon God. It does not matter what God is like, what matters is how we show our absolute dependence on him.

He said that sin is not transgressing any particular law, it is the desire to be free, to be independent of God. Jesus was the man who had the greatest consciousness of God, and he can help us by the power of his own God-consciousness.

His approach was not to look at religious experience in the Bible narrative, but to look for features common to all kinds of religious experience. Here we see the beginnings of a non-rational religion which emphasises experience without involving human thought, the view that can be caricatured by saying "It does not matter what you believe so long as it makes you feel good"!

The rise of atheism

In England, it was generally considered respectable to believe in God, though it was definitely not respectable to be too enthusiastic about it. But when Darwin published his

Origin of the Species in 1859, this provided those who wanted it with an excuse for not believing in God.

The coining of the word agnostic is attributed to T.H. Huxley, the man who helped popularise Darwin's writings. This view is that we say we cannot know anything about God, a half-way house to a complete denial of the existence of God.

Although the pragmatism of Charles and James (see chapter 2) did away with any idea of absolute truth, they were not atheists. James said that we may not know for a certain the truth about God, but at least we can live as if it is true, for religious beliefs meet certain real needs in people. "If the idea of God works satisfactorily in the widest sense of the word, it is true" (Pragmatism, A New Name for Some Old Ways of Thinking 1907).

Soren Kierkegaard (1813-55)

We have seen that Kierkegaard believed that what mattered in life was feeling and choosing rather than thinking. What is needed is commitment. A person must stake his whole life on his beliefs, and this requires faith, not reason. Indeed reason seems to have no place in his thought, for he said that paradox is of the nature of religious truth.

For him, faith is shown in feeling. In the presence of God we should feel Angst, (a German word which combines the ideas of dread and anxiety) as we become aware of our finiteness in comparison with an infinite God. So our relationship with God is an emotional experience that is not based on any intellectual understanding of the nature of God.

But by reacting against impersonal philosophy, he went too far in the opposite direction. Commitment to an ideal is fine, but this is meaningless if the object of that commitment is not real. This is why, when existentialism arose a hundred years later, claiming to be based on his ideas, it led to both an atheistic and a pantheistic form.

Friedrich Nietzsche (1844-1900)

He was born into a family of Lutheran pastors, he studied theology and philosophy, and became an outspoken atheist.

It was he who coined the phrase "God is dead", meaning that we do not need to believe in God any more. Freed from the restrictions of religion we can launch out onto the sea of life to face unknown hazards. We devise our own way of life, we create our own values.

He scorned those who rejected the Christian God but still clung to Christian morality, so at least he was consistent. But what are the values that man creates for himself?

He despised the egalitarian ideas which were spreading at that time. His ideal was a superman (German: Übermensche), not the do-good heros of modern films, nor the Nazi ideal of a super race, but somebody who triumphs over weakness and despises it in others.

His outspokenness encouraged others to attack Christianity. They took the phrase "God is dead" to mean the death of the idea of God as found in the Bible. This enabled them to create their own morality with "freedom" as the key word. But freedom taken to an extreme is selfishness, the opposite of love, and this is decidedly anti-social!

The Twentieth Century

By the end of the nineteenth century, theologians were making their own contribution to the undermining of traditional Christian belief. Some continued the approach of Hume by re-writing the life of Jesus, leaving out all the miracle stories. They portrayed him as a good

man who preached love, but when he fell foul of the religious authorities he chose to accept martyrdom.

Rudolph Bultmann (1884-1976)

Bultmann is perhaps the name best known to be associated with this view. He set out to interpret the Gospels in existential terms. He believed that we do not have an accurate portrait of Jesus in the Gospels since it has been overlaid by the mythological beliefs of the time. So he set about to strip all these away, calling this process "demythologizing" Christian belief. In the end he had to admit that we cannot know with any certainty what Jesus was like!

He also adopted a critical approach to the rest of the Bible. Much of traditional Christian teaching on sin and atonement was credited to Paul, and therefore need not be accepted. The Jewish sacrificial system was a late invention, and all predictions of future events were in fact written after those events. He said that the God of the Old Testament is not the God of the New, for the Old Testament presents him as a God of war, who favours the Jews and is unjustifiably harsh on all other nations. This is contrary to the picture of God which he saw in the New Testament.

It must be noted that this theory about the rise of Christianity is entirely subjective. There is no support for it from the oldest fragments of the Gospels, and early Christian writings tell us that each Gospel was based on the authority of the apostles who had been with Jesus.

Paul Tillich 1886-1965)

Tillich was another who used the ideas of Existentialism to reinterpret Christianity. He tried to strip it of non-essentials in order to make it relevant for modern man. For him, we do not think of a remote God, but one who is the "Ground of our Being". This means that faith involves looking within oneself rather than to a person with whom we can have a relationship.

Sin is being estranged from this Ground of Being, and Jesus overcame this through his suffering and death. We need to allow this power of New Being to transform our personalities and our communities.

But again, on this approach, each person becomes his own authority. Having rejected the personal God who is presented in the Bible, what authority is there for any other idea?

His views achieved widespread but brief popularity in this country through the publication of Honest to God by John Robinson, a book largely based on Tillich's ideas. It was yet another excuse to knock traditional Christian belief and advocate a less challenging religion.

Evaluation: the place of religion in a philosophical system

Having seen the various views that have been held in the past on religion in general and the teaching of the Bible in particular, we now need to ask what place, if any, religion can have in a system of thinking compatible with a scientific view of the world. We no longer need a God to "explain" what we see happening around us, so do we need any sort of God?

None of the attempts to prove the existence of God by philosophical argument have proved satisfactory. The main objection is that the conclusion to any intellectual argument cannot be equated with a personal God.

Nor is it satisfactory to believe in a God who is necessary to prop up an otherwise inadequate philosophical system. For others have devised better systems and so conclude that it is no longer necessary to believe in God.

But even if we decide we cannot use reason to prove that there is a God, we can still give reasons for believing in him.

Then we must ask which of the conflicting ideas of God can we believe? History has shown that people have not been able to agree on what God is like simply by the exercise of reason, we need an external authority for a knowledge of God, just as science looks to observation for its authority. This is why many Christians accept the authority of the Bible for our knowledge of God.

Chapter 9 God and the Bible

In view of what was said in the previous chapter, there are a number of questions to be faced.

1. Can an intelligent, twentieth century person believe in God?
2. How much of the Bible can we believe? Is it a revelation from God, or simply the account of what people thought about God?
3. How can we talk about a supernatural God in human language?
4. If there is a God, how does he relate to the material world?
5. How do we experience such a God? How do we balance our thinking and our feeling about him?
6. What effect does a belief in God have on our lives? Can we formulate a moral code without reference to any God?

