Integrating Faith and Learning

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INTEGRATING FAITH AND LEARNING

How can we help our students live their lives in such a way that faith and praxis are not kept in separate compartments but are fully integrated? This is a question the present conference deals with. Mr. Vander Ark speaks about it, and it forms the topic of my paper as well. As the title shows, however, I focus on the integration of faith with only one aspect of our everyday existence, namely the life of the mind. To put it in traditional terms, I am joining the ancient discussion about the possibilities of "reconciling" faith and learning, revelation and reason.

Today the big issue Christians are confronted with in the area of learning is a secular scholarship that is dominated by the naturalistic worldview of modern science. That worldview, which in practically every respect is hostile to the teachings of the Bible, is reflected in the modern *theory of knowledge.*[1] My focus will be on the manner in which we can teach our students to evaluate that theory and so help them respond to the intellectual challenges they meet. This is an important means of dealing with the obstacles that modern naturalism so easily and so frequently places on the way of faith. It is therefore part of the attempt to integrate faith and learning.

I have divided my paper into two unequal parts, followed by a conclusion. The first part contains a survey of what is often called the warfare between faith and science as it has been fought for the last century and a half. The rise of theories of evolution and their implications get special attention in this part.

In the second and much longer section I come to the main topic, namely the evaluation of the modern theory of knowledge. A basic issue, we will note, is the conviction – which is still widely held in today's postmodern society – that the scientific method guarantees total objectivity and therefore leads to infallible truth. I am referring here to the "objective ideal," or the philosophy of "scientism" or "positivism." The conclusions of science, according to this philosophy, are the only possible truths and must be accepted as unquestionable. Any other truths, including those of the Bible, are non-scientific and no more than subjective opinions.

It is this conviction that has caused most of the difficulties that modern secular scholarship has caused for Christians. It is therefore of great importance to know that in our postmodern age the modern objectivist belief is under attack, not only by Christians, but also by secular scholars. An ever increasing amount of recent scholarship concludes that the claim of full scientific objectivity is groundless; that there is a strong personal or "faith" element in the conclusions of science, as in all human knowledge; in short, that scientific theories are provisional and fallible. With this development, then, I deal in the second part of my paper. My aim is to describe how the modern theory of knowledge with its belief in an infallible scientific method is being challenged, and what the implications of this challenge are for our teaching.

As will have become clear from the foregoing, this paper will not deal with the "how" of teaching science. Nor is it presented as a detailed critique of specific interpretations, such as, for example, the Darwinian theory of evolution. My concern is with the underlying ideas and philosophies that affect our understanding of science, and indeed of all learning. It is here that we have to start. Our task, after all, is to prepare our

[1] With the term "theory of knowledge" I refer to the theory that for any given period answers the question as to what can be known, how and why it can be known, and how certain our knowledge is.

students for their life as Christians in an intellectual environment that is secular and virulently anti-Christian. The problem is that many of our teachers have been educated at secular universities, and when starting their work at a Christian school they are often unsure how to teach in such a way that their students develop a Christian mind. It is these teachers we have to reach first of all, helping them to discern and evaluate the ruling assumptions in the world of learning.

I know by experience – and so, I expect, do many of you – that the method I propose is not easily applied. Teachers often find the approach too abstract, too philosophical, or they argue that it interferes with their practical work, namely that of teaching "the facts" of their particular discipline. For that reason especially I am glad that I may introduce the topic at a meeting of principals, for the task of helping our teachers in this respect falls to them in the first place. Some of you may already have succeeded in convincing your staff of the need to integrate faith and learning in the manner I propose, and will be able to tell us about your experiences. By all means do so; we need all the help we can get.

In the end, I hope, we will agree to incorporate the new insights into the curricula of our schools. I am thinking of a collective enterprise, at the national and even the international level, so that the best possible use can be made of the available resources and expertise. This I see as our long-range challenge. The immediate challenge, as a colleague put it to me, is to help and encourage each other to introduce the issue at the local level, and to do it in such a way that the impact on both teachers and students is lasting.

So much, then, by way of introduction. I am now turning to Part 1 and say something about the so-called warfare between faith and science.

1. When faith and science clash…

That warfare is of comparatively recent origin. The idea of a permanent conflict between faith and science is a myth. It is true, the early centuries following the scientific revolution witnessed the occasional collision. We all know of Galileo's encounter with the Inquisition. But such clashes were the exception, not the rule. Practically all early scientists were Christians, who saw as a major aim of their work the proclamation of God's greatness. Orthodox theologians tended to agree. For them also, the discoveries showed more clearly than ever that "The heavens declare the glory of God; the skies proclaim the work of his hands" (Psalm 19:1).

This generally harmonious co-existence ended in the course of the nineteenth century. The main cause was the spread of theories of evolution, and especially the publication of Charles Darwin's *The Origin of Species* (1859). The struggle that then began continues today, and the stakes are as high as they have ever been. This is so because we are dealing not just with evolution as a *scientific theory*, but also with evolution*ism* as a *worldview,* which explains all things in atheistic and evolutionary terms. The issue is therefore directly related to religious convictions. This goes for both sides. On the one hand there is an influential group of scientists and philosophers who believe that Darwin proved the truth of atheism and of a material basis of existence, and who make the promotion of this belief their life's task. The other side, which consists mainly of Christians, concentrates on the scientific weaknesses of Darwinism and attempts to refute the atheist claims.

