

A Philosophical Attempt to Define Science

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ABSTRACT

The aim of this paper is to find a definition for science. At the end of this paper, we will be able to state what we think science is, and know why we reject other possible views of science. There are very different views of science in the modern western world, as there have been through time. In fact, the considerations involved in arriving at a definition of science are clearly outside of the domain of science itself— rather, they are in the realm of philosophy.

It is to be hoped that the word 'philosophy' will not scare off any potential readers, because philosophy is not really the esoteric and obscure subject it is sometimes perceived to be. Nor should philosophy per se be mistrusted. It is taken here to simply mean how we think about things, or the very basic means of arriving at any knowledge.

Our subject is 'The philosophical basis of science', and if we are dealing with philosophy some would say there are no definite answers; we must each make up our own mind. Let's be generous and go as far as possible in this direction. Various people are taken as authorities on this subject. Some Christians, such as C. S. Lewis, Kurt Wise, Francis Schaeffer, D. James Kennedy and Ken Ham; and some non-Christians, including Bertrand Russell, Sir Karl Popper, Alfred North Whitehead and the late Carl Sagan. To some extent, this paper is a bringing together of the thoughts of these people who have contributed significantly in this area of knowledge.

It is demonstrated that the Reformation had a positive effect on the philosophy of science, but that recent humanistic trends have had a damaging effect. Even non-Christians such as Bertrand Russell realised that modern science is in serious difficulties. A quote from Russell is analysed to show how he is a victim of his own philosophy.

It is shown that a recent (20th century) undesirable shift in science is not due to scientific discoveries, but due to a shift in the philosophical basis of science, which has resulted from the tendency towards a naturalistic (or humanistic) mindset.

The contributions of Sir Karl Popper are analysed in some detail. It is argued that some of his contributions leave cause for concern; but it is admitted that it is very difficult to come to clear and unambiguous conclusions on his contributions to the philosophical basis of science.

In conclusion, a 'correct' definition of science is presented. Although each person must make up his own mind on what science is, and how it operates, it is argued that the correct basis of science is the Biblical basis. Many people would take this as the correct basis without realising that it is derived from Scripture and the Christian worldview.

HISTORICAL OVERVIEW

The best place to start is to find where the word 'science' came from, and find what it therefore means. It actually comes from a Latin word *scientia* meaning 'knowledge', but its meaning in English is a little more specific — it relates to our knowledge of 'the external world', as philosophers would express it.

There have been two major movements which have affected our view of science, so they conveniently divide the history of science into three periods. The three views of science may be explained in Table 1.

Tiner¹ documents some case histories, of the days when the opinions of the experts were what counted, but researchers believed that they had found problems with the official views. One example is Edward Jenner, who is acknowledged as the founder of vaccination. In 1775, smallpox was a dreadful disease, killing one person out of four who contracted it.

*'A country girl told Jenner she didn't need to worry about smallpox. She had caught cowpox, a mild disease which was harmless. But it protected her from smallpox.'*²

Jenner spent years in research, and found that there was one particular strain of cowpox that did indeed give immunity from smallpox. He then faced the greater challenge of trying to convince the medical establishment of the importance of his discovery.

TIME PERIOD	PHILOSOPHICAL BASIS OF SCIENCE	SCHAEFFER'S DESIGNATION
Pre-Reformation	Science relied mainly on the authority of the experts.	Medieval science
Post-Reformation	Human authority was rejected.	Modern science
Twentieth Century	Divine authority has now also been rejected.	Modern-modern science

Table 1. *The three views of science through history.*

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It was a long, often painful, process to displace the mindset of the authority of the 'experts'.

Before we progress from here, it might be well to explain what philosophy means, and to look at a little of its history.

Definition of Philosophy

Originally 'philosophy' meant simply 'love of wisdom', which is what it means in the original Greek. The word though, has had a long history, and it has been given different shades of meaning. It could even be said, with some measure of truth, that every philosopher has given it a new meaning so that he has something new to say.

It is therefore necessary to define **philosophy** for our purposes.

Bertrand Russell has given a lengthy definition of philosophy, which is here abbreviated a little. He says philosophy deals with ultimate questions:-

'Almost all the questions of most interest to speculative minds are such as science cannot answer, and the confident answers of theologians no longer seem so convincing as they did in former centuries.

Is the world divided into mind and matter, and if so, what is mind and what is matter?

Is mind subject to matter, or is it possessed of independent powers ?

Has the universe any unity or purpose? Is it evolving towards some goal?

Are there really laws of nature, or do we believe in them only because of our innate love of order?

Is man what he seems to the astronomer, a tiny lump of impure carbon and water impotently crawling on a small and unimportant planet? Or is he what he appears to Hamlet? Is he perhaps both at once?

Is there a way of living that is noble and another that is base, or are all ways of living merely futile?

If there is a way of living that is noble, in what does it consist, and how shall we achieve it?

Must the good be eternal in order to deserve to be valued, or is it worth seeking even if the universe is inexorably moving towards death?

Is there such a thing as wisdom, or is what seems such merely the ultimate refinement of folly?

*... The studying of these questions, if not the answering of them, is the business of philosophy!*³

Consider briefly two of the ultimate questions which

Russell lists. Is mind independent of matter?

Christians would say yes. Erudite Christians such as C. S. Lewis

would say that mind is something of the

supernatural invading the natural realm.⁴ But

most people we meet believe that mind is

merely an evolutionary development of the natural world,

which occurred spontaneously, somewhere along the road of biological development. Or the question as to whether there are really any laws of nature. It will be shown in this paper that the experts have been unsuccessfully searching for proof for a long time.

These are all difficult questions; and fall into the proper domain of philosophy (and religion). Philosophy and religion both deal with ultimate questions such as Russell lists above. The difference between them is that religion provides answers while philosophy does not.⁵ On many issues, therefore, philosophy does not dictate 'right' answers.

Or we might take this dictionary definition:-

*'That department of knowledge or study which deals with ultimate reality, or with the most general causes and principles of things.'*⁶

The New Testament makes one reference to philosophy, and it is a warning:-

'Beware lest any man spoil you through philosophy and vain deceit, after the tradition of men, after the rudiments of the world, and not after Christ.' (Colossians 2:8 KJV)

The word **philosophy** can have many different meanings. It is suggested that the writer to the Colossians is using it in that sense which could be expressed as 'atheistic religion' in modern usage. Christian theology has, by and large, been happy to employ philosophy, as long as it is understood as we are taking it. For people who are not familiar with philosophy, there is a glossary of terms in Table 2.

