Science and Technology

L. T. Jeyachandran

I remember speaking some years ago to a class of post-graduate science students in a well-known university in southern India. The audience comprised mainly Hindu students but the meeting was arranged by a few of their Christian friends to draw them into a discussion into the philosophy that underlay science. I projected the following five statements in everyday language onto the screen:

1. The external universe we observe is real and not illusory;
2. This universe works according to certain rational laws;
3. Human rationality corresponds to that of the universe;
4. Every event in this finite universe has an underlying cause;
5. In this universe, the same cause produces the same effect under the same conditions.

Pointing to the above, I asked them whether these were scientific assumptions or philosophical assumptions without which science would lack a starting point. To my great disappointment, every student without exception who was willing to speak up said that these were scientific assumptions — they were not able to see the point that these were not provable by scientific means but without these, science could not have got started in the first place! In other words, they could not recognise the fact that these five statements are the most fundamental assumptions behind the discipline called science and so constitute the philosophy of science.

Lest you think that the students I have referred to above were not sufficiently sophisticated in their thinking, let me shock you by quoting from Stephen Hawking in his latest book:

L. T. Jeyachandran is a civil engineer who worked in several parts of India for a little over 28 years as a Senior Civil Engineer with the Government of India. Thereafter, he served with the Ravi Zacharias International Ministries for nearly 19 years in Chennai (India) and Singapore. L.T. discovered the meaning of new life in Christ Jesus during his undergraduate college days. He has been involved in preaching the Gospel in conferences and is well known as a Bible expositor. He is a keen student of theology and comparative religions, and also interested in the study of Indian and foreign languages. He is knowledgeable in both Hebrew and Greek and is thus able to handle Scripture effectively in his ministry.

> Did the universe need a creator? Most of us do not spend most of our time worrying about these questions, but almost all of us worry about them some of the time [!] Traditionally, these are questions for philosophy, but philosophy is dead. Philosophy has not kept up with modern developments in science, particularly physics.

On the next page, he has a cartoon of a professor writing on a blackboard a complex partial differential equation and saying, "... and that is my philosophy"![1] I am sure one should be deeply disturbed that such a renowned physicist as Hawking would make a philosophical statement — "Philosophy is dead" — and not realise that his statement in itself is a huge contradiction! It should also be fairly obvious that his statement is not a scientific statement either. Francis Schaeffer has argued that in some sense, every human being is a philosopher at his or her most basic level.[2]

Edward Feser, a Roman Catholic who teaches philosophy in Pasadena City College has something interesting (and humorous) to say in his blog of the 13th February 2011 entitled, "Why are (some) physicists so bad at philosophy?"[3] Feser rightly assumes that science needs a starting point that science itself cannot provide. Feser's main argument is that physicists like Hawking and Ethan Siegel (whom Feser quotes in his blog) have to assume something — an exercise in philosophy — to be there in order to conclude that God is not necessary; for Hawking and Siegel, it is, so to speak, "...in the beginning, there was physical law"![4] I think Jean-Paul Sartre, the French existentialist philosopher was more to the point when he pointed out that the basic philosophical problem was that something rather than nothing was there.[5] John Horgan, a former journalist with the respected American science magazine, *Scientific American*, in his blog of the 23rd April 2012, makes the same point that science, in itself, will not be able to explain why there is something instead of nothing.[6] Clearly, this assumption belongs to the realm of philosophy.

> ***Scientism proceeds with an uncritical, anti-philosophical application of scientific or quasi-scientific methods inappropriate to the fields of study or investigation.***

Professor Alister McGrath, who holds doctorates in molecular biology and historical theology and who now teaches Christian Doctrine at King's College, London, and his psychologist-wife, Joanna Collicutt McGrath have written a small book challenging Richard Dawkins' *The God Delusion*. The McGraths have aptly called their own book as *The Dawkins DELUSION?* They rightly point to Dawkins' refusal to see that there are limits to science. This is the big philosophical pitfall of Dawkins' book; and he fails to support his thesis and keeps insisting that true scientists have to be atheists.[7]

In this brief article, I shall make an attempt to challenge the view that science is the sole, dependable source of knowledge. This view is called Scientism. Scientism proceeds with an uncritical, anti-philosophical

application of scientific or quasi-scientific methods inappropriate to the fields of study or investigation. As an exaggerated example, I can imagine a historian who is convinced of the philosophy of scientism and sets out to establish the historicity of Julius Caesar by designing a scientific experiment to precipitate Caesar in a test-tube in a chemistry laboratory! Each discipline of study requires an appropriate method of investigation, and the insistence that scientific method is the only way to knowledge is seen to be ludicrous.

