

Avondale University

ResearchOnline@Avondale

---

Science and Mathematics Papers and Journal  
Articles

School of Science and Mathematics

---

1999

## Integrating Science and Scripture: The Case of Robert Boyle

Kevin C. de Berg

Avondale College, [kevin.deberg@avondale.edu.au](mailto:kevin.deberg@avondale.edu.au)

Follow this and additional works at: [https://research.avondale.edu.au/sci\\_math\\_papers](https://research.avondale.edu.au/sci_math_papers)



Part of the [Science and Mathematics Education Commons](#)

---

### Recommended Citation

de Berg, K. C. (1999). Integrating science and scripture: The case of Robert Boyle. In H. Rasi (Ed.), *Christ in the Classroom*. Paper presented at the International Faith and Learning Seminar, Andrews University, Berrien Spring, Michigan, USA (pp. 81-95). Silver Spring, MD: Institute for Christian Teaching.

This Conference Proceeding is brought to you for free and open access by the School of Science and Mathematics at ResearchOnline@Avondale. It has been accepted for inclusion in Science and Mathematics Papers and Journal Articles by an authorized administrator of ResearchOnline@Avondale. For more information, please contact [alicia.starr@avondale.edu.au](mailto:alicia.starr@avondale.edu.au).

Institute For Christian Teaching  
Education Department of Seventh-day Adventists

INTEGRATING SCIENCE AND SCRIPTURE  
THE CASE OF ROBERT BOYLE

By

**Kevin C. de Berg**  
Avondale College, Australia

371-99 Institute for Christian Teaching  
12501 Old Columbia Pike  
Silver Spring, MD 20904 USA

Prepared for the  
24<sup>th</sup> International Faith and Learning Seminar  
Held at  
Andrews University, Berrien Spring, Michigan, U.S.A.  
June 20-July 2, 1999

## Introduction

Robert Boyle (1627-1692) was born to rich land-owning parents in Ireland but spent most of his life in England during a time of great civil and religious unrest. The civil war between Cromwell's parliamentary Roundheads and the Royalist army under Charles I brought political unrest and the continuing feud between Protestant and Catholic and between the estimated two hundred different opinions in Protestant thought brought religious unrest. In addition, the great plague of London was taking countless lives forcing many to move out of the city into the country. Boyle was educated largely by private tutors and whilst overseas records his early conversion to Christianity. Boyle was a prolific author with nearly half his published works being in the area of theology. He is more popularly known, however, for his scientific writing, particularly Boyle's Law, and has become known as the father of modern chemistry. He was one of the founders of the Royal Society under Charles II and refused academic posts at Oxford and ordination to the Anglican priesthood, preferring to be known as a lay theologian and a Christian Virtuoso (one skilled in the reading and interpretation of Scripture and experimental philosophy). The significance of Boyle's life and writings to issues in faith and learning can be summarized in a sermon preached at Boyle's funeral in 1692 by Bishop Burnet (1692,p.8) who characterized him as one of those individuals who

have directed all their inquiries into nature to the Honor of its great Maker: And have joined two things, that how much so ever they may seem related, yet have been found so seldom together, that the World has been tempted to think them inconsistent; A constant looking into Nature, and yet a more constant study of Religious, and a Directing and Improving of the one by the other.

Boyle was well placed to make such a contribution possessing a deep knowledge of Scripture including its original languages of Hebrew, Greek, Aramaic, and Chaldean and possessing the skill of an experimental philosopher at the dawn of modern science.

In this paper I will address Boyle's understanding of Scripture and Nature and seek to outline those features of his philosophy, which enable him to integrate religious and scientific activity in a way that was faithful to both Religion and Science. I will depend predominantly on primary source material for this and on a recently published work by Jan Wojcik entitled, "Robert Boyle and the Limits of Reason" (1997). This paper is also significant from the point of view of post-modernism's criticism of Science, which, while making some legitimate criticism of the way Science has fragmented out thinking through scientism, often forgets about the kinds of legitimate problems that Science has been able to solve for humankind. By looking forwards into the modern era from the past one can balance the post-modern view of Science, which looks backwards into the modern era from the present. I will conclude the paper with a discussion on how Boyle's philosophy might help us in the current origins debate and in issues related to chemistry curricular in colleges and universities.