In a nutshell, that is all we need to know about **philosophy** for the purposes of this paper.

CONTRIBUTION OF THE REFORMATION

It is significant that modern science arose in Christian Europe in the years following the Reformation. This historical fact cannot be denied: in no other age did science achieve as much; nor in any other culture.

Francis Bacon, although he has been criticised as being inconsistent, was one who was instrumental in changing the basis of science. *'Bacon pleaded for scholars to lay aside "vain speculations" and to turn to "the contemplation of nature and the observation of experience".'*⁸

Francis Schaeffer has written:

*'Christianity is the mother of modern science because it insists that the God who created the universe has revealed himself in the Bible to be the kind of God he is. Consequently, there is a sufficient basis for science to study the universe.'*⁹

Yet we may wonder why science did not arise until the time of the Reformation. Man had the Bible long before. One thing that the Reformation stressed was the sinfulness of Man. The words of men cannot therefore be trusted. Hence, the means to acquire knowledge of the external world was to be by means of observation of the external world. Scientific authority would rest in observation and experience; not in the words of sinful men.

Alfred North Whitehead, the non-Christian philosopher from early this century recognised the fundamental influence Christianity had upon science. In his book **Science and the Modern World**,¹⁰ (first published in 1925), he wrote:-

'I do not think, however, that I have yet brought out the greatest contribution of medievalism to the formation of the scientific movement. I mean the inexpugnable belief that every detailed occurrence can be correlated with its antecedents in a perfectly definite manner, exemplifying general principles. Without this belief the incredible labours of scientists would be without hope. It is this instinctive conviction vividly poised before the imagination, which is the motive power of research — that there is a secret, a secret which can be unveiled.'

How has this conviction been so vividly implanted in the European mind?

When we compare this tone of thought in Europe with the attitude of other civilizations when left to themselves, there seems but one source for its origin. It must come from the medieval insistence on the rationality of God, conceived as with the personal energy of Jehovah and with the rationality of a Greek philosopher. Every detail was supervised and ordered; the search into nature could only result in the vindication of the faith in rationality. Remember that I am not talking of the

PHILOSOPHICAL TERMS	
a priori	That which precedes and conditions experience, such as a form of intuition (as per Kant). Or, whatever is true independently of experience.
empiricism	The philosophical theory that all knowledge is derived from experience and that no knowledge is innate or a <i>priori</i> . In western philosophy, this view is represented by Locke, Berkeley and Hume.
existentialism	A modern philosophical theory which claims that in man, existence precedes essence. The trend was started by Sjaren Kierkegaard last century.
external world	The real universe which I presume exists and to which I have access via my senses (as per Descartes).
metaphysics	Matters which lie beyond the range of empirical enquiry. Traditionally including ontology, cosmology and epistemology.
naturalism	The theory that reality is understandable without reference to the supernatural, or that reality consists of the natural only.
philosophy	A difficult term to define because it can mean anything from 'How we think about everything' to 'A systematic view of reality including logic and beliefs'. For the purposes of this paper, it has the first of these two extremes of meaning.
pragmatism	The modern philosophical theory, originating in the United States of America, which argues that an idea is true if it works satisfactorily. This view is represented by Pierce, James and Dewey.
presupposition	A belief held prior to approaching the subject at hand.
rationalism	The philosophical theory that knowledge of reality is possible through the use of reason without reference to matters of sense experience. In western philosophy, this view is represented by Descartes, Spinoza and Leibnitz.
scepticism	The philosophical position of one who maintains that knowledge is not possible. Or, the view that all knowledge is merely probable, never certain.

Table 2. For the benefit of newcomers to philosophy, here is a glossary of philosophical terms.⁷

explicit beliefs of a few individuals. What I mean is the impress on the European mind arising from the unquestioned faith of centuries. By this I mean the instinctive tone of thought and not a mere creed of words.

In Asia, the conceptions of God were of a being who was either too arbitrary or too impersonal for such ideas to have much effect on instinctive habits of mind. Any definite occurrence might be due to the fiat of an irrational despot, or might issue from some impersonal inscrutable origin of things. There was not the same confidence as in the intelligible rationality of a personal being. I am not arguing that the European trust in the scrutability of nature was logically justified even by its own theology. My only point is to understand how it arose. My explanation is that the faith in the possibility of science, generated antecedently to the development of modern scientific theory, was an unconscious derivation from medieval theology.'

So modern science came out of Christian Europe after the Reformation,¹¹ when people were taking the Biblical worldview seriously (see Table 3).

Many of the leaders in the field in the early days were sincere Bible-believing Christians. For example, James Joule, who made substantial contributions to thermodynamics, wrote (in a paper found with his scientific notebooks):

After the knowledge of, and obedience to, the will of God, the next aim must be to know something of His attributes of wisdom, power and goodness as evidenced by His handiwork.^{12,13}

Great Bible-believing scientists were not only confined to the early days. Wernher von Braun, who was the force behind space research, wrote:

'Manned spaceflight is an amazing achievement, but it has opened for mankind thus far only a tiny door for viewing the awesome reaches of space. An outlook through this peephole at the vast mysteries of the universe should only confirm our belief in the certainty of its Creator.'^{14,15}

THE PRESUPPOSITIONS OF SCIENCE

We have seen that the contribution of the Reformation was (negatively) a rejection of human authority, but some means had to be found to replace human authority as a means whereby we can discover knowledge about the external world. As the Reformation caused the Biblical worldview to permeate western society, it is to be expected that a set of Biblical beliefs should provide the replacement for the word of the experts.

Post-Reformation science was based on a number of such beliefs or presuppositions. In other words, there are a number of beliefs which the practitioner must accept implicitly, before he starts to do any scientific enquiry. Or, to put it another way, every scientist needs to believe

THE BIBLICAL WORLDVIEW

Blaise Pascal, the eminent mathematician, scientist and theologian, summarised the biblical worldview in his *Pensées* (Number 556)*:—
'The Christian religion consists in two points. ... The Christian religion properly consists in the mystery of the Redeemer, who, uniting in Himself the two natures, human and divine, has redeemed men from the corruption of sin in order to reconcile them in His divine person to God. ... The Christian religion, then teaches men these two truths; that there is a God whom men can know, and that there is a corruption of their nature which renders them unworthy of Him. ... And, as it is alike necessary to man to know these two points, so it is alike merciful of God to have made us know them. The Christian religion does this; it is in this that it consists.'