I shall confine myself in this article to addressing the following fundamental points: First, Science cannot get started without making certain fundamental philosophical assumptions. Examples of this are the five assumptions quoted at the start of this article. Secondly, from a Christian point of view, philosophy in itself needs a starting point — it is therefore important to recognise that the theology of the Being and work of the God of the Bible provides the necessary theological underpinning for the assumptions of the philosophy of science.

Some important introductory remarks

A few important general points are however in order before we delve into discussing the five assumptions that underlie the scientific enterprise: (1) It is common knowledge that the basic degree in our universities (which comes from a Western tradition) is a *Bachelor*'s and the next level degree is a *Master*'s; however, someone who wants to specialise in her or his discipline goes on to do a PhD (*Doctor of Philosophy*) regardless of whether the subject is from the pure and applied sciences, humanities or fine arts. Why is this so? Because at that level of specialisation, one is not just studying the intricacies of the subject involved, but one is expected to be looking at the subject concerned at a more fundamental level, namely the philosophy that undergirds the subject of study. The so-called *New Atheists* (Daniel Dennett, Sam Harris *et al*),[8] who are from a science background, seem as a whole to be in total ignorance of this basic fact.

... all evidence, including scientific evidence, is filtered through an interpretive framework ...

(2) We should also recognise that all evidence, including scientific evidence, is filtered through an interpretive framework — a pair of spectacles, so to speak — called a *Worldview*. Some scientists seem to assume that the facts uncovered by science need nothing else and are in themselves a commentary on the metaphysics underlying the universe. This is patently untrue. Lesslie Newbigin makes the point very clear: "Facts do not imprint themselves like images on a photographic plate. They have to be grasped and understood. All facts are interpreted facts."[9] Michael Polanyi, an Oxonian of an earlier generation and a Fellow of the Royal Society, in his brilliant work, *Personal Knowledge*, devotes an entire chapter to explode the myth that there is something called pure objectivity.[10] In the same book, Polanyi goes on to say in the context of some of the great scientific controversies, "Within two different conceptual frameworks, the same range of experience takes the shape of different facts and different evidence."[11] One only wishes that Professor Richard

Dawkins (till recently) at Oxford had read the work of his fellow-Oxonian before launching his scathing attack on religion in his book, *The God Delusion*. One can think of three persons watching a ship sink — a fact — and coming to three different conclusions: (a) The humanist thinks that this tragedy has resulted in a grievous loss of life; (b) The materialist says that this event has caused a great loss of property; (c) The physicist will exult in the fact the law of gravity works beautifully. Each is correct within his own worldview but does not exclude the others and *at the same time does not have an overarching worldview that will include the others*.

(3) Science is a tool in discovering facts and relationships within these facts — science itself, because of its very nature, cannot provide the basis for true epistemology. The bigger question is to determine the correct worldview through which scientific facts should be interpreted in order to arrive at true knowledge. We also realise that there exists a kind of dialectic relationship between facts and worldview; scientific (and other) facts do assist us in establishing a right worldview, *but* the right worldview allows us to interpret science correctly. This apparent circularity is one of the indications that true knowledge turns on an objective-subjective axis.

... science itself, because of its very nature, cannot provide the basis for true epistemology.