### Boyle's Understanding of Scripture

Much of Boyle's understanding of Holy Scripture appears in a paper published in 1661 entitled, "Some Considerations touching the Style of the Holy Scriptures". This appears as a lengthy response to the vociferous debates within the religious community about predestination, the wearing of vestments, and the role of reason in interpreting Scripture; to the onslaught by atheist within and without academia and government who regarded Scripture as lacking consistency and literary style and finally; to some churchmen who had grown slack in their study of the Bible because of its uninteresting style. The major features of Boyle's position on Holy Scriptures are:-

1. *Scripture is a temple for worship not an arsenal for war.* Boyle (1661,p.277) says,

I use the Scripture, not as an arsenal, to be restored to only for arms and weapons to defend this party, or defeat its enemies, but as a matchless temple, where I delight to be, to contemplate the beauty, the symmetry, and the magnificence of the structure, and to increase my awe, and excite my devotion to the Deity there preached and adored.

Boyle was appalled at the level of bitter debate between branches of the Christian Church on matters relating to a particular interpretation of a text of Scripture and the fact that people would go to war for the cause of that interpretation. Reverence for Scripture rather than for one's particular viewpoint was important to Boyle.

2. *The Bible is not an oration of God to men but a collection of composures of very different sorts written over a long period of time primarily to those to whom they were first addressed and to their contemporaries.* Boyle was here addressing the criticism that the Bible contained crude sayings of a type not fit for public consumption. He emphasized that such sayings would not have been regarded as crude by the people to whom the book was originally addressed and that these words were not dictated by God but formulated in a particular context by men moved by the Holy Spirit. The variety of compositions in Scripture was necessary, according to Boyle, to meet the needs of a variety of people down through the ages who would read the Scriptures. In spite of the fact that the Bible was written primarily for its first audience Boyle believed that the Scriptures applied to people of all generations and contained some passages particularly pertinent to the future age.

3. *We should obtain our opinions from Scripture rather than take them to Scripture since Scripture is the best expositor of itself.* Although we all come to a text with presuppositions, Boyle's (1661, pp.266-267) major concern here was with the subtle way we often twist Scripture to suit our needs.

I am sorry I can add on this occasion that different texts are made to appear more dark, than otherwise they would, by the glosses and interpretations of some that pretend to expound them. We need to distinguish between the plain sense of the text itself and the metaphysical subtleties given to it. It is not oftentimes so much what the Scripture says, as what some men persuade others it says that makes it seem obscure.

Boyle did not dispute that some texts were obscure and that good commentaries and history texts were invaluable for enlightening a text, but he was concerned with the tendency of expositors to impose their ideas on Scripture and make the Scripture say more subtle things than it was designed to say.

4. *The Bible would not appear so obscure in parts if the reader could read and understand the text in its original idiom.* Boyle mentions the particular difficulty in translating Hebrew phrases into English or Latin phrases. In authorized versions words have been translated rather than idioms or phrases which makes some texts particularly obscure. The other difficulty is that some Hebrew expressions are just not translatable and no extant Hebrew texts are available to help decipher the kinds of expressions used. Boyle encourages further studies into the Hebrew language and its translation to rectify the problem.

5. *Many ideas in the New Testament are based upon ideas established in the Old Testament.* "There is scarce a page of the New Testament to the better understanding of which the study of the Old Testament is not either absolutely necessary, or at least highly useful" (Boyle, 1661, p.291).

6. *A text of Scripture is often not understood on a first or second reading but on third or fourth reading the meaning often emerges.* Boyle agreed that some parts of Scripture appear to have no useful application to the Christian life when first confronted by a reader but with experience and the passage of time the text often becomes 'pregnant' with meaning. Despite the great variety of books in the Bible Boyle believed that all the constituent books of Scripture would prove a necessary part of the Canon.

7. *Scripture makes use of logical and popular arguments to an extent consistent with a due latitude for the exercise of faith.* Boyle argues that Paul uses logical argument as solidly as does Aristotle but in some parts if Scripture popular argument is more effective than logical argument. This is because Scripture arguments are often designed to convince believers rather than persuade nonbelievers. "Though there be scarce anything more groundless and unstable than popular opinions and persuasions, yet a wise teacher neglects them not, and may sometimes makes much use of them as to draw thence arguments more operative than the most accurate syllogism logic could devise" (Boyle, 1661,p.274).