Reasons for believing in God

Any thinking Christian should be able to give a reason why he believes in God. This is not the same as a philosophical proof for the existence of God, it is not an inescapable conclusion, but it does mean I have thought of the alternative possibilities.

There have been many different reasons why people have believed in God. In the past, it was thought that various natural phenomena such as thunder and earthquakes were "acts of God", they needed to believe in God because they could not find any other explanation for them. To others, God is the Ultimate Insurance Policy, he is there to prevent serious disasters happening to me, and to take care of my soul after my body dies. There are also those who feel the need to believe in something mysterious, to them God is the Ultimate Mystery which human words are inadequate to describe.

There may be elements of truth in all these, but better reasons can be put forward.

One important reason for believing in God is that it gives a purpose for the existence of everything. In the Bible we read that our main purpose in life is to enter into a relationship with God, this is how we find true satisfaction.

A second but related reason for believing in God is that this is the only sure way of knowing what actions are right or wrong. If there is a Creator God, then he is the one who decides what is right and what is wrong conduct. Just as an instruction book is given with every technical device so that we know how to operate it correctly, so we need to look to him to give us the "Maker's instructions".

This resolves the tension between considering my own well-being and that of others. For in the Bible we find the principles to follow in order to achieve social harmony and also individual happiness. In Christian belief, morals are closely bound to our understanding of God's nature.

This is also why God cannot be simply an impersonal Creative Force. For we cannot relate to an impersonal force in a personal way. Pantheism is no basis for moral standards.

Then if we decide we will believe in God, the next question to ask is how we can know anything about him, and how can we know the standards by which we should live? The Bible claims to answer both these questions.

But first we need to look at what sort of book the Bible is, and consider whether or not we can take its teaching seriously.

The Bible

The origin of the Bible

The Bible is a unique collection of writings. At least 2000 years must have elapsed between the first written records that form part of the Old Testament and the writing of the last book in the New Testament. Yet it is possible to find a unity in it.

Many of the Bible authors claim to record how God revealed himself to different people. First this was to individuals like Abraham, then to the nation of the Jews through Moses. The writings attributed to Moses include laws which reflect the nature of God, these were to govern all aspects of their life; personal, religious and civil.

The New Testament centres on Jesus. He claimed that his teaching was from God[1]. More than that, he claimed that to see him was to encounter God[2]. He endorsed all the teaching of the Old Testament[3]. He said that the Old Testament predicted his coming[4]. He often referred to the Old Testament, for he quoted from the story of Adam and Eve as the authority for his view on marriage[5].

The rest of the New Testament applies the teaching of Jesus. However, many of the writers frequently quote from the Old Testament to show that they were not introducing any new doctrine, rather they were building on what was taught in the Old Testament.

The four Gospels were accepted as the only reliable accounts of the life of Jesus. By the second century A.D., copies of Paul's letters and the Gospels were circulating and used alongside the books of the Old Testament as the authority for Christian teaching.

In the fourth century, a list was drawn up of books that were considered to be reliable sources of religious instruction, and so the “canon” of the Bible came into being. It is important to note that this decision was not made by any religious hierarchy, they simply took account of what was generally accepted by the church as a whole. All the evidence points to the fact that from the time they were first written, people accepted the books that make up the Protestant Bible as a reliable account of what God is like and how we are to behave.

Understanding the Bible

In order to understand what the biblical authors were saying, we must first understand that the Bible is made up of many different kinds of writing. Some books are historical, some are reflections on life, some are collections of religious songs. There are also many different literary styles; poetry and prose, simile and metaphor, wit and sarcasm. To understand any particular passage, we need to look at it in its context, and also in its cultural and historical setting.

Old Testament history is unashamedly biased. The social and political achievements of most of the kings are often ignored. What mattered to the writers was whether or not they kept the Old Testament Law. Military victories were regarded as signs of God's favour. They saw human history as the actions of God in human affairs.

Similarly, events in the natural world are described as God's actions. It is God who sends snow, frost and hail[6]. Jesus himself said that God makes the sun shine and sends rain[7]. This was the world-view of that time. It does not rule out the scientific point of view, it tells us that the processes of nature also show God in action.

The more philosophical books of the Old Testament are classified as wisdom literature (e.g. Proverbs and Ecclesiastes). Here the approach is very practical, wisdom is knowing how to live. No attempt is made to fit things into a rational system of thought; if any

aspect of the world is incomprehensible, it is because God made it so. But the writers still challenge the reader to think, for they believed that the most reasonable course of action is to live according to God's moral laws.

Religious Language

Another important question that needs to be considered is, how can human language convey anything meaningful about a supernatural Being? Are we to take the language of the Bible as being literally true?

In answer to that question, we must first realise that there are many different kinds of language used in the Bible. There is narrative where we read that God revealed himself in human experience. Certain individuals and also the nation of Israel had experiences which they believed revealed something of God to them. This is the language of experience, finding God in our own situation.

There is also language which refers to moral qualities, and here God is said to be the ideal. For example, we are told that God shows ideal love, and ideal justice. It is important that we do not assess God by independent standards of love and justice. Instead we must accept that God's actions reveal what true love and true justice are. These are the standards we should aim at.

Some words are used of God which suggest a relationship. He is called Father and Master. These words tell us that we can relate to God in a way which resembles human relationships, father-child or master-servant. But as many human relationships are far from ideal, we must say that human relationships should mirror our relationship with God and not vice versa.

There are other words which are unique to God. We are told that he is holy, separate from mortal man. Things and people can only acquire holiness as they are set apart from normal use. This sort of language can only be understood by its context. It is similar to the "technical terms" that belong to any specialist subject. A car mechanic understands what a carburettor is by looking at one and seeing how it functions. So words such as "holiness" are understood by seeing how they are used in religious experience.

Some of the words used to describe God are human words to be understood in a symbolic way. He is called a Shepherd, a Rock etc. This means that there are properties which God possesses which these material things also possess. A rock is a symbol of security, a shepherd is one who protects and guides the sheep. These words are said to belong to the language of analogy. But they only illustrate various attributes of God, the most basic statements about God are made in the more direct forms of language already mentioned. When a word is used in a symbolic sense, we need to check that we use it in the correct sense. For rocks have a different significance to a sailor than to an architect!

One way of understanding how human language can say anything meaningful about a supernatural God is to consider that Jesus claimed to reveal God in human form. The fact that he could become tired and hungry shows that he had a human body. But he also claimed to have a unique relationship with God, in other words, to be divine[8]. So if it was possible for the divine nature to be revealed in human form in the person of Jesus, then it is possible to express spiritual truth in the human language that we find in the Bible.