(4) Sam Harris, neuroscientist and CEO of *Project Reason*, has launched a devastating critique of religion in his book, *The End of Faith: Religion, Terror and the Future of Reason*.[12] This book need not concern us here. Harris is also a neuroscientist who holds a PhD in the subject from UCLA. In his recent book, *The Moral Landscape*,[13] he has a subtitle that says, "How Science can Determine Human Values". In his chapter on good and evil,[14] he describes with a great degree of expertise, the various centres of the brain that deal with moral motions and then draws a conclusion larger than what the evidence warrants — that there need be no objective criterion for moral values but that the brain is able to determine and guide one's behaviour rightly. I do not have the expertise to critique the neuroscientific content of his argument, but I discern a certain reductionism:[15] I am not a watchmaker but a watchmaker can explain to me how a watch works. But will that let me know the *purpose* of the watch, i.e., that it is to indicate time? In taking this approach, Harris reduces the human being to the level of a machine although he does invoke certain 'higher' components of the machine. Newbigin recognised this problem in saying:

> A complete, mechanical, chemical, [we may add 'neuroscientific'] and physical analysis of the parts of the machine and the interrelation between them is not an explanation of the machine. It is inexplicable without some concept of the purpose of the for which these pieces of metal were put together in this way.[16]

In fact, we can turn this argument against Harris by saying that his views on religion are conditioned because of the way the neurons and synapses in his brain are constructed,

and therefore his views need not be taken as universally applicable. There is a subtle philosophical leap in Harris' argument that needs to be noted.

(5) A scientist no less than Einstein has said, "The supreme task of the physicist is the search for those highly universal laws from which a picture can be obtained by pure deduction. *There is no logical path to these laws*. They are only to be reached by intuition based upon something like intellectual love."[17] Love and faith seem to be quite fundamental even to the scientific enterprise!

Let us now turn to the assumptions that I outlined in the opening section. The assumptions given above appear to be so obviously the case that one rarely thinks beyond them. But if we look carefully, these are conclusions reached inductively because we have seen these aspects of behaviour of nature occurring without exception (*so far*). An inductive argument (in logic) is one in which we proceed to make universal conclusions on the basis of particulars observed. By definition, the conclusions are only *probable* ones, with the degree of probability depending upon the extensiveness of the samples. Logically, conclusions that are *certain* can be drawn only in deductive arguments — where the major premise is a universal and the conclusion is a particular. It may be pertinent to point out that all 'laws' of science are probable ones that are always inviting us to fine-tune our findings as more and more facts emerge as our capacity for observation and measurement improves. Thus, for example, Newtonian understanding of space and time had to be revised based on Einstein's Theory of Relativity. The latter is seen to have a greater explanatory power than the former. Physicists are constantly working now to further improve upon and, if necessary, modify Einstein's assumptions.

> ***... all 'laws' of science are probable ones that are always inviting us to fine-tune our findings as more and more facts emerge ...***

Why are the five assumptions of the philosophy of science fundamental?

Let us look at these in turn: *Assumption #1 — The external universe we observe is real and not illusory*. There is an intriguing scene in the first of *The Matrix* trilogy of movies: A spoon is suspended in front of a boy about eight years old; his head is clean-shaven and he stares at the spoon and bends it without touching it. Neo, the hero of the movie, exclaims, "You have bent the spoon!" The boy answers with commendable calm, "There is no spoon!" What is being portrayed here is the philosophy of some of the schools of the New Age movement who believe that the whole world of distinctions of which we are aware is illusory — some would say that the whole of the universe is an extension of the Divine. Shirley Maclaine, the Hollywood actress turned spiritualist is reputed to have said, "I and the universe are one."

The Indian school of philosophy called *Advaita* (non-dual, undifferentiated and monistic) is founded on one interpretation of an ancient Sanskrit saying, *Aham Brahmasmi*,[18] which is roughly translated as, "I am *Brahman*." Brahman, in Indian philosophy, is the infinite, impersonal principle (roughly comparable

to the Greek *logos*) that is considered to be the only reality. (The word *Brahman* is not to be confused with the *Brahmin* caste or the personal god of creation in the Hindu pantheon, *Brahma*.) The human person who makes the statement, "I am Brahman," is therefore denying any differentiation between him and the divine. But then, this philosophy leads to the further conclusion that all that we see in the universe is also an extension of the divine; thus, distinctions that we see are illusory as well! Could this type of a philosophy have given rise to science?