The counter-offensive has gone through different phases. There is first of all the approach of young-earth creation-scientism, which is well known among us. In addition, there is a more recent movement which

focuses on intelligent design (ID) – that is, design by an intelligent supernatural agent. The latter movement is not altogether new. Already in the eighteenth century Christian apologists pointed to the order and apparent design in nature as proof that the universe could not be the product of chance, but must have been the work of a supernatural intelligence.

Today's ID movement differs from the earlier one in that it is able to make use of recent advances in biochemistry, physics, and cosmology. One of the ID's arguments is that complex systems (for example, the eye) cannot have been the result of a slow evolutionary process, because they would not work unless all the interlocking parts were in place. A second argument is that of the exceptional fine-tuning of the universe. It has become clear that the laws of nature had to be "just so" for life to exist; that even the smallest difference in any of the basic forces of nature would have made a life-sustaining universe impossible. While not refuting the idea of evolution as such, ID scientists conclude that evolution cannot be explained as a random process of chance variations and natural selection. The apparent "coincidences" necessary to fine-tune the universe so that it could sustain life are so remarkable that the only possible conclusion is belief in design.

The ID movement has come here with an important argument, to which the opposing camp so far has not been able to give a satisfactory answer. This does not mean, however, that that camp has conceded defeat. On the contrary, the challenges with which it confronts anti-Darwinians remain strong. To show this, I need to mention only some of the arguments it uses. I begin with those marshalled in support of the idea of a common origin of species. Among them are references to the so-called homologies, that is the similarities in structure and function of fins, wings, and arms, and also to the similarities among species at the physiological level. Reference is further made to the existence of vestigial organs and structures, such as, in the case of humans, the appendix, the coccyx or tailbone, and the muscles that give "goose bumps." In addition there are the striking similarities among living beings at the level of biochemistry and the DNA. As we are repeatedly reminded, the DNA of man and that of the primates is very similar. In fact, the DNA sequence of the highest primate, the chimpanzee, is for at least 96% identical with that of the human.

This is not yet the extent of the challenge. Christians are not only confronted with theories of evolution in sciences like biology, geology, and astronomy. Far from being a mere scientific hypothesis, Darwinism, as already mentioned, has become an all-encompassing worldview. That worldview is based on philosophic materialism – the belief that nothing exists except matter, its motion, and entities like force and energy. Atheistic Darwinists, then, explain the origin and nature of life in purely material terms. The existence of the supernatural is denied, and so it the reality of the life of the spirit as it was traditionally understood. This explains, incidentally, why in the attempt to prove a common origin of species the material similarities between man and the higher primates are stressed, and the characteristics that distinguish the human from the animal kept out of the equation.

These characteristics – the ability to speak, to reason, to make conscious moral choices, to believe in the supernatural, and so on – do of course exist and therefore must be accounted for. A common explanation is that they developed because they helped the process of evolution. Here we come to the work of evolutionary psychologists (or sociobiologists), who teach that moral actions, for example, are determined by the effect they have on natural selection and the survival of the fittest and therefore on the improvement of the species. In some instances the evolutionary process requires kindness, altruism, gentleness, but in other cases oppression and even murder are the proper attitude – and indeed the only possible one. There is no freedom of choice or human responsibility. Mankind is hardwired to act in certain ways. Naturalistic Darwinism implies genetic determinism.

Recent developments in brain research have provided additional data to be used in support of a naturalistic and materialistic view of life. Neuroscientists are now able to "map" the brain and locate the physical seat of memory, will, emotions, and so on. This serves to substantiate the claim that mental states, moral convictions, even religious faith, have an exclusively material base. It has been suggested that in view of this, one of the big philosophical issues of our century will be the definition of man's true nature. For a long time already he has been defined as a complex machine, and the new brain studies serve to support that view. Intelligent machines will be developed, we are told, that simulate spiritual behaviour and so confirm that religious faith is materially based; that it is a faith therefore without God.

A number of atheistic scientists and philosophers works hard to spread these ideas. Socio-biologist Edward O. Wilson, for example, looks forward to the time when naturalistic science can explain "traditional religion…as a wholly material phenomenon." Darwinist philosopher Daniel Dennett gave his most recent book the suggestive title, *Breaking the Spell: Religion as a Natural Phenomenon*. Another well-known atheist, Richard Dawkins, recently published a book under the equally suggestive title, *The God Delusion.* In all cases the anti-religious pronouncements are made *in the name of an objective, infallible science.* The authors generally portray religion not just as a harmless fantasy, but as something that is dangerous, a malignant virus that has to be gotten rid of if society is to flourish. Their ideas are propagated in scholarly works, in the popular press, on the Internet, and probably also in high school and college textbooks. They will not pass by our youth. Perhaps sooner than their elders, our young people will become acquainted with terms like "God gene," "God virus," and "the brain as a believing machine."

As the above shows, the challenge we face in confronting a materialistic scientism is a serious one. The difficulty is increased by the fact that the combined might of the world's most prestigious universities, its most celebrated scholars, and its most influential media supports the secular worldview. Christians will have to be sure that their weapons and means of defence are reliable. They can, as I implied in the foregoing, follow two strategies. One is to make use of the arguments of "creation-science" and the ID movement and concentrate on the scientific weaknesses of a materialistic view of life. These approaches can certainly be fruitful, although, as I will show later, they are not without pitfalls. The second strategy, and the one I propose, I have already outlined*. It is to challenge the claim that science is totally objective and that the scientific method guarantees absolute, infallible truth.* This brings me to the second part of my paper.