The Bible and human thought

We saw in the previous chapter that recently there has been a tendency among theologians only to accept those parts of the Bible which they consider reasonable. No longer is it taken to be authoritative from cover to cover. The commonest point of view is to approach the Bible with three assumptions:

1. Nobody is able to make reliable predictions of future events. So those passages in the Bible which claim to predict the future were in fact recorded after the event.
2. There are no such thing as miracles. This includes certain events in the life of Jesus namely the virgin birth, the resurrection and ascension.
3. God is a God of love who never wishes to harm anybody. Therefore all teaching which conflicts with this, e.g. the mention of God's judgment, even by Jesus, is to be ignored.

Now if we examine the prophetic books of the Bible, we see that predictions were always made with a definite purpose. Sometimes this was to demonstrate that God is in control of human affairs, and often to warn people of judgment on them if they did not obey God's moral laws. So we must regard the predictions as an essential part of the teaching of the Bible.

The question of miracles is considered in chapter 10. But we must note that they also had teaching value, they were signs of God's power, or events which should lead to wonder at the nature of God.

Some people describe many Bible stories as "myths", events which have symbolic meaning but no historical fact. But it is vital to Christian belief that our faith is based on events which actually happened. If they did not, then Christian belief is indeed an illusion[9].

Those who reject certain passages of the Bible, in particular Old Testament passages which seem to portray a God who is not loving, have already made up their minds as to what kind of God they can accept, they want an easy-going God who makes few demands on them. We need to realise that those passages of the Bible which speak in grim terms of the wrath of God are saying that God sits in moral judgment on everybody.

Authority

Philosophers do not take kindly to the suggestion of authority in their field, for it brings back unpleasant memories of the medieval period when the authority of the Church stifled creative thinking.

By contrast, scientists work continually under the authority of experimental evidence. When they make observations which do not fit their existing theories, once they have checked that these are genuine and not due to the equipment malfunctioning, they have to modify their theories in the light of this new experience. They do not use their minds as a sieve to decide what results they will accept and what they will reject. Nor do they expect all theories to be neat and rational, they are used to working with paradox. Their work is also subject to rigorous scrutiny from other scientists as we saw in chapter 6.

When we consider the question, can we accept the authority of the Bible? we must first understand that the language of the Bible is the language of the culture in which it was written. We have already noted that the Bible writers did not view historical accuracy in the same way that we do today. But we can still accept that the historical books give a generally accurate account of the history of the Jews. And if archaeology is found to agree with this account, then that is a bonus.

There is also a record of what people thought God was saying to them, people we usually call prophets. And we must also note that many of the messages of the prophets were spoken to their generation, there is very little prediction of future events. And when these predictions are made, we need first to ask what was the reason for these predictions being made. The message was first of all for the original hearers.

And we must also note that the language of the Bible is the language of the culture of that day. So we cannot take idioms such as the "windows of heaven" in a scientific sense.

This is why the Church was wrong in using the Bible to refute Galileo's theory that the earth goes round the sun. And in particular, it is very difficult to connect the first 3 chapters of Genesis with what scientists believe about the origin of the world. I believe we can take the very first verse of the Bible to mean that, whatever happened, we can attribute it to the action of God. But also that what happened occurred through the operation of the scientific laws that govern the present operation of the Universe. The one exception is the origin of people we call “human”, and that was considered in chapter 7.

A humble person will accept that we cannot pick and choose and only believe certain things about God. We need to accept that our understanding of God is imperfect because our minds are finite. To approach the Bible with an open mind means a willingness to take its claims seriously. If certain parts are rejected, we need to ask upon what criterion are they rejected? If that criterion is the opinion of a particular human, is that person to be relied upon more than God?

However, this does not mean that there is no place for rational thought in Christian belief. There is a difference between faith and credulity. This is why this chapter began with reasons for believing in God. But we should be willing to approach it with an open mind, free from irrational prejudice. Then we can use our minds to consider what is taught, how the different books relate to each other, and how its teaching relates to our own experience.

There is also an element of paradox in the Bible. It is difficult to reconcile God's love and his justice. Also, how does the teaching on God's predestination fit in with the idea of human free will? These are more like the paradoxes in science, that matter behaves sometimes like particles and sometimes like waves. God would not be God if he fitted into a logical system like maths. If there were no paradox or mystery, God would be sub-human.

So it is not unreasonable to accept that the Bible is an authoritative source of knowledge on religious matters. This is not the same as dogma which has to be accepted without question, each individual can read the Bible and find out its meaning for himself.

Another important point to consider is that if there is a supernatural God who has given us the ability to communicate with each other, then he must be able to communicate with us. It is intellectual arrogance to think that we are better at guessing what God is like than he is at revealing himself to us.

This is certainly the view of the writers of the Bible. In the wisdom literature the basic belief is that "The fear of the Lord is the beginning of wisdom"[10]. In other words human thought must start by acknowledging that there is a God.

So let us look at some of the basic things about God that we find in the Bible.

BIBLE TEACHING

The nature of God: God is personal

The Bible writers all speak of God in personal terms. We relate to God as a person, not as a thing, nor an abstract idea.

What makes us different from things is that we have self-consciousness, and feelings. We also have freedom of action and should have motives for our actions. When we relate to other people, we must respect their feelings and their individuality. So when we relate to God, we believe that he responds to us in a personal way. He is pleased when we do right, and is grieved when we do wrong.

We read that man was made "in the image of God"[11]. This means that our nature reflects that of God, particularly in the non-physical aspect, our mental, emotional and moral aspects. When the Bible writers speak of God's heart, hand, eyes or ears, we are not expected to take this literally. But it does help us to think of God in personal terms.

It is because God is personal that he can communicate with us Some people saw angels in human form who brought messages from God. Then we read in the New Testament that in Jesus "The Word became flesh"[12]. He was a revelation of God in human form. In other words divine and human nature were united in one unique person.

This may be a surprising statement, but it is the only possible understanding of what Jesus said. All truly great men are also humble. But Jesus claimed to be unique, on a level with God (8). There are only three ways of understanding this claim. Either he was mentally unbalanced, or he was deliberately deceiving people to gain personal power, or his claims were genuine.

God and the world

There is also an element of paradox in the Bible view of the relation of God to the world. As creator, it means he is separate from the world, holy, transcendent. But he is also actively involved in everything that goes on in the world. Everything that happens is an "act of God". This is why Jesus said that God causes the rain to fall and the sun to shine[7]. We say that God is immanent in the world.

This means that the laws of science describe how God normally works, and the fact that there are fixed laws shows that God is reliable, not capricious. But God is not bound by these laws, this is why miracles are possible, they are occasions when God acts in a different way.

God and man

Because our bodies are part of the physical world, they operate according to the laws of science. Also, because we are created by God, we should obey his moral laws. The fact that all have some sense of right and wrong is evidence that we are all made in the "image of God".

In the Old Testament, the books of Exodus to Deuteronomy describe the civil, moral and ceremonial laws that were given to the Jews. The fact that laws were given shows that we are treated as being morally responsible, free to obey or disobey any particular law.

