

Science



The Complementary Nature of Science & Christianity

By Dick Tripp

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Foreword

Dick Tripp's thoughtful book explores the close historical relationship between science and Christianity, and shows, as the title rightly emphasises, the complementary nature of these two different means of understanding the world we live in.

When I was asked to write the foreword for this book, I pondered the attitudes of Christians to the topics discussed in it, and came to the somewhat surprising conclusion that many contemporary Christians appear to be afraid of science, especially the scientific study of the natural world. This seems to be because they perceive a conflict between their Christian faith and the findings of science, and fear that somehow their faith in the Creator of the world will be weakened or destroyed by scientific discoveries.

Conversely, some scientists are reluctant to look closely at Christianity-perhaps because they see it as irrelevant to their scientific philosophy. Dick demonstrates very clearly that the roots of modern science are deeply embedded in Christian philosophy and worldview, and that anyone interested in or engaged in science should seriously explore this close relationship, especially given current debates about the nature and relevance of science.

Two of the aspects of science, which cause particular concern to some Christians, are the idea that the universe is very old, and the theory of evolution. Dick explores various interpretations of the first chapter of Genesis, and shows that devout, Bible-believing Christians can accept a vast age for the universe without in any way compromising their faith.

Dick also discusses the varied views held by both Christian and atheistic/agnostic scientists on aspects of biological evolution. He concludes that Christians who 'believe in the God of the Bible...still have the option of believing in his creation of the world through "natural" processes.'

As a geologist and paleontologist who spends much of my working life exploring the relationships between living animals and plants, and their fossil counterparts, I am awed by the vastness of geological time in the same way that anyone who studies astronomy must be deeply impressed by the vast distances in space. My Christian faith is enhanced by what my studies show of the magnitude of the world that God created and sustains, and what they reveal of the majesty of the Creator.

Many scientists of the past (and present), have gone about their scientific studies of astronomy, physics, chemistry, geology, zoology, et cetera with the belief that they are thinking God's thoughts after Him. As the psalmist says, "Great are the works of the Lord, pondered by all those who delight in them."

Read Dick's book with this in mind. The so-called warfare between science and Christianity is a myth propagated by a small number of people committed to various alternative worldviews and has little to do with either science or Christianity.

I strongly recommend this clearly written and presented account of the close and complementary relationship between Christianity and science. It will help Christians appreciate science in a new way, and provides a fair and balanced perspective on the Christian view of the world for scientists who are seeking to explore the relationship between science and Christianity.

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Introduction

There are few subjects that have resulted in more open conflict, hidden agendas, prejudice, misinformation, popular misconceptions, half-truths and wasted energy than that of the relationship between Christianity and science. Back in 1895, A. D. White, the first president of Cornell University, wrote a massive and influential work entitled *A History of the Warfare of Science with Theology in Christendom*. A hundred years later (1993) we have Karl Giberson's book *Worlds Apart: The Unholy War Between Religion & Science*. The battle still rages! For instance, on one particular issue, the age of the universe, we have a rather ridiculous situation in the United States. A 1982 Gallup poll reported that 44 percent of Americans believe God created the universe within the last 10,000 years. Meanwhile, more than 99 percent of America's practising scientists view this idea as more far-fetched than the hypothesis that the earth is flat!

Some make no bones of their views. Consider the remarks of Michael Ruse, a philosopher of science, in *Darwinism Defended: A Guide to the Evolution Controversies*, concerning the form of creationism propounded by the more fundamentalist wing of the Church:

I believe Creationism is wrong, utterly and absolutely wrong. I would go no further. There are degrees of being wrong. The Creationists are at the bottom of the scale.

In another article he adds:

What we must do...is to show scientific creationism for the wicked, sterile fraud it is.

But strong opinions, and also biases and half-truths are found on all sides of the debate!

The situation is complex, as has been the whole history of the debate. For instance, in the courtroom battles that have been fought in the US on the Creation/Evolution issue it is frequently difficult to tell which side is which. On the one side of the courtroom, theologians contend that evolution is science and scientists assert that evolution is religion. On the other side of the courtroom, different scientists and different theologians argue the opposite!

However, that is only a small part of the story. There are thousands of scientists who hold Christian beliefs and who see no conflict whatever between their faith and their work. Back in the nineteen-fifties a Fellow of the Royal Society commented on the number of Fellows described in the Royal Society Obituary Notices (primarily concerned with their scientific research) 'as having had a deep Christian faith'. That would certainly be no less true today. There is also a large proportion of Christians in other walks of life, worldwide, who are quite happy with science and even unaware of any conflict at all! It is interesting to note not only the significant number of scientists today who profess faith in Christ, but also a growing number of philosophers. Kelly Clark, in *Philosophers Who Believe* (1993), says that at least 1,000 practising professional philosophers now reckon themselves as Christians. Keith Ward, former Professor of Moral and Social Theology at King's College, London University, and now at Oxford, in *The Turn of the Tide*, notes the situation in England. Commenting on the change over the 25 years that he had been lecturing, he said:

The vast majority of professors in philosophy in England now are committed Christians.

That's a very significant factor. What it means is that the intellectual arguments are going in Christianity's favour, at the very least there's a greater sympathy for the existence of God and the existence of the soul.

The purpose of this booklet is to seek to give some guidance, perspective and balance to those interested in the subject. There is a growing mass of material available today on the relationship between Christianity and Science. The substantial volume, *Who's Who in Theology and Science* (Winthrop Publishing Co. 1992) lists 1,500 academics throughout the world working on these kinds of issues, as well as 72 journals, organisations and institutions specialising in the area. From my limited reading I have sought to pick out the significant issues and give a brief, but comprehensive, picture of the debate. I don't wish to tell readers what to believe, though I have indicated my own preferences. Hopefully you will find a sufficient range of material on which you can come to your own conclusions. I have been a student of the Bible for 45 years. I am not a scientist though I have had an interest in the subject since secondary school days. I write from the perspective of one who thinks it is silly to waste energy on a battle between disciplines that should be of the greatest support to one another.

I will look first at the Christian foundations of modern science and some areas where science and Christianity have always been allies. Next I will look at the two areas over which most of the battles have been fought, the age of the universe and the theory of evolution. Then I will focus on the first chapter of the Bible to explore various views about what it really does teach. As the interpretation of this chapter has had such an impact on the debate, I will spend some time there. Finally, I will look at the need of science and Christianity for each other. And I will explore a few byways along the way. For a more detailed summary of this booklet see the list of contents on pages

Christian foundations of modern science

Modern science has grown out of Christian soil. This has been documented by many people, not necessarily Christians themselves. It was stressed by such writers as Alfred North Whitehead, the widely respected mathematician and philosopher, and J. Oppenheimer, who wrote on a wide range of subjects related to science after becoming director of the Institute for Advanced Study at Princeton in 1947. More importantly, it has been amply substantiated within the new discipline of the history of science by scholars such as Duhem, Crombie, Jaki, Nebelsick and Kaiser.

However, in order to understand more clearly the influence of Christian thought in the development of modern science, it is necessary to give some space to understanding the weaknesses of earlier systems of thinking.

Early technology and worldviews

Primitive religions

In primitive religions there was no rationality, regularity and consistency in the natural world that we would express in the term "laws of nature".

When the world was permeated by a host of uncoordinated gods and spirits, of uncertain behaviour, there was no room for science.

Greek influence

Around the 6th century BC, a remarkable development in religious thinking began to take place. This was led by a number of independent leaders who instigated revolts against the traditional tribal faiths. It might even be claimed that seven of the new universal or major religions arose in different parts of the world within fifty years of one another! In varying degrees these great faiths all moved towards a more moral, universal and unified idea of divinity. For the purpose of science, the most important developments were those that happened in Greece.

While other peoples were still hearing in nature the angry and discordant roar of the gods, Pythagoras (who lived in the 6th century BC) and other Greek philosophers began to look at the world more objectively—attempting to understand natural phenomena by rational speculation. The answers they came up with may have been mistaken (Pythagoras himself decided that everything in the universe was built up on a pattern of numbers), but this was a start.

In this and following centuries, the Greeks made some amazing achievements. In mathematics, Hipparchus' development of trigonometry and Euclid's geometry have lasted into our own times. There was Archimedes' measurement of the surfaces and volumes of curved figures, and much more. In astronomy, there was the sphericity of the earth, the true explanation of lunar and solar eclipses, and Hipparchus' discovery of the precession of the equinoxes. Aristarchus of Samos founded theoretical mechanics and proposed a heliocentric view of the earth and the sun, measuring their distance apart and their relative sizes fairly accurately. Aristotle set out to organize and systematize the whole field of knowledge and made profound contributions to biology. In anatomy and physiology, Galen's complete physiological scheme lasted until three centuries ago. In the field of technology there were the achievements of architecture, and even the harnessing of steam power to open temple doors. The theory and practice of the five basic machines of mechanics were well understood—the lever, the wedge, the wheel, the pulley and the screw. Archimedes' water screw is still used to raise water in the Middle East.

Why did all these achievements not lead to the development of science? The answer lies basically in the flawed theology behind them—wrong ideas about the nature of God and reality. Plato, whose thinking had a profound influence in the West up till the 13th century AD, taught that we must try to focus on purely theoretical notions that revealed themselves only to the mind. The failure of early scientists such as Anaximander, Anaximenes, Empedocles, Anaxagoras, Leucippus and Democritus to come to any agreement about the nature of the physical world convinced him that their fundamental approach was in error. This world was an inferior version, only an unreal shadow, of the higher, eternal and perfect world. Truth about the natural world could not be discovered through observation via the senses, but only through reason and mental processes. Thus observation and experimentation had little value.

A striking example of this deductive way of reasoning comes from Aristotle who believed women were inferior to men. He argued from this premise that they would therefore have fewer teeth than men. Although married twice, he never thought to count the teeth of either of his wives! People like Anaxagoras could examine a meteorite and conclude that the heavenly bodies could not be divine or animated beings, but made of stone just like the earth. But these potentially fruitful early Greek ideas were overridden by the triumph of the more deductive philosophies of Plato and Aristotle.

This faulty thinking is illustrated in the great astronomical system of Ptolemy. His system was supported by massive observations of the heavens by the instruments he invented, and by his mathematical skills. It worked for over fifteen centuries, predicted eclipses, and enabled the 15th and 16th century explorers to circumnavigate the globe. But its premises were wrong. In his view the heavenly bodies were animated, intelligent, perfect and eternal divine beings, and therefore had to move in a perfect, circular fashion. And the observations were all interpreted to fit the theory. There was no way of marrying this to the systems of Copernicus and Kepler. These had to start from quite different premises. Ptolemaic astronomy was not science. It was in a sense applied theology and the theology was wrong.

A further disadvantage arose from Aristotle's distinction between the "form" of the higher world and the "matter" of this one. The latter was always inferior. As the least experimental of the sciences, activities such as astronomy and mathematics were fit for gentlemen. Involvement in the physical world was only fit for slaves. Even Archimedes, who was famous for experimenting and inventing all sorts of clever mechanical devices, regarded these technical things as beneath the dignity of pure science and declined to leave any written record of them, apart from his treatise on sphere-making and his planetary model. This contrasts strongly with the later Christian monastic principle that "to labour is to pray"; with the requirement of St. Benedict, one of the founders of Christian monasticism, for six hours of manual labour daily from his monks; and with the great development in the practical arts that marked the monasteries, and their contributions to technology—their invention of labour-saving machinery, especially the harnessing of water-power, and the mechanical clock.

Another disadvantage lay in the Greek view of time. Aristotle said, "We do not say that we have learned [anything] or that anything is made new or beautiful, by the mere lapse of time, for we regard time itself as destroying rather than producing..." History runs downhill and there is little room for progress. The Greeks, in common with other great religions that emphasise reincarnation, failed to escape from the cyclic view of time. So it was that Socrates could envisage repeating the same debates in future cycles, and drinking the hemlock all over again...and again.

Other cultures

India and China both developed clever technologies which prepared the way for the development of science. Both the mathematical concept of zero and the system of place value for numerals and decimals seem to have been known in India. There was much reasoning and observation in astronomy,

and various detailed medical treatment systems. But there was no experimentation, except in psychology and associated psycho-somatic techniques, as in yoga, for the mastery over mind and body. The most striking technological achievement was represented by the pillar of pure iron at Delhi and the rustless iron pillars of the emperor Asoka.

China has a notable technological record, especially in engineering—water-power for industry, iron and steel technology, suspension bridges, hydraulic engineering in general, and mechanical clockwork. The careful observation and recording that are essential to science are common in Chinese records. There was early discussion of the hexagonal nature of snowflake crystals. Their discovery of zero, of negative numbers and decimal place values was earlier than in India, as were optics, acoustics and magnetism, with knowledge of magnetic compasses. All this, however, did not develop into true science. No doubt the Chinese philosophy of Yin and Yang was one of the main barriers to this. The Yin and the Yang controlled everything else in opposite pairs. The Yang embraced everything round, dry and weightless, which might be seen as physical qualities for scientific examination. But this vanishes when the Yang correlates them with its other non-physical principles of peace, eating, wealth, cheerfulness, celebrity and profit! Likewise Yin embraces everything square, wet and heavy—again physical qualities. But what have these to do with sorrow, drinking, poverty, ignominy and decapitation? No intelligible order or empirical relationships are discernible in this arbitrary jumble of concepts.

Another negative factor which held back the development of science in Asia generally was the influence of Hinduism and Buddhism. The emphasis in these religions on the unreality of the physical world (maya) was not conducive to an objective study of nature. A further factor in this regard was the Buddhist perspective of seeing the cosmos as intrinsically evil, the source of suffering. For Buddha, enlightenment required the closing of our eyes to the world outside and the withdrawal from the physical senses.

Islam, which arose in the seventh century AD, made certain positive contributions, especially in astronomy and mathematics. They supplied the Hindu-Arabic system of numerals without which neither science nor mathematics could proceed. However, orthodox Islam so stressed the free will of Allah as to make it absolute, unqualified by the constraints of a rationality shared by both God and humans. It was impossible to hold the notion of natural laws that might impose constraints on the infinite power of Allah. And since everything is fatalistically determined by the will of Allah, there is no point in trying to manipulate the natural world to change things.

Hebrew religion

There was one religion, however, which stood out in clear contrast to these. In the 2nd millennium BC, the Hebrews had begun to develop a view of one supreme God who was the creator of the universe and everything in it. Though eternal and distinct from all he has created, he is intensely personal. He communicates with humans but he never loses his authority, dignity, sovereignty, lordship, wisdom or goodness and moral perfection. He is never seen as arbitrary or inconsistent. As the world is made by this kind, good, rational and consistent creator, it therefore reflects its maker and

so is itself good, rational and consistently ordered. This was in contrast to other views that depreciated the world as of low value, unreal and meaningless; or worse still, as disorderly, hostile, or positively evil. As we are created in the likeness of God, with minds that can work rationally and consistently, then we can begin to understand a universe structured in the same way.