2. Working toward integration

2.1 The trust in method

To help us understand the role of the scientific method in the modern period, we will have to give some attention to the history and philosophy of science. Modern science began with the scientific revolution of the seventeenth century – the age of men like Galileo, Kepler, and Newton. That century was one of great achievements and of an ever-increasing trust in the power of human reason. It was at the same time, however, an age of much uncertainty. It followed a lengthy period of profound cultural change, endless political and social upheavals, and steep religious decline. The uncertainty these developments caused was increased by the break-up of the medieval church, the conflicting truth claims of the different church groups, and the religious warfare and persecution that followed. In addition there were the findings of the scientific revolution itself, such as the replacement of the old earth-centred model with one that placed the

sun at the centre. Too many of the ancient certainties were under attack, and among large sections of the population the result was an attitude of scepticism and doubt.

It was in this period that modern philosophy arose. Among its first representatives were Sir Francis Bacon in England and René Descartes in France. Anxious to prevent Christendom from drowning in a sea of scepticism, these men and their followers worked on a method that would guarantee the acquisition of scientific, religious, and other knowledge that was objectively true and therefore universally valid. This implied a drastic methodological innovation. In previous centuries people had sought knowledge by turning to tradition and authority; but this, according to the new approach, was counterproductive and had been a cause of the problems society faced. The new method dictated that the thinker ignore tradition and authority. He was to rely instead on observation, experimentation, and logical-mathematical reasoning. Existing knowledge was to be forgotten. Even the personal element – that is, the scientist's expectations and his private beliefs – was to be put on hold, and the same applied to the expectations and beliefs of his culture and environment.

The scientific method of detachment proved its worth during the scientific revolution. The main concern at this time was with sciences like physics and astronomy, which dealt with matter in motion and therefore with phenomena that could to a large extent be investigated in a detached, impersonal manner. In the end, however, it was applied in other disciplines as well, such as the human sciences, where it was far less appropriate. But although misplaced, the trust in the method's universal validity was not really surprising. The astounding accomplishments of the scientific revolution blinded people to the limitations of the new method. The belief took hold that, as Descartes had already promised, the method could be successfully applied in all areas of life, including even religion. By guaranteeing knowledge that all thinking humans would have to admit was objectively true, it would put an end to the scepticism and the religious divisions that plagued Europe. In short, salvation was to be found in the scientific approach. As has been well said, under modernism science was god and method its prophet.

2.2 Consequences

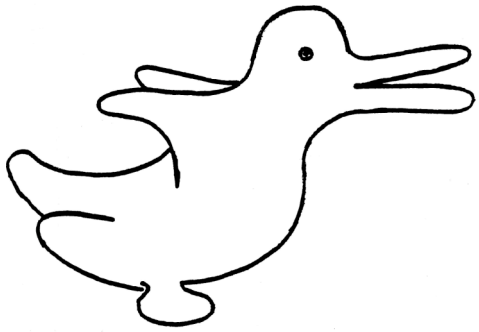
The belief in the scientific method's universal validity played a role in the adoption of a materialistic worldview. This was all but inevitable. The method depended on observation, experimentation, and mathematical reasoning and could therefore deal only with what was visible, measurable, and/or what could be explained in terms of human logic. The supernatural, the invisible, the life of the spirit – whatever could not be observed, weighed, measured, and expressed in a mathematical formula – was to be ignored as not belonging to the world of reality. That world consisted of matter in motion, which meant that in the end everything could be explained in terms of these basic elements. And so religion, for example, was reduced to psychology, psychology to biology, and biology to physics and chemistry. To mention some other well-known examples of reductionistic reasoning: the mind is nothing but brain; man is nothing but a machine; the beauty of sunsets and of other aspects of nature is nothing but waves of energy; Bach's music is nothing but vibrations in the air; and romantic love is nothing but the work of hormones, and is therefore again reducible to biology and ultimately to physics and chemistry.

Another result was what has been called the disenchantment of the world (Max Weber). The discoveries of scientists like Galileo, Kepler, and Newton presented a universe that operated in obedience to eternal, fixed natural laws and therefore worked like a clockwork or machine. Once life itself had been reduced to matter in motion, all of nature could be treated as a lifeless object, a "thing." God Himself was removed from the world. Until Darwin, God was still needed as the First Cause, or as the Great Engineer or Clockmaker who had made the world and put it in motion, but since everything now worked with mechanical precision, he no

longer concerned himself with the daily operations of the universe. He became the God of deism. At the same time angels, spirits, demons and all the "spiritual forces of evil in the heavenly realms" (Eph. 6:12), departed from the world as well – even for many Christians.

It was this materialist-mechanistic worldview that in the course of the eighteenth century gave rise to the Romantic reaction. Rebelling against modern rationalism and materialism, the Romantics exalted the emotions, the mysterious, the irrational, and in some cases tried to "re-enchant" the world by embracing occult or pantheistic beliefs (much as is done in our postmodern era). The Romantics did not, however, challenge the philosophical basis of scientism, nor did they bring about a lasting change in the modern worldview. This did not happen until the twentieth century. It was only then that efforts would be made to get to the root of the matter by exposing and challenging scientism's religious and philosophical underpinnings.

The work would be joined by scholars of various nationalities and of practically every discipline under the sun – by philosophers, scientists, theologians, historians, linguists, psychologists, and others. Among them were Dutch Reformed theologians and philosophers – men like Abraham Kuyper, Dirk Vollenhoven, and Herman Dooyeweerd. Although their work certainly merits attention, I will in what follows concentrate on the contributions of a leading thinker from the Anglo-Saxon world, namely the American philosopher of science Thomas Kuhn.