In the New Testament, Jesus upheld the principle behind Old Testament law[3], but he objected to the legalistic attitude of the religious leaders of that time. The essence of the law is love to God and our neighbour[13]. The rest of the New Testament writers continue this emphasis on the inner aspect. The civil laws of the Old Testament were only for the period when the Jews were a self-governing nation, but they are still of interest as they show certain principles of social life which can still apply.

Throughout the Bible we read that sin breaks the relationship between us and God. But God has provided a means of forgiveness, the death of Jesus was the price that had to be paid. We are assured that anybody who admits their sin can find God's forgiveness[14].

Sin also affects our thinking processes. Paul claims that everybody can learn something about God by looking at the world around us[15]. But those who reject this knowledge also reject God's moral standards of living[16]. Paul only speaks against "the wisdom of this world" inasmuch as it represents the thoughts of people who deliberately reject a belief in God[17]. He believed that the revelation of God brought by Jesus represents true wisdom for us[18].

The problem of evil

We have seen that one problem with any rational approach to Philosophy is the existence of evil in the world. This becomes an even greater problem if we believe that the world was created by a loving and all-powerful God. How can such a God allow the suffering that goes on around us?

A full survey of the views of the Bible writers to this problem is beyond the scope of this book. But a few general points can be made.

First, a distinction must be made between physical and moral evil. We now have a considerable understanding of the physical basis behind natural disasters - floods, earthquakes, volcanic eruptions etc. We know that they are part of the natural world. Also, we have the technical ability provide some protection against all but the worst natural disasters.

Many people are not happy with the idea that God deliberately created a world which is in such turmoil. But we read that when God had finished creating everything, he pronounced that it was "very good"[19]. If we decide that a very good world cannot have volcanoes and earthquakes, at least we can say it suited the purpose for which God made it. In the epistle to the Romans, we read that "the creation was subject to frustration", but one day it will "be liberated from its bondage to decay[20].

This means that God made the world as it is because he knew that man would rebel against him, and it is a suitable place where rebellious humans can find him and obey him, not by compulsion, but by free choice. The existence of moral evil is the price we pay for having freedom of choice.

But we have seen that when we do wrong, God offers forgiveness for all who will receive it. Then a right relationship with him is restored, and we can find his power to avoid wrong in the future. One day we are assured God will put an end to all evil by removing those who will not turn to him of their own free will. Then God's purposes for planet earth in general and mankind in particular will be fulfilled.

Mystery

Finite man can never completely understand an infinite God, we cannot even understand ourselves! There is always an element of mystery in God's nature. When the Jews were migrating from Egypt to Canaan, they had a sacred tent as the centre of their worship. We read that a cloud was always over this tent, and this was the symbol of God's presence. Occasionally this cloud entered the tent, then nobody could enter. The fact that a cloud symbolised the presence of God shows that there is a mystery in the nature of God that we cannot penetrate. This should make us humble, admitting that there are things we cannot understand.

The response of the mystic to this aspect of God is to seek for emotional experiences. But while reverence in the presence of God is vital, the Jews were never encouraged to seek for mystical experiences for their own enjoyment. Where people saw visions, these were to emphasise God's transcendental nature, but often a message was given which was expressed in intelligible words. It is important to keep in balance the different aspects of God's nature. We cannot know all, we are assured that we are told enough about him so that we can enter into a relationship with him.

Morals and Religion

Some want to retain Christian moral standards but reject the Bible view of the nature of God. But we have seen that the only sure basis for moral standards is when there is an authority over man and that is God.

Others feel the need to believe in some sort of God, and are faithful in their religious devotions. But for the rest of the time they feel they are at liberty to live as they please.

Christianity is unique in uniting morals standards and religious belief.

References:

1. Jn.7:16,
2. Jn.14:9
3. Mt.5:17-19
4. Jn.5:39
5. Mt.19:4-6
6. Ps.147:16,17
7. Mt.5:45
8. Jn.10:30
9. 1 Cor.15:17
10. Ps.111:10
11. Gen.1:27
12. Jn.1:14
13. Mt.22:37-40
14. 1 Jn.1:9
15. Rm.1:19-20
16. Rm.1:21-32
17. 1 Cor.1:20
18. 1 Cor.1:24,25
19. Gen.1:31
20. Rm.8:20,21

Chapter 10 The Interface between Science and Bible Teaching

Introduction

If we accept that science and religion are different ways of looking at life, both equally legitimate in their own domain, then there need not be any major conflict. It is rather like the fact that two photographs of an object from different angles can be totally different. However, there are areas where there seems to be conflict between the two viewpoints.

The important question is, does either science or religion have any authority in each other's realm? In chapter 6 it was stated that science, by its very nature, deals with only one aspect of human experience, it cannot pronounce on the reality or otherwise of a spiritual dimensions to human life.

Similarly, if we accept the authority of the Bible in giving us a knowledge of God and of the spiritual side of our nature, this does not stop us understanding the world from the scientific point of view. In the previous chapter, we saw that it is possible to arrive at some knowledge of God from looking at the world around us. Scientific theories are under the authority of the experimental evidence, and for the Christian, this means the authority of the world God has made. So by faith, the Christian has to accept that the same God would not say two different things through the two different methods of revelation, the Bible and the world. People have said that God has revealed himself by giving us two books, the Bible and the book of Nature. If that is so, there cannot be a fundamental contradiction between the two. Some say the authority of the Bible determines how we interpret nature. Personally I do not agree with that view. If there are apparent conflicts between what the two books say on a particular topic, there must be a means of resolving them.

Three areas of overlap will be considered in this chapter, the study of ourselves, of how things began, and miracles.

Human Beings

The biblical view of people

The ancient Hebrews were straightforward people. All events in the natural world were regarded as "acts of God". In particular this was true of all processes of the human body, including conception and sterility.

They knew something about plant and animal breeding, but there is nothing in the Bible to suggest that they had any understanding of what we might call scientific principles. Also their understanding of the function of the various parts of the body was very primitive.

They regarded the heart as the centre of thinking as well as the centre of man's personality. We have retained something of this use in our phrase "the heart of the matter". But normally we use the word "heart" as opposed to "head" to mean "emotion" as opposed to "thinking". But the ancient Hebrews had no such distinction, they had no separate word for "mind", as they thought with their hearts!

The Greeks had several different words for "mind" and "thought", so in the New Testament there are many exhortations to think, consider, and generally use our minds.

In the Old Testament, we find that the kidneys were regarded as the seat of certain emotions (in the Authorised Version the archaic word "reins" is used). Also the bowels are sometimes mentioned as being involved when a person was mourning.