Although Pascal speaks of two truths, he is making at least these four points:—

- (1) There is a God whom men can know.
- (2) Men have a corruption of nature which makes them unworthy of Him.
- (3) God, in His mercy, has given a revelation of these truths to men.
- (4) Christ has redeemed men from the corruption of sin in order to reconcile them in His divine person to God. In this mystery, Christianity consists.

This, however, leaves some unanswered questions. We could present a fuller statement of the biblical worldview in these seven points:—

- (1) God is the primary reality, who is eternally self-existent. He brought into being the whole physical universe out of nothing.
- (2) Man was made in the image of God, and given the task of administering the world on God's behalf, and in fellowship with the Creator.
- (3) The first man Adam, disobeyed God, and brought sin and spiritual death into the human condition. So mankind is cut off from God and the supernatural realm, and subject to God's righteous anger.
- (4) God gave a revelation of truth in the Bible, in a form which sinful man can comprehend. Had He not done so, we would indeed be in darkness.
- (5) God brought in physical death as a result of man's sin, and as a remedy from sin. For centuries the blood of animal sacrifices provided an effective covering for sin. Then at the appointed time, the true Lamb of God provided His own blood to cancel man's debt of sin, and to redeem the world back to God.
- (6) All who truly believe that 'God was in Christ reconciling the world to Himself have 'passed from death to life'.
- (7) There will be a restoration of the physical world, on the basis of the redemptive sacrifice of Christ, when nature will be freed from her 'travail' and 'bondage to decay'.

REFERENCE

- * Pascal, B., as quoted from: Hutchens, R. M. (ed.), 1952. *Great Books of the Western World*, Encyclopaedia Britannica Inc., New York, pp. 270-271.

Table 3. *The biblical worldview.*

implicitly a set of postulates which cannot be proved from science or by any other means. The best available list of the presuppositions of science was given by Kurt Wise,¹⁶ in this list of eight:-

- (1) A reality actually exists external to man.
- (2) This external reality is ordered.
- (3) Our senses can provide reliable information about this

reality.

- (4) Man has the mental capacity to comprehend this orderly reality.
- (5) The law of cause and effect operates.
- (6) Natural law is uniform throughout all space.
- (7) Natural law is uniform throughout all time.
- (8) All natural laws are ultimately unifiable.

What do we mean by these presuppositions? A brief explanation of some of them is in order. The first means to say that there is a real world containing trees, cars and other people; it is not just in my imagination. The second was mentioned in Russell's list of ultimate questions: Is the world actually ordered? Or does my mind imagine order where there is none? The third assumes that my senses can provide me with the truth about the world. I know that my senses can be deceived by magicians. Why should I then trust my senses at all? The law of cause and effect comes up in such things as chemistry experiments where we are titrating a solution of unknown acidity. We assume that the colour change of the indicator is **caused** by a change in the pH, which is in turn **caused** by the quantity of reagent which runs in, which is in turn **caused** by our action of controlling the stop cock. By numbers (6) and (7), we assume, for example, that the law of gravity, which was tested by experiments in the Cavendish laboratory, applies equally well everywhere throughout space, where we cannot check it; and applies to all time, past and future.

Scientists need to believe these presuppositions without a shadow of a doubt. If even one is brought into question, then all scientific work, and all past achievements of science, are brought under a cloud of suspicion.

Kurt Wise made the point that all these presuppositions are consistent with the Biblical worldview. He also pointed out that the eighth presupposition is not strictly necessary before commencing scientific work, but the vast majority of scientists do believe it, and it too is consistent with the

Biblical worldview.

Biblical Justification

The presuppositions of science as given by Kurt Wise are clearly consistent with the Biblical worldview. Thus they are true. If God's Word indicates they are true, then they are true. We have the best proof of their truth that is possible. Table 4 lists the passages of Scripture on which they are based. It is recommended that these passages be studied carefully to verify that the eight presuppositions of science are, in fact, substantiated by the Word of God.

Where the Bible is not taken seriously, science could not take root.

*'Science could not have originated in India among the Hindus, nor in China among the Buddhists. Both Hinduism and Buddhism teach that the physical world is unreal and that the only reality is the reality of the worlds soul, and that the greatest thing anyone has to learn is that the physical world is not real.'*¹¹

Then in countries with an Islamic heritage people are not sure that we live in a world where the law of cause-and-effect operates; because Islam teaches that causality is a denial of the absolute sovereignty of Allah,¹⁸ which can be expressed:-

*'Since everything is fatalistically determined, obviously there is no point in trying to manipulate the natural world to change anything, because all things are unchangeable.'*¹⁹

Then what about the average man in the street in western society?

Extra-Biblical Justification

Most people in western society dismiss the Bible as a collection of folklore, myth and superstition. They would certainly not accept the Bible as proving the eight presuppositions of science. Then why do they accept them?

We will come back to this question after a brief diversion.

It should be said that the first four presuppositions are not unique to science. They are necessary for mathematics, history and just about every area of human knowledge. Philosophers have been wrestling with them for centuries, and as is to be expected, they have come up with answers that the philosophers themselves find satisfactory, on the whole.

So while the first four of these presuppositions are vital to science, they will not be dealt with in this paper. They will be considered, however, in another paper which is in preparation.

Most people, on being presented with these presuppositions for the first time, will say to themselves: *'Those are obviously true, I don't need the Bible to prove them'*; or else, *'Science has proved them to be true'*. But these are not

PRESUPPOSITION	REASON FOR ACCEPTANCE	BIBLICAL REFERENCE
(1)	A reality exists because God created it.	Genesis 1:1
(2)	Man's reason is of God. So we expect to find order we can comprehend in God's creation.	Isaiah 1:18
(3) and (4)	Man was given dominion over the creation so it follows that man has the capability to comprehend and administer the creation.	Genesis 1:26-27
(5)	The prophets indicate that we live in a cause-and-effect world.	Genesis 11:5 Isaiah 1:19-20
(6), (7) and (8)	God is one, and He does not change. The creation should then reflect His nature.	Deuteronomy 6:4 Numbers 23:19 Malachi 3:6

Table 4. Proof of presuppositions.

adequate justification. The presuppositions of science are not all obvious to Hindus, Buddhists or Muslims, as we saw above. Nor is there any way they can be proved by science. Since science presupposes them all, any attempt at proof will inevitably involve circular reasoning.