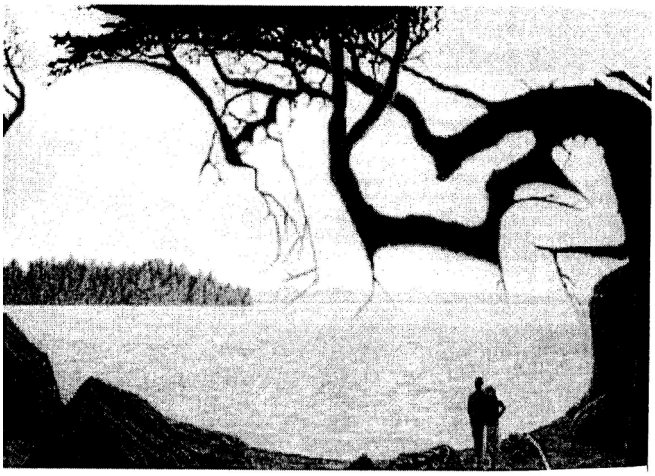
2.3 Thomas Kuhn on paradigm shifts

Thomas Kuhn (1922-96) was probably the most influential philosopher of science of the twentieth century. His major work, published in 1962, was *The Structure of Scientific Revolutions*. Herein he popularized the idea of the scientific "paradigm," a term whereby he referred to the body of theoretical and methodological beliefs held by a scientific community at any given time.[2] Architects of such paradigms were Newton, Darwin, Clerk Maxwell, Einstein, and other well-known scientists, but science knows of course of many less spectacular paradigms as well. During periods of "normal science," Kuhn said, the accepted paradigm serves scientists as norm and guide. Their task is not to prove its truth or falsity, but simply to fine-tune it and to solve whatever problems still remain. Although the number of anomalies may be large, in times of normal science the reputation of the ruling paradigm is strong enough for scientists to be confident that solutions will be found. Normal science, in short, is based on the conviction that the scientist knows what the world is like. His job is not to find novelties, but to force nature into the accepted conceptual boxes.

In the end that may become difficult, however. When theory and nature continue to clash a crisis arises, which may be followed by the search for a new paradigm, one that is capable of accounting for the anomalies. If a new paradigm is found and accepted, a paradigm shift or scientific

[2] When using the word paradigm I refer to these scientific paradigms only. The terms paradigm and paradigm shift are also used to denote general worldviews and their succession, but to avoid confusion I will not do so in this paper.

revolution occurs. The new paradigm, Kuhn says, does not build on the old one, and is in fact incompatible and even incommensurate with it, which means that adherents of rival paradigms are unable to see the world in the same way. Their own paradigm determines not only what they are looking for, but also what they actually see. A frequently used analogy is that of a Gestalt switch. Before the shift, scientists see a duck; afterwards they see a rabbit – and they can't see both at the same time. In order to perceive, one must know what to look for. Observation is theory-dependent, and the observer is also influenced by what prior experience has taught him to see.



Lake or ? 1

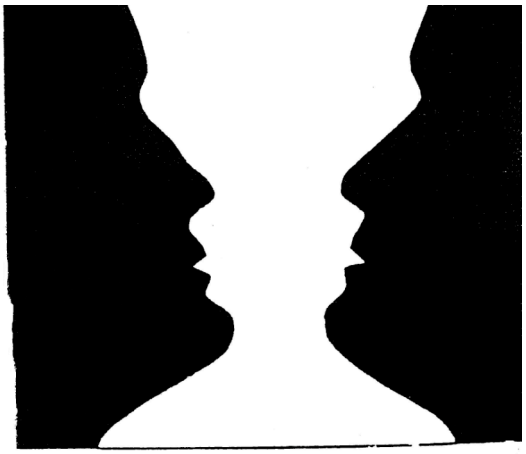
With his theory of paradigms, then, Kuhn renounces the traditional view that scientific revolutions are the more or less automatic result of fully objective processes, guaranteed by adherence to the scientific method, as had been thought ever since Bacon and Descartes. It is of course true that scientific requirements play a role. A paradigm is replaced because it no longer fits the known facts of nature, and for the new paradigm to succeed it has to do a better job than the previous one in explaining and predicting phenomena. But while there are objective criteria, Kuhn says that subjective elements play a role as well. He points in this connection to the role played by scientific genius, imagination, creativity, thought experiments, even mere "hunches," and also by the scientist's personality and the prevailing worldview.

If the *rise* of a new paradigm is influenced by subjective factors, so is its *acceptance*. A scientific community embraces a new paradigm not because it can prove its superior truth – for example by following the normal processes of verification and falsification. It uses instead criteria like simplicity, accuracy, consistency, scope, and fruitfulness (how well it promises to help in problem-solving)
Ultimately, Kuhn says, a scientist's acceptance of a paradigm is a matter not of proof, but of "conversion" and "faith" – that is, of simply believing that the new paradigm will yield better results than the old one.

These are not the only subjective elements. Throughout the process, there is the influence of the scientist's personal history and also that of the prevailing worldview. Kuhn suggests that a changing social and cultural climate played a role in the victory of Copernicus' sun-centred model, and also in nineteenth-century England's embracing of Darwinism. Kuhn is cautious here. He does not want to suggest that the scientist's personality or his culture *determines* the origin and acceptance of a scientific theory, only that they play a role. But by admitting that role, he strengthens the position of other scholars who posit a relationship between the general worldview and scientific theories.