8. *Scripture is designed to teach us divinity rather than natural philosophy.* Boyle regarded Scripture as primarily instructing us in relation to grace, love, virtue and salvation rather than in relation to the properties of Nature and references to Nature in Scripture are "spoken of rather in a popular than accurate manner" (Boyle, 1663,p.19) with the possible exception of the Genesis account of creation although Boyle specified ever here that the Genesis account was for 'spiritual ends' rather than 'natural ends' (Boyle, 1686,p.189). In another source (Boyle, 1674,p.11), he stated that he did not agree with the 'opinion and practice of those that would deduce particular theorems of natural philosophy from this or that expression of a book, that seems rather designed to instruct us about spiritual than corporeal things".

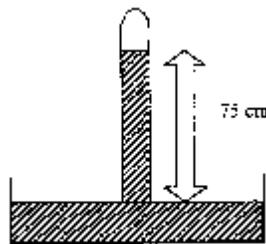
It is interesting to note that as Boyle discusses his understanding of scripture he often uses analogies from the natural world to clarify his meaning. For example, in answering the objection related to the fact that Scripture records ungodly sayings and actions, he recalls that "just as parts of Nature that resemble a diseased part are medical for that part or infirmity, so the record of vicious persons may prove an antidote to vices within"(Boyle, 1661,p.261). Another example relates to the obscure passages of Scripture. "As the moon for all those darker parts we call her spots, gives us a much greater light than the stars, that seem all luminous; so will the Scripture, for all its obscure passages, afford the Christian more light than the brightest human authors"(Boyle, 1661,p.270). Some of the analogies would not be appropriate today in the light of modern Science but in Boyle's day they were particularly pertinent. Boyle's reverence for Scripture is attested by the fact that he gave large sums of money toward its dissemination and translation into other languages and it is said that he could recite the New Testament and significant portions of the Old Testament from memory.

### Boyle's Understanding of Nature

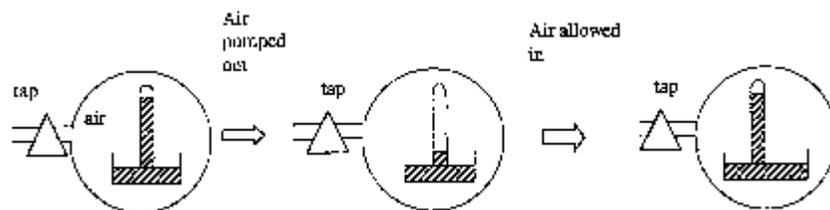
In a "Free Inquiry into the received Notion of Nature" and the "usefulness of Experimental nature Philosophy", Boyle particularly addresses Aristotelianism which was one of the prevailing views of Nature current in the seventeenth century. Aristotelianism viewed nature as eternal and so there was no need for a Creator God. According to Jan Wojcik (1997,p.124), "substantial forms were invoked to explain the natural motions of objects, which were hence endowed with their own source or cause of activity, and this activity was conceived as each body's attempt to fulfill its own nature, an activity that could easily be conceived as the having of intuitions and the exercising of volition". Thus heavy objects fall to reach their natural place of abode and mercury rising in an evacuated capillary tube because it abhors a vacuum. Boyle was extremely critical of this defied view of Nature because any observed

behavior in Nature could be ascribed to its natural tendency and he considered such a view as "injurious to the glory of God and a great impediment to the solid and useful discovery of his works" (Boyle, 1686, p. 163). Boyle, on the other hand, considers Nature to have been made of matter and motion according to certain laws by the Creator at the beginning of time and that the job of the natural philosopher was to discover the nature of these laws through experiment. This exercise, according to Boyle, was more likely to bring glory and adoration to God because of his works. In comparison, Boyle describes the followers of Aristotle as using "occult qualities, empty names, to describe Nature and they content themselves to tell us, that Nature does such a thing, because it was fit for her so to do; but they endeavor not to make intelligible to us what they mean by this Nature" (Boyle, 1663, p. 38). Boyle believed that the provision of physical reasons based on matter and motion was likely to prove more intelligible.

An example of the difference between Aristotle and Boyle can be seen in the explanations given for the rise of mercury in a barometer tube. If a filled tube of mercury is up-ended in a bowl of mercury the mercury stays suspended in the tube to a height of about 75 centimeters above the level in the bowl at sea level. All the mercury does not fall out of the tube as one might expect.