The Hebrew word usually translated "soul" in the Old Testament is *nephesh*. Its basic meaning is "breath", and so it is sometimes used for anything which breathes, both

humans and animals. It has other meanings as well, sometimes it is used for the biological life of a person, and sometimes it refers to our inner life, feeling, thinking, desiring, as opposed to our physical side.

The Greek word used in the New Testament for "soul" is *psyche*. It is usually used with a similar meaning to the Hebrew *nephesh*, since most of the New Testament writers were Jews.

The word "spirit" also means "wind" or "breath" both in Hebrew and Greek. There is a considerable overlap in meaning between the words "soul" and "spirit" in the New Testament. If there is a difference, "spirit" is used for the higher level, what we would call the spiritual aspect of our nature, that which is aware of God, while "soul" is more involved in thinking and feeling.

We certainly cannot take the Bible as authority for any scientific understanding of the workings of the human body. But the use of these different words shows that the language of the Bible supports the view that human life has a physical, a mental, and a spiritual dimension.

Religious Experiences

Some people claim that it is possible for science to "disprove" the reality of a religious experience. But this statement confuses the spheres of activity of science and religion. It is legitimate for a psychologist to study the effects of a person's religious beliefs on his behaviour. But in his professional capacity he has no right to say anything about the content of these beliefs any more than he has a right to pass judgment on a person's political views.

This includes a study of the various methods by which people are persuaded to convert to Christianity or to any other religion. It is a fact that many people know how to sway an audience, this is an ability shared by "Pop stars", evangelists, and politicians. Using a few simple techniques, they can persuade their audience to do almost anything, and believe almost anything. But the test of the permanence of the change is when the individual gets home and is on his own. It is the task of psychology to study the methods of persuasion, and their effect on a person's behaviour, but not what is being conveyed by those methods.

One thing that has been established is that a religious conversion which is made simply on the basis of an emotional appeal is unlikely to last. A lasting change of attitude is only brought about when all aspects of the person's life are involved, the thoughts as well as the emotions. Then the person is making a free choice and not a forced decision.

But the Bible gives yet another dimension to Christian conversion. God speaks to people in different ways, and when a person responds to this call, it is regarded as a change brought about by the Holy Spirit[1]. It is the beginning of spiritual life, called being "born again" because the change is as dramatic as the beginning of physical life.

Some people use the term "religious mania". Now there may be an abnormal state of mind where this term can legitimately be applied, where a person acts irrationally. But there is a world of difference between this and somebody who is enthusiastic about their faith, consciously applying this to every aspect of life. Also, there is a clear difference between a schizophrenic hearing voices telling him to destroy himself and a sane person believing that God has spoken to him.

Our destiny

Many people are interested in the possibility that there is life after death; we find it hard to accept that physical death is the end of human existence. But such a topic is

beyond the realm of science. The study of "out of body" and "near death" experiences may tell us something about the human mind and its link to the physical body. But these experiences cannot prove the existence or otherwise of a realm of existence beyond physical life.

There are many passages in the Bible which deal with human destiny. The Jews in Old Testament times shared the belief common to many ancient peoples that there is a shadowy underworld to which all go, good and bad. In Hebrew this is called *Sheol*, and in Greek it is *Hades*. But these words are only used because they were the language of the day, there is no detailed teaching on what happens after death till the New Testament.

In the New Testament, two aspects of human destiny are clearly taught. First, we are told that after death we will all be judged by God for what we have done[2]. This confirms the link between moral standards and Christian belief mentioned in the last chapter, ultimately I am answerable to God for my actions.

Secondly, there will be a final separation according to people's attitude to God. Those whose names are written in the "book of life" (those who have received God's offer of spiritual life) will enter a new universe. The rest will be destroyed in what is called "the lake of fire"[3]. This new universe will be the full realisation of the "Kingdom of God"[4]. But Christians can only rise to this new existence because Jesus rose from the dead[5].

Humans in this new universe will not be simply minds as the ancient Greeks thought. For in the New Testament there is no suggestion that the soul or spirit of a person can exist outside his body. This supports the idea that we must not think of ourselves as having separate bodies and spirits, but as whole people. Any life after physical death involves the whole person. This is why the New Testament speaks of the "resurrection of the body". The clearest statement on this is given in 1 Cor.15:35-58. But even here, the language is highly symbolic, Paul speaks in terms of an analogy with a plant growing from a seed, he does not go into any more detail as to what this new body will be like.

What is clear is that in the new state we will have a relationship with God which is closer than we have now, and we will be able to live in harmony with each other[6].

Moral issues in science

We now have a much better understanding of the workings of the human body than we had 100 years ago. This has enabled surgeons to perform operations which were not even dreamt of then. But now that medical science has enabled us to prolong human life in many situations, many ethical questions have been raised.

Is it ever justifiable to switch off a life support machine if the patient has little likelihood of making any significant recovery? Should there be any curbs on research into research on fertilised embryos? Is it right to abort a foetus that is thought to be malformed? What is the aim of human genetic engineering?

These and many other similar questions cannot be answered on the basis of scientific knowledge alone, they have a moral dimension as well. The fact that something is scientifically possible does not make it morally right. For a Christian, the same moral principles apply to these as to every other aspect of life. People with scientific knowledge and those with a knowledge of the Bible need to get together to lay down guidelines.

* * * *

In the beginning ...

The Darwinian Debate

Perhaps the greatest controversy between science and religion has been that which started when Charles Darwin published his book "Origin of the Species" in 1859. Why was this?

At that time, people considered that the gap between animal and human life was so great as to be unbridgeable. Above all, there was the moral difference. When Darwin's ideas were popularised to imply that we descended directly from monkeys, this challenged the dignity of human life. It was a threat to the whole basis of moral standards.

But we must first realise that when Darwin started his research, he only wanted to advance scientific knowledge. He saw evolution simply as a scientific process, and insisted that he was not disproving the existence of God. Later on his religious convictions seem to have wavered, but that is more because of his temperament than as a result of his research. It was his friend T.H.Huxley who urged him on in his writing because Huxley saw it as a support for his agnostic views (see chapter 3).

However, it can also be argued that the publication of the book did a lot of good indirectly. The fuss that it created was like the type of forest fire which burns up the dead material which is lying around, but which does not harm the healthy trees so that they grow even stronger.

These were some of the effects of the publication of "Origin of the Species":

1. Those who were atheists, but who had kept quiet about it when this was not fashionable, could now use Darwin as an excuse for not believing in God.

2. There were also many, who would not call themselves atheists, but who would rather not take too much of the Bible seriously. Now they too had "scientific reasons" for not believing at least the first few chapters of the book of Genesis. Then once they had a reason for rejecting those chapters, the way was open for them to question any other part of the Bible that they did not want to accept.