To conclude: Although there had been predecessors, Kuhn did pioneering work. As is usually the case with studies introducing novel interpretations, his book was controversial and its conclusions have had to be modified in a number of areas. These modifications have not, however, invalidated Kuhn's general theory regarding the subjective element in science. That theory is well substantiated, by Kuhn's work and by that of other scholars, and to maintain today that science proceeds by adherence to a foolproof method in an automatic fashion is to ignore mountains of contrary evidence. Of course, it does still happen. The old

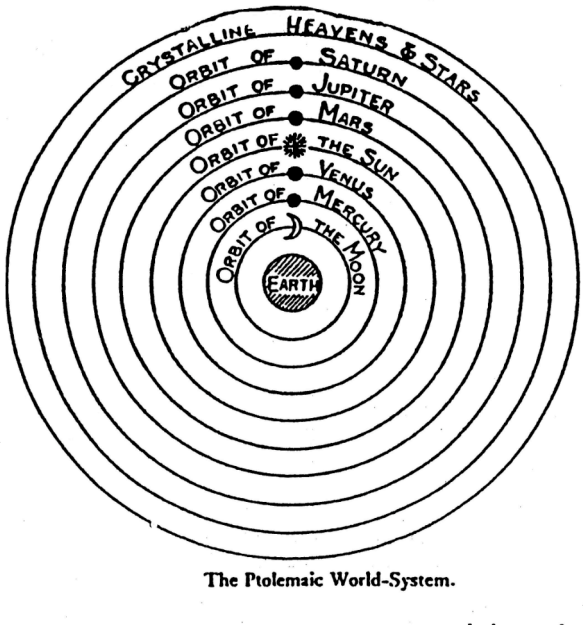
objectivist doctrine continues to underlie much of today's literature about science, and it continues to be propagated, implicitly or explicitly, by textbooks, possibly also by those used at Christian schools. (A worthwhile exercise, incidentally, would be to determine the visibility of the prevailing theory of knowledge in the curricula of our schools.)



2.4 Science and worldview

Before ending this second part, I want to say a bit more about the point made by Kuhn (and by various other scholars) that science is influenced by the prevailing worldview. This is an important insight and deserves our close attention. It underlines the subjective element in scientific paradigms and reminds us that these paradigms are provisional and temporary things. That is good news, especially in the case of the Darwinian paradigm, as we will see presently.

The history of science gives many examples of the interaction between worldview and scientific paradigms. A well-known one is the seventeenth-century establishment of the heliocentric model of the universe. The switch from an earth-centred to a sun-centred paradigm or model was initiated in 1543 by Copernicus and completed in 1687 by Newton. As the diagram shows, the old system, which had served the Greeks, the Romans, and the Christian Middle Ages, had a stationary earth as its centre with the sun and all the other heavenly bodies revolving around it. The system was static, unchanging. It was also finite, consisting of only one solar system, and it was organized in a hierarchical manner. The earth, moreover, was made of base materials, whereas the heavenly bodies (sun, moon, planets and stars) were indeed heavenly – non-material, pure, translucent. And all around this system were the empyrean heavens where God resided. The cosmos was under God's constant governance and protection.



The Ptolemaic World-System.

The new Copernican-Newtonian model reversed practically every relationship. The sun now was the stationary centre of the solar system. The earth became a planet, moving freely in space. The new cosmos was boundless, perhaps infinite, and contained untold numbers of suns and solar systems. Being boundless, the cosmos had no centre and no circumference, and one could no longer point to a heaven above where God resided. As the contemporary poet John Donne complained, "The Sun is lost and th'earth, and no man's wit / can well direct him where to look for it. /…. Tis all in pieces, all coherence gone." God Himself seemed to have disappeared from the universe.

As historians of science have shown in much more detail than I can reproduce here, the old system fitted the worldview of the Christian Middle Ages, whereas the new one was in agreement with that of the Renaissance. The people of the Middle Ages believed in values like immutability, hierarchy, and finitude. They were also convinced that God surrounded and controlled the universe; and they fully agreed with the position of the earth, man's dwelling place. It was at the centre, because man was the crown of God's creation, but it also was at the bottom, because man had fallen into sin. These beliefs were far less potent during the Renaissance, an age that was more secular, humanistic, and individualistic than the Middle Ages. The Renaissance did not relish the idea of God's omnipresence, nor did it value hierarchy and changelessness. Far more dynamic than the previous period, it was desirous of crossing ancient boundaries and exploring the unknown. After all, this was the age of Columbus and subsequent explorers. The medieval value of finitude gave way to a desire for reaching the infinite.

The old model being uncongenial to the Renaissance, it is hardly a coincidence that precisely at this time the foundations were laid for the new. It is true that scientific factors – the work of men like Copernicus, Kepler, Galileo, Newton, and others – were in the end decisive. But it is equally clear that extra-scientific elements like religious beliefs and social and cultural values played their part. Poets, philosophers and other non-scientists had spoken of a dynamic, sun-centred world well before Copernicus. Had there been no worldview change, it is doubtful that the shift from old to new would have occurred at this time. After all, the old model was still functioning. Based on a good deal of observation and mathematics, it accounted for the observed phenomena and served to predict eclipses. I am told that it can be used even for shooting rockets to the moon. True, it was not the most efficient model. Over the two thousand years of its rule many adjustments had been necessary, and as a result it had become cumbersome. But as long as trust in the paradigm remained, the anomalies were taken in stride. It was only when a worldview change took place that this tolerance ended, and a paradigm shift occurred.