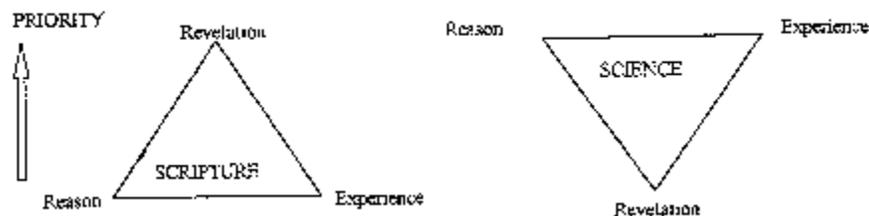
The Aristotelian Schoolmen explained the suspension of mercury in the tube as due to Nature abhorring a vacuum and attempting to fill any possible vacuum space with matter; in this case by mercury. Boyle sought a physical explanation. Putting the apparatus in a vacuum chamber he slowly pumped out the air of the chamber and observed the mercury in the tube to fall. On re-admitting air to the chamber the mercury rose again. A physical explanation based on the influence of air pressure, rather than some mystical drive in Nature such as that which abhors a vacuum, proved much more intelligible and successful. Because the mercury rose in the tube due to the outside air pressure according to Boyle, it became possible to use such apparatus to measure air pressure at different heights and positions on the globe and under different weather conditions.



However, not all churchmen agreed with Boyle's emphasis on experiment to discover Nature's behavior. It was commonly believed that such inquiries into Nature would lead to atheism because explanations could be given without reference to God. It must be remembered the Aristotelianism had served the church well to this point in time because it provided an explanation for transubstantiation and for the idea of the immortal soul. Boyle argued, however, that study of Nature by experiment would lead to laws of a kind that would demonstrate the goodness, wisdom, and power of God. Why, Boyle argued, would God the Creator "give men the opportunity every seventh day to contemplate God in his works" (Boyle, 1663,p.34) if this was going to lead to atheism? Experimental philosophy became for Boyle a divine duty because he regarded Nature, like Scripture, as a temple where "man sure must be the priest, ordained to celebrate divine service not only in to, but for it" (Boyle, 1663p.32). The experimental philosophy, combined with the mathematization of the laws of Nature, became the hallmark of modern Science and has led to the greatest technological achievements in our history. It has been a pity that such achievements seem to have been advanced at the expense of religious commitment, a situation that would have been deplored by Boyle. On what basis then, did Boyle integrate his view of Nature and his view of Scripture?

### Boyle's Integrating theme for Science and Scripture

Boyle believed that Science, as the Nature, and Scripture, as the study of the ways of God, have a common epistemology, namely, one based on *revelation, reason, and experience*. But what does Boyle mean by revelation, reason, and experience? Knowledge communicated by revelation, according to Boyle, could not have been discovered by the use of reason or experience alone. Thus the nature of the infinite God and the prophetic portions of Scripture would fall into this category. By experience Boyle was particularly referring to experimental philosophy in regard to Nature or, for example, the recorded experiences of the apostles in Scripture. Experience thus involves providing evidence for a phenomenon. Reason could refer to common sense reasoning, logical-deductive reasoning, or abstract reasoning. Boyle was adamant that all three elements, *revelation, reason, and experience*, were required more or less in knowledge generation although the relative contributions of each would change. Abstract reasoning without the benefit of experimental checks would prove fruitless, for example, and experiment without the benefit of deductive reasoning would prove ineffectual. Revelation also needed to be guided by reason if it wasn't going to lead to fanaticism. Boyle was clear that the relative contributions of *revelation, reason, and experience* were different for Science and Scripture. The relative contributions could be illustrated as follows.



Whilst revelation plays a dominant role in the major themes of Scripture it plays only a minimal role in the study of Nature. Reason and experience together are the major contributions to the generation of knowledge in Science. Integration of Scripture and Science involves overlapping the triangles to lead to the coexistence of two different forms of knowledge grounded, however, in the same epistemological

elements but with different relative contributions. Integration does not force Science to adopt the role of Scripture or Scripture to adopt the role of Science in a one-to-one correspondence. Each is allowed to exist on its own term but in a way that contributes to a more complete view of reality. Thus, Boyle



always insisted that Scripture's primary focus was spiritual, to do with personal salvation, virtue, and grace whereas Science's primary focus was Nature as matter and motion and its laws. However, both were essential for achieving an integrated view of reality.