3. Up till then, many devout Christians had believed that certain natural phenomena could only be explained by saying that they were the results of a direct action of God, and of course the creation of the world was one of these. In their way of thinking, these "acts of God" could not have any scientific explanation. A significant number of these have chosen to hold on to their interpretation of Genesis 1, and reject all the scientific evidence for the age of the universe and for macro-evolution.

4. However, there were those who began to see the absurdity of some of the arguments put forward on both sides, and tried to reconcile the Bible narrative with the scientific evidence.

This has made many realise that we do not need to look to God to explain the gaps in our scientific knowledge; and the subject of origins is one gap which is now being filled in. If God was being squeezed out of a particular gap, then they were looking for him in the wrong place. So Darwin did good indirectly in further separating science and religion so that the rightful place of each in our thinking could be seen.

Implications for Christians

There are three important issues in trying to reconcile the scientific and biblical accounts:

1. The question of the time scale,
2. The origin of biological life,
3. The origin of human life.

These will be dealt with in reverse order.

The creation of human life

In Genesis 1 we read that "God created man in his own image"[7]. The important difference between man and other animals is that we have both a moral and a spiritual dimension to our life, we have the ability to enter into a relationship with God.

Then in the next chapter, we read that God formed man "from the dust of the ground"[8], in other words from matter that already existed. These words allow us to suggest that human life originated by the operation of a normal scientific process. I do not see that it contradicts this particular verse if we say that there was a continuous development from primates to hominoids; but at a particular time, God endowed an existing pair with the extra faculty which the Bible calls the "image of God". This marked the start of what we now call *homo sapiens*.

The Bible story then goes on to say that this first pair lived in a very fertile place, they were able to cultivate plants for their benefit. Their moral faculty was demonstrated when God gave them one simple command, not to eat from a particular tree (we are not told it was an apple tree!). But they disobeyed, and we are told that all the moral evil in the world has resulted from this one incident.

The tree was clearly symbolic. But that does not mean that it was not a real tree, for in the Old Testament, material things are often given a spiritual significance.

From the point of view of Christian belief, it is important to say that this account of Adam and Even is history and not myth. A myth is generally taken to mean a story which has no historical basis, but is told in order to illustrate a particular belief. But the Christian faith is based on the belief that certain events actually happened in human history. The belief in the unity and the uniqueness of the human race relies on the truth of the story of Adam and Eve.

The Bible writers took the same view, as there are several references back to it to show what we are to learn from this incident. Jesus appealed to the creation of man and woman as showing God's ideal in the marriage relationship[9]. Also Paul has a long discussion based on the story of Adam's disobedience[10]. He says the human race is a unity, because of our physical descent from Adam (and Eve), and because of this, Adam's sin affected all humans. Similarly one Man (Jesus) has been able to reverse the effects of this sin.

This means that the reason why we believe in a fundamental difference between man and animals is in our understanding of what human nature is. Our uniqueness is that we have a moral and a spiritual nature. How and when our physical nature originated does not alter this uniqueness.

The origin of biological life

This is another example where many Christians insist that there must be a gap in the fossil record so that we can say that it was a direct act of God. However scientists find it difficult to define "life" precisely. The biochemical processes that take place in living matter are different in degree but not in kind from biochemical processes which can be performed in any laboratory. One day it might be possible to synthesise "living matter" from non-living components. But I have already said that the uniqueness of humans (as opposed to animals) is in having this extra non-material dimension in our nature. If a scientific description of the origin of biological life is found, I do not see how that stops us saying that God worked in whatever process that took place.

The problem of the time-scale

On the face of it, this appears to be the biggest problem. In Genesis 1, we read that God created the world as we know it by a series of commands. Six times the phrase is repeated, "And there was evening and there was morning" and then the number of the day is then given. On the seventh day we are told that God rested from this work of creation.

The only other references to the fact that Creation took six days occur in connection with the custom of having one day's rest in seven. In the Ten Commandments the reason given for having a rest day is "For in six days the Lord made the heavens and the earth, the sea, and all that is in them, but he rested on the seventh day"[11]. In other words, God himself has set the pattern of activity and rest for us to follow.

But what scientific interpretation do we give to these "six days"? On the face of it, it seems to be saying that God first created matter out of nothing, then after only six days, the earth was more or less as we know it now, with a balance of plant and animal life, and in the sky could be seen the sun, moon and stars.

But does it matter how long God took to create the universe? If God is truly all-powerful, he could equally create it in one second or in many billions of years. To lengthen the period of creation does not lessen his power.

Some say that God did create the world in six literal days, but that when he created planet earth, he made the rocks appear to be very old, and created fossils in them. Also, when he made the stars, he made them with light beams that had already spread out over millions of light years. The objection to this interpretation is that it means God has deceived us, like a criminal planting false clues to lead detectives on a false trail.

Another way of looking at the problem is to say that God created time when he created humans, so the question of the time scale is not important. This means that the situation is rather like the beginning of a novel. When a character is introduced in a story, we are aware that each has their own "past", but this past is not recounted as it is not relevant to the plot. So God created a world with a real past. The biblical narrative starts with the creation of man. All that went before is irrelevant to the story of how God has revealed himself to us. In some ways, this is simply a more sophisticated version of the view put forward in the previous paragraph.

This view is close to the thinking of those scientists who speak of the creation of Time. I see no objection to saying that for us humans, time started when human life began. For what matters to each one of us is time as measured by our own biological clock.

Other objections to evolution

Some people object to the idea of biological evolution because they see moral implications in it. But why should there be any moral implications in a particular scientific process?

They cannot understand why God should choose to work through such a seemingly random process as evolution. How can the beauty and order of the world we see around us arise from random mutations? Surely the important thing is to see beauty and harmony, and those of us who believe in God as Creator can thank him for it. If a biologist loses his appreciation of the beauty of the natural world by discovering the genetic changes that brought it about, then that is his problem.

Also random mutations are thought to be wasteful, as most mutations have no survival value. But this is no more wasteful than a fish laying thousands of eggs when only a few grow to mature fish. The rest provide food for other creatures. We also find the

fossilised remains of forms of life that died out because they were not able to adapt to the great environmental changes that have occurred in the past. Perhaps there is a moral to be learnt from that. But we do not have to find a moral "reason" for the development of these species. We must not let our scientific knowledge take away our sense of wonder at the variety of the world, "How many are your works, O Lord! In wisdom you made them all"[12].

Some have a problem with carnivorous animals because in some places the Bible gives us a picture of an ideal world where the wolf lives with the lamb and the lion eats straw[13]. But carnivorous animals (and birds and fish) are at the head of a long food chain. Is it more immoral that an antelope should be eaten by a lion than by maggots? Is it wrong for a whale to feed on microscopic organisms? How big must an organism be before it is immoral to eat it?

These days we have come to realise how much all life forms are dependent on each other. One feeds off another, and so a dynamic balance is set up. We can see this as part of the wisdom of creation, for we read that "the lions roar for their prey and seek their food from God" [14].