Assumption #2 — This universe works according to certain rational laws. Lesslie Newbigin, whom I have quoted liberally in this essay and whom I had the privilege of hearing long ago in person, is not a scientist but a theologian and philosopher. However, he had worked long enough with Eastern intellectuals to know that the assumption of the rationality of the universe does not come from nowhere. Here is what he says:

> If the universe did not have a rational structure, if different instruments readings at different times and places were simply random events which could not be brought into a coherent relation with each other, then science would be impossible. But the rationality of the universe is not something science can prove; it has to be as the starting point of scientific effort, and the assumption is a faith commitment.[19]

Assumption #3 — Human rationality corresponds to that of the universe. The 2004 Nobel Prize for Physics was given to three American physicists: David Gross, David Politzer and Frank Wilczek. Without going into the technical contribution that their discovery has made to the forward march of physics, let me quote from the press release of Nobel Prize committee for Physics:

> This discovery was expressed in 1973 in an *elegant* mathematical framework that led to a completely new theory, *Quantum Chromo-Dynamics*, QCD. This theory was an important contribution to the Standard Model, the theory that describes all physics connected with the electromagnetic force (which acts between charged particles), the weak force (which is important for the sun's energy production) and the strong force (which acts between quarks). With the aid of QCD physicists can at last explain why quarks only behave as free particles at extremely high energies. In the proton and the neutron they always occur in triplets.[20]

What is intriguing in the citation is the use of the adjective "elegant" to describe what is obviously a complex mathematical formula. It would have been more appropriate to use that adjective to describe the gait of a fashion model as she strolls down the catwalk. But, why should mathematical devices like algebra and calculus devised by us humans be able, with elegant accuracy, to describe the behaviour of the physical universe? This is a huge assumption which we are not authorised to make except that this has been repeatedly proved to be uncannily correct by verification.

Assumption #4 — Every event in this finite

universe has an underlying cause. The assumption stated above is called the principle of causality. It is so fundamental that we do not stop to give it a second thought. The relationship between causes and their effects come about because of a gigantic assumption: the universe around us has a certain degree of autonomy and it is at the same time contingent. By autonomy, I mean a degree of freedom that it exists by itself and its identity is not to be confused with any other; by contingency, I mean that the universe is not eternal but is finite. Some wise words again from Newbigin:

> [I]f the universe were not contingent, if it were (as Indian thinking has generally assumed) an emanation from an absolute spirit rather than the creation of a personal God who has, by an act of creation, given it a degree of autonomy, then science as we know it would be unnecessary. We would know ultimate reality by the exercise of pure contemplation and the whole business of testing hypotheses by laborious experiment would be unnecessary. It is therefore not an accident that modern science was born in a culture which had been shaped for many centuries by this belief.[21]

Assumption #5 — In this universe, the same cause produces the same effect under the same conditions. The above assumption is loosely called the law of uniformity of cause and effect. The assumption is central to the universal applicability of scientific discoveries and experimentation. An experiment conducted in Singapore can be repeated elsewhere in the world and be expected to yield the same results under the same conditions of temperature and pressure. If the sun were to rise in the east today, the west tomorrow and so on, no study of astronomy would have been possible. But, why should it be so? Why is there so much dependable order in the universe that laws can be formulated and expected to function in the same way under the same environment?

What does the Bible say in support of these assumptions?

The much-touted conflict between science and Christianity is an imaginary antithesis that has little evidence to back it. The feeling that Christianity in particular is inimical to the scientific enterprise is a recent phenomenon, promoted by scientists of the genre of Dawkins. Robert Oppenheimer, often called 'The father of the atomic bomb' and who was not a Christian, has said that Christianity was needed to give birth to modern science.[22] Stanley L. Jaki makes this point forcefully:

> Great cultures, where the scientific enterprise came to a standstill, invariably failed to formulate the notion of physical law, or the law of nature. Theirs was a theology with no belief in a personal, rational, absolutely transcendent Lawgiver, or Creator. Their cosmology reflected a pantheistic and animistic view of nature caught in the treadmill of perennial, inexorable returns. The scientific quest found fertile soil only when this faith in a personal, rational Creator had truly permeated a whole culture, beginning with the centuries of the High Middle Ages. It was that

> faith which provided, in sufficient measure, confidence in the rationality of the universe, trust in progress, and appreciation of the quantitative method, all indispensable ingredients of the scientific quest.[23]

An interesting collection of interviews with scientists who are Christians[24] is worth perusal as many of the interviewees contribute to a better understanding of the theology that undergirds the philosophy of science. The following section provides a brief insight into the Bible's contribution to the assumptions underlying science.