It is important to realize, as did Boyle, that the three elements of epistemology do not always lead to the same conclusion. Experience as recorded in the gospels and the writings of Paul confirm the resurrection of Christ although common sense reasoning would suggest it to be an impossible event. Experiment confirms the wave/particle duality of matter and light but common sense reasoning finds it difficult to grapple with this property. Experiment confirms that a 10 kg ball falls to the ground in the same time as a 1 kg ball whereas common sense reasoning would have suggested otherwise. Revelation outlines the eternal goodness of an infinite God that is prepared to die for his creation but reason alone could not suggest the worthiness of such an act.

Boyle observed that reason itself was able to conclude that in both fields of knowledge, Science and Scripture, there existed things that were above reason but not against it (Boyle, 1681). The things above reason could be divided into three categories.

1. *The incomprehensible.* This refers to those objects or ideas which are, by nature, not able to be understood because they transcend our finite minds. The nature of the eternal God and the angels fall into this category as does the concept of infinity in Science. The concept of being able to get closer and closer to a point but never going beyond that point after an infinite number of attempts is a difficult one to get the mind around. The concept of infinity is still topical today in such fields as astrophysics (Morris, 1998).
2. *The inexplicable.* This refers to those things for which there are no apparent cause. Boyle refers here to the difficulty of explaining what holds matter together, what actually causes the human body to move once a conscious decision is made to move it, and also how human memory operates. Interestingly, although significant progress has been made in these areas, they still feature in today's scientific literature.
3. *The unsociable.* This is where two propositions which are confirmed to be truthful in themselves are contradictory. Boyle gives example of the controversy about the endless divisibility of a straight line as follows (Wojcik, 1997, p.159).

Since it is manifest, that a line of three foot, for instance, is thrice as long as a line of one foot, so that the shorter line is but the third part of the longer, it would follow, that a part of a line may contain as many parts as a whole, since each of them is divisible into infinite parts; which

seems repugnant to common sense, and to contradict one of those common notions in Euclid, whereupon geometry itself is built.

Boyle also refers to the free will/determinism debate in the church as belonging in this category because of the inherent apparent contradictions. How, for example, can God offer free will if he knows in advance what will happen?

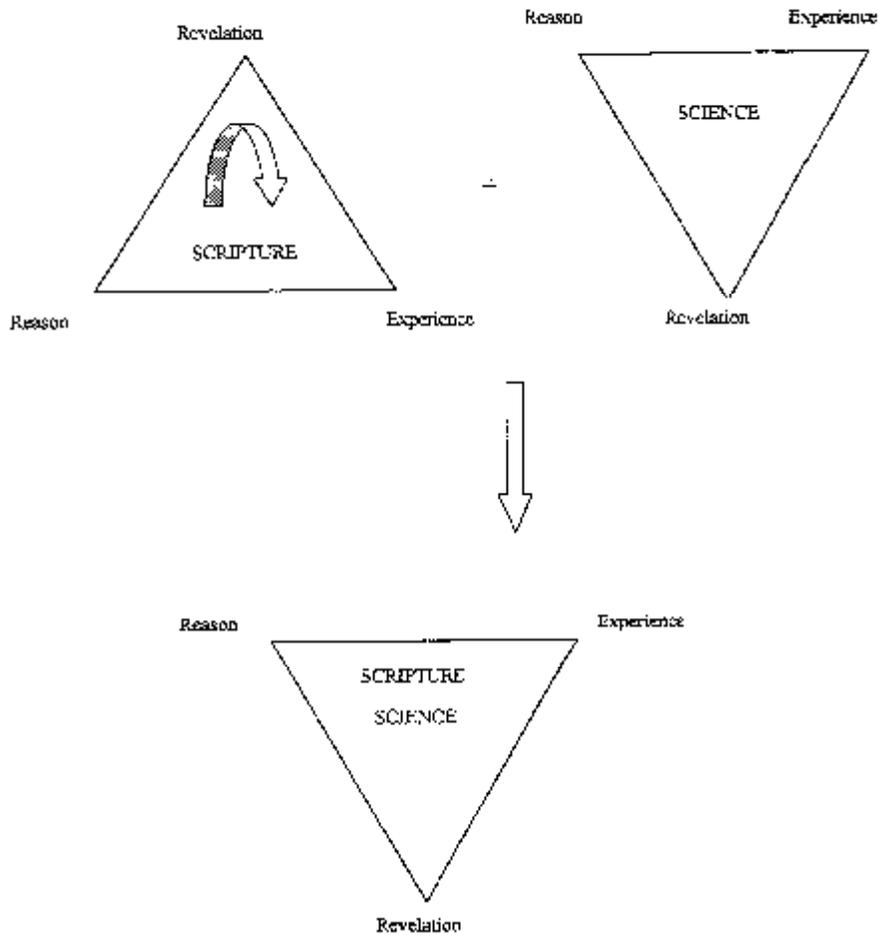
Boyle was not at all perturbed by the existence of things above reason because this was somewhat expected where finite beings are trying to understand the infinite. In fact, he calls them 'privileged things' in the following statement (Boyle, 1681,p.409). "There may be things, that surpass our reason, at least so far, that they are not to be judged of by the same measures and rules, by which man are wont to judge of ordinary things; for which reason I shall often give them one common name, calling them privileged things". Both knowledge system, Science and Scripture, contain such privileged things. I would now like to show how the integration scheme gleaned from Boyle and illustrated in this section using the triangle above might help us in origins debate and the development of chemistry curricula.