Here then is the moral of the story: If we want to demonstrate to students the role of worldview in paradigm shifts, we must combine the teaching of science as such with that of its history. A historical approach to the cosmological revolution illustrates, as we saw, that worldview has much to do not only with the acceptance of a paradigm, but also with its lifespan and ultimate demise. May we not envisage a similar development in connection with other paradigms, such as Darwinism? The acceptance of Darwinism was influenced by the nineteenth-century belief in automatic progress, with Darwin's theory serving, among other things, as a scientific confirmation of that belief. The postmodern age, however, is no longer convinced that things are bound to improve, and in the long run this far more pessimistic mindset is bound to have its effect on scientific theory. For all we know, evolution may be replaced by its opposite, namely devolution.

As I said, all this is good news for those who struggle with the exorbitant claims of modern scientism. A warning is necessary, however. Acknowledgement of the subjective element in science and of the provisional nature of paradigms should not lead to subjective relativism. Nor does it have to. I will come back to this later. At this point I want to draw attention to the fact that the same data can accommodate very

different conclusions. A good example is again the seventeenth-century cosmological revolution. In the earth- and sun-centred paradigms we have models that are each other's virtual opposites, yet neither is a simple product of the scientists' imagination. Both are solidly based on observation and mathematical reasoning, and both "work." Apparently creation is rich enough to allow for different and even opposing models which nevertheless account for a good many of the observed phenomena.

No one has described this phenomenon better than C.S. Lewis. I will quote his description. Having told his readers that we should respect all models but idolize none, he continues:

> No Model is a catalogue of ultimate realities, and none is a mere fancy. Each is a serious attempt to get in all the phenomena known at a given period, and each succeeds in getting in a great many. But also, no less surely, each reflects the prevalent psychology of an age almost as much as it reflects the state of that age's knowledge. Hardly any battery of new facts could have persuaded a Greek that the universe had an attribute so repugnant to them as infinity; hardly any such battery could persuade a modern that it is hierarchical.
>
> It is not impossible that our own Model [Darwinism] will die a violent death, ruthlessly smashed by an unprovoked assault of new facts…. But I think it is more likely to change when, and because, far-reaching changes in the mental temper of our descendents demand that it should. The new Model will not be set up without evidence, but the evidence will turn up when the inner need for it becomes sufficiently great. It will be true evidence. *But nature gives most of her evidence in answer to the questions we ask her. Here, as in the courts, the character of the evidence depends on the shape of the examination, and a good cross-examiner can do wonders. He will not indeed elicit falsehoods from an honest witness. But, in relation to the total truth in the witness's mind, the structure of the examination is like a stencil. It determines how much of that total truth will appear and what pattern it will suggest* (italics added).
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> (C. S. Lewis, *The Discarded Image,* pp. 222f.)

3. Conclusion

As I said at the beginning, I hope that we will decide at this conference to look for ways and means of incorporating the new understanding of the nature of science (and of the role of the prevailing theory of knowledge) into the lesson plans and the curricula of our schools. With this in mind I make a few additional comments. Because of the need for brevity, I cannot work them out as fully as I would have liked. Time will probably be lacking to present all of them at the conference even in their abbreviated form. I suggest therefore that this section be read in advance and that the points serve as topics for discussion.

(1) In Reformed schools science must be treated with great seriousness. Students must learn that it is one of God's great gifts to humankind – witness, among other things, its astonishing effects in technology and medicine. The study of science also shows us the Creator's majesty and omnipotence. God's omnipotence is evident both in the macro- and the micro-cosmos, and this must be illustrated. As for showing his glory in the macro-cosmos, some teaching of astronomy would be very much to the point at all levels. Students must also learn to marvel at the fact that we can understand so much of the universe. Einstein once said: "The most incomprehensible thing about the universe is that it is comprehensible." That the cosmos obeys mathematical laws which are understandable to man is one of the arguments that the world cannot be the result of chance.

(2) In preparing students specifically for the encounter with Darwinism, we can and should make use of findings of the young-earth creationist and ID movements. We must not do so uncritically, however. In young-earth creationism there is a tendency to underestimate the persuasiveness of the claims of Darwinism, and I fear that students who have been taught that the creation-science approach answers every possible question will have a rude awakening when they enter college or university. If in our schools we do make use of creation-science publications, videos, etcetera, we should make sure to acquaint ourselves also with the works of Christian scientists who seriously question the approach. We must further keep in mind that "creation-science," instead of explicitly teaching the limitations of science, appears to hold to the modernist idea that if properly used, the scientific method leads to absolute truth.[3]

The ID movement is less ambitious. Instead of promising to demonstrate the truth of the biblical account of creation, ID scientists try to prove, as we saw, that the order and complexity of the universe suggest design, rather than mere random processes. There are problems, however. One of them is that ID arguments are being used as proof of the existence of God. This is unfortunate, for as satirical pieces in the secular press have reminded us, the God of Intelligent Design is not necessarily the God of the Bible. By mentioning this I am not suggesting that we should ignore the ID arguments. But students must be told that these arguments serve at most as a challenge to a materialistic Darwinism; not that they can prove the existence of God.

We should also be aware of the danger of a "God-of-the-gaps" approach. All too often Christians have tried to reserve a place for supernatural intervention in areas that current scientific understanding left unexplained, only to find that at a later date science could account for the phenomenon in question after all.[4] This use of the "God hypothesis" to cover temporary scientific ignorance has done Christianity a lot of harm. I fear that the ID movement runs the risk of committing the same error by speaking of *scientific evidence* of design (and therefore, by implication, of a designer). I suggest that, rather than trying to protect our students by using this type of argument, we simply remind them that scientific theories are provisional things, and that history knows of many cases where they are modified or discarded altogether. To say, as some ideologues do, that evolution is "a fact" is plain nonsense. No scientific theory can be declared true for all time. And therefore, in the words of a modern physicist, "to hitch a religious philosophy to a contemporary science is a sure route to its obsolescence."