Assumption #1 — The external universe we observe is real and not illusory. The Bible describes God creating the universe by His word (Psa. 33:6; John 1:3; Heb.11:3). This is in marked contrast to some forms of the Indian belief-system, for example, which hold that the god of creation dreamt creation into existence. The main difference is that a *word* is *outside* the speaker — objective — whereas a *dream* is inside the *dreamer* — subjective! Creation is outside of and distinct from the Creator. Strong support for the objectivity of creation can also be found in a number of verses in Genesis 1 in which God names various entities that He creates: day, night, land, oceans, etc (vv 5, 8, 10). We can therefore be absolutely sure that these are for real, and not part of some cosmic illusion as New Age proponents suggest.

Robert Oppenheimer... has said that Christianity was needed to give birth to modern science.

Assumption #2 — This universe works according to certain rational laws. If John 1:3 suggests that the universe was created as an objective reality by the Word, Heb.1:3, Psa. 104 and Col. 1:17 indicate that in Christ, God is immanently active in Creation. The Logos, as Creator, stamps His logic upon His creation; we may therefore expect creation to behave reasonably. That God can be transcendent over creation as well as immanent in creation is possible only because of the fact that God is Trinity. This is further explained under Assumption #4 below.

Assumption #3 — Human rationality corresponds to that of the universe. In creating us humans in His image, God has vested us with rationality to understand His world; this is further underlined by the fact that He gave us the authority to "have dominion" over His creation (Gen. 1:26-28).

Assumption #4 — Every event in this finite universe has an underlying cause. The first verse of the Bible lays the ground rule for causality: "In the beginning, God (The Infinite First Cause) created the heavens and the earth (The finite effect)." This distinction between cause and effect is systematically maintained in the Bible. In fact, even within the Uncaused Cause — the Triune God — there is a real distinction between the Father and the Son which is the philosophical-theological basis for all true distinctions in the created order. There is a tendency, in recent times, to refer to the indeterminate behaviour of electrons at the quantum level (where the distinction between cause and effect is seemingly erased) and then extrapolate from that the macro-universe. The conclusion? There is no real distinction between cause and effect, and thus cause and effect are

all one — the undifferentiated oneness that is the foundation of all New Age philosophy. The justification for the extrapolation is never clearly made out, not to mention the fact that if the distinction between cause and effect is non-existent, all scientific enterprise will cease. Genesis 1 also makes out a clear case for distinctions within the created order (vv 4, 6, 7, 18).

Assumption #5 — In this universe, the same cause produces the same effect under the same conditions. When Noah gingerly steps out of the ark, he finds a world that is markedly different from the one that he had left. God promises him a world where day and night, summer and winter, seedtime and harvest will follow a regular pattern (Gen. 8:22). Because this is underwritten by the word of the sovereign Lord, we can expect the same effects to follow the same causes under the same conditions.

What do scientific facts say in support of the Biblical worldview?

I made the point earlier that there is an interesting circularity between how scientific (and other) facts contribute to a worldview and how worldviews help us to interpret facts. The correspondence between assumptions underlying the scientific enterprise and the view of reality propounded by the Bible cannot therefore be dismissed as a coincidence. Time and time again, the grounds on which science has made progress is seen to support Biblical presuppositions:

> ***Creation is outside of and distinct from the Creator.***

(1) One of the facts of science repeatedly investigated and found to be true is the finiteness of the universe. This idea had not been popular in scientific circles. Scientists who are atheists are aware of the immense philosophical and theological implications of this notion. Einstein himself grudgingly accepted "the necessity of a beginning". His general theory of relativity (1915) theoretically established the fact that the universe was finite. This has been subsequently confirmed by a number of observations by astronomers. Points where all known laws of physics break down cannot be avoided. These points are called 'singularities' and it has been proved that, under very general conditions, solutions to Einstein's equations will always contain a singularity.