With such a view, why was it that the Hebrews did not advance beyond elementary technology to science? The answer probably lies in the fact that they remained basically a pastoral people, in a poor land with few natural resources and limited economic development. They lacked commercial products for trading exchanges that would bring stimulating interaction with other societies. They remained a semi-tribal, small-scale society without great cities or a leisure class; a people who spent most of their history at the mercy, or under the sovereignty, of the great civilizations that rose and fell around them. However, as we shall see, it was their religious beliefs, revealed even more clearly in the life, death and resurrection of Jesus Christ (the God of the Old Testament is also the God of the New Testament!), that ultimately provided the worldview in which modern science could develop.

This is obviously a simple analysis, but it gives us some background for looking at the question of why modern science developed in Europe and not elsewhere. One can suggest many factors that led to the rise of modern science. Things such as economic pressure, competition and trade, the development of industrial and military technology, the rise of nationalism and natural human curiosity—all had their part to play. However, it took Christianity to provide the philosophical worldview that resulted in the climate necessary for science to develop in the manner in which it did in the sixteenth century. Professor Hooykaas argued in *Religion and the Rise of Modern Science*:

Metaphorically speaking, whereas the bodily ingredients of science may have been Greek, its vitamins and hormones were biblical.

Christian foundations—1st to 14th centuries

There still exist strongly entrenched stereotypes of the medieval period as authoritarian, obscurantist, dominated by a reactionary, corrupt, anti-scientific Catholic Church from which the later Greek-inspired Renaissance and then modern science set us free! In the English-speaking world perhaps the first person to publicly query this view was the philosopher-mathematician Alfred North Whitehead, of Harvard University. In public lectures in 1925, entitled *Science and the Modern World*, he declared that “the approach to the scientific mentality which had been attained by the Greeks” was “absolutely in ruins” by the sixth century, and that the “Middle Ages formed one long training in the intellect...in the sense of order”, i. e. of rationality in creation. But more than this: science also needs a confidence “in the intelligible rationality of a personal being”, which is “an unconscious derivative from medieval theology.” One can imagine the startled silence at such a politically incorrect suggestion. Worse still, the book containing the lectures sold over a million copies in about a decade.

A generation earlier, the French physicist, philosopher and historian of science, Pierre Duhem, had set out these ideas with massive erudition. However, he was boycotted by the French scientific establishment because he was a Catholic, and he is still little known in the English-speaking world. But he stands at the beginning of the new discipline of the history of science.

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It may be helpful at this point to give a very brief synopsis of some key thinkers in the first fifteen centuries of Christian history.

Clement of Rome

Clement of Rome (end of 1st century) accepted a good deal of Greek mathematics and astronomy, including belief that the earth was spherical. Unlike Aristotle, however, for him the earth was not eternal and it was sharply distinguished from the divine. Both the heavens and the earth were created and they were orderly: "the sun, the moon and the dancing stars...circle in harmony within the bounds assigned to them." The whole creation was under the command of one God, and it was a blessing from him.

Origen

Origen (185-254), an immensely influential Egyptian theological teacher, was emphatic in seeing the created material world as good, despite its ugly aspects. It was created out of nothing by an eternal, rational God who gave it a systematic order that enabled us to comprehend it. Though he attempted to incorporate the Greek beliefs that the sun, moon and stars were endowed with life and intelligence, they were, for him, created beings and underwent changes like other earthly things.

Basil "the Great"

Basil "the Great", a Greek theologian in the 4th century, in contrast to Aristotle, believed the heavens and the earth were made up of the same materials: earth, air, fire and water. He also questioned the Aristotelian view that divine spirits in the heavenly bodies must continue imparting motion directly to everything that moves. By analogy with a child's top, he spoke of the heavenly bodies, "which after the first impulse, continue their revolutions, turning upon themselves when once fixed in their centre; thus nature, receiving the impulse of this first command, follows without interruption the course of the ages..." Basil's spinning top provides an early formulation of the idea of impetus. His views on creation allow for the principle of the conservation of momentum, or of inertia, that appeared repeatedly in Christian thinkers over the next twelve centuries.

Augustine

Augustine (354-430) was the dominant thinker of the first thousand years of Christian history. For him, the universe, being the creation of God, was not eternal but finite in space and time. Time itself had its created beginning. He developed a great philosophy of history which served God's ultimate purposes. This affirmation of historical time provided a most influential

basis for later science. The Greek notion of cyclic returns was ridiculous, and eliminated the possibility of happiness.

His other great contribution was to affirm of the world that “a good God made it good.” He said, “I must admit, I am unable to see why mice and frogs have been created, or flies and worms for that matter. I see, however, that all things, in their own way are beautiful...I cannot look at the body...of any living creature without finding measure, number and order. ...The [supreme] craftsman...arranged everything according to measure, number and weight.” The last part of this quote is from the Hebrew Book of Wisdom, chapter 11, verse 20, which is said to be the most quoted biblical verse in the Middle Ages. Nature is mathematically structured; it is ordered in this particular rational way.

Augustine was unsure whether the stars were alive or not. If they were, they might influence natural phenomena such as the tides and the seasons. However, through observation of the different lives of twins, he rejected the influence of the stars over humans, as in astrology.

John Philoponus

All these views were gathered up and confirmed by one man in the first half of the sixth century: John Philoponus. He has been almost unknown in discussions of the history of science, but he is perhaps the outstanding figure between the Council of Chalcedon (451) and Galileo. Individual scholars, however, have been discovering Philoponus; and in 1983, seventy-five Philoponus scholars, from many disciplines, met in conference in London.

Philoponus was a Greek Christian, a first-class lay scholar, professor in the school of philosophy in Alexandria at the heart of Graeco-Roman culture. He was one of the greatest exponents of Aristotle in antiquity, with commentaries on almost all his works. While he adopted much of Aristotle’s system for the orderly classification of nature, he was the first to mount a devastating critique of the deductive method and much of the content of Aristotle’s physics and cosmology. There was no rival to its thoroughness until Galileo. For him, heavenly bodies were not animated beings, but were made of the same stuff as this world. The light from the stars was the same as that of glow-worms and luminescent fish. Astrology was rejected as pagan. Similarly, the heavenly bodies were not perfect. They did not move with regularity in the perfect shape of the circle—a simple matter of observation. The apparent changelessness of the universe did not mean that it is eternal. It had a beginning and will have an end. Without the acceptance of these facts about the heavenly regions there can be no real scientific study of them.

In the area of physics, Philoponus rejected Aristotle’s view that heavier bodies fall faster than lighter ones (a thousand years before Galileo!). He declared, “Our view may be corroborated by actual observation more effectively than by any sort of verbal argument.” His theories on motion were the forerunner of the later theories of inertia and momentum that are embedded in Newton’s first law of motion.

As regards nature, he stated that God, having finished the creation of the universe, “hands over to nature the generation of the elements one out of

another, and the generation of the rest out of the elements.” That sounds like a summary of the evolution of the universe from basic materials that modern science would identify with. The relative autonomy of nature, with its own order and laws, is basic to science, and these early Christian thinkers were laying the foundations.

Guidelines for the University of Paris—1277

An event of note in the thirteenth century was a promulgation of 219 propositions related to Greek science, primarily as guidelines for the University of Paris. This was initiated by the Pope and dealt with most of the matters that had exercised the Christian thinkers of the previous twelve centuries. The list included the following: rejection of the eternity of the world and of the cyclic recurrence of its life every 36,000 years; the natural world was uniform in its constitution and laws, and stood in a contingent relation to its Creator; rejection of the heavenly bodies being animated and incorruptible, and of the influence of the stars upon human lives; and acceptance of the possibility of linear motion for the heavenly bodies, instead of the circular movement obligatory in Greek science. Pierre Duhem went so far as to say that “modern science was born” on the day these decrees were promulgated by the Bishop of Paris—in 1277!

Thomas Bradwardine

Others in these centuries critiqued the dominant Greek cosmology. Thomas Bradwardine (died 1349), the mathematician, is worth noting. His contribution lay in expressing the behaviour of both earthly and heavenly bodies in the same mathematical terms, so developing the essential place of mathematics in defining the laws of nature.

Since the 1930s there has been a wealth of research on Christian thinkers in the Middle Ages. The purpose of giving these examples is to demonstrate that there was much more continuity between the Middle Ages, indeed, between the first centuries of Christianity, and the scientific revolution that followed, than our popular stereotype allows for. Copernicus, Galileo, Descartes and the other 16th century pioneers of modern science knew, and drew upon, most of the medieval figures we can name; and it now transpires that Galileo knew the key work of Philoponus, from a thousand years earlier.

Beginnings of modern science

Christian pioneers

It is significant that the early pioneers in modern science were men of deep Christian faith. For Copernicus, the first astronomer of the scientific revolution, God was personally responsible for all the activity in the heavens. His radical ideas were contained in his book *On the Revolutions of the Heavenly Spheres*, which was published in 1543, the year of his death. The regularity he was discovering in the movements of the planets was, for him, a manifestation of the faithfulness of a loving Creator.

Galileo (d. 1642) invented the hydrostatic balance and discovered the laws of dynamics from observation of falling bodies. However, he is chiefly known for his achievements in astronomy. His discovery of the four satellites

of Jupiter on 7th January, 1610, with the aid of the newly invented telescope, revolutionised the study of astronomy. He has been called the first *modern* scientist and his work confirmed the observations of Copernicus. He regarded his science as illuminating the work of the Creator. For all his quarrelling with the church he remained a devout Christian until he died.

Kepler, the German astronomer, a contemporary of Galileo, was also a devout Christian. His discovery of the three laws of planetary motion laid the foundation for Newton's theory of gravity. He regarded his study of the physical universe as "thinking God's thoughts after him". In *The Secret of the Universe* he wrote:

Here we are concerned with the book of nature, so greatly celebrated in sacred writings. It is in this that Paul proposes to the Gentiles that they should contemplate God like the Sun in water or in a mirror. Why then as Christians should we take any less delight in its contemplation, since it is for us with true worship to honor God, to venerate him, to wonder at him? The more rightly we understand the nature and scope of what our God has founded, the more devoted the spirit in which that is done.

The baton of scientific leadership passed in the next generation to Newton, born in the year of Galileo's death. Though he had problems with the Christian view of the Trinity, he was a strong believer. As a member of the Anglican Church he was involved in distribution of Bibles to the poor and the construction of new churches. He actually wrote more than a million words on the Bible and theological topics, more than he wrote on science. His well-worn Bible, with marginal notes in his own handwriting, is in the Wren Library of Trinity College, Cambridge. He became the foremost mathematician in Europe. He published *Principia mathematica* in 1667, "a book that transformed the course of western science". His work gave new direction to optics, mechanics and celestial dynamics. His work on gravity established the Cambridge reputation for mathematics. His studies of light produced the first refracting telescope. His invention of calculus gave science the mathematical tool it needed for further exploration of the trails he blazed.

Biblical foundations

How was it that the Christian faith aided the scientific approach of many of the original thinkers of those times and enabled them to break with the preconceptions of the past? In his 1925 lectures, Alfred North Whitehead had said that Christianity is the mother of science because of "the medieval insistence on the rationality of God". Because of the confidence of the early scientists in this rationality, they had an "inexpungable 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." Newton wrote in *Principia*:

This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being...This Being governs all things, not as the soul of the world, but as the Lord over all.

This God is not only intelligent, but also faithful and worthy of trust, as the Scriptures often declare. His faithfulness is expressed in the regularity and order of the created world, a regularity that could be expressed scientifically as “laws”. Newton is noted for his formulation of the law that governed the motion of the celestial bodies—his famous law of universal gravitation.

This God also declared that all he has created is good, a word that occurs seven times in Genesis 1. Therefore his works are worthy of study. This contrasted with the idea of the unreality, or inferiority of the natural world, common to Greek philosophy and other religions.

Many studies have been done on the influence of “voluntarism” on the rise of early modern science, from Augustine to Ockham to Boyle and Newton. This is the idea that emphasises the will of God and that he is free to choose his own way of doing things. He did not have to create or to do so in the way he did. This world might not have existed, or it might have had different properties from the ones it has. As a result, nature’s properties must be discovered rather than merely deduced from the principles of logic or mathematics.

The central theme of Protestant theology at that time was the glory of God, and they saw this partly in understanding his creation. The early Christian scientists also saw it as their task to take seriously the command given in Genesis 1:28 to subdue the created order.

A further factor was undoubtedly the Christian view of progress in history which is implied in God’s first command to “replenish the earth and subdue it.” The idea of progress is inherent in *applied* science. The Christian view of purpose in history, which had a beginning, and which will end with the second coming of Christ, is very different from the cyclical view, with constant repetition, common to some other major religions. This sense of the rationality of God, the faithfulness of God, the goodness of his creation and his purposes in history underlie much of what surfaced in the sixteenth and seventeenth centuries and largely grew out of the Reformation, though we have seen that its beginnings go back to the early Christian centuries—indeed, to the Bible itself.

Finally, the picture of a single God who created the whole universe to operate by consistent laws, is very different from the idea of many different nature gods whose activities may vary. As Guillermo Gonzalez and Jay W. Richards state in their very significant book *The Privileged Planet: How our place in the cosmos is designed for discovery*:

Since they believed that God is one and that human beings are created in God’s image, medieval Christians and Jews could expect nature to have a sort of unity (to be a universe) and to be accessible to the human mind. These ideas, brought to fruition by interaction with the Greeks, were the seedbed from which natural science slowly grew. It’s hardly a coincidence that science emerged in the time and place where these many factors converged. Although they are now forgotten, modern science draws on the interest of specific theological convictions.

Alfred North Whitehead, in *Science and the Modern World*, declared eighty years ago: “Faith in the possibility of science, generated antecedently to the development of modern scientific theory, is an unconscious derivative from medieval theology.

The Book of God’s Word and the Book of God’s Works

One of the results of the Reformation was a new sense of freedom. People felt free from the old traditions, whether ecclesiastical, political or philosophical. The scientists said they were free from the preconceived ideas of Greek philosophy, and they would submit their ideas to the Book of Nature, just as they submitted all matters of faith to the Book of Scripture. As God was the author of both there could be no conflict between them, other than that which arose from human misunderstanding. Galileo wrote that “the world is the work and the Scriptures the word of the same God.” Or as Kepler put it: “The tongue of God and the finger of God cannot clash.” This was a common theme. Francis Bacon, lawyer, philosopher, and the founder of the new scientific approach in England, who was made Lord Chancellor in 1618, declared in his *Proficiency and Advancement of Learning*:

Let no man think or maintain that a man can search too far or be too well studied in the Book of God’s Word or in the Book of God’s Works.