We feel that these ideas are correct, if we live in a western nation. Very few people would deny that our lot has been improved immensely where science has been taken seriously. But this is circular reasoning. We are assuming we live in a cause-and-effect world to justify the presuppositions of science, one of which is that we do live in a cause-and-effect world. Scientists, and people in general, operate as if there is a Creator who made general physical laws. On this basis everything seems to work and make sense. People do have a correct²⁰ view of reality even if they don't believe in a Creator, even if they haven't really thought about it and don't care anyway. People believe these ideas because our heritage in western society is based on the Biblical worldview.

So how can we justify our belief in these presuppositions? It is written in the book of Proverbs: 'The fear of the LORD is the beginning of knowledge.' (Proverbs 1:7 RSV). And this is exactly right. It is the view of reality based on the Bible that made modern science possible.

SCIENCE CHALLENGED

We now need to ask the philosophers how they justify belief in presuppositions (5), (6) and (7). These are, as we have seen, the linchpins of science. Presuppositions (6) and (7) are together addressed by philosophers as 'induction'. This is the reverse of deduction in which we deduce an instance from a general rule. Induction is the process whereby we infer a completely general law from a limited number of instances. Philosophers have done a lot of thinking about causality and induction. David Hume challenged their validity, and it seems that nobody since has been able to restore confidence in them:

*'Before Hume, rationalists at least had supposed that the effect could be logically deduced from the cause, if only we had sufficient knowledge. Hume argued — correctly as would now be generally admitted — that this could not be done. Hence he inferred the far more doubtful proposition that nothing could be known a priori about the connexion of cause and effect.'*²¹

Kant agreed with David Hume's analysis of the situation:-

'If the general principle that every change must have a cause is to be proved, it can only be by showing that its opposite is self contradictory. That this cannot be shown "we may satisfy ourselves by considering, that, as all distinct ideas are separable from each other, and as the ideas of cause and effect are evidently distinct, it will be easy for us to conceive any object to be non-existent this moment, and existent the next, without conjoining to it the distinct idea of a cause or productive

*principle". There can be no self-contradiction in imagining the effect to occur without the cause since the effect certainly does not include the cause in itself and vice versa.'*²²

*'According to Mill,²³ the law of causation is proved by an admittedly fallible process called "induction by simple enumeration ".'*²⁴

Russell discusses Mill's method, and says:

*A method of proof which, when used as directed, gives sometimes truth and sometimes falsehood — as the method of simple enumeration does — is obviously not a valid method, for validity demands invariable truth.'*²⁵

Russell goes on to conclude that we can prove causality in this way, only if we can prove induction.

Therefore we look at induction.

One author says:

*' "Induction" which has been called "Hume's problem " has baffled philosophers from his time to our own.'*²⁶

Bertrand Russell asks:

*'Have we any reason, assuming that [the laws of science] have always held in the past, to suppose that they will hold in the future?'*²⁷

He answers his question a few pages later:-

'The principle of induction . . . is itself not capable of being proved by experience and yet is unhesitatingly believed by everyone, at least in all its concrete applications.'^{28*}

In another book, Russell has said:-

*'Hume has proved that pure empiricism is not a sufficient basis for science. But if this one principle [induction] is admitted, everything else can proceed in accordance with the theory that all our knowledge is based on experience. It must be granted that this is a serious departure from pure empiricism, and that those who are not empiricists may ask why, if one departure is allowed, others are forbidden. . . . What these arguments prove — and I do not think the proof can be controverted — is, that induction is an independent logical principle, incapable of being inferred either from experience or from other logical principles, and that without this principle science is impossible.'*²⁹

And Russell has also written:-

*'But this brings us to our other question, namely, how is our principle [of induction] known to be true? Obviously, since it is required to justify induction, it cannot be proved by induction; since it goes beyond the empirical data, it cannot be proved by them alone; since it is required to justify all inferences from empirical data to what goes beyond them, it cannot itself be even rendered in any degree probable by such data. Hence, if it is known, it is not known by experience, but independently of experience. I do not say that any such principle is known: I only say that it is required to justify the inferences from experience which empiricists allow, and that it cannot itself be justified empirically.'*³⁰

Philosophers talk about the grue-bleen paradox³¹ to highlight the point about scientific laws being constant through time. It is postulated that at some future point in time, t (say January 1, 2020), all objects which have hitherto appeared green will become blue (these are grue in colour), and all objects which have hitherto appeared blue will change to green (these are of course bleen in colour). Now, we need to ask if there is any less observational, scientific evidence to support this theory as against the conventional theory that says blue things will always be blue and green things will always be green. One author writes:

*Inasmuch as all emeralds observed to date have been green and all such observations have been made before time t , then there is no escaping the fact that both generalisations must be considered as equally confirmed.*¹²

We may seek to reject the grue-bleen hypothesis on the grounds that the predicted change is unfalsifiable, and/or unobservable because it is to take place at a future time. The hypothesis is thus unscientific. This is quite true, but the same argument applies equally well to the conventional theory, so gets us nowhere.

So no proof has been offered by the philosophers for induction.

It appears then, that the ordinary man in the street will get no help from the philosophers in trying to substantiate his belief in either causality or induction. The **only** proof we have for their validity is in the Word of God.

ONE NEW PRESUPPOSITION

As we saw earlier, the 20th century change in the philosophy of science involves the rejection of divine authority. It can also be understood as the addition of a new, ninth, presupposition. Instead of the previous humble statement that 'Science cannot deal with miracles', we are now being told that 'Science rules out the possibility of the supernatural, of miracles and of a creating, self-revealing God'. Perhaps the most succinct statement of this new presupposition has been given by Carl Sagan:-

*'The cosmos is all that is or ever was or ever will be.'*³³

Obviously, miracles are impossible if there is no miracle worker.

This new presupposition can also be expressed as the secular humanists have put it:-

*'[Humanism] does insist that the way to determine the existence and value of any and all realities is by means of intelligent inquiry.'*³⁴

If the physical reality is all that exists, then man must be a part of it and nothing more. He is just a cog in the machinery of the universe, just a purely random phenomenon in the great casino of the Universe. Philosophy has certainly moved in this direction.