### Boyle and the Origins Debate

The origins debate revolves around the fact that Scripture, particularly Genesis 1 and 2, is seen to describe origins as a creation event recently initiated by God some six to ten thousand years ago over a period of six days whereas Science describes origins naturalistically by evolution over billions of years. Clausen (1997) gives a helpful summary of the issues involved. There are some similarities between the origins debate and the heliocentric astronomy debate three hundred years ago. It should be understood the Boyle, and before him Galileo, had to wrestle with the implications of Copernicans Astronomy (earth moving around the sun) in the light of such scriptures as Psalm 93:1 describing, so it seemed, a stationary earth. Boyle and Galileo, avowed Copernicans with a strong reverence for Scripture, came to regard the scriptural statement as not a scientific one but rather a general statement describing a state of stability rather than the state of motion of the planet earth. In general they regarded Scripture as our source of knowledge for salvation and grace and Science as our source of the knowledge of Nature. However, because there was no intelligible scientific model of origins in the seventeenth century, Boyle and Galileo relied upon the Genesis account as being the only reliable account available although Boyle specified even here as previously mentioned that the Genesis account was for 'spiritual ends' rather than 'natural ends' (Boyle, 1686,p.189).

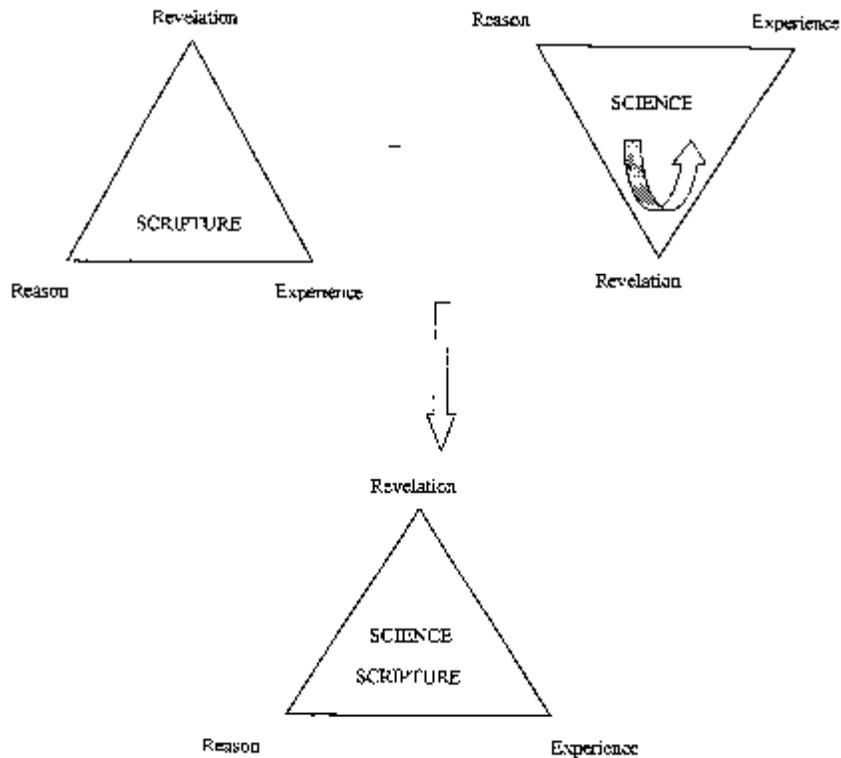
There appears to have been at least three approaches to dealing with the origins issue. The first, which I am calling the Conformist A approach, tries to make Scripture conform to the modern scientific description of origins by revealing the Scripture triangle so it matches one-to-one with the Science triangle. It should be noted here that *Revelation* in the Science triangle meant predominantly revelation for Scripture for Boyle but for a modern scientist who doesn't espouse Christianity it would mean those rare flashes of insight that appear to depend neither on reason or experiment. In any case, it could be argued that Boyle's three elements of epistemology apply to modern Science and Biblical Studies as well as to seventeenth century Natural Philosophy and Religion (Canale,1999). The conformist A approach is evidenced in such attempts as making the Genesis days equivalent to thousands or billions of years in order to match the timescales. Such an attempt really destroys the significance of 'days' in the Genesis account in its relationship to the Sabbath and tries to impose scientific descriptors (millions/billions of years) upon theological descriptors (days). This approach has not, therefore, proved that helpful in resolving the issues. The Conformist A approach can be illustrated as follows.