(Interestingly enough, this quote appeared opposite the title page of Darwin’s *Origin of the Species*.) Bacon also stated in *Novum Organum* that natural philosophy (science) is:

after the word of God, the surest remedy against superstition, and the most approved support of faith.

Kepler felt himself to be “a high priest in the book of nature, religiously bound to alter not one jot or tittle of what it had pleased God to write down in it.” That is why he took seriously the eight minutes of divergence from the circular in the orbit of Mars, which he discovered by observation. He revealed the motivation for his work when he wrote:

Since we astronomers are priests of the highest God in regard to the book of nature, it befits us to be thoughtful, not of the glory of our minds, but rather, above else, of the glory of God.

They were following the lead given in the Bible 2,000 years or more earlier: “**Great are the works of the Lord; they are pondered by all who delight in them**” (Psalm 111:2). Lord Rayleigh prefixed this text to his collected scientific papers and it is carved on the great door of the Cavendish Laboratory in Cambridge. It was put there at Maxwell’s request, one of the greatest scientists of his day. And as scientists began to study this universe, and took seriously what they saw, the old ideas that had been appropriated from Aristotle—the earth was perfectly round; it was the centre of the universe; it was immovable; the sun was a perfect sphere without spot or blemish; air fell upwards, etc.—began to fall like dominoes.

Puritan influence

The influence of Christianity in the early days can be seen very clearly in the formation in 1660 of the Royal Society of London for Improving Natural Knowledge, normally known just as the Royal Society, which was very significant in the promotion of scientific advances. Most of its members were professing Christians. It began with informal gatherings in Gresham College, a Puritan College in London. Seven of the ten scientists who formed the nucleus of those meetings were Puritans. In 1663, sixty-two per cent of the members were clearly Puritan in origin—at a time when Puritans were only a small minority in England. Robert Boyle, the “father of chemistry” and one of the founders of the Royal Society, left the sum of £50 per annum in his will for a series of eight lectures to be given against unbelievers in some church in London. There were also important scientists in the sixteenth and seventeenth centuries who were Roman Catholics.

Nineteenth century

Moving on to the early nineteenth century, the number of pioneer geologists who were Bible-believing Christians is noteworthy. Among them were William Buckland, who held the chair of geology at Oxford, and his counterpart at Cambridge, Adam Sedgwick. Both were leading churchmen. They maintained contact with the famous French geologist, Baron Cuvier, another Bible-believer. In the mid-nineteenth century, the most famous Christian geologist was probably Hugh Miller. His brilliant field research on the geology of the Western Highlands gained him the presidency of the Royal Physical Society of Edinburgh. He wrote a number of best-selling books on geology, including *Footprints of the Creator*. The highly regarded Edward Hitchcock, president of Amherst College in Massachusetts, is also worthy of mention. He also held the chairs of natural theology and geology there. His lectures on the age of the earth were famous.

The basis of physics was established by men of Christian faith: Newton, Gauss, Faraday, Maxwell, Lord Kelvin, to name a few. The early outstanding botanist, John Ray (d. 1705), declared:

The treasures of nature are inexhaustible...If man ought to reflect upon his Creator the glory of all his works, then ought he to take notice of them all and not to think anything unworthy of his cognisance.

Atheistic science, which followed on from the French Revolution, reached Britain in the 1820s. However, it could still be said in the mid-nineteenth century that most of the world’s scholars and scientists were still professedly Christian. The British Association for the Advancement of Science was formed in 1832. Clergymen were active in its formation and provided three of its presidents during the first five years. At a meeting of the Association in 1865, a manifesto was drawn up and signed by 617 men, many of whom were of the highest eminence, in which they declared their belief not only in the truth and authenticity of the Holy Scriptures, but also in their harmony with natural science. The original document is in the Bodleian Library at Oxford.

In his very helpful book, *What If Jesus Had Never Been Born*, D. James Kennedy gives a list of some of the outstanding Bible-believing scientists

who gave the lead in *founding* the following branches of science. This list is worth repeating:

Antiseptic surgery, Joseph Lister
 Bacteriology, Louis Pasteur
 Calculus, Isaac Newton
 Celestial Mechanics, Johannes Kepler
 Chemistry, Robert Boyle
 Comparative Anatomy, Georges Cuvier
 Dimensional Analysis, Lord Rayleigh
 Dynamics, Isaac Newton
 Electronics, John Ambrose Fleming
 Electrodynamics, James Clerk Maxwell
 Electromagnetics, Michael Faraday
 Energetics, Lord Kelvin
 Entomology of Living Insects, Henri Fabre
 Field Theory, Michael Faraday
 Fluid Mechanics, George Stokes
 Galactic Astronomy, Sir William Hershel
 Gas Dynamics, Robert Boyle
 Genetics, Gregor Mendel
 Glacial Geology, Louis Agassiz
 Gynaecology, James Simpson
 Hydrography, Matthew Maury
 Hydrostatics, Blaise Pascal
 Ichthyology, Louis Agassiz
 Isotopic Chemistry, William Ramsey
 Model Analysis, Lord Rayleigh
 Natural History, John Ray
 Non-Euclidean Geometry, Bernard Riemann
 Oceanography, Matthew Maury
 Optical Mineralogy, David Brewster

However, over the last 150 years the gap between science and Christianity has widened. The causes of this are many: science's share in the increased secularisation of Western society; prejudices and misunderstandings on both sides of the fence; the trend of increasing reductionism in science (reducing subjects to their ultimate units as in quantum mechanics and molecular biology) and so missing out on the bigger picture—to name a few.

Having looked at the Christian foundations of modern science I will now explore the two issues over which most of the battles have been fought, the age of the universe and the theory of evolution.

The age of the universe

By far the most important cause of the conflict that has taken place over dating the age of the universe has arisen because of the insistence of some Christians that the word "day" in Genesis, chapter 1, must refer to a day of 24 hours. It is instructive to trace the history of this interpretation.

A history of the debate

The early Church Fathers had differing views on this subject and they don't seem to have regarded it as a matter of prime importance. For instance, Justin Martyr and Irenaeus, in the second century, used Psalm 90:4 and 2 Peter 3:8 to support their view that the creation days were each a thousand years. Clement of Alexandria a little later claimed that these days communicated the order and priority of created things, but not the time. Origen in the third century taught that we should seek a spiritual meaning, not a literal one, in a difficult passage such as this. For him, time as we mark it did not exist until the fourth day, so the earlier days could not possibly have been 24 hours. Augustine, who wrote more on this subject than any other early writer, said:

As for these "days," it is difficult, perhaps impossible to think—let alone explain in words—what they mean.

In *The Literal Meaning of Genesis*, he adds:

But at least we know that it [the Genesis creation day] is different from the ordinary day with which we are familiar.

Ambrose, bishop of Milan in the fourth century, is the early church leader quoted most frequently as supporting the interpretation of the six Genesis creation days as a 144-hour period, but even he made statements that are ambiguous and refer to an era or epoch as the word's possible definition.

Through the Dark and Middle Ages, church scholars maintained this tolerant attitude of their forefathers. However, in 1642 things began to change. In that year, 31 years after the completion of the King James translation of the Bible, Cambridge University Vice-Chancellor, John Lightfoot, published his calculation of the exact day for the creation of the Universe—September 17, 3928 BC. He drew this conclusion by analysing the genealogies in Genesis, Exodus, 1 & 2 Kings and 1 & 2 Chronicles, taking the years cited as precisely 365 days. Eight years later, James Ussher, an Anglican Bishop of Ireland, also with copious calculations, published his date, making it October 3, 4004 BC. In a final round of academic sparring Lightfoot made a final adjustment to Ussher's date. All creation took place during the week of October 18-24, 4004 BC, with the creation of Adam occurring on October 23 at 9.00 am, forty-fifth meridian time!

Remarkably, the date of 4004 BC became firmly fixed in the minds of millions and was taken seriously, with little or no question, for more than a century. From the turn of the eighteenth century onward, editions of the King James Bible included Ussher's chronology as margin notes, or even as headings, in the text. Further, this Bible quickly became *the* translation of the English-speaking world, when English Protestantism was spreading throughout the world. Sadly, this proved an unnecessary barrier to the spread of the gospel in Asia because Chinese historical records gave an earlier date for the origin and spread of human civilisation.

The impact of geology

It was the geologists who eventually undermined this view in the late eighteenth and early nineteenth centuries. William Smith, the “father of English geology”, constructed the first geologic column of fossil bearing rocks in 1799. Lyell, d’Orbigny, and Hall, building on the earlier work of Werner, Hutton, Smith, Cuvier and Lamarck, concluded from their calculations of geological deposition rates, that life must have existed on earth for at least a quarter of a billion years, with significant progressive changes over that time. Also, the evidence was growing that the fossiliferous rocks could not have been deposited by one particular flood such as that described in Noah’s day, however extensive that might have been. This was before any theory of evolution had surfaced. The view was still widespread that God had responded to various catastrophes with separate, successive creations.

In the first half of the nineteenth century there were some fierce skirmishes between the geologists and those who clung to Ussher’s chronology. However, the increasing evidence produced by the geologists eventually won the day. Hitchcock in the US could write in 1840 of a small minority who were still dragging their feet. By the middle of the century almost all educated Protestants were content to reconcile Genesis with geology.

This situation was generally true for the next 100 years. Even members of the Evolution Protest Movement, launched in London in 1932, with physicist Sir Ambrose Fleming, the “father of modern radio” as president, fully accepted the findings of the geologists. Their protest was with evolution, not the age of the earth. A minority in America believed otherwise, but it is doubtful if any of them were professional geologists. Alternative views, whether sensible or otherwise, have tended to be more common in America. (The *Creation/Evolution* magazine, Winter 1981, reported that the International Flat Earth Research Society had 1500 members, “many of whom are doctors, lawyers and other professional and educated people.”)!

However, in 1963 recent-creationism took off again as an organised movement with the foundation of the Creation Research Society in America, two years after Whitcomb and Morris published their famous book, *The Genesis Flood*. This book took a substantial part of the evangelical world by storm. In a surge of enthusiasm several new creationist societies were formed in the USA in the nineteen-sixties and a couple in Britain in the nineteen-seventies. The majority were formed to promote recent-creationism which was seen as the only reasonable alternative to Darwinism. The influence of this movement has been enormous. Ancient-creationists in America have found themselves becoming a less fashionable minority, with the trend in Britain following not very far behind.

The evidence from geology for the ancient age of the earth, and the impossibility of the observed phenomena being created by a single Genesis Flood, is literally massive. This evidence comes from many sources: the strata in the sedimentary rocks; the billions of fossils and their distribution; the quantity of coal in the earth’s crust; the Yellowstone petrified forests where 44 successive forest layers have been discovered in one huge stack; the

Haymond sedimentary column in the USA which contains more than 30,000 *alternating* layers of shale and sandstone, etc. However, over the last generation new evidence has arisen which overshadows that produced by geology. This evidence is concerned not primarily with the age of the earth, but the age of the universe.

The impact of astronomy

The nineteenth century astronomers were not far behind the geologists in concluding that the universe was far older than people had thought. England's greatest astronomer of the age was the German-born Sir William Herschel. By 1800 he had calculated the distances of many remote stars in our galaxie. He realised that the light from these galaxies must have taken very much more time than 6,000 years to reach our planet. In the eighteen-thirties Friedrich Bessel, using improved instruments, confirmed his basic findings, and other astronomers followed fast. In 1850 the Christian writer, John Pye Smith, concluded in his book *On the Relation Between the Holy Scriptures and Some Parts of Geological Science*, that:

These views of the antiquity of that vast portion of the Creator's works which Astronomy discloses, may well abate our reluctance to admit the deductions of Geology, concerning the past ages of our planet's existence.

The theory of relativity

At the beginning of this century Einstein formulated the theories of Special Relativity (1905) and General Relativity (1916). For most of us ordinary mortals, understanding of this theory hardly goes beyond the famous limerick of Arthur Buller that appeared in *Punch* on December 19, 1923:

*There was a young lady named Bright
Whose speed was far faster than light;
She set out one day
In a relative way
And returned home the previous night.*

However mysterious, this theory was shown to be accurate to one part in a hundred million by Russell Hulse and Joseph Taylor in 1993. They received the Nobel Prize in Physics for their work in this area.

The big bang

The Theory of General Relativity concerns the relationship of energy, matter and time in the universe. American astronomer, Edwin Hubble, discovered in 1924 that ours was not the only galaxy in the universe, and in 1929 that the universe was expanding. Einstein's work between 1917 and 1930 pointed to the fact that the universe is not only expanding, but that its rate of expansion is slowing down. What physical phenomenon would produce simultaneous expansion and deceleration? An explosion. In other words the universe had *a beginning*.

In 1970, three British astrophysicists, George Ellis, Stephen Hawking and Roger Penrose took this a step further. Working on the space-time theorems of general relativity, their work showed that if general relativity truly

describes the physical dynamics of the universe, not only did matter and energy have a finite beginning, but so did space and time. This beginning has become known as the “big bang”. A Belgian priest/scientist, George Lemaître, had first called it the “big noise”. Astrophysicist Fred Hoyle insultingly referred to it as the “big bang” and the name stuck. It is now the accepted picture in university science faculties of the way things began.

Over the past decades astronomers have amassed a tremendous amount of information about the universe. They have developed well-proven techniques for determining the temperature, the mass, the composition and the energy output of stars. This knowledge has been advanced significantly by the Hubble Space Telescope, placed in orbit in 1990. Since the remarkable correction to a flaw in this telescope, done by space walkers from the shuttle *Endeavor* in 1993, it has continued to send back breathtaking pictures in colour of our universe that are 10 times sharper than those produced by earthbound telescopes. This telescope is expected to have a useful life of another 10 years and who knows what amazing discoveries it will reveal in that time, or even before this booklet gets into print?

Since April 1992, probes done by the Hubble Telescope, together with the Roentgen Satellite and several land-based telescopes, have made a significant discovery. For some time cosmologists have been puzzled by the fact that radiation left over from the big bang (discovered in 1965) appears to be smoothly distributed throughout the universe. This would lead us to expect that matter, too, would be smoothly distributed. But this is not so. This was one of the remaining puzzles about the big bang theory. However, the presence of what is called “exotic” matter in the universe, that only acts weakly with radiation, and the “cosmic ripples” in the background radiation, which were confirmed by these probes, provides the explanation. And the ratio of exotic to ordinary matter fits the picture exactly. The fitting together of various pieces of research in this regard, both theoretical and observational, is the kind of thing scientists dream about.