The Cosmic Machine

Whereas previously man and God were outside of the

'cosmic machine' so that they could influence it, man has now been plated firmly inside it, and God has gone altogether.³⁵

*'As he looks out upon the world, as he faces the machine, he [modern man] cannot tell himself from what he faces. He cannot distinguish himself from other things. Quite in contrast, a Christian does not have this problem. He knows who he is.'*³⁶

*'The early modern scientists believed in the concept of the uniformity of natural causes in an **open** system. God and man were outside the cause-and-effect machine of the cosmos, and therefore they **both** could influence the machine. To them all that exists is **not** one big cosmic machine which includes everything. The shift from modern science to what I call **modern modern science** was a shift from the concept of the uniformity of natural causes in an **open system** to the concept of the uniformity of natural causes in a **closed system**. In the latter view nothing is outside a total cosmic machine; everything which exists is part of it.*

... To say this another way: Prior to the rise of modern modern science (that is, naturalistic science, or materialistic science), the laws of cause-and-effect were applied to physics, astronomy, and chemistry. Today the mechanical cause-and-effect perspective is applied equally to psychology and sociology.

*Notice especially that the scientists who gave birth to the earlier great break-throughs of science would not have accepted this concept. It arose not because of that which could be demonstrated by science, but because the scientists who took this new view **had accepted a different philosophic base**. The findings of science, as such, do not bring them to accept this view; rather, their world view brought them to this place. They became naturalistic or materialistic in their presuppositions.*³¹

The big problem with this new philosophical basis of science is that if we accept this ninth presupposition, there is then no valid reason to believe any of the other eight presuppositions. We have denied our justification for believing them. Science has shot itself in the foot, philosophically speaking.

In response to this, the pragmatists will say something like:-

'We know that we don't understand how science works, and we are not concerned about that in the slightest, because we know that science works. Just look at how infant mortality rates have been reduced, and how life-spans have been extended in nations where science has been accepted. We know that science works, so we don't care how it works.'

But they are assuming the truth of the law of cause and effect. If they are challenged by sceptics to prove the law of cause and effect, they have no answer. Pragmatism cannot defend itself from sceptical attacks.

With the Biblical basis, however, we know why we

accept all the eight presuppositions. Which philosophical position, then, should we choose?

A Bargain

C. S. Lewis dealt with this problem in 1947. In considering the uniformity of natural law, he wrote :-

*'But if we admit God, must we admit Miracle? Indeed, indeed, you have no security against it. That is the bargain. Theology says to you in effect, "Admit God and with Him the risk of a few miracles, and I in return will ratify your faith in uniformity as regards the overwhelming majority of events". The philosophy which forbids you to make uniformity absolute is also the philosophy which offers you solid grounds for believing it to be general, to be almost absolute. The Being who threatens Nature's claim to omnipotence confirms her in her lawful occasions. . . . The alternative is really much worse. Try to make Nature absolute and you find that her uniformity is not even probable. By claiming too much, you get nothing.'*³⁸

However, the addition of a new ninth presupposition is not the only recent change.

POPPER'S PHILOSOPHY

There is one person who is recognised as a significant influence in the philosophy of science in this century. His views have been influential amongst those who are leaders in the direction of scientific thought. The man was Sir Karl Popper, and any paper written in the late 20th century that involves the philosophy of science would be incomplete without some mention of him.

It is difficult for anybody to come to grips with all that Popper has written, because he has written so much. Fortunately, material is now appearing either enthusiastically in favour of Popper, or avidly against him. So we can look at the ideas put forward by these writers, and carefully weigh up their arguments. The conclusions arrived at here may not be the final word on this matter; but perhaps the views expressed will prompt others to follow up this issue more diligently.

There is a book written by Bryan Magee, a supporter of Popper, which is valuable because: *'Popper himself has endorsed this account of his views as accurate.'*³⁹ In explaining Popper's contribution to the philosophy of science, Magee contrasts what he understands as the traditional view of science with Popper's view.⁴⁰ The difference, as perceived by Magee, is set out in Table 5.

Popper's View of Induction

One significant change introduced by Popper is his treatment of induction. Popper is aware that induction has been a problem ever since the time of Hume: *'C. D. Broad described it as the skeleton in the cupboard of philosophy'*⁴¹

But one wonders if Popper has gone too far. Popper assumes that *'... induction is a procedure which is logically*

*invalid and rationally unjustifiable.'*⁴² To say that induction is **rationaly unjustifiable** may be reasonable, but to say it is **logically invalid** would seem to be going too far. Just because it cannot be proved to be correct does not mean it is therefore false.

Magee says that *'Popper's seminal achievement has been to offer an acceptable solution to the problem of induction.'*⁴² But what is his solution to the problem? He has simply removed induction. Although, whether it can actually be removed from people's thinking or whether science can exist without it, is quite a different matter.

Popper's views here are in stark contrast to Bertrand Russell's. Russell wrote that

*'... induction is an independent logical principle, incapable of being inferred either from experience or from other logical principles, and that without this principle science is impossible'*⁴⁴

as was quoted earlier. Russell says that science is **impossible** without the principle of induction, while Popper thinks that science will not be affected by its rejection. Obviously they can't both be right, and a case can be argued that Russell was at least as knowledgeable in the philosophy of science as Popper.

THE METHOD OF SCIENCE

The traditional steps are:—

- | | |
|-----|---------------------------------------|
| (1) | Observation and experiment. |
| (2) | Inductive generalisation. |
| (3) | Hypothesis. |
| (4) | Attempted verification of hypothesis. |
| (5) | Proof or disproof. |
| (6) | Knowledge. |

By contrast, under Popper's new approach, the steps are:—

- | | |
|-----|---|
| (1) | Problem (usually rebuff to existing theory or expectation). |
| (2) | Proposed solution, in other words a new theory. |
| (3) | Deduction of testable propositions from the new theory. |
| (4) | Tests, that is, attempted refutations by, among other things (but only among other things), observation and experiment. |
| (5) | Preference established between competing theories. |

Table 5. According to Bryan Magee 's understanding of it, Popper 's new method may be compared with the traditional method of science according to this table.

[Magee, B., 1985. *Philosophy and the Real World (An Introduction to Karl Popper)*, Open Court Publishing Company, La Salle, Illinois, p. 55.]

Popper's Denial of Knowledge

At what cost, though, has Popper done away with the step of induction? It is no oversight that knowledge does not appear in Popper's section of the table comparing his new method with the traditional one (see Table 5). Does he mean to say that science will never arrive at knowledge? In contrast to what people have believed for centuries, is knowledge now impossible according to Popper's view? Is

the best we can hope for a never-ending iterative cycle of theories? This would seem to be contradicted by much that Popper has written.

The writings of an Australian philosopher seem to be helpful here. David Stove, from the Department of Traditional and Modern Philosophy at the University of Sydney, has pointed out that Popper has introduced irrationalism into the philosophy of science. He has written a book entitled **Popper and After: Four Modern Irrationalists**.⁴⁵ The four irrationalists he refers to are: Popper, Lakatos, Kuhn and Feyerabend. Stove argues that these men have introduced irrationalism in many ways. He claims that they are inconsistent in their use of words.