We saw in the previous chapter that God pronounced the world "very good" after he had made it. This does not mean that it conforms to whatever moral values we may impose on it. Rather it means it was fitted for God's purpose, as an environment where we could live and find God.

Another problem is caused by those who make a very clear distinction between God's acts of creation and his present "sustaining" of the world through the operation of natural processes. They say that what happened in those first six days was creation, and quote Gen.2:2 where we read that God "rested from all his work", so no creation took place after that. But many new life forms have appeared in relatively recent times, and are as much God's creation, even though their appearance is an example of "evolution" in its general sense. So it is difficult to draw a line between God creating and sustaining.

What are the important issues?

There are several matters that Christians who take the Bible seriously should be agreed on.

1. The Bible asserts that it was God who created the world, and works through all "natural" processes. This must include the changes which took place in the past and are still taking place, which biologists call "evolution" in its widest sense.

2. This does not in any way lessen the authority of the Bible. No part of it should be regarded as "myth", all history in the Bible is told in order to teach us something about God.

3. I do not believe that the Bible commits us to believe in any one scientific theory of origins. We assess each theory according to how it fits the scientific evidence that we have.

4. In particular, if we find a gap in our knowledge, this must not be taken as meaning that at that point God intervened and performed a miraculous act of creation. For later, we might find a "scientific" explanation for that gap.

As an example of this some people attach great importance to the the fact that there are many "missing links" in the fossil record. But these are of no greater significance than the missing clues in a murder hunt. The absence of a clue does not prove that no murder took place. There is nothing wrong with asking by what process any particular life form reached its present state.

If anything is wrong with the present scientific theories of origins, they will be refuted by scientific evidence. Although some promote evolutionary views because they consider that it supports an atheistic philosophy, this is not the basis of the theory. A theory stands or falls solely on its scientific evidence. This is the only level on which the scientific theories can be challenged.

* * * *

Miracles

The popular definition of a miracle is an event which has no "natural" explanation, and is therefore caused by some supernatural agency. However, it is difficult to say if any event is a miracle on the basis of this definition, for every day in research laboratories, scientists are seeing things happen for which they do not at present have a scientific explanation.

The various Hebrew and Greek words used in the Bible for miracles show that the they were regarded as events which had a spiritual significance. Some of these words mean literally "wonders", “signs" or "acts of power". What happened was taken to be something which God did in order to reveal something about himself.

As the Bible writers regarded all events as being caused by God, we cannot draw a rigid distinction between God's normal and his abnormal working. Sometimes we are given a "natural" explanation of what is regarded as a miracle. When Moses led the Jews out of slavery in Egypt and they came to the Red Sea, we are told that "the Lord drove the sea back with a strong east wind and turned it into dry land" [15]. So they were able to cross, but the Egyptians who were chasing them drowned as the sea returned to its normal position. The event was clearly an act of God. A meteorologist would have said that it was due to abnormal weather conditions. But the miracle was in the timing, first in the sea being blown back when the Jews reached it, then in returning when the Egyptians tried to cross.

Miracles in the Bible

The Bible miracles mainly occur at three periods of the Jews' history; when they were freed from slavery in Egypt, in the days of the prophets Elijah and Elisha when the worship of God was all but eclipsed, and at the beginning of the New Testament era.

On one occasion, the prophet Elijah called for a showdown with the prophets who worshipped a god called Baal. He challenged these prophets to ask Baal to create fire to burn up a sacrifice they had prepared, but nothing happened. But when Elijah prayed, his sacrifice was burnt up. The fire came to prove that Elijah's God was real and that Baal was false[16]. However, Jesus consistently refused to perform miracles to convince sceptical Jews[17]. So we cannot expect God to persuade today's atheists with a display of supernatural pyrotechnics!

Miracles also show us something of God's nature. When Jesus healed the sick or fed the hungry, it was a token of God's concern for people's need. But he only helped particular people; he would not provide free meals on demand. Also, when Jesus healed sick people, he made it clear that it was a person's faith which enabled them to receive his healing.

So miracles were always performed in order to teach something, to confirm the truth of a message being proclaimed, or to reveal something of God's nature, his power and his concern for human need. Jesus' miracles were also a sign that he was the one whose coming was predicted in various places in the Old Testament[18]. But only those who had faith realised this.

Miracles in the person of Jesus

The three greatest miracles recorded in the Bible must be those connected with the person of Jesus.

The unique nature of Jesus is an essential part of the teaching of the New Testament. This is shown first in the manner of his birth. We read in the gospels of Matthew and Luke that Jesus did not have a human father. Instead his conception was by a miracle brought about by the Holy Spirit in Mary's womb[19]. This proves that Jesus had a divine as well as a human nature. This is an essential part of Christian belief, for if he had been conceived in the normal way, he would be no different from any other human.

We are told that Jesus died by crucifixion. No Roman soldier instructed to crucify a person would dare give up the body till he had made sure it was dead. But three days later, the disciples saw Jesus alive. There is no scientific explanation of that. Then 40 days later, while he was talking to his disciples, "he was taken up before their very eyes, and a cloud hid him from their sight" [20]. His body was taken away from the physical universe to a spiritual dimension. These facts are taken as proof that Christians have a destiny after death[21].

If we accept that such unique things could happen to Jesus, then it is possible to accept that God can work miracles that are less dramatic.

Modern miracles

Since Bible times, there have been numerous reports of miracles being performed by various people. Some of these are clearly fanciful. But there are also many well documented accounts of miraculous healings being performed by respected Christian leaders.

There are also many people alive today who believe they have been healed in answer to prayer. Those who wish to be sceptical can say that they would have recovered even if they had not prayed, it was mere coincidence. On the other hand, there are many devout Christians who pray for healing but who do not recover. In one sense, all healing is from God. But we can say that God sometimes heals in unexpected ways when he has a special reason for doing so.

We have seen that a Christian view of the laws of science is that they describe God's normal working. But God is not bound to work always according to these laws, he is not limited by any principle outside of himself otherwise he would not be God. The fact that there are laws shows that he is not capricious. But the fact that miracles do occur show that he is in control of everything in this world.

So it is not helpful to define a miracle as something which happens when God suspends natural laws, for then people look for a "natural" explanation of a miracle, and lose faith if they find one. Those who do not believe in God can easily find a reason for not accepting a particular event as a miracle.

It is better to say that a miracle is an event with a particular spiritual significance, through which God wants to teach us something of his power and love. This is why faith is necessary to appreciate a miracle. We can learn something of God from the miracle stories in the Bible. We can also learn something about him when he chooses to perform miracles today.