As reported by Dr. Hugh Ross in *Christianity Today*, Carlos Frenk, of Britain’s Durham University, exclaimed to reporters, “[It’s] the most exciting thing that’s happened in my life as a cosmologist.” Cambridge University’s Stephen Hawking, a master of theoretical physics and of understatement, described just one of the several breakthroughs as “the discovery of the century, if not of all time”. Michael Turner, University of Chicago and Fermilab astrophysicist, said researchers have found “the Holy Grail of cosmology.” George Smoot, University of California at Berkeley and leader of one of the breakthrough projects, said: “What we have found is evidence of the birth of the universe...It’s like looking at God.” Science historian, Frederic Burnham, adds that many scientists have suddenly come to consider God’s creation of the universe, “a more respectable hypothesis today than any time in the last 100 years.”

Scientists now tell us they can describe many events right back to the first fraction of a second ($t=10^{-10}$) of our universe’s existence when it existed as a source *incomparably* compact and *incomparably* hot (10^{14} K). Eminent historian of science, Owen Gingerich, describes events at that point of time in these words:

At that point, at a second split so fine than no clock could measure it, the entire observable universe is compressed within the wavelike blur described by the uncertainty principle, so tiny and compact that it could pass through the eye of a needle. Not just this room, or the earth, or the solar system, but the entire universe squeezed into a dense dot of pure energy. And then comes the explosion. "There is no way to express that explosion," writes Robinson Jeffers,

*"...All that exists
Roars into flame, the tortured fragments rush away from
each other into all the sky, new universes
Jewel the black breast of night; and far off the outer nebulae
like charging spearmen again
Invade emptiness."*

It's an amazing picture, of pure incredible energetic light being transformed into matter, and leaving its vestiges behind. It's even more astonishing when we realise that the final fate of the universe, whether it will expand forever or fall back on itself to a future Big Crunch, was determined in that opening moment.

This remarkable event, with everything in existence springing forth from that blinding flash, bears a striking resemblance to the picture given in Genesis 1:3, "**And God said, Let there be light.**" Who could have guessed even a hundred years ago—not to mention two or three thousand years ago—that the scientific picture would emerge with energy in its various forms, including electromagnetic radiation, as the starting point of creation! It is interesting also that there are more than seventy five verses in the Bible affirming that the universe had a beginning and that God created it.

Further back from this first millisecond the present known laws of physics do not allow our scientists to go. If this is indeed the beginning of space and time, then the God who achieved it exists beyond the confines of both, a picture that fits perfectly with that which we find in the Bible.

And if it is true, as seems the case, that neither time nor matter existed before the big bang, however scientists of an atheistic bent may try to explain it, it at least raises the question as to whether it had any cause or not. If it had a cause, then at least God looks to be a very probable possibility. If it had no cause, then the words of Professor Dallas Willard of the School of Philosophy at the University of Southern California are very relevant: "We must at least point out that an eternally self-subsistent being is no more improbable than a self-subsistent event emerging from no cause." As C. S. Lewis pointed out in *God in the Dock*, "An egg which came from no bird is no more natural than a bird which had existed from all eternity."

How long ago did this event occur? Various methods for measuring the age of the universe, such as expansion of the universe, colour-luminosity fitting, deuterium abundance and mass density, anthropic principles and nucleochronology, yield reasonably consistent figures, give or take a billion or two years. However, scientists now believe they can date this event more accurately. About 300,000 years after the initial Big Bang, electrons combined with protons to form atoms, leaving the universe like a big microwave oven. Today the microwave temperature is 2.725°K (minus 270°C). The microwaves

have been travelling for more than ten billion years. The discovery of this microwave background, first observed by the Horn Antenna at Holmdel, New Jersey, and more recently, the discovery of certain fluctuations in that background, have enabled scientists to extrapolate the expansion of the universe back in time to when the galaxies were all together. After years of uncertainty due to the difficulty of measuring over such astronomical distances, NASA's Wilkinson Microwave Anisotropy Probe in 2003 narrowed the universe's age to 13.7 billion years, with an error margin of less than two percent.

In 1860, Thomas Huxley, reviewing Darwin's *Origin of the Species* in *Westminster Review*, wrote with glee:

Extinguished theologians lie about the cradle of every science as the strangled snakes beside that of Hercules; and history records that whenever science and orthodoxy have been fairly opposed, the latter has been forced to retire from the lists, bleeding and crushed, if not annihilated. But orthodoxy is the bourbon of the world of thought, it learns not, neither can it forget.

It is instructive to compare this with the often quoted statement of Robert Jastrow, Director of NASA's Goddard Institute for Space Studies. This was written in 1978, well before the recent discoveries described above. He wrote in *God and the Astronomers*:

For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance, he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been sitting there for centuries.

Having explored the debate concerning the age of the universe, we now turn to the second area of conflict, the theory of evolution.

The theory of evolution

There are two points that I wish to make at this stage, both very important if we are to get a balanced picture of the debate. The first is that the theory that all life on this planet evolved over time from atoms floating in some primordial soup (or on the crystal edges of minerals as is the more modern view) *is not necessarily a theory that is anti-God*. There have been (and still are) plenty of Christians, scientists or otherwise, who have accepted the basic philosophy of evolution (and still do) who believe that perhaps this is the way that God chose to do it. And they see no conflict between this and the teaching of Genesis 1. In fact, some would say that Genesis 1 supports such a view. After all, if God is a creative God, why should he not take time to do it. With our increasing knowledge of the amazing properties of the DNA molecule that exists in every living cell, the tape-recording of every detail of our physical makeup, why should not God choose to reprogram the tape along the way as he lovingly prepared life on earth for the existence of us humans? Eric Delve, British evangelist and clergyman, has written:

What about the...question: "If God could have made the world in six days why would he bother to take six billion years?" Why not ask: "Since Yehudi Menuhin has recorded the Bach Violin Concerto in A minor—why bother to learn to play it yourself?" The answer is parallel. The God of creation making man in his image, created a being who could only be fulfilled by creating. How many men have found

themselves, like me, at the seaside completing a magnificent sandcastle "for the kids" only to find they have lost interest long ago. Why would he take so long? He enjoyed it!

Darwin himself, though agnostic in his latter years as to how life began, never argued against the existence of God. From the second edition on of his *Origin of the Species*, first published in 1859, he inserted a reference to the Creator who "originally breathed life with its several powers into a few forms or into one." What Darwin *did* do was to give those who did not believe in God, for other reasons, or who did not *wish* to believe in God, a more reasonable explanation of how life *could* have arisen without God.

The second point of importance is that to believe in evolution does not necessarily mean that one believes in Darwin's view of how it might have happened. It is a little known fact that a sizeable proportion of biology research fellows, professors, and graduate students at leading institutions are Bible-believing Christians who deny the neo-Darwinist hypothesis of the development of molecules to primordial life, and primordial life to humans, through natural processes alone.

The central idea of Darwinism is that evolution is due to the combined effect of mutations and natural selection. "Copying errors" occur in the genes, some of which happen to be beneficial, to give the organism some advantage over other organisms. These advantages are passed on to offspring. The arguments against all life on this planet evolving in this manner, within the time scale allowed, or even evolving at all, are many and impressive. It is not difficult today to find people with impressive qualifications, and not necessarily Christian, who believe in evolution, but do not believe it happened the way Darwin said it did.

One example is the French zoologist, Pierre-Paul Grasse, who has been described as the most distinguished of French zoologists. He edited the 28 volumes of *Traité de Zoologie* and is the author of numerous original investigations and ex-president of the Academie des Sciences. He is known for his encyclopedic knowledge of the living world. In 1973 he published a major book on evolution, which appeared in English translation, *Evolution of Living Organisms*, in 1977. First and foremost, the book aims to expose Darwinism as a theory that does not work, because it clashes with so many experimental findings. Having studied the subject extensively, both inside his laboratory and in nature, he says that neither mutation nor natural selection work the way Darwinists think they do. Having spent 200 large pages packed with evidence that Darwinism is on an entirely wrong track, he then offers a new theory to replace it. Some would go further. Swedish zoo-physiologist, Sören Lovtrup, damns Darwinism as "the greatest deceit in the history of science"!

Another very recent example is that of biochemist Michael Behe, who in *Darwin's Black Box* has challenged ("demolished" in the word of one reviewer) the idea that complex biological structures could possibly happen by means of gradual accretions of random mutations, chosen and preserved by natural selection. Either direct intervention or a guiding mind that knows the target at which the organism is shooting would be necessary. The details he marshals are very compelling. Behe says that his fundamental assumptions about evolution began to change when he read *Evolution: A*

Theory in Crisis, by Michael Denton, a New Zealand medical doctor and human genetics professor.

Mathematicians, physical scientists and philosophers of science could also be quoted in this regard. This is not to say that evolution did not happen. It is simply to point out that, if it did happen, there is still plenty of uncertainty as to *how* it happened. Other suggestions have been put forward such as Alister Hardy's "third factor"—of species selecting the environment! However, there are many that believe that it is not wrong, even in science, to rule out the possibility of a guiding hand.

In November, 1996, more than 160 academics—scientists, philosophers and theologians—from 98 universities, colleges and organisations, gathered at Biola University in California to address these issues. The majority represented secular universities. Only a few of the participants were young-earth creationists. This was the first major gathering of what may be now described as "the intelligent-design movement". The movement's defining view was spelled out by Phillip Johnson, author of *Darwin on Trial*. He said:

We have to recognize the difference between materialist philosophy and scientific investigation. We need to have a separation of the philosophy from the real science, both in order to have an honest, unbiased scientific enterprise, and to protect the public from getting the false impression that scientific evidence has shown that [the] evolutionary process is our true creator.

Of the participants at the conference he said:

These are people who want to learn what truth is, what the facts are. They have a devotion to finding the truth, whatever it is.

If you do believe in the God of the Bible, then you still have the option of believing in his creation of the world through "natural" processes. However, if you don't believe in God, then you have no alternative to believing that evolution happened *somehow*. And I strongly suspect that what scientists believe about God is usually the result of other factors than whether their particular line of work gives evidence of him or not!

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Since I first published this booklet (1997) there has been an amazing explosion of knowledge of the human genome. As Graeme Finlay explains in his excellent booklet *God's Books: Genetics & Genesis* in the Science and Faith Series (Published by TELOS Books, P. O. Box 56 167, Dominion Road, Auckland 1030, New Zealand):

Each cell in our bodies has 46 chromosomes. Each chromosome contains a single DNA molecule. Each DNA molecule consists of four building blocks ('bases') designated A, G, T, and C. Tens or hundreds of millions of these bases are strung together in the DNA molecule of a single chromosome. Our total genetic endowment consists of 3 billion such building blocks. The order ('sequence') of the bases specifies the information that is required for the construction of an organism. The much-publicised human genome project has used biochemical techniques and computers to place in order most of the 3 billion A, G, T, and C units that comprise the totality of our genetic information (our 'genome').

These DNA sequences are a record of our genetic history. The information has revealed that our DNA molecules have undergone many structural alterations in the past. Some of these changes are minor, such as single base changes. Some are very large rearrangements involving segments thousands or millions of bases long. Instances are known in which the orientation of segments of chromosomes has been reversed ('inversions'). New genes have been formed by copying and modifying old ones ('duplications'). Old genes fade away (degenerate to 'pseudogenes'). DNA of genetic parasites may be added to chromosomal DNA ('insertions'). All these are random and unique events. The interesting fact is that we share particular duplications, pseudogenes, and insertions ('errors') with other primate species. This establishes that we and the other species possessing a uniquely arising genetic construction are related by descent from an ancestor in which the particular genetic change occurred.

For those who like technical information, Graeme Finlay gives the following example of many that could be given:

The S100A7 gene family comprises several members because of a duplication that produced a 33,000 base segment (region 1) and a 31,000 base segment (region 3) separated by a linker of 11,000 bases. Besides the S100A7 genes, over 20 specific insertions of genetic parasites are shared between regions 1 and 3, proving that the two regions were generated by duplication of one progenitor segment of DNA. A specific rearrangement allows region 1 and region 3 to be distinguished, and the two regions are present in chimpanzees as well as humans. It may be concluded that the duplication occurred before the chimpanzee lineage diverged from the human one. Such duplications....are common. The human Y chromosome has eight such duplications, and at least six of these are possessed in common with other great apes (chimpanzees, gorillas).

Similarly, many examples are known in which multiple primate species share a particular pseudogene which in every case has the same disruptions to its structure. It is unlikely that the same disruptions would occur independently in many species. We could not have stronger evidence that this same pseudogene was inherited from an ancestor in which the gene was knocked out. In addition to our 30,000 or so human genes, we have 10-20,000 such derelict genes. These are degraded remains of genes which are still active in other species, or scrambled copies, derived from authentic genes that retain their protein-coding function in our own DNA.

In his booklet *Evolving Creation* in the same series, Finlay sums up this and other evidence as follows:

The rapid development of genetics has conclusively demonstrated that humanity has evolved from primate progenitors. We share common ancestors with chimps, with all the apes, with the simians, and with prosimians such as the tarsier and lemur...Not only does this genetic evidence establish the evolutionary route of our own biological history, it also demonstrates that macroevolution has occurred.

This evidence, of course, says nothing whatever about whether all this happened because an intelligent being such as the Christian God was in

some way involved in the process and planned it all, or whether it merely happened “by chance”. It merely reveals what has actually happened. We have to look elsewhere to answer such questions. Neither does it have anything to say about the implantation of the human spirit, which I have referred to in a later chapter.

What does Genesis 1 really teach?

The debate between Christianity and science concerns not just the scientific facts, but how they fit in with the teaching of the Bible, particularly with Genesis 1. So let’s explore that.

I am aware of seven different ways in which Genesis 1 is interpreted. They are not all mutually exclusive, though most are. There are variations on some of these interpretations which I won’t go into. However, as this is so crucial to the debate I think it is important to mention them all. The first four of these interpretations all take the “day” of this chapter to refer to a day of 24 hours.

Scenario 1—Recent Creationism

There are many Christians today who believe that to take the word “day” to refer to anything other than 24 hours is to be unfaithful to what they believe the Bible says, and therefore unfaithful to God. They would rather be true to what they believe God is saying than accept what appears to be the physical evidence presented by scientists. The world must therefore have been created comparatively recently and within a 6 day period, and the scientists have just got it wrong—for whatever reason. A statement of this view is given to us by Dr. Henry Morris of the Creation Research Society, cited by S. G. Brush in *Journal of Geological Education*, 30:

The only way we can determine the true age of the earth is for God to tell us what it is. And since he has told us, very plainly, in the Holy Scriptures that it is several thousand years in age, and no more, that ought to settle all basic questions of terrestrial chronology.

Scenario 2—Creation, then chaos, then re-creation

To get around the evidence produced by geologists, some have suggested that “**the earth was formless and empty**” of verse 2, should be translated “the earth *became* formless and empty”. (The Hebrew *could* be translated that way, though I understand from good authority that the grammatical construction is against it here.) That implies that there was an original creation which was good, and the life now represented by fossils flourished. But then something went wrong, perhaps associated with the rebellion of Satan and other spiritual beings. As a result of God’s judgement chaos resulted. The rest of Genesis 1 then speaks of a *re-creation* which did take place within the 6 day period. This view has its roots in early Jewish tradition and has been held by some throughout the history of the church. It was held by some geologists in the nineteenth century and was popularised by the Scofield Reference Bible in 1909. However, there are problems with this view on both Biblical and geological grounds, and I am not aware that there are many who would hold it today.