In his chapter entitled 'Neutralising Success Words', Stove says:

*It is the word "knowledge", however, which was the target of Popper's most remarkable feat of neutralisation. This word bulks large in his philosophy of science, and in recent years, in particular, the phrase "the growth of knowledge" has been a favourite with him and with those he has influenced most. Some people have professed to find a difficulty, indeed, in understanding how there can be **growth-of** knowledge and yet no **accumulation-of** knowledge. . . . Let us just ask, how does Popper use the word "knowledge"? Well, often enough, of course, like everyone else including our other authors, he uses it with its normal success-grammar. But when he wishes to give expression to his own philosophy of science he baldly neutralises it. Scientific knowledge, he tells us, is "conjectural knowledge". . . . No phrase is more central to Popper's philosophy of science, or more insisted upon by him. The phrase even furnishes, . . . nothing less than the "solution to the problem of induction".⁴⁶ In one way of course this is true. . . . What problem could there be so hard as not to dissolve in a sufficiently strong solution of nonsense? And nonsense is what the phrase "conjectural knowledge" is. . . . To say that something is known, or is an object of knowledge, implies that it is true, and known to be true. To say of something that it is conjectural, on the other hand, implies that it is not known to be true.⁴⁷*

As we might expect, Popper's devotees take the opposite view to Stove. Magee says Popper's approach is not dialectical (in any Hegelian or Marxist sense)

'since it regards contradiction as something that cannot be accommodated on any level, and still less welcomed.'^{48}*

We each need to see for ourselves whether or not Popper's philosophy is contradictory.

But it seems that Russell was right, that science will indeed suffer by the rejection of the principle of induction, and that Popper is knowingly rejecting real knowledge. Then 'knowledge' can never be anything more than conjecture. But if science (according to the Latin) means 'knowledge', or in a more modern form, knowledge of the external world

gained by a particular method, then it can no longer be termed 'science' if it is incapable of arriving at knowledge.

Popper and Falsification

Popper also gives a definition of science in these words :- **Falsifiability is the criterion of demarcation between science and non-science.** *The central point is that if all possible states of affairs fit in with a theory then no actual state of affairs, no observations, no experimental results, can be claimed as supporting evidence for it. There is no observable difference between its being true and its being false. So it conveys no scientific information. Only if some imaginable observation would refute it is it testable. And only if it is testable is it scientific.⁴⁹*

We should ask why he emphasises falsification instead of the more traditional verification. In his paper 'Science: Conjectures and Refutations',⁵⁰ Popper explains what started him thinking. He contrasted Einstein's theory of gravitation (on one hand) with the Marxist theory of history, psychoanalysis, and Adler's theory of individual psychology, for all of which he previously had great respect. He eventually came to the conclusion that these latter three theories are pseudo-science **because** every observation fits into them, as opposed to Einstein's theory of gravitation which left itself open to falsification, for example, from Eddington's eclipse experiment of 1919.⁵¹

Popper uses the term 'imaginable observation' in this passage, which seems to be reasonable. What he has in mind is that our measuring capability may not be sufficiently accurate at the time of the proposal.

We certainly agree that scientific theories must relate to the real observable world, and thus leave themselves open to falsification.

Popper also seems to be justified, to some extent, in considering falsifiability rather than confirmation. If we had the scientific law 'What goes up must come down', and we had thousands of instances to confirm it, we might think we had come to the truth. It is not until we find an instance where our law does not hold, that we will be forced to rethink our law, and perhaps come up with the reformulation 'What goes up at less than 11.2 kilometres per second, must come down'. For this reason Popper's approach has merit.

However, we should stress that verification is necessary (but not sufficient). Consider some specific examples to see where Popper might lead science:-

- (1) Geologists believe the Earth has an outer core of molten iron because earthquake waves are transmitted exactly as they would be if that was the case.
- (2) Astronomers accept a model of the interior of stars on the basis of observations of their visible surface only.
- (3) Cosmologists accept the idea of a Big Bang without any solid evidence. All the evidence that is used to support it (such as red shifts and background microwave radiation) could have some other explanation.

Should these be accepted as science (knowledge of the external world)? If the evidence for them was presented in a court of law, it would be dismissed as purely circumstantial, at best. As creationists, we have no particular axe to grind with the first two of these, only with the Big Bang idea which is contradicted by Scripture. But they should all be seen merely as theories or possibilities at this stage of our knowledge. We need actual observational evidence before we can consider them as real scientific knowledge.

Scientific speculation is all very well, but such ideas must be seen as tentative until they have actually been verified by a check against reality.

But we should question Popper's understanding of science. There is a danger that Popper be taken by his followers to mean that any theory which has not been falsified should be taken to be true. As was noted above, confirmation by observation is required to substantiate any scientific theory.

There is another significant change advocated here by Popper (see Table 5). It is the widening of the means available for the disproof of theories. He allows other things beyond observation and experience. Now he is not talking about including logical contradictions or mathematical considerations, because these were already included. What things, then, does he have in mind? Will he allow the opinions of the experts? Will he permit things which are unobservable? This is a concern.

To Summarise

It seems that much of Popper's contribution to the philosophy of science is questionable. At least, we need to consider it very seriously. There is one positive aspect which is set out in Table 6. It may be well, here, to summarise those aspects of Popper's philosophy which I believe to be suspect:-

- (1) Induction is held by Popper to be **logically invalid**.
- (2) Popper believes science can do without the principle of induction.
- (3) Popper's philosophy seems to be irrational.
- (4) According to Popper, science can never arrive at knowledge.
- (5) Popper thinks that falsification of general laws is possible but verification is not.
- (6) Popper may allow things beyond observation and experience.

Please note that this is my considered opinion. I realise I am going against the trend in questioning Popper's views, and can only hope that if Popper's ideas are actually correct, then somebody will present a further paper to this journal defending his views.

So where have we got to? Let's restate what this is all about. In Schaeffer's words, here is what science consists of:-

- (1) *'God as the Creator and Lawgiver has implanted laws in his creation which man can discover.'*⁵¹

A CONTRIBUTION FROM POPPER

Sir Karl Popper has, in many ways, opposed what Christians might consider to be the proper direction for science, and yet in one way his view agrees entirely with creationists.