(2) Einstein demonstrated that space and time as relative to each other. Newton had held that these two were absolutes and one could be measured against the other. (It is also to be noted that space and matter are interchangeable terms; so when we describe the universe as expanding, we do not mean that it is expanding *into* pre-existing space, but expanding *as* space). It is significant that the Bible begins with the phrase, "In the beginning…", rather than "Once upon a time…". Thus, space-time begins at creation.

(3) The first and second laws of thermodynamics are indirectly supported in the Bible. The first law states that matter (or energy) can neither be created nor destroyed. At the end of creative activity, the Bible states in Gen. 2:1-3 that the work of creation was finished. The institution of the Sabbath makes it clear that there was no further work involving creation of matter/energy. The second law states

that the universe is inexorably heading towards heat-death. All energy would have ceased to be available for useful work as entropy reaches a maximum and there will be no more work, no activity, no life. The universe will have reached a uniform temperature; cosmologists name this state as 'heat death'. This is implied in what God says to Adam after his disobedience, "With the sweat of your brow you will toil" (Gen. 3:17b-19). Output will always be less than the input, and efficiency will be less than 1 — the difference is wasted as entropy. It is only the return of Christ and the redemption of creation that will prevent this from happening (Rom. 8:19-22; Rev. 21:1, 2).

Some Important Concluding Remarks

First, we need to recognise a hierarchy in disciplines. The most fundamental discipline is history. Theology results from reflection on Biblical history and provides the basis for the philosophies that undergird all other disciplines, i.e., pure and applied sciences, humanities, and fine arts. We are in danger of missing this order and giving undue importance to science and technology only to discover that they are good servants, bad masters, worse philosophers but worse still theologians!

> *In creating us humans in His image, God has vested us with rationality to understand His world...*

Second, the grand narrative is inaugurated at creation (Gen. 1 & 2) and consummated at Rev. 21 & 22. Unfortunately, for the average evangelical Christian, theology begins with the Fall at Gen. 3 and ends in the Judgment of Rev. 20. This unhinged view of theology leads our scientist-detractors to think that we have nothing to say about the material world. Our Buddhist friends, on the other hand, think that the Christian good news is another escapism into a vacuous 'heaven' not very different from their own view of nirvana. How we need to capture the solid materiality of the New Creation portrayed by C. S. Lewis in *The Great Divorce*,[25] and N. T. Wright in *Surprised by Hope*![26] What a contrast between the doctrinal basis of present-day evangelical organisations that begin with the inspiration of Scripture — very important and crucial — but say so little about the grand narrative in which we are placed. The ancient Christian creeds began with the statement of God as Creator and ended with the triumphant statement of the hope of the resurrection of the *body*.

Third, technology has a way of depersonalising humans. Christians need to guard against this movement. A few decades ago it was the machine that was replacing human agents; now cybernetics has come to replace knowledge and wisdom with an information overload, leaving little time for reflection. We should implore the Triune God to equip His Church to communicate the good news of the Kingdom in today's context.

Fourth, every advance in science and technology immediately presents an ethical choice to humans — whether to use that added knowledge for good or for ill. Science and technology do not have the wherewithal to provide the basis of that choice. The cover story in a recent issue of *The Economist* (June 2nd to 8th, 2012) has a technology insert with the interesting title, "Morals and the Machine

- Teaching robots right from wrong!" "Science is one thing, wisdom is another. Science is an edged tool, with which men play like children, and cut their own fingers."[27] May the God of the universe grant his Church the wisdom to use science and technology as servants of society and to a better appreciation and worship of God as Creator! ■

Endnotes

[1] Stephen Hawking, *The Grand Design* (London: Bantam Books, 2011), 13-14.

[2] Francis Schaeffer, *The Complete Works of Francis A Schaeffer — Volume One — A Christian View of Philosophy and Culture* (Wheaton: Crossway Books, 1982), 279-280.