To prevent misunderstanding, the foregoing warning against the ID movement does not imply a rejection of the ancient Argument from Design. Design and purposefulness in creation are abundantly clear. Scripture reminds us of this, and the argument has again been strengthened, as we saw, with the discovery of the fine-tuning of the universe. The danger I am concerned with is that of using divine intervention as a scientific hypothesis.

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[3]While working on this paper I received a letter I from a colleague who commented that there is a tendency among us to idolize the creation-science approach and hold it up as "Reformed doctrine." Much of its appeal lies in the glossy material which shows the beauty of God's creation; but the fact that acceptance of Genesis 1 - 3 is a matter of faith, rather than "scientific evidence," is overlooked. Creation-science, he remarks, is also frequently used to make Darwinism look 'stupid,' something we can chuckle about, which does nothing to prepare our students for what they will meet in their studies at secular institutions.

[4] A famous example is Newton's attempt to provide scientific evidence of God's providence by concluding that repeated divine intervention was needed to secure the stability of planetary orbits. Less than a hundred years later, however, the French mathematician and physicist Laplace was able to prove that the irregularities in question were self-correcting, so that "the God hypothesis" was no longer necessary.

(3) Theories, we saw, are provisional and temporary. Even so, they do serve their turn. This too must be emphasized. In teaching the subjective element in science and other knowledge we run the risk, especially in this postmodern age, of leaving students with the impression that there is no truth, that all things are relative. To avoid this, it is essential that we always speak of science as God's gift and show that it yields reliable truth – witness again its results in science-based technology, modern medicine, and so on. And also when no such results are available, there are safeguards against arbitrariness. They include the facts that scientific work is subject to peer review, that theories should be testable, and that they can be evaluated by the degree of their predictive and explanatory power. There is also the fact, which I already mentioned, that nature can accommodate different and even opposing theories which nevertheless work. In short, we must be sure to show students that reliable knowledge can be and is being found, in science as in other fields, in spite of the subjective element in all knowing. But at the same time they must be reminded that we remain creatures; that we can't know as God knows. For these reasons they must learn, as Lewis pointed out, to respect all scientific theories but to idolize none.

(4) At all times it will be necessary to distinguish between science as such and the reductionistic, materialistic system that masquerades as science. Students should realize that science is limited to what can be observed, counted, and measured; that it has nothing whatsoever to say about the invisible and non-measurable. (This implies, of course, that we in turn abstain from attempting to "prove" God's existence by means of the scientific method.)

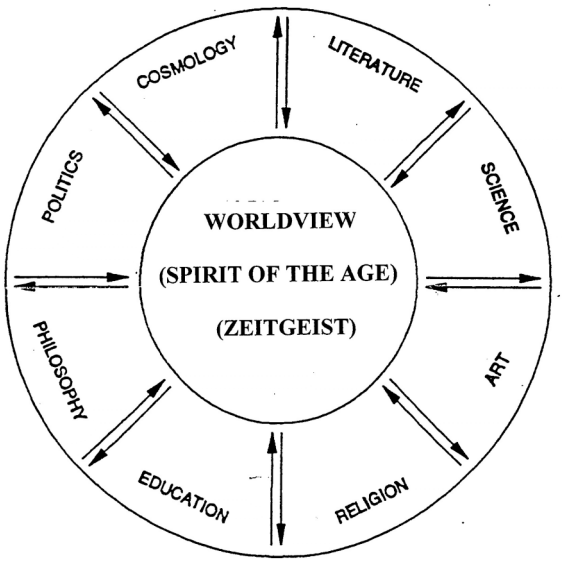
(5) In view of the fact that theories are provisional and can no longer be seen as replicas of the external world, the question could be asked if we can perhaps accept Darwin's theory, as long as we reject the ideological system built around it. Many Christians, scientists and others, have said "yes" to that question. Among them are men like C.S. Lewis, Pope John Paul II, and Francis Collins, the head of the Human Genome Project and author of the bestseller *The Language of God: A Scientist Presents Evidence for Belief* (2006). These men are theistic evolutionists. They accept the process outlined by neo-Darwinism but posit God as the final cause. John Paul II, for example, stated that he would not agree to a materialistic or reductionistic view which excludes all intelligent design or divine intervention, and he also insisted that believers must hold that the human soul is directly created by God. But if these conditions were met, believers were free to affirm that man had evolved from earlier forms of animal life.

The problem, however, is that one cannot totally divorce Darwin's theory from the ideology derived from it. The theory is materialistic and atheistic at the core. Darwin refused to consider the idea of theistic evolution; the process was to be absolutely mechanistic, unguided, naturalistic. And he himself already concluded that his theory had repercussions for all of life. He therefore questioned, for example, the Christian habit of helping the weak, since that interfered with the survival of the fittest. Hitler followed him here, as did others. Indeed, Darwin (with men like Marx, Nietzsche, and Freud) has done much to establish the post- and anti-Christian era. His ideology is a major source of today's spirit of moral relativism; it has fundamentally changed the West's view of man, nature, and the supernatural; it is at the basis of the new paganism and the nihilism that plagues what used to be western Christendom; and it has destroyed the belief that human beings can find truth.[5] It is clear, moreover, that in practice it appears to be very difficult

[5] The only ground for our certainty that we can find reliable truth is that we are made in God's image. For those who hold that man and the universe are products of matter and chance, there is no basis whatsoever for belief in truth. "Truth" can at most be something that "works" and conveys power at a particular moment. Materialism, naturalism, atheistic evolutionism, and all –isms derived from them, therefore cut off the branch on which they are sitting: their adherents can place no trust in the theories' intrinsic truth. Darwin already had an inkling of this, witness his statement to a friend that he could not help entertaining a "horrid

to live with this theory as simply theory, rather than fact – witness the Pope' statement that Christians are free to believe that man evolved from the animal. Such a view can only imply, among other things, that the first chapters of Genesis can no longer be read as historical. For all these reasons I am convinced that we must continue to reject the theory, even though admitting that it has considerable explanatory power and therefore serves well as a scientific model.