There is a book written by Bryan Magee, also quoted in the text, which Popper has endorsed.^a In this book, Popper gives a definition of science in these words:—

'Falsifiability is the criterion of demarcation between science and non-science. The central point is that if all possible states of affairs fit in with a theory then no actual state of affairs, no observations, no experimental results, can be claimed as supporting evidence for it. There is no observable difference between its being true and its being false. So it conveys no scientific information. Only if some imaginable observation would refute it is it testable. And only if it is testable is it scientific.'^b

This is an excellent contribution to the philosophy of science, with which we heartily agree. Very many articles have been written by creationists, making the point that evolution is not able to be falsified, and therefore it is not science. It is pleasing to see that somebody as influential as Sir Karl Popper agrees; although, probably neither Popper nor Magee would admit that evolution is exactly in this situation.

Darwin's theory of evolution required there to be fossils of intermediate forms, and he said he expected these to be discovered as time went by. They were not found. As a result the theory of *punctuated equilibria* has been formulated to explain why Darwin's evidence is missing. But evolution is now exactly in the situation described above: every possible state of affairs is consistent with the theory of evolution so this theory contains no scientific information.

Popper has actually confirmed this elsewhere. In *Unended Quest: An Intellectual Autobiography*, he wrote:—

I have come to the conclusion that Darwinism is not a testable scientific theory, but a metaphysical research programme — a possible framework for testable scientific theories.^c

Although he later retracted this statement, it is clearly consistent with the point we are making about his view of falsification.

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Table 6. A significant contribution from Popper on evolution and science.

- (2) *'God has made a cause-and-effect universe; therefore we can find out something about the causes from the effects.'*⁵¹

These two things, induction (which enables us to infer general laws) and causality, are the linchpins of science. But do our authorities believe them? The late Carl Sagan, together with the majority of scientists, believe in general laws and causality, but don't believe that God instituted them. They therefore have **no good reason** to believe in them. Popper has taken the next step, and actually questions man's ability to know anything certain about our external world. He even appears to doubt whether general laws exist.

SCIENCE IS IN A DILEMMA

As long ago as 1943, Bertrand Russell realised that science was in a dilemma:-

The great scandals in the philosophy of science ever since the time of Hume have been causality and induction. We all believe in both, but Hume made it appear that our belief is a blind faith for which no rational ground can be assigned. Dr Whitehead believes that his philosophy affords an answer to Hume. So did Kant. I find myself unable to accept either answer. And yet, in common with every one else, I cannot help believing that there must be an answer. The state of affairs is profoundly unsatisfactory, and becomes more so as science becomes more entangled with philosophy. We must hope that an answer will be found; but I am quite unable to believe that it has been found.

Science as it exists at present is partly agreeable, partly disagreeable. It is agreeable through the power which it gives us of manipulating our environment, and to a small but important minority it is agreeable because it affords intellectual satisfactions. It is disagreeable because, however we may seek to disguise the fact, it assumes a determinism which involves, theoretically, the power of predicting human actions; in this respect it seems to lessen human power. Naturally people wish to keep the pleasant aspect of science without the unpleasant aspect; but so far the attempts to do so have broken down. If we emphasise the fact that our belief in causality and induction is irrational, we must infer that we do not know science to be true, and that it may at any moment cease to give us the control over the environment for the sake of which we like it. This alternative, however, is purely theoretical; it is not one which a modern man can adopt in practice. If, on the other hand, we admit the claims of scientific method, we cannot avoid the conclusion that causality and induction are applicable to human volitions as much as to anything else. All that has happened during the twentieth century in physics, physiology, and psychology goes to strengthen this conclusion. The outcome seems to be that, though the rational justification of science is theoretically inadequate, there is no method of securing what is pleasant in science without what is unpleasant. We can do so, of course, by refusing to face the logic of the situation; but, if so, we shall dry up the impulse to scientific discovery at its source, which is the desire to understand the world. It is to be hoped that the future will offer some more satisfactory solution to this tangled problem.⁵⁴

Russell has packed a lot of ideas into this brief passage. He wrote this when he was well into a long career in philosophy, science and mathematics. This quote, therefore, summarises the thinking of this intelligent man.

For the purposes of analysis, his points may be identified

thus:-

- (a) Hume has 'shown that belief in causality and induction is a faith position.
- (b) Immanuel Kant and Alfred North Whitehead have tried unsuccessfully to show otherwise.
- (c) Scientists nevertheless believe in causality and induction, even though it requires a blind faith, because no proof exists.
- (d) Russell believes there must be some proof that causality and induction are valid and hopes that it will be found.
- (e) Science is agreeable to us in that it gives us control over our environment.
- (f) Science is also agreeable to a band of scientists to whom it gives intellectual satisfaction.
- (g) However, science is also disagreeable to us in that it seems to make man purely an automaton whose actions are completely predictable.
- (h) Twentieth century discoveries in physiology and psychology lead to the conclusion that human volition is subject to the laws of science,
- (i) We do not **know** science to be true, and so it might fail us at any time,
- (j) There is no means whereby we can secure the pleasant aspect of science without the unpleasant aspect,
- (k) By refusing to face this predicament, we are in danger of removing the stimulus for scientific discovery, that is, the desire to understand the world.
- (l) Russell hopes some solution will be forthcoming in the future.

Is Russell correct? Some statements are correct, and others need some qualification. Let's look at them separately.

We cannot prove that science is true because causality and induction cannot be proved (a), (b), (c), (i)? Russell has got it right. The correctness of science is not provable except from the Scriptures (d).

Man is an automaton whose actions are, in theory, completely predictable (g), (h)? This is wrong. It results from Russell's naturalistic philosophy (addition of a ninth presupposition). In the early days of modern science it was no problem, because those early scientists did not take a naturalistic position. One author has also recognised how this shift is linked with the teaching of evolution. He notes that in the second half of the 19th century

'the impact of Darwin's theory of evolution and the increasing development of psychology as a science seemed to be reducing all of man's fondest hopes and most cherished aspirations to the level of a purposeless flux of matter and energy.'⁵⁵

As quoted previously, Schaeffer has argued that this was a philosophical shift. Man was moved from his rightful position, where together with God, he is able to affect the cosmic machine; to be firmly inside the cosmic machine.

There is a means, then, whereby the pleasant aspect of science can be retained without the unpleasant aspect (j). It simply involves an acceptance of the worldview of the

Scriptures, the worldview which was accepted by the early scientists. But unless there is a return of the philosophical basis of science to its post-Reformation position amongst leaders of science, Russell's concern for science itself (k) is justified.