Scenario 3—Six days in which the stages of creation were revealed

A very reasonable view was presented by Air Commodore P. J. Wiseman, CBE RAF (1888-1948), in two studies—*New Discoveries in Babylonia about Genesis* (1936) and *Creation Revealed in Six Days* in 1946. R. K. Harrison summarised the first of these studies in his impressive *Introduction to the Old Testament* on pages 545-53 (1970). Both these two studies were edited by his son, Donald J. Wiseman, Professor of Assyriology in the University of London and formerly Assistant Keeper, Department of Western Asiatic Antiquities, The British Museum, and republished together in 1977 with the title *Clues to Creation in Genesis* (Marshall, Morgan & Scott, ©).

The Inter-Varsity Magazine said of this latter book:

We can recollect few books so startlingly convincing or so helpful in clearing up many difficulties connected with the Old Testament. Fortunately it is book easily read and understood...

After reading it one realises how inadequate one's previous understanding of Genesis has been. Read it and pass it on. It is one of the best books we have seen.

Wiseman's basic argument is that the six days do indeed represent days of 24 hours, but they are not days in which God created the universe, but days in which he revealed truths of his creation to an individual at the dawn of history over a period of six days.

We now know a great deal about ancient writing in Assyria, Babylonia, Ur and Egypt. There are over a quarter of a million cuneiform tablets now scattered in museums around the world, going back to 3,500 B. C. They deal with mundane issues of personal, family, and business matters and well as issues of state. Wiseman gives impressive evidence to show how the whole structure of Genesis fits so well with the way tablets were written in ancient times, tablets that could well have been handed down through several generations. Moses would have been in an ideal position to edit these.

Evidence he assembles to support the view that Genesis describes six days over which God revealed these truths rather than six days in which he created the universe include, very briefly:

- The ten-fold "God said", analogous to the "Ten Words" God spoke to Moses on Mount Sinai, which he suggests are God's revealing of the *history* of Creation, not the acts of creation itself.
- The Hebrew word for "made" which simply means "did", not "create". What God "did" was to reveal this particular truth on this particular day.
- The writing of each day would be sufficient to write on one tablet. Babylonian accounts of the Creation were written on six tablets.
- Babylonians had a tradition of early man being instructed in the truths of creation over six days.

- The beginning and end of each tablet fits well with what we know of ancient tablets. Genesis 2:1-4 would be the colophon, which came at the end of a series of tablets.
- The giving of names (i.e. “God called”) makes sense if these names were given for *man’s* benefit. The giving of names indicates that God is telling the story.
- The word “rested” in 2:2 would be better translated “ceased”. The early Septuagint (Greek) translation of 2:3 supports the idea that it was not the work of creation, but the *histories* of creation that God ceased. God ceased his revelation on the seventh day in order to enable man to rest, not himself. Jesus said that the Sabbath was made for man, not man for the Sabbath (Mark 2:27). If God instituted the Sabbath at the dawn of history, that would explain why it is mentioned several times before Sinai (e.g. Genesis 7:4; 8:10; 29:27, 28; Exodus 16.).
- The Babylonians and Egyptians had a tradition of the truths of creation being *revealed* to the first man. The Jews had an early tradition of these truths being revealed to both Adam and Enoch.
- The Hebrew words for “evening” and “morning” would be better translated “sundown” and “daybreak” and simply indicate the period of night between each of the six days when man was allowed to rest.

Wiseman points out seven difficulties that are eliminated by the above interpretation:

(1) God giving names—we now see the reason for this. (2) ‘God said’—the whole account was a revelation to man, just as the two final statements of what ‘God said’ are stated to have been. (3) The ‘evenings and the mornings’ are now seen to be, quite naturally, for man’s nightly rest. (4) The seventh day on which God ‘ceased’ was for man’s sake. While (5) all the days, including those in the fourth commandment and the seventh day’s rest, are seen to be natural days, there is no need to give these days exceptional duration, and this (6) disposes of the idea that (a) the day of rest was instituted a few hours after Adam had been created (b) that it was the end of a long geological age, or that the seventh day is one of some thousand years. And (7) it resolves the old conflicting ideas about the ‘light’ of day one being present before the ‘sun and moon’ of day four and all its related problems.

Reasons which Wiseman gives for believing that Genesis 1 is very ancient are:

- The absence of mythical or legendary matter such as occur in all other accounts of Creation.
- All the references in this first chapter are universal in their application and unlimited in their scope. We find no mention of any particular tribe or nation or country, or any merely local ideas or customs. Everything relates to the earth as a whole and to humans without reference to race. Every other account of Creation includes such references.

- There is no mention of any event subsequent to the creation of humans.
- It is uncontaminated by human speculation.
- There is no hint of the worship of sun or moon or the influence of stars, all later developments.
- All the facts in the chapter are things humans could not have found out for themselves at the dawn of history. God did not keep them in the dark till later generations.
- The simplicity of terms used.
- The term “Sabbath” is not used. It is simply “the seventh day”.
- No Israelite of a later generation would have used the plurals “us” and “our” of God in verse 26.
- The Bible speaks of revelation of such things from the beginning (i.e. Isaiah 40 which contains the statement “**Has it not been told you from the beginning?** [literally: “from the first”]. **Have you not understood since the earth was founded?**—v. 21).

Wiseman says:

Genesis 1, disencumbered of its misinterpretations, stands out in its sublime grandeur, its remarkable accuracy, its concise comprehensiveness, quite unique in the creation literature of the world.

Scenario 4—God spoke his words of creation over 6 days

This view suggests that on each of the recorded days God spoke his intention. Thus, on Day One God spoke his intention of creating light, on Day Two of creating the earth’s atmosphere, and so on. After each spoken word a parenthesis is added to show the consequence of that word. This view is based upon two well-established Biblical principles: that when God has foreordained something it is often spoken of as if it had already happened—though the outworking of it may take considerable time, in this case millions of years—and the widespread use of parentheses in Scripture. This interpretation fits in well enough with the rest of the Bible and yet allows unlimited time for the outworking of God’s creative words, with some overlapping of the events recorded.

This way of understanding Genesis 1 was published by F. H. Capron in 1902 tucked away in the middle of a massive book on other matters. It made little impact and lay forgotten until discovered by Dallas Cain who published it in a paper *Creation and Capron’s Explanatory Interpretation* in 1982. It is argued for fairly convincingly by Alan Hayward in *Creation and Evolution*.

Scenario 5—The “days” represent unspecified ages

Some of the arguments to support this view are well spelled out by Dr. Hugh Ross in *Creation and Time*. I summarize them as follows:

- *Yôm*, the Hebrew word for “day”, is “frequently put for time in general, or for a long time, a whole period under consideration...Day is also put for a particular season or time when any extraordinary event happens”

(William Wilson, in his *Old Testament Word Studies*). Some examples would be Genesis 30:14 (*yôm* = wheat harvest time); Joshua 24:7 (*yôm* = a long season); Proverbs 25:13 (*yôm* = harvest time); Isaiah 4:2 (*yôm* = a future era); Zechariah 14:8 (*yôm* = summer + winter); and many references to the day of the Lord where it means “an occasion when God acts”. A particularly significant verse in this regard is Genesis 2:4, **“These are the generations of the heavens and the earth when they were created in the day of their making”** (literal Hebrew translation) where the word is used of the whole creation period. Also, the plural “generations” in this verse implies a lengthy period.

- The Hebrew word *'ereb*, translated “evening”, also means “sunset”, “night”, or “ending of the day”. And the word *boqer*, translated “morning”, also means “sunrise”, “coming of light”, “beginning of day”, “break of day”, or “dawning”, with possible metaphoric usage. In other words, evening and morning refer to the beginning and ending components of “day”, however it is used.
- It doesn't make sense to see the events of Genesis 2 compressed within a 24-hour-day.
- The uniqueness of the seventh day. There is no “evening” or “morning” mentioned for the seventh day. This suggests that this day has not yet ended. This is further implied in Psalm 95:7-11 and Hebrews 4:4-11. Though God is obviously still active in his creation, as Jesus indicated (John 5:16-18), his “creative work” of producing new forms of life has ceased. As biologists Paul and Anne Ehrlich report: “The production of a new animal species has yet to be documented.” One day this period of rest will end when God creates, **“a new heaven and a new earth, the home of righteousness”** (2 Peter 3:13).
- In describing the eternity of God's existence, several Bible writers compare it to the length of the age of the mountains or the “foundations of the earth.” The figures of speech used in passages such as Psalm 90:2-6, Proverbs 8:22-31, Ecclesiastes 1:3-11, and Micah 6:2 depict the immeasurable antiquity of God's presence and plans. The brief span of a few-thousand-year earth history seems an inadequate metaphor for God's eternity.
- The Bible contains explicit statements of the earth's antiquity, such as Habakkuk 3:6 and 2 Peter 3:5.
- The Bible affirms that God reveals his eternal power and divine nature through his creation (Romans 1:20; Psalm 19:1-4). We are therefore meant to observe it and learn from it. In this sense the natural world could be described as the 67th book of the Bible. Would God want to deceive us by revealing truths through nature that were misleading?
- The Sabbath day for man, and Sabbath year for the land, are analogous to God's work week. Exodus 20:10-11 tells us that the seventh day of each week is to be honoured as holy, **“For in six days the Lord made the heavens and the earth...but he rested on the seventh day.”** This passage

is often cited as proof for the 24-hour-day interpretation. Evangelical Hebrew scholar, Gleason Archer, disagrees:

By no means does this demonstrate that 24-hour intervals were involved in the first six 'days,' any more than the eight-day celebration of the Feast of Tabernacles proves that the wilderness wanderings under Moses occupied only eight days. The rest period for land is a full year (Leviticus 25:4).

Since God is not subject to biological cycles, his rest period is completely flexible. The emphasis in Exodus 20 is on the pattern of one out of seven, not the literal duration of the days of creation. Just as the priests served **"at a sanctuary that is a copy and shadow of what is in heaven"** (Hebrews 8:5), the days demarked by the rotation of the earth are copies and shadows of the days distinguished by God in the Genesis creation record.

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The purpose in listing these arguments is not to say that they are necessarily correct, but to show that a good *Biblical* argument can be made for assuming that the days of creation represent long periods of time. Some would say it is a stronger argument than that for 24-hour periods. I have given some space to this as it is a crucial one to the whole debate.

Perhaps also relevant to this scenario is George Knight's statement that, the Authorised Version of the Bible has done us a disservice in its translation of Genesis 1:1: "In the beginning, God created the heavens and the earth..." Grammatically, 'created' is in fact a participle which should read: "In the beginning of God's creating of the heavens and the earth..." or, in better English, "When God began to create..." The legitimacy of this understanding is recognised by OT scholars. Newer Bible translations include as alternative readings:

"When God began to create the heavens and the earth..." RSV, CEV
 "When God began to create the universe..." GNB

If it is correct to regard the days of Genesis 1 as referring to indeterminate lengths of time, then it is important to ask the question: Does the rest of the chapter fit in with the stages of creation revealed to us in the fossil record? If we allow for some overlapping then the picture seems to fit in a remarkable way. If verses 1 and 2 can be regarded as an introductory statement, then Day 1 could refer to the initial creation of light in the big bang, resulting in the contrast of darkness much further down the track. Or maybe it refers to the first rays of light penetrating the earth's atmosphere. The chapter is written from earth's perspective, as this is the focus of God's ultimate purpose.

As the earth cools, then the moisture surrounding it condenses to form a clear division between the oceans and the moisture in the atmosphere. Day 4 does not represent the original creation of the sun, moon and stars, but rather the point at which their light shines on the earth sufficiently to create *seasons*, and therefore to *govern* the day and night. Previous to that, the amount of carbon dioxide that we know existed in the atmosphere, together

with the moisture and other gases thrown up by multiple volcanoes, had prevented this.

This chapter does not align with the fossil record as precisely as some would require. For instance, reptiles are found lower down in the geological column than birds and fruit trees; sea mammals come after land mammals; and insects come before birds and sea mammals. However, this can be explained by a precise analysis of the Hebrew words used for living things in this chapter and also by the brief nature of the account given. The fact that the *general* picture fits is remarkable, particularly when it is compared with the creation stories of other cultures, of which we have many. In other accounts the gods create the universe like mere workmen, from pre-existing raw material—sometimes even from the carcasses of other slain gods. Or from their own energy or qualities, oozing out to make a world. Or again, by some sexual process, with a consort, or even by masturbation as in some myths. For instance, the Babylonian account goes something like this. Marduk, tall, handsome and powerful, with four eyes and four ears, the loftiest of the gods, goes to battle with Tiamat, another of the gods. Having torn her belly, he cuts through her insides, splitting her heart. With his mace he crushes her skull. He splits her into two parts like a shellfish. With half of her he creates the sky and with the other half the earth!

In contrast to this Genesis 1 is simple, sober and restrained. The progression is orderly and complete. (Where will you find another creation account that correctly orders even two of the dozen or so events mentioned here?) The whole universe and each part of it owes its existence to the one God. And the general picture fits what is known today. I find it difficult to see how anyone could imagine that a passage such as this, written around 3,000 years ago, could not have been divinely revealed.

Scenario 6—Prophetic poetry

This view declares that to look for any correlation at all between Genesis 1 and modern science is to miss the whole point of the chapter. Though not strictly poetry, there are certain characteristics which suggest we should regard it more as a “Hymn of Creation” than a factual statement in prose. Some of these characteristics are: a number of alliterations which are lost in translation; the prominent use of repetition; the anthropomorphic treatment of God’s creative acts (he “speaks,” “sees,” “moves,” “breathes”); the use of the numbers three, seven and ten in a very specific and coherent way (groups of 7 are especially significant in the Hebrew arrangement of this chapter); and places in the account where the words rhyme, which is also lost in translation. No scientific literature ever uses these kinds of literary devices. It bears some similarities with more poetic passages on the creation, like Job 38:1, 4-11 and Psalm 104.

Charles Hummel, in *The Galileo Connection*, gives an excellent discussion of this. He shows how the original Hebrew text divides up naturally into a series of eight poems, with repetitive endings and beginnings tying them all together into a pattern. Wiley’s *Christian Theology* also does an excellent job of laying it out in such a way as to clarify its literary character.

Since the time of Herder (c. 1750) students have noted that it naturally falls into two related groups of three, thus:

Day 1	LIGHT appears
Day 2	WATERS are divided
Day 3	LAND appears, with vegetation
Day 4	LIGHTS appear
Day 5	WATERS bring forth living creatures
Day 6	LAND is populated

Poetry was originally intended for saying out loud; what could be more natural than God's six great fiats should be proclaimed in poetic form.