Bible References:

1. Jn.3:3,5
12. Ps.104:24

2. Rev.20:13
3. Rev.20:15
4. 1 Cor.15:24-28
5. 1 Cor.15:21,22
6. Rev.21:3,4
7. Gen.1:27
8. Gen.2:7
9. Mt.19:4-6
10. Rm.5:12-21
11. Ex.20:11
13. Isa.11:6-9
14. Ps.104:21
15. Ex.14:21
16 1 Kings 18
17. Mk.8:12
18. Mt.11:4,5
19. Mt.1:20, Lk.1:35
20. Acts 1:9
21. 1 Cor.15:20-22

Chapter 11 Conclusion: Is there a Christian way of thinking ?

The future for human thought

In chapter 1 we looked at some of the fundamental questions that people ask. The next step is to consider where to look for the knowledge necessary to answer the questions.

Scientists gain knowledge of the world around us by using their senses, then by thinking about what they observe. They assume that there are universal regularities which we call the Laws of Science. Then they find out what these regularities are by the process described in chapter 6. This is the basis of the technology which has revolutionised our lives.

But we saw in the last chapter that, while science can tell us what we *can* do, we also need guidance as to what we *should* do. The appliance of science raises moral questions.

By contrast with the success of science, we saw in chapter 2 those who have relied simply on human thought have not been able to agree about many things. So the tendency now is to say that by pure thought we cannot arriving at anything which can be accepted as Truth, or anything which might be regarded as Absolute. Some go even further and say that there is no higher authority than ourselves; everything is relative, man is master of his own destiny, I can live as I like. But such ideas tend only to anarchy, and few would seriously advocate that.

This is why it is unsatisfactory to make the human mind the ultimate authority in the Universe. Social harmony can only be achieved by appealing to an external authority. We need to consider the possibility that there is a God who created the universe, who decides what is the purpose of everything, and who tells us the moral principles which should govern our actions.

So perhaps we should not look inside our minds to find any knowledge apart from knowing what is actually going on inside them. Instead we should use our thinking powers to assess and integrate the knowledge that we gain from various sources.

We can think about the many aspects of our lives: art, history etc. Each has its own approach and technical terms. We need to realise the principles by which each discipline operates, and see how these relate to those of other disciplines. We can no longer become specialists in more than a few of these disciplines, but at least we can become aware of the contribution that each makes to life in general.

But what sources of knowledge are there apart from our senses? In chapter 9 we considered the claim of the Bible to be an authoritative source of information. The Bible deals mainly with the nature of God, and how he wants us to live. So this is where we need to look if we want to find out the purpose of the world in general and about human life in particular. But if we want to find out about the nature of the world, we use the methods of science.

Where the Bible deals with subjects which are also open to scientific investigation, we have seen (in chapter 10) that it is possible to harmonise the two viewpoints.

But does the Bible commit us to a particular system of thought? The simple answer is "not in detail", but certain guidelines can be laid down which are consistent with Bible teaching.

Is there a specifically Christian system of thought?

Conclusion

We saw in the previous chapter that the Bible regards the truly wise person as one whose thinking starts by assuming that there is a God[1], in other words we can say that God is the Ultimate Reality.

Then, since God made the world, we can say that the whole material world is real. It is something objective, outside ourselves, not a product of our own imagination. We may not be certain as to the exact nature of the fundamental particles of which everything is composed, but that does not stop us from believing that what we see and touch is real.

Also, we can say that the laws of science are the principles by which God operates. They are not above him, but describe his normal working. So the fact that there are fixed laws of science is rooted in the nature of God, and the fact that we may never know all the laws shows that God is greater than we are.

Then if we acknowledge that there is a creator God, we must acknowledge his moral authority over all aspect of our lives. It is God who says how we are to live, relate to other people, and use the faculties that we have.

But we must be careful how we apply moral principles. We cannot say that one scientific theory is moral and another is immoral, although honesty means that we cannot ignore facts which do not fit in with our theory. Morality is relevant to the appliance of science in technology. We have already seen the need for moral guidance in medical research. Another example is the invention of explosives, these can be useful in coal mining, but wrong when innocent people are blown up. Moral principles also apply in simple matters such as health and safety precautions. Even in Bible times, they realised that a guard rail was needed on a flat roof to stop people falling off[2]!

Moral questions arise in subjects such as history and literature, which deal with human actions. But in the creative arts, the situation is different. We cannot say that one art form is more moral than another. Our artistic abilities enable us to express ourselves and communicate our feelings to others. There is a wide variety of personal preferences in the different styles of art, and is difficult to say that one style is more moral than another. What must be condemned is anything which is specifically intended to corrupt our minds. For as in every other aspect of life, we can lay down principles of harmony, rhythm, etc. which help us appreciate a particular work of art. These principles exist because they describe how our artistic appreciation operates.

Also, if God made the world, then it is he who decides what should be its purpose. In the account of creation, we read that God told man to "rule over" the material world[3]. This means that we can use the natural resources of the world, but not squander them. Conservation is for the benefit of mankind as a whole, not for the benefit of some abstract ideal. We should aim to leave the planet in a better condition than we found it.

So the basic Christian outlook is that all human activity is under the authority of God. While some knowledge of God can be learnt by looking at the world and our own moral consciousness, our main source of knowledge of God is the Bible.

Wisdom and Knowledge

Wisdom is the application of knowledge. The advent of the computer with its vast storage capacity, and its ability to link up with data banks anywhere means that we do not need to overload our brains with vast stores of information. Surely what is more important than the possession of knowledge is how we apply it. The thinkers of ancient Greece certainly applied their ideas to everyday life - education, politics etc. Now we tend to have people who specialise in a particular discipline. But we still need people who can try to integrate all these different specialities.

Conclusion

The human mind has great powers. We need to make sure that our thinking will be for the benefit of ourselves and for our society. Surely this is the true meaning of wisdom. And according to the writers of the Bible, we are accountable to God for the use we make of the abilities he has given us. We look to him to find meaning and significance to our life.

A cautionary tale

If there are moral considerations in the application of our knowledge, are there any in the acquiring of knowledge? There is a story at the beginning of the Bible which may help illustrate the dangers of an unlimited thirst for knowledge. We read that when Adam and Eve were in the Garden of Eden, they were forbidden to eat of the tree of the knowledge of good and evil. When the serpent came along to tempt Eve, it told her that eating the fruit of that tree would make her "like God, knowing good and evil"[4]. But when she and Adam ate the forbidden fruit, they found they were not able to handle the knowledge so gained. It became a barrier between each other, (symbolised by their desire to wear clothes) and between them and God (they ran away when God approached).

Surely the lesson to be learnt from this is that when we have gained knowledge, we cannot always handle it. Our thirst for knowledge must be limited by our ability to control the power that this knowledge gives us. We should be more concerned with wisdom than knowledge.

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(1) Ps.111:10.
(2) Deut.22:8.
(3) Gen.1:28.
(4) Gen.3:5.

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