DEFINITION OF SCIENCE

We are now in a position to try to define science. Consider these five possible definitions:-

- (1) Science is nothing else than the search to discover unity in the wild variety of nature (J. Bronowski).
- (2) The business of science is to find uniformities, such as the laws of motion and the law of gravitation, to which, so far as our experience extends, there are no exceptions (B. Russell).⁵⁶
- (3) Falsifiability is the criterion of demarcation between science and non-science (K. Popper).⁵⁷
- (4) What is science? At its core, science is observation. . . . science is empiricism (D. Breese).⁵⁸
- (5) Science involves observation, using one or more of our five senses, to gain cumulative knowledge about the world and to be able to repeat the observations (K. Ham).⁵⁹

The first two definitions, by J. Bronowski and B. Russell, are closely related to presupposition (8). Scientists believe that there should be a unity in the creation, and those who are able to find such unity are highly honoured. For example, Mendeleev is honoured because of his establishment of the periodic table of the chemical elements, by which the properties of elements are seen to follow a pattern. And Einstein is accorded honour because he was supposedly able to unify the disciplines of mechanics and electrodynamics. Truly, people who are able to perceive a unity, where previously no unity had been seen, do deserve acclaim. These statements may describe a large part of what scientists do; but they are not very good definitions of science. If science is essentially our knowledge of the external world, and the means whereby we find new knowledge, these definitions miss the point altogether.

The third of these definitions, by Popper, has some merit. Any theory, if it claims to be scientific, must relate to the real world, and thus leave itself open to falsification by observation and experience. However, for various reasons as set out earlier, Popper's contribution to science appears to be suspect. It seems there is still a real place for verification. Science needs to have reality checks against what we can actually observe.

The definition by Breese is saying that scientific knowledge is knowledge gained through observation, that is, it is empirical knowledge of the world. And Ken Ham's definition is the best. It says that science is empirical knowledge, knowledge of man's external world gained by observation. But it goes further and insists on repeatable observation. We are dealing with nature in her repeatable occurrences, as C. S. Lewis expresses it. That is exactly

what empirical science is.

If we define science according to Ken Ham's definition, though, it clearly has certain limitations:-

- (1) Science **cannot** deal with unique events (including miracles).
- (2) Science **cannot** deal rigorously with either the past or the future without making some assumptions which are outside of science.
- (3) Science is **not** omnipotent, but only deals with what man has observed.
- (4) Science is **not** infallible as human beings can make mistakes.
- (5) Science may **never** have all the answers.

CONCLUSION

This is a philosophical paper, and in philosophy it is difficult to find common grounds on which everybody can agree. Thus, each of us is entitled to come up with our own understanding of what science is. But look at the alternatives!

We need to believe by faith that the important presuppositions of science are true, otherwise we can forget about certainty. Max Black believes that this position is unlikely to change:

*We seem now to have arrived at a stalemate. None of the ways of justifying induction that have been explored by a long line of able and acute thinkers seem to offer any prospects of success. Attempts to justify induction by using inductive procedures seem hopelessly circular; attempts to find principles expressing the alleged uniformity of nature simply raise the old question in a new form; introducing probability statements does not help; and the fashionable "pragmatic" justifications really leave us helpless against skeptical objections to induction. Considering the intensity with which the problem has been studied, there is no hope that we shall do better where so many powerful intellects have labored in vain.*⁶⁰

If we are prepared to accept the Biblical worldview as a basis for science, then it also turns out that man has a place in the world, he has free will, and the ability to perhaps actually change the course of world history. As Jenner began vaccination, as was mentioned earlier, so anybody else starting from the Biblical worldview might come up with some new scientific discovery or innovation, which could save millions of lives.

On the other hand, if we insist that no supernatural exists, and so science is the means of finding **ALL** truth, we place impossible demands upon science, and we end up where man is nothing but a meaningless cog in the great impersonal machinery of the universe; there would be no incentive or justification for scientific enquiry, and no such thing as knowledge.

Because of the rejection of Christianity by more and more people in western society, and the acceptance of the

MAJOR SOURCES OF MATERIAL			
AUTHOR	TITLE	MOST SIGNIFICANT MATERIAL	TYPE OF PUBLICATION
Lewis	Miracles (A Preliminary Study)	The relation between miracles and the laws of science.	Book
Russell	The Problems of Philosophy	An honest introduction to philosophy, and its limitations.	Book
Wise	Scripture in Science	The presuppositions of science	Paper
Tiner	When Science Fails	Case histories that document the transition to modern science.	Book
Schaeffer	How Should We Then Live?	Where science came from, and where it is heading.	Book
Lamont	21 Great Scientists Who Believed the Bible	Important scientists who believed the biblical worldview.	Book
Morris	The Biblical Basis for Modern Science	The Christian influence in the early days of science.	Book
Kennedy	Science, Evolution and Christianity	Why other religions question the presuppositions of science.	Paper

Table 7. These eight writings were the main source of material for this paper.

new philosophical basis of science, it is inevitable that modern man will find himself with no firm foundation. This is the end result of accepting naturalism.

Very few new thoughts have been presented in this paper. The material has been drawn mainly from the sources listed in Table 7. They are therefore highly recommended for further reading. Particularly **Miracles** by C. S. Lewis. After having read this paper, it is recommended to read **Miracles** to see if Lewis is not addressing exactly those issues raised here.

We will give Lewis the final word. He realised in 1947 that the scientific mindset would inevitably lead to naturalism:-

'You do not need — indeed you do not wish — to be always thinking about windows when you are looking at gardens or always thinking about eyes when you are reading. In the same way the proper procedure for all limited and particular enquiries is to ignore the fact of your own thinking, and concentrate on the object. It is only when you stand back from particular enquiries and try to form a complete philosophy that you must take it into account. For a complete philosophy must get in all the facts. In it you turn away from specialised or truncated thought to total thought: and one of the facts total thought must think about is Thinking itself. There is thus a tendency in the study of Nature to make us forget the most obvious fact of all. And since the Sixteenth Century, when Science was born, the minds of men have been increasingly turned outward, to know Nature and to master her. They have been increasingly engaged on those specialised inquiries for which

truncated thought is the correct method. It is therefore not in the least astonishing that they should have forgotten the evidence for the Supernatural. The deeply ingrained habit of truncated thought — what we call the 'scientific' habit of mind — was indeed certain to lead to Naturalism, unless this tendency were continually corrected from some other source. But no other source was at hand, for during the same period men of science were coming to be metaphysically and theologically uneducated.⁶¹

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