There is much more that could be said about the literary structure of this chapter. However, if it is not intended to be compared to a modern scientific document, then what *is* it intended to convey? The most obvious answer is that it was written to counteract the false mythologies and world-views that existed in those days. This it does admirably.

Conrad Hyer, in *Is God a Creationist? The Religious Case Against Creation-Science*, edited by Roland Mushat Frye (1983), says:

In the light of this historical context it becomes clearer what Genesis 1 is undertaking and accomplishing: a radical and sweeping affirmation of monotheism vis-à-vis polytheism, syncretism and idolatry. Each day of creation takes on two principal categories of divinity in the pantheons of the day, and declares that these are not gods at all, but creatures—creations of the one true God who is the only one, without second or third. Each day dismisses an additional cluster of deities arranged in a cosmological and symmetrical order.

On the first day the gods of light and darkness are dismissed. On the second day, the gods of sky and sea. On the third day, earth gods and gods of vegetation. On the fourth day, sun, moon and star gods. The fifth and sixth days take away any associations with divinity from the animal kingdom. And finally human existence, too, is emptied of any intrinsic divinity—while at the same time all human beings, from the greatest to the least, and not just pharaohs, kings and heroes, are granted a divine likeness and mediation.

It is significant that the words “God”, or “he” referring to God, occur 38 times in this chapter.

11 times God *said*
 7 times God *saw*
 5 times God *created*
 5 times God *called*
 4 times God *made*
 Twice God *blessed*
 Twice God *divided*
 Once God *moved*
 Once God *set*

In other words, *whatever* happened, God was behind it all. In this respect Genesis 1 not only stood against false philosophies of 3,000 years ago, but false philosophies of any age. In its God-centredness it contradicts the materialism, secularism and humanism that is rampant today. In its statement of the goodness of creation it contradicts those philosophies that see this material world as something bad from which we must escape. In the

distinction it makes between the Creator and his creation it contradicts much that is found in New Ageism and some Eastern religions. In its clear statement of the qualities it gives to humans it contradicts those who would blur the distinction between us and the rest of living things.

Although, as suggested under this heading, Genesis 1 has poetic qualities, in contrast to popular poetry its main purpose is to teach rather than entertain; in contrast to allegory, it has a strong historical element; in contrast to human speculation, it is revelation; and in contrast to legend, it is unembellished. It is a great prophetic message, with roots in eternity and its fruit in history.

James Packer, in *God's Words*, has five points which sum up very well this approach to the chapter:

- (i) the narrative is a celebration of the fact of creation and of the Creator's wisdom, power and goodness, rather than an observational monitoring of stages in the creative progress;
- (ii) the story focuses not on the cosmic system as a system, but on the Creator apart from whose will and word it would not at this moment exist;
- (iii) the narrative method is imaginative, pictorial, poetic and doxological [expressing worship] rather than clinically descriptive and coldly prosaic in the deadpan scientific manner;
- (iv) the Earth-centredness of the presentation reflects not scientific naivety about the solar system and outer space, but theological interest in man's uniqueness and responsibility under God on this planet;
- (v) the evident aim of the story is to show its readers their own place and calling in God's world, and the abiding significance of the Sabbath as a memorial to creation, rather than to satisfy curiosity about the details of what happened long ago.

Scenario 7—Symbolic interpretation

This interpretation is not, strictly speaking, relevant to the main issues of this booklet, but I give it here for those who may find it of interest.

Sometimes, particularly in the Old Testament, we find passages that have a primary historical application, but which display a secondary meaning in picture form, illustrating truths that are expressed more clearly in the New Testament. One has to be careful in giving this kind of secondary meaning, as it is possible to be carried away with all kinds of fanciful interpretations. Usually, however, the Bible itself gives some clear guidelines.

Paul, in 2 Corinthians 4:6, gives us the first clue here by illustrating Christian conversion from Genesis 1:1-3, Day 1: **"For God who said, 'Let light shine out of darkness,' made his light shine in our hearts to give us the light of the knowledge of the glory of God in the face of Christ."** The

emptiness and lack of fulfilment experienced in the life without Christ are transformed by the light of his presence.

Following on from this the following have been suggested:

Day 2— Once a person has received Christ into their life they begin to breath a new atmosphere, the atmosphere of heaven itself. Also a clearer division comes between those things which are of God and those which are of earth (1 John 2:15,16).

Day 3— Where the third day is mentioned in the Old Testament there is often a picture of resurrection. Here the land appears above the waters and new life springs forth.

Day 4— Jesus is spoken of as the **“Sun of righteousness”** (Malachi 4:2). John uses the moon as a symbol of the church (Revelation 12:1). It has no light of its own, only that which it reflects (2 Corinthians 3:18). God declares that those who lead many to righteousness will shine **“like the stars for ever and ever”** (Daniel 12:3). Our present responsibility is to be **“blameless and pure, children of God without fault in a crooked and depraved generation, in which you shine like stars in the universe as you hold out the word of life...”** (Philippians 2:15,16).

Day 5— The turmoil and confusion of peoples and nations is sometimes likened to the restless oceans (Isaiah 5:30; 57:20; Revelation 17:1). Christians are supposed to be fishing (Ezekiel 47:10; Matthew 4:19)!

Day 6— The creation of humans prefigures the time when Jesus, the “second man” (1 Corinthians 15:47), will reign over creation restored to its intended glory (Romans 8:21, Revelation 11:15) and the earth will indeed be fruitful (2 Peter 3:13).

Day 7— God’s people enjoy his blessing and all that he has prepared for them in that day which has no evening (Ephesians 2:7).

This way of seeing the completeness of the gospel message anticipated in the Bible’s first chapter may, of course, go along with any of the previous scenarios. It ties in with the divinely revealed character of all the 66 books that make up our Bible.

Sorting it all out

With so many different interpretations, how does one choose? This is up to the individual. I believe Scenario 4 is a good starting point and makes a lot of sense. Scenarios 5 and 6 have a lot to commend them, and, because I believe in the inspired nature of Scripture, I have no trouble adding in Scenario 7. I would have the greatest problem with Scenario 1. My belief in the legitimate place of modern science, my respect for its methods and the integrity of the great majority of scientists, together with the vast amount of evidence accumulated over 200 years from astronomy, physics, geology and paleontology, precludes me from accepting a recent creation scenario. In Romans 1:20, God declares very clearly that we are accountable to him for the truths we learn about him from the created world. Would he hold us thus accountable and then send us distorted messages from this source?

However, having said this, it is necessary to maintain a good deal of humility, both in our efforts to understand the Book of God’s Word and the

Book of Nature. Many, Christians and scientists, have been wrong in the past. They have often repeated Augustine's mistake, putting too much confidence in their own *deductions* from Scripture. The church would like to forget that it ever denied the roundness of the earth, the races of people on the other side of the planet, the moons around Jupiter, the existence of comets, the reality of fossils—all because it claimed to have a revelation that told them otherwise. Whenever Christians have tied the Bible to any particular scientific theory they have been in trouble.

However, Galileo was also wrong when he insisted that the action of the tides was the clinching argument for the movement of the earth—mistaken in his science and premature in his dogmatism. Science has been correcting its views ever since it began. That is what it is all about. Some of the greatest scientists have been the most humble of people. Newton declared when an old man:

I am as a child on the seashore picking up a pebble here and a shell there, but the great ocean of truth still lies before me.

Einstein said shortly before he died:

I feel like a man chained. I get a glimpse of reality and then it flees. If only I could be free from the shackles of my intellectual smallness, then I could understand the universe in which I live.

There is an ancient prayer:

*From cowardice that shrinks from new truth,
From laziness that is content with half-truths,
From the arrogance that thinks it knows all truth—
O God of truth, deliver us!*

The remarkable nature of Genesis 1 is ample testimony to its divine origin. If, when I get to heaven, I discover that my interpretation of it was misled at some points I will not be put out. My faith in Christ as my personal Saviour and Lord is not dependent on my ability to rightly interpret one chapter of the Bible!

The three greatest acts of creation

A significant Hebrew word *bara* is used five times in Genesis 1. In the Old Testament, the form of the word that occurs in this chapter is used only of God's activity, implying in its usage that it refers to acts of creation that are beyond the scope of human ability. Though not necessarily meaning to "create out of nothing", it has the concept of "initiating something new".

This word is used in Genesis, chapter 1, verse 1, of the creation of the physical universe—the creation of matter. It occurs in verse 21 of the creation of living things—the creation of life. And it occurs three times in verse 27—the creation of human beings, the most important of his creations. Here we have God's three greatest acts of creation.

The creation of matter

Over the last few decades scientists have probed some of the amazing properties of the atom. We are told that this fantastic thing, of which all matter is composed, is made up of a central nucleus with electrons whizzing

around it. If it could be blown up to the size of a football field, its nucleus would be about the size of a fly in the centre. Where did the power come from that holds it together? Nobel prize winner, Arthur H. Compton, declared that actino-uranium is theoretically capable of yielding 235 billion volts per atom. It is significant that the Bible states of Jesus, **“all things were created by him and for him...and in him all things hold together”** (Colossians 1:16,17).

We are told that the atom contains wonderful things such as leptons, muons, bosons, neutrinos, photons, gravitons, psions, neutrons and goodness knows what else. Maybe reality is somewhat like the jingle, “Big fleas have little fleas upon their backs bite ‘em. Little fleas have smaller fleas and so ad infinitum!” However, scientists now tell us they think they have got down to the smallest particle from which protons and neutrons are made—the quark. There are 6 types of quark; up and down, charm and strange, bottom and top—with their anti-quarks. These are stuck together with gluons! The last of these, the top quark, was discovered in 1995.

My question is: “Did the atom, with its amazing design, consistent throughout the universe, evolve?” The story is told of a Hyde Park orator who was attacking belief in God. He argued that the world just happened. As he spoke he was hit by a soft tomato. “Who threw that?” he demanded. A Cockney voice replied, “No one threw it—it threw itself.” As G. K. Chesterton has put it:

It is absurd for the evolutionist to complain that it is unthinkable for God to make everything out of nothing, and then pretend that it is not more unthinkable that nothing should turn itself into everything.

The creation of life

The simplest form of independent life is the single-cell bacterium. Bacteria have been around for several billion years and though possessing an amazing adaptability, unknown in larger creatures, have shown no sign of evolution into another species. Bacteria are amazingly complex organisms and are of the same design as all other living cells of which higher life forms are made. A single cell is a wonderfully complex thing.

Dr. Michael Denton, a medical doctor and molecular biologist, in seeking to convey the complexity of a single living cell, uses the following illustration in his book *Evolution, A Theory in Crisis*:

“...to grasp the reality as it has been revealed by molecular biology, we must magnify a cell a thousand million times until it is twenty kilometres in diameter and resembles a giant airship large enough to cover a great city like London or New York. What we would then see would be an object of unparalleled complexity and adaptive design. On the surface of the cell we would see millions of openings, like the port holes of a vast space ship, opening and closing to allow a continual stream of materials to flow in and out. If we were to enter one of these openings we would find ourselves in a world of supreme technology and bewildering complexity...”

Paul Hawken, in *Blessed Unrest*, describes the complexity of the simplest of cells as follows:

A single bacterium cell, Escherichia coli, contains 2.4 million protein molecules of nearly 4,000 different types, 280 million small metabolite and ion molecules, 22 million lipids, a genome consisting of 4.6 million base pairs of nucleotides, and 40 billion water molecules, all packed into a cell whose diameter is one-hundredth the width of a strand of hair. Those first cells, in Robinson Jeffers's words, "had echoes of the future" in them (De Rerum Virtute," Selected Poems) and essentially took over the planet. They are in every ditch, on every leaf, in the sky, at the South Pole, on our tongues, three miles deep in the ocean, and throughout the deserts of the world. They created photosynthesis, respiration, and fermentation, and eventually mitochondria and chloroplasts, the organelles that digest, breathe, and circulate nutrients in our cells. Although we have identified the molecules in a single E. coli cell, we do not understand how they work together to create shape, reproduction, mentation, and purposeful behaviour. When we take apart a cell, life disappears, because molecules are all we find.

According to Princeton biologist, J. T. Bonner, an average-sized cell contains about 200,000 billion molecules. In *The Ideas of Biology* he says:

...it seems easier to imagine a single cell evolving into complex animals and plants than it does to imagine a group of chemical substances evolving into a cell.

If we want to consider the possibility of this happening, some of the factors we would have to consider are:

- The importance of proteins in the structure of the cell. These are among the most complex molecules known, with very precise molecular structure, and with molecular weights up to 50,000. Proteins may contain 200 - 300 amino acids, which must be exactly the right sort in exactly the right order. Amino acids come in approximately 20 different types with either left-handed or right-handed shape.
- The complexity of the DNA molecule which every cell possesses. The 'simple' *Escherichia coli* bacterium (living in our gut) is a 'prokaryotic' single cell (with no nucleus), but has a wound-up DNA strand which is 1,000 times its own length and has 3,000 genes made of some 4 million base pairs. RNA is a shorter, usually single-stranded molecule, but still with large numbers of nucleotide bases.
- Proteins and enzymes do not reproduce without the corresponding genetic materials, the nucleic acids DNA and RNA, yet the latter cannot function without the former. Which came first? The old chicken and egg problem!
- Without the protective membrane surrounding the cell, which is a very complex structure in itself, it could not survive.
- All life must have food of some sort. The first life form would have needed the capacity of either photo-synthesis or chemo-synthesis to create food from chemicals, or else have had access to organic food from some source. Otherwise it would perish on the spot.

Many have sought to show the impossibility of all this happening by chance. In 1981, Sir Fred Hoyle, mathematician, astronomer, and a long time anti-theist and evolutionist, together with Chandra Wickramasinghe, head of the Department of Applied Mathematics and Astronomy at University College, Cardiff, and a lifelong Buddhist-atheist—brainwashed, he reported, into believing that any concept of God must be excluded from science—calculated it to be one chance out of $10^{40,000}$! (That is one chance out of 1 followed by 40,000 zeros). However, statistics tend to become rather meaningless at this level. Hoyle has declared that the probability of an evolutionary origin of life is equal to the probability that a tornado, sweeping through a junkyard, would assemble a Boeing 747. He says:

A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature.

.....

However, having said all this, it is important to point out that if one day science *did* determine how matter originated from nothing, or how living cells developed from a chemical soup, it would not disprove that God was behind it all. Our faith must be based on a surer foundation than that! More of that later.

The creation of humans

The third use of the Hebrew *bara* in Genesis 1 concerns the creation of humans. As regards the process by which humans were created, and the time scale involved, I believe it is a wise person who keeps an open mind. There are still too many unknown factors. Some believe the Adam and Eve of Genesis 1 were the first humans, as seemingly indicated by Romans 5:15-21 and 1 Corinthians 15:45-49. Others believe they are representative of humans living at that time.