[3] Edward Feser, http://edwardfeser.blogspot.com/2011/02/why-are-some-physicists-so-bad-at.html [accessed 30 June 2012].

[4] Stephen Hawking, *Grand Design*, 18.

[5] Quoted in Francis Schaeffer, *The Complete Works of Francis A. Schaeffer - Volume Two – A Christian View of Bible as Truth* (Wheaton: Crossway Books, 1982), 10. Also see Colin E. Gunton, *The Triune Creator* (Edinburgh: Edinburgh University Press, 1998), 1.

[6] John Horgan, "Science Will Never Explain Why There's Something Rather Than Nothing," http://blogs.scientificamerican.com/cross-check/2012/04/23/science-will-never-explain-why-theres-something-rather-than-nothing/ [accessed 30 June 2012].

[7] Alister McGrath and Joanna Collicutt McGrath, *The Dawkins DELUSION?* (Downers Grove: Inter-Varsity Press, 2007), 34. There is a humorous endorsement of McGraths' book on the front of the dust jacket given by a famous American atheist, Michael Ruse with these words: "*The God Delusion* makes me embarrassed to be an atheist, and the McGraths show why"!

[8] Richard Dawkins helpfully provides a list of names of many scientists of this ilk; see his *The God Delusion* (New York: Houghton Mifflin Company, 2006), 7.

[9] Lesslie Newbigin, *The Gospel in a Pluralist Society* (Grand Rapids: Eerdmans, 1989), 21.

[10] Michael Polanyi, *Personal Knowledge* (Chicago: The University of Chicago Press, 1962), 3-17.

[11] Polanyi, *Personal Knowledge*, 167.

[12] (New York: W. W. Norton and Company, 2004).

[13] (New York: Free Press, 2010).

[14] Harris, *The Moral Landscape*, 55-112.

[15] Vinoth Ramachandra, *Subverting Global Myths: Theology and the Public Issues Shaping our World* (Downers Grove: Inter-Varsity Press, 2008), 187-89.

[16] Newbigin, *Gospel in a Pluralist Society,* 38.

[17] Cited by Newbigin, *Gospel in a Pluralist Society*, 31. Emphasis is mine.

[18] *Brihadaranyaka Upanishad,* 1.4.10. The Upanishads are ancient Indian writings comprising of pithy statements such as the one referred above but are subject to multiple interpretations.

[19] Newbigin, *Gospel in Pluralist Society*, 20.

[20] http://www.nobelprize.org/nobel_prizes/physics/laureates/2004/press.html [accessed 30 June 2012]. Emphasis is mine.

[21] Newbigin, *Gospel in a Pluralist Society*, 20. See also Willis B. Glover, *Biblical Origins of Modern Secular Culture* (Macon: Mercer University Press, 1984), 79-106; Gunton, *Triune Creator*, 112-115.

[22] In the article 'On Science and Culture' in *Encounter*, October 1962. Quoted by Francis Schaeffer, *The Complete Works of Francis Schaeffer — Volume One — A Christian View of Philosophy and Culture*, (Wheaton: Crossway Books, 1982), 225.

[23] Stanley L. Jaki, "Introduction" in *Science and*

Creation (New York: Science History Publications, 1974). Jaki (1924-2009), a Roman Catholic priest and physicist, is the author of over fifty books, many of them on the history and philosophy of science; see Ellen Myers, "Creation and Science: The Work of Stanley L. Jaki," http://www.creationism.org/csshs/v09n2p17.htm [accessed 30 June 2012].

[24] Nigel Bovey, ed., *God, Big Bang & Bunsen-burning Issues*, (Milton Keynes: Authentic Media, 2008). The scientists interviewed may not all agree on the details of Biblical interpretation but that does not in any way detract from their unanimous view that the Bible provides the basis for the pursuit of the scientific enterprise.

[25] (San Francisco: HarperCollins, 2001).

[26] (London: SPCK, 2011).

[27] Attributed to the British astrophysicist Sir Arthur Eddington by Robert L. Weber in *More Random Walks in Science* (New York: Taylor & Francis Group, 1982).