(6) We should not hesitate to admit that questions remain for Christians – but we must also point to the fact that questions remain for the opposing camp. They have not been able to prove macro-evolution – that is, the change from once species to another. When cross-breeding occurs, the offspring is infertile or there is a reversion to earlier forms. Evolutionists have also not been able to explain why, if intellect helps the survival of the fittest, only one species in several billions has developed it. Nor are they able to account for the origin of life, or for the mathematical structure of the universe, or for the ability of man to understand that structure – and we could go on. We must also constantly keep in mind that evolution had not been proven beyond doubt. As evolutionists themselves admit, one anomaly (for example the discovery of human fossils with fossils from dinosaurs) would refute the theory, or at least cause it to be modified beyond recognition.



(7) Students should further be reminded that the method followed by the sciences is not the only way to knowledge. The seventeenth-century mathematician Blaise Pascal expressed this truth in the well-known statement, "The heart has its reasons of which reason does not know." Pascal referred, I believe, to intuitive certainties, perhaps also to the certainty of faith. Martin Buber, a twentieth-century existentialist philosopher, has expanded on Pascal's insight by referring to interpersonal knowledge. He distinguishes between an "I-It" and an "I-Thou" relationship. In the first case we treat the object of our study as a "thing" – that is, as something to be analyzed, manipulated, and controlled, much in the way of modern science. In the second case we approach it as a "Thou," a person, who addresses us and opens up to us, and to whom we respond. The second approach yields knowledge that is different from but no less certain than the scientific kind, and is the only means to get to know a fellow human being. It is also the only means to get to know God. Religious scepticism threatens if we forget that faith is not just assent to true doctrine, but also, and above all, trust in and commitment to a Person, who has committed himself to us, speaks to us, and asks for our response. Knowledge here depends on participation and trust, rather than observation and analysis.

(8) In view of the importance of worldview in theories of knowledge and in scientific paradigms, I suggest that our schools give attention to the role and historical succession of worldviews, at least at the secondary level. Knowledge of worldview is essential if we do not want our students to become the helpless victims of whatever secular doctrine prevails. An awareness of the role and succession of worldviews is also helpful

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doubt" as to the trustworthiness of metaphysical ideas. "Would any one," he asked, "trust in the convictions of a monkey's mind, if there are any convictions in such a mind?"

for understanding subjects such as literature, music, the arts, history, and philosophy, as well as the origin and nature of scientific paradigms. My experience as a teacher at both the secondary and the post-secondary level is that students find this worldview approach enlightening. It helps them to understand the past as well as their own time. Because the prevailing worldview serves as "spirit of the age" (*Zeitgeist*), it also enables them to see the *unity* of a culture at any given time. I hope to illustrate this more fully in my workshop.

(9) Closely connected with the previous point is Christian apologetics, another subject that I believe we should consider introducing at the senior levels. I hope to deal with this topic in my workshop as well. At this point I mention only the following: Our main concern should be with apologetics as a defensive strategy, a means of helping students deal with the attacks upon the faith by a materialistic scientism and other secular forces. Apologetics is to be used not only as a defensive strategy, however, but also as an offensive one, namely for the propagation of the faith. True, we should not assume that it can "prove" Christianity. As John Calvin already warned, arguments in defence of the credibility of Christianity cannot by themselves lead to faith in revelation. Only the Holy Spirit can do that. Yet arguments from nature, history, logic, and human experience are to be used. In addition to encouraging wavering believers, they may cause an unbeliever to consider the possible truth of Christianity. In the latter case they may serve, therefore, as a kind of pre-evangelism, to be followed by evangelism proper, namely the teaching and preaching of God's revelation in Scripture.

(10) Apologetics, then, is a means of both protecting our own members and of caring for the unbelieving neighbour. The fact that we have a task with respect to the world is something that as Reformed believers, also as Reformed teachers, we have perhaps failed to stress sufficiently in the past. As to our responsibility as educators, I am not suggesting that we tell students to go out and change the world. That is not their calling. They must be made aware, however, of the world's needs and of their task to help fill these needs. This means that they must always be prepared to answer those who ask them to give a reason for the hope they have (1 Pet. 3:15). It also means that they realize the need for evangelists, theologians, apologists, for Christian scientists, philosophers, lawyers, politicians, social workers, and so on. The ultimate goal of our work is to prepare our students for their task of serving their God (Article 12 B.C.), and to do so in all areas of life. This is a matter of obedience and also of much training. As Daniel Vander Ark reminds us in his paper, it is essential that the Christian community – parents, teachers, pastors, and indeed the entire congregation – set an example for our youth in *living* the faith.

(11) Finally, a brief comment on resources. There is a large and ever-expanding amount of printed and digital material available for those who wish to study the topics discussed in this paper in greater detail. With respect to our main topic, I alert you also to the resources to be found at the Pascal Centre of Redeemer University College in Ancaster, Ontario, which was established for the express purpose of studying the relationship between faith and science. A request for information should yield good results.