It does seem clear that they, or at least their children, grew crops and kept domestic animals. Our present information suggests that people first developed these skills in the Middle East around 10,000 years ago. The earliest known localised settlements are Jericho in the Jordan valley and Catal Huyuk in modern Turkey. What about the hunter-gatherers who appear to have existed well before this time? Were they truly human?

In seeking to resolve this question it is important to note what the Bible does say and what it doesn't say. One thing it is very clear about is the spiritual side of human nature. The New Testament, particularly, often refers to our "body", our "soul" and our "spirit". Paul can write, "**May your whole spirit, soul and body be kept blameless at the coming of our Lord Jesus Christ**" (I Thessalonians 5:23). Both the Hebrew and Greek words for "soul" are used of animals in the Bible (e.g. Hebrew: Genesis 1:20—the same word as is used of Adam in Genesis 2:7—and Greek: Revelation 16:3). The Hebrew idea of "soul" is somewhat similar to our word "personality." It is that part of me that thinks (intelligence), feels (emotions) and makes decisions (will). Animals possess these qualities, though not so highly developed as humans. Animals, however, are never spoken of as having "spirit".

The emphasis in Genesis is not on *how* humans were created, but on what they *are* and *why* they were created. We were created with God-like qualities, able to enjoy a vital relationship with the living God, who is spirit (John 4:24), and created with clear responsibilities over the rest of creation. God is the one, **“who lays the foundation of the earth, and who forms the spirit of man within him”** (Zechariah 12:1). It has never seemed important to me whether one believes that God created a human-like being over millions of years, and then at a certain point, planted the “spirit” within him, or whether he started from scratch and did the whole job in a brief moment of time. Either way, God was creating something entirely new. I believe Genesis 2:7 can be taken either way as no time scale is given. If you believe the former, it explains why, for instance, our skeletal structure is so similar to other mammals, or why our DNA is so similar to that of a chimpanzee. Concerning the problem of the early hunter-gatherers, you can’t find out whether a creature had a spirit or not by looking at its bones!

The place of humans in the universe

What has become increasingly clear over recent decades, particularly in studies on the creation of the universe in the big bang and the formation of galaxies, is that a number of amazing “coincidences” seem to have happened, without which no life could ever have developed. To give a few examples:

- Physicist Stephen Hawking makes the point in his book *Black Holes and Baby Universes and Other Essays*:

If the density of the universe one second after the Big Bang had been greater by one part in a thousand billion, the universe would have recollapsed after ten years. On the other hand, if the density of the universe at that time had been less by the same amount, the universe would have been essentially empty when it was about ten years old.

- Physicist John Polkinghorne in *One World* points out that the expansive force (driving things apart) and the force of gravity (pulling things together), in the early part of the Big Bang, had to differ from equality by not more than 1 in 10^{60} (10 followed by 60 zeros).
- Very precise factors were required in the first three minutes of the big bang to allow the right ratios of helium and hydrogen to develop.
- The mass of the neutron outweighs that of the proton by a fraction of a percent. If this were not so stars would not be able to shine for more than just a few hundred years.
- The charge on the electron and proton are exactly equal and opposite, otherwise stable bodies like ours could not exist.
- If one of the four fundamental forces in nature (weak interaction) had been very, very, slightly different, then stellar production and distribution of essential heavier elements could not have taken place.
- Very, very precise energy levels in helium-4, beryllium-8, carbon-12, and oxygen-16 are needed for carbon to form in stars without it all turning

into oxygen. Cambridge Professor of Astronomy, Martin Rees, and popular science writer John Gribbin, in *Cosmic Coincidences*, state:

This combination of coincidences, just right for resonance in carbon-12, just wrong in oxygen-16, is indeed remarkable.

- Quoting astrophysicist Brandon Carter in his book *Superforce*, Paul Davies sees

an almost unbelievable delicacy in the balance between gravity and electromagnetism within a star. Calculations show that changes in the strength of either force by only one part in 10 to the power of 40 would spell catastrophe for stars like the sun.

• To all this we could add the seeming “coincidences” that occur on our particular planet that make life possible: the amazing properties of water and carbon; the precise distances from, and the mass of, the sun and moon; the exact strength of the strong force that holds the nucleus together that enables the maintenance of nuclear reactions that power the shining of the sun; the ratio of ocean to land mass; the ratio of gasses in the atmosphere; the rate of earth’s revolution and its density; the thickness of the earth’s crust, etc.

Dr. Hugh Ross, in *Creation and Time*, states:

As of October 1993, twenty-five different characteristics of the universe were recognised as precisely fixed. If they were different by only slight amounts, the differences would spell the end of the existence of any conceivable life. To this list of twenty-five can be added thirty-eight characteristics of our galaxy and solar system that likewise must fall within narrowly defined ranges for life of any kind to exist.

It is worth noting the very significant book by astronomers Guillermo Gonzalez and Jay W. Richards *The Privileged Planet* (Regnery Publishing, One Massachusetts Avenue, NW, Washington, DC 2001). Though there are something like two hundred factors about our universe and planet that are now recognised as necessary for life to be able to exist, many of these are inter-related. Gonzalez and Richards have isolated about 20 such factors that are independent of one another. They sum up as follows:

With respect to habitability, our existence depends on such local variables as a large stabilising moon, plate tectonics, intricate biological and nonbiological feedback, greenhouse effects, a carefully placed circular orbit around the right kind of star, early volatile elements – providing asteroids and comets, and outlying giant planets to protect us from frequent ongoing bombardment by comets. It depends on a Solar system placed carefully in the Galactic Habitable Zone in a large spiral galaxy formed at the right time. It presupposes the earlier explosions of supernovae to provide the iron that courses through our veins and the carbon that is the foundation of life. It also depends on a present rarity of such supernovae. Finally, it depends on an exquisitely fine-tuned set of physical laws, parameters, and initial conditions.

They also show that we are superbly placed in the right sort of solar system, in the right place, in the right sort of galaxy, at the right time to be able to study the rest of the universe.

What are we to make of all this? British physicist, Paul Davies, who in the past has denied the possibility of God as Creator, in his book *Superforce*, stated:

[I see] powerful evidence that there is something going on behind it all. The impression of design is overwhelming.

However, the moment you suggest that there may be some purpose behind it all you have a problem. G. K. Chesterton put it like this:

It is typical of sceptics and pessimists that they will sometimes rather timidly use the word Purpose; but blush at the very mention of the word Person...We do not need anything but our own common sense to tell us that if there has been anything from the beginning that can possibly be called Purpose it must reside in something that has the essential elements of a Person. There cannot be an intention hovering in the air all by itself any more than a memory that nobody remembers or a joke that nobody has made.

In a more recent book, *God and the New Physics* (1992) Paul Davies even goes as far as to say:

It may seem bizarre, but in my opinion science offers a surer path to God than religion.

Of course, one way around the problem is to suggest that there may be an infinite number of universes, and we were the lucky ones who happened to be in the one that had everything right to support life. Paul Davies estimated that for every time a big bang produced a universe in which life could exist, there would be one followed by at least a thousand billion billion billion zeros of universes where life was impossible! However, this is guesswork for which there is no evidence—and that is not science!

One thing is clear. All the evidence *seems* to point to the fact that this universe was created to support life—and ultimately human life. An interesting question is: Would there be any point in having a universe *if humans were not here to observe it?* When Harry Elmer Barnes asserted that “Astronomically speaking, man is insignificant,” George Coe replied, “Astronomically speaking, man is the astronomer.” The very fact that humans *can* observe it, and can also worship the One who planned it all, maybe gives a clue as to the purpose of it all.

Over the last generation scientists have talked about what they call the “anthropic principle” (from Greek “anthropos”, meaning “man”). It is one way of bringing the seeming importance of humans in creation into the discussion, without necessarily talking about God or purpose. The hypothesis takes a number of forms but basically it recognises that the physical features of the universe are conditioned by the requirement that it must be capable of supporting life. *Why* this is so, it is not necessary to state. The empirical evidence, however, all points to the fact that that’s the way it *is*. It is at this point that some scientists and some theologians are co-operating to provide interesting debate. Scientist Gordon Rodley, in a series of lectures given in Christchurch, New Zealand, stated:

Was our universe created in a very special state, carefully fashioned so that, in the fullness of time, life and eventually mind, would blossom forth to marvel at it? Or do we live amid a monstrous and meaningless accident, a cosmic eruption from nothing, that has occurred purely at random? Surely there can be no more pressing task for today's cosmologist than to tackle that central question of existence.

This question leads on to our next subject, the need of science and Christianity for each other.

The need of science and Christianity for each other

It will be helpful to look at this aspect of the subject under a number of headings.

Science is unable to meet basic human needs

In 1928, in an article on the notorious Scopes trial of 1925, *The Nation* stated:

A sentence which begins "Science says" will generally be found to settle any argument in a social gathering, or sell any article from toothpaste to a refrigerator.

However, today the climate has changed somewhat. In fact, there has been a growing "anti-science" movement over recent years. Many books have been written, particularly by ecologically-minded folk of a New Age bent, blaming science for many of our problems. As it was Christianity that spawned science, it often gets blamed in the process!

Much has been written over recent decades about what science can and cannot do. This has been a healthy corrective to much of the thinking of what is called "The Enlightenment" of seventeenth and eighteenth century Europe. Central to Enlightenment thought was the celebration of the power of reason—the power by which we understand the universe and improve our condition. This brought enormous progress in science, technology and medicine, but inasmuch as it overemphasized the power of reason and ignored divine revelation, it carried the seeds of its own destruction. The Bible keeps a balance between the power of our own minds, and hence the capabilities of science, and the need to humbly submit those minds to truths that God has revealed about himself and our human condition.

•Firstly, science cannot meet the deepest needs of the human heart. The Chief Rabbi in Britain, Sir Immanuel Jakobovits, in a letter to the *Daily Telegraph*, said:

Human life, generated from test tubes and petri dishes, sustained by artificial foods and drugs and terminated by unplugging some life-support machine, may be reduced to a form of mechanisation in which the incomparable grandeur of the human spirit, the genius of the human mind and the noblest virtues of the human heart are asphyxiated in the exhaust fumes of our technological wonders.

Science cannot speak to our deepest needs as beings created in the image of God.

If you leave God out of the picture, as did Jacques Monod who won the Nobel Prize for his work on genetic mechanisms, then, as he put it, we are left “alone in the unfeeling immensity of the universe”, however wonderful that universe might be. We live in “an alien world; a world that is deaf to [our] music, and as indifferent to [our] hopes as to [our] crimes”.

Gamaliel Bradford, the famous biographer, a brilliant scholar who read staggering amounts daily in 7 languages, exclaimed towards the end of his life, “Who will tell me something of God. I know nothing about him whatever. It is a mere name, a mere word to me, and yet it clings. Why?” Why indeed? Science cannot answer that question.

• Secondly, science cannot deal with the question of purpose. It cannot answer such questions as: Why is the universe here? Is there any great destiny for human beings? Stephen Hawking, one of today’s most brilliant physicists, stated in *Black Holes and Baby Universes*:

...science may solve the problem of how the universe began, but it cannot answer the question: why does the universe bother to exist?

Albert Einstein, perhaps the most revered scientist of the twentieth century, wrote in *Ideas and Opinions*:

The scientific method can teach us nothing beyond how facts are related to and conditioned by each other...knowledge of what is does not open the door directly to what should be. One can have the clearest and most complete knowledge of what is, and yet not be able to deduce from that what should be the goal of our human aspirations.

As Dr. Bernard Lown in Norman Cousins’s *The Healing Heart* put it:

While science may help explain how a virus multiplies, it leaves unanswered why a tear is shed.

Richard Dawkins, in his popular science book, *The Selfish Gene*, written from the perspective of scientific materialism, can attempt to come up with a scientific explanation of such things as a mother’s love. However, such answers don’t satisfy our basic instincts, least of all those of the mother!

As Stephen Toulmin showed clearly in his standard work *The Philosophy of Science*, the major scientists today do not expect to produce final or invariable knowledge of the world. The physical and chemical properties they develop are simply practical aids to understanding, useful vehicles for getting about in reality. One cannot, by analogy, deduce from them anything about the ultimate nature of the universe, as so many people in the nineteenth century tried to do.

Mary Hesse, in her *Criteria of Truth in Science and Theology*, and Jurgen Habermas, in his *Knowledge and Human Interests*, also warn of this. Commenting on the role of science and the restrictions it must observe, Hesse reminds us that knowledge of science...

...does not yield truth about the essential nature of things, the significance of its own place in the universe, or how it should conduct its life.

Some would say that the views of Hesse are too extreme. Science *does* tell us things that bear a *real* relationship to what is *really* there, even though it

may be a varied mixture of fact and opinion. However, these are warnings against too much presumption, particularly in the area of answering all the “whys”.

•Thirdly, science cannot solve our problems in the moral sphere. Our most pressing problems in the world today are moral problems. Science itself is morally neutral. Dr. George Lundberg, professor of sociology at the University of Washington, in *Can Science Save Us?* says:

Science only provides a car and chauffeur for us. It does not tell us where to drive. The car and the chauffeur will take us into the highlands or into the ditch with equal efficiency.

It is *people* who use science and they can use it for good or evil. Charles Lindberg, the first person to fly solo across the Atlantic, went to Germany after the war to see what allied bombing had done to the Germans, who had been leaders in science. He said:

In Germany, I learnt that if his civilisation is to continue, modern man must direct the material power of his science by the spiritual truths of his God.

General Omar Bradley, in a 1948 Armistice Day address, put it bluntly:

We have too many men of science, too few men of God. We have grasped the mystery of the atom and rejected the Sermon on the Mount...Ours is a world of nuclear giants and ethical infants. We know more about war than we know about peace, more about killing than we know about living.

We can perform thousands of calculations in one second on a computer, but we have no formula that will increase people’s compassion or take away racial prejudice from their hearts.

These are all areas where Christianity and science must work together, as some of today’s thinkers are learning to do. We owe a great debt to people of science for much good that has been achieved by their discoveries, but without a Christian base, where it largely began, our problems will be multiplied.

Christianity needs science

Bruce Bradshaw, in his introduction to *Bridging the Gap: Evangelism, Development and Shalom*, says:

Nothing has hindered the modern mission movement more than modern dualism that separates body from spirit, science from religion, and natural from supernatural.

Einstein observed, “Science without religion is lame, religion without science is blind.” He also declared that anyone who is not in awe at the mind behind the universe is as good as a burnt-out candle. The discoveries of modern science can greatly enhance our wonder and awe at the amazing complexity and size of the universe and the manner in which it sustains our life on this planet, and hence the amazing greatness of the God behind it all. C. S. Lewis used to say that the Christian does not go to nature to learn theology—the message is too garbled—but rather to fill theological words with meaning.

Nature never taught me that there exists a God of glory and of infinite majesty. I had to learn that in other ways. But nature gave the word glory a meaning for me. I still do not know where else I could have found one.

Inasmuch as we long for the good and well-being of our fellow humans, science can enable us to multiply that good. Francis Bacon wrote over three hundred years ago in *Novum Organum Scientiarum*:

Man by the Fall, fell at the same time from his state of Innocence and from his dominion over nature. Both of these losses, however, can, even in this life, be in some part repaired; the former by religion and faith, the latter by the arts and sciences.

In this sense science becomes an imperative religious duty, part of our mandate to care intelligently for God's world and for other people in it, for whom we have a collective responsibility. Bacon also declared that natural philosophy (science) is "after the word of God, the surest remedy against superstition, and the most approved support of faith."

Handling conflict

If science and Christianity need each other, then how should we handle conflict? It will obviously help a lot if we recognise the truth of physicist Sir William Bragg's famous saying:

Religion and science are opposed...but only in the same sense as that in which my thumb and forefinger are opposed—and between the two, one can grasp anything.

Both Christianity and science are seeking to understand the truth—*what is really there*. Truth does not conflict with itself. It is only our *perceptions* of what is really there that differ—and that is because none of us has the whole truth.

Harvard scientist J. H. Van Vleck, summarising the profound philosophical significance of Werner Heisenberg's "uncertainty principle", stated:

The least arguable conclusion is that man should remain humble in the face of nature, since there are inherent limitations to the precision with which he can observe.

We all need a good dose of humility, not least in our understanding of the Bible in those areas where Biblical scholars disagree. The philosopher Whitehead said, "A clash of doctrines is not a disaster—it is an opportunity." He continued: "A mere logical contradiction cannot in itself point to more than the necessity of some readjustment, possibly of a very minor character on both sides." And we need to respect the right of others to hold their opinions in those areas where we do disagree.

Summary

I will close this section with three quotes which aptly summarise the need of science and Christianity for each other. The first is by John Polkinghorne in an article in the Daily Telegraph. Polkinghorne is a theoretical physicist and a member of the Royal Society. He was a professor of mathematical physics before his ordination to the Anglican ministry in 1983. Today he is president of Queens' College Cambridge and has been one

of the leaders in what seems to be a growing contingent of British physicists who are engaging in meaningful theological discussion. He says:

Men of religion can learn from science what the physical world is really like in its structure and long-evolving history. This constrains what religion can say where it speaks of that world as God's creation. He is clearly a patient God who works through process and not by magic. Men of science can receive from religion a deeper understanding than could be obtained from science alone. The physical world's deep mathematical intelligibility (signs of the Mind behind it) and finely tuned fruitfulness (expressive of divine purpose) are reflections of the fact that it is a creation.

The second quote is from the eminent philosopher Alfred North Whitehead. He observed:

When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them.

The third quote, which I like most of all, comes from Gordon Cooper, American Astronaut, who named his spacecraft "Faith 7". He said:

At an altitude of more than 150 miles over the Indian Ocean, I had faith and thanked God for the privilege of being on the space flight. Our launch team had faith in God, in the hardware we had developed and in each other. As we learn more about the universe we gain greater faith in the work of the Supreme Architect. Upon contemplating the complex workings of millions of planetary bodies — and the unknown immensity of the universe — we realise what a fantastic miracle it all is, including our little earth.

The nature of God's creative activity

There is one other area of misunderstanding that needs to be dealt with. It concerns the nature of God's creative activity. Among some who accept the reality of God as the creator of the universe, there has often been the tendency to regard his activity as being rather like a watchmaker. He created it all, including the natural laws by which it would be governed, and then wound it up and left it to run very much under its own steam. From time to time, as he sees necessary, he tinkers with the mechanism, and that is what we call a "miracle". The problem with this view is that anything which we can explain, or translate into a mathematical formula, is regarded as due to *natural* causes, whereas anything we can't explain is due to *supernatural* causes, or God's direct activity. In this sense God then becomes what has been termed the "God of the gaps".

A classic example of this is found in a letter which Isaac Newton wrote to the Master of his College at Cambridge: "the diurnal rotations of the planets could not be derived from gravity, but required a divine arm to impress it on them." In other words, "natural law" (in this case gravity) is responsible for the orbiting of the earth round the sun, but "God" is responsible for its rotation on its own axis (because Newton didn't have any other explanation for it). The obvious problem with this view is that, as we discover more about the natural laws that govern nature, God is gradually edged out of his own universe. This misunderstanding led to much of the conflict between

some scientists and some Christians in the last century, and deserved Julian Huxley's stinging scorn in *Religion and Revelation* that "Operationally, God is beginning to resemble not a ruler but the last fading smile of a cosmic Cheshire Cat."

Professor Donald MacKay, in *Science and the Christian Faith Today*, says that this "dispute deserved to die, because it was not really between science and Christianity at all, but between mistaken views of each." Unfortunately, it is a view that still keeps cropping up.

The picture of God in relation to his creation given to us in the Bible is very different. He is certainly distinct *from* his creation and not to be confused *with* it, as some would believe. However, he is very much involved *in* it, sustaining it and achieving his purposes *through* it. God is not in the gaps, but in every place, whether it appears to us full or empty. "**Do not I fill heaven and earth? declares the Lord**" (Jeremiah 23:24). God is said through Christ to be "**sustaining all things by his powerful word**" so that "**in him all things hold together**" (Hebrews 1:3; Colossians 1:17).

The processes of nature are portrayed, not as automatic mechanisms, but as due to his personal activity. This comes out clearly in passages such as Psalm 104 and Job 37. The so-called consistent "laws" of nature are merely expressions of God's faithfulness and his own consistency. Donald Mackay said that "the laws of nature we discover are not *alternatives* to divine activity but only our *codification* of that activity in its normal manifestations." This does not mean that he may not give a certain freedom to nature, within boundaries, to develop in its own way, similar to the way he allows humans freedom. Neither does it mean that he cannot act in ways that seem to us contrary to those laws when he chooses to do so. He is not a prisoner within his creation.

J. Stafford Wright, in *God's Answer*, expresses this relationship between God and his creation well when he says:

God the Creator is different from a human creator. If I make a piece of furniture, its continued existence does not depend upon my own existence. When I die the piece of furniture will still be here: my life is not in it. But if the Bible is correct, the relation of God to the Universe has in it something more. God himself sustains the Universe in existence so that if it were possible for God to die, at that moment the Universe would fall into nothingness...The Universe is not in any sense necessary for the existence of God, but God is necessary for the continued existence of the Universe.

The logical consequence of this is that, if it were possible for science to work out exactly *how* the universe developed, according to certain defined laws, from the first millisecond of the big bang until the present, this, in itself, would say nothing at all about whether God was present in the process or not. It certainly does not rule him out. The Bible declares that he is present in the total process. If, however, we want to look at the likelihood of it happening without God, then those who would argue for that appear to have massive evidence stacked against them.

A word to those still searching for God

For folk who may still be trying to sort out their views on God, I would make some suggestions.

- Firstly, keep a proper perspective on the importance of respective issues. The Bible contains around 1300 chapters. It would be silly to reject the central theme of it because you disagreed with the way *some* Christians interpret one of those chapters!

- Secondly, focus on Jesus. The central theme of the Bible, and hence Christianity, is that God has made himself known to us supremely by entering human history in the person of Jesus and taking upon himself our human nature. The Bible declares that he lived a perfect human life, that he died on the cross for our sins to reconcile us to God, that he rose from the dead, that he now reigns as Lord, and that he will one day return to judge the world.

This is not the only way he has revealed truths about himself. The Bible states very clearly that God speaks through nature. **“The heavens declare the glory of God; the skies proclaim the work of his hands”** (Psalm 19:1). **“God’s eternal power and character cannot be seen. But from the beginning of creation, God has shown what these are like by all he has made. That’s why those people don’t have any excuse. They know about God, but they don’t honour him or even thank him”** (Romans 1:20,21).

However, God’s revelation of himself through nature does not tell us *all* we need to know about him. It speaks of his power, but not of his love. It does not tell us whether he is personally interested in us, or how we can have an intimate relationship with him. But if Jesus is all that the Bible declares him to be, then God has revealed himself to us in a manner that *does* tell us all we need to know.

- Thirdly, don’t allow prejudices about Christianity, whatever their source, to prevent you from looking at evidence. Dr. Paley said:

There is a principle which is a bar against all information, which is proof against all argument, and which cannot fail to keep a man in everlasting ignorance. The principle is contempt prior to examination.

A good scientist, if he is to arrive at truth, must examine evidence. The history of science is littered with examples of how the discovery of truth has been delayed because scientists, for one reason or another, refused to consider evidence. Jesus is a historical figure. We have very good evidence for trusting the accuracy of the records we have about him. If he was not the divine Son of God he claimed to be, he must be the most remarkable con-man in history. If you are interested in exploring the evidence for these things further, you may like to read some of the other booklets listed at the end of this one.

- Fourthly, be prepared to experiment. If a scientist develops a theory he must be prepared to put it to the test. This may involve a step of faith. In Christianity, as in science, faith comes before certainty. We have enough evidence to point us in a certain direction. As we put it to the test, the evidence increases (or otherwise). Faith is not contrary to evidence, but is

prepared to trust beyond where the evidence can go. In fact, faith sometimes comes before any evidence at all. A good example from science is Enrico Fermi's postulation of the existence of what he called a "neutrino", a quantity of energy that had neither positive or negative charge and no mass. This caused a considerable scandal in the field of science because no one could capture it. Some considered the whole idea a fraud and thought it might even be intellectually dishonest to continue to discuss its role in atomic physics. However, though there was no experimental evidence for its existence, some scientists persisted "in faith", and eventually evidence was forthcoming.

"Proof" is something that comes later and it is interesting that "proof" is a concept that scientists are much less likely to use today. Christian apologist Ravi Zacharias, in *A Shattered Visage: The Real Face of Atheism*, says:

God has put enough into the world to make faith in Him a most reasonable thing, and He has left enough out to make it impossible to live by sheer reason or observation alone.

A useful experiment could be something like this. Read through one of the gospel stories in a modern translation of the New Testament. As you do, tell God that whatever doubts you may have, you are open to any truth he may teach you and that you will follow wherever that truth leads. Ask yourself such questions as: Does this have the ring of truth about it? Could Jesus really have been invented by a group of enthusiasts? Was he really God? If not, who was he? What right did he have to make the personal claims on our lives that he obviously did? Is he worthy of my trust?

If you wish to take the experiment further with a step of real commitment, then you may wish to pray a prayer something like this:

God, whatever my doubts I am willing to trust you.

If Jesus really came into this world to die for my sins, then I accept his forgiveness.

I submit to him as the Lord of my life.

I invite you to come into my life and to give me the assurance of your love.

I ask you to mould me into what you want me to be and to fulfil whatever purpose you may have for me.

Help me to grow in my understanding of your truth and to live worthy of your love.

Should you take this step of faith, then continue reading through the New Testament, asking God to reveal himself to you as you do. My expectation is that you will find that the *experience* of the Holy Spirit in your heart will join with the growing *understanding* of God in your head, to give you the *certainty* that you are on the right path. Dr. Nelles Silverthorne, a Canadian paediatrician who committed his life to Jesus Christ at a Billy Graham Crusade, said:

To a man of science, it [conversion] is the most convincing experiment I've ever done.

Professor Simpson, who in 1891 was elected President of the Royal College of Physicians, said in his farewell address on July 28, 1905:

I do not know in what mood of pessimism I might have stood before you today had it not been that ere the dew of youth had dried from off me I made friends with the Sinless Son of Man, Who is the well-head of the stream that vitalises all advancing civilisation, and Who claims to be the First and the Last and the Living One: Who was dead and is alive evermore, and has the keys of Death and the Unseen. My experience compels me to own that claim.

He was, of course, speaking of his experience of Jesus, of whom such phrases are used in the New Testament. Having thus experienced the reality of this living God, you may well begin to view this wonderful universe that he has created in a new light. Astronomer Hugh Ross, in an article in *Christianity Today*, put it like this:

How awesome to consider that God caused the big bang and all its components, including exotic matter and over 10 billion trillion stars, for the sake of knowing and being known by us in an eternal love relationship. The thought both reduces me to a speck of dust and lifts me up to the heavens.

•Finally, if you do reject the fact that God exists, and that he is personally interested in you and wants to enter into a personal relationship with you, check on your motives for such an opinion. Often the reason we reject something that may be true has more to do with matters of the heart than of the mind. The agnostic, Aldous Huxley, once wrote with considerable honesty:

I had motives for not wanting the world to have a meaning: consequently assumed it had none; and was able without any difficulties to find gratifying reasons for this assumption. Those who detect no meaning in the world generally do so because, for one reason or another, it suits their books that the world should be meaningless. We objected to the morality because it interfered with our sexual freedom.

Conclusion

I remember well as a student, over forty years ago, meeting with an elderly Anglican clergyman in Dublin, Ireland. During our conversation, I asked him how he had found a personal faith in Christ. He explained that as a young man he had been sceptical about Christianity, claiming to believe that there was no God. One evening he got into discussion with a Christian who pointed him to Psalm 14, which begins, "**The fool says in his heart, 'There is no God'.**" Having read it, he went outside and looked up at the stars in the heavens. At that point it dawned on him that he had indeed been a fool! His conversion to Christ followed as a matter of course.

Lord Kelvin, one of the most prominent scientists of the latter half of the nineteenth century, declared, "If you think strongly enough you will be forced by science to the belief in God." The insights science has given us over this last generation, as to the amazing structure and development of the universe, provide even greater reasons for faith.

Bestselling novelist, Susan Howatch, had houses in several countries and drove a Porsche and a Mercedes. She said that after the break-up of her marriage, “God seized me by the scruff of the neck” and she became a Christian. Recently she gave £1 million to Cambridge University to finance a lectureship in theology and natural science, having come to the conclusion that science and theology were “two aspects of the truth”.

We need science. Above all we need Jesus Christ. The two happen to be on the same side.

The material I have used for writing this book comes from quotes I have gathered over 40 years. However, there are three recent books which I have found particularly helpful in putting it all together. Each author has a background in science. A more detailed recording of the sources of some of the quotes I have used can be found in these books. They are:

Creation and Time: A Biblical and Scientific Perspective on the Creation-Date Controversy by Dr. Hugh Ross

(NavPress, P.O.Box 35001, Colorado Springs, Colorado 80935)

Creation and Evolution: Rethinking the Evidence from Science and the Bible by Alan Hayward

(Bethany House Publishers, Minneapolis, Minnesota 55438)

Worlds Apart: The Unholy War Between Religion and Science by Karl Giberson

(Beacon Hill Press, Kansas City, Missouri)