## CONFORMIST A



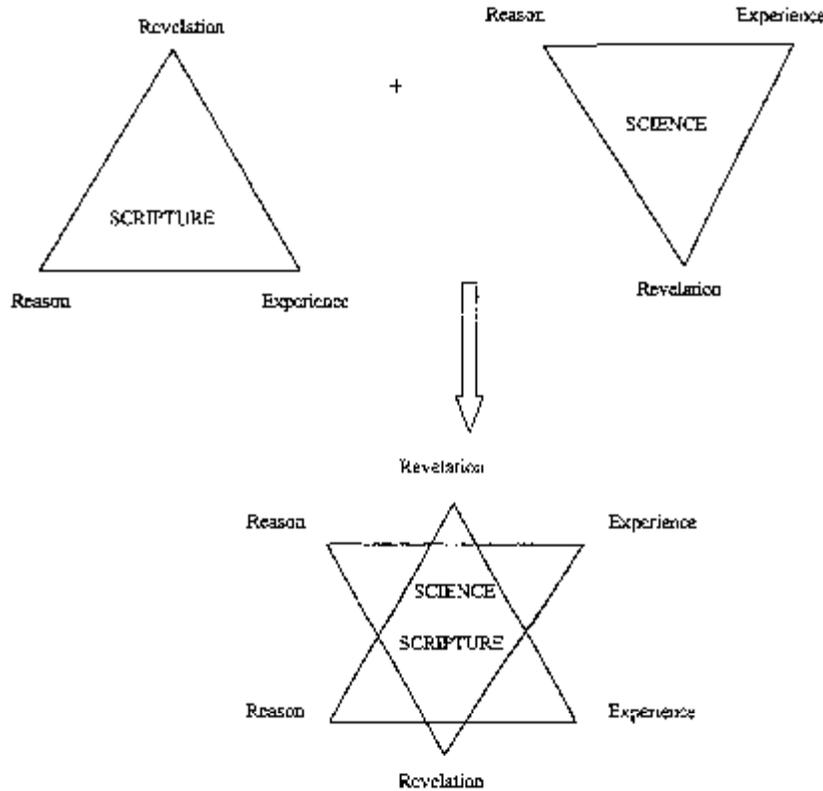
The second approach, which I am calling the Conformist B approach, tries to make Science conform to the Scriptural account of origins by reversing the Science triangle so it matches one-to-one with the Scripture triangle. Some interpreters understand Genesis to teach a young earth and universe of the order of six to ten thousand years old and in order to accommodate this have suggested that the speed of light has been slowing down. If this was true it is suggested that our radioactive clocks would be overestimating timescales and it would not have taken millions of years for light to reach us from distant stars. While this is an interesting concept there is no substantial scientific evidence for it and caution in dealing with such ideas is warranted because both Science and Scripture stand to be discredited if such concepts are pushed too far while the evidence is lacking. The Conformist B approach can be illustrated as follows.

## CONFORMIST B



The third approach, advocated by Boyle, and which I am calling the Integrated Approach, allows the triangles for Scripture and Science to overlap as they are without rotation. This approach is based on a belief in the integrity of both Science and Scripture and allows each to inform us from within their own paradigms. That is, each is allowed to sing a different note to produce harmony as in a duet rather than the same note to produce unison as in a solo. Scripture is accepted as it reads in the light of our knowledge of the audience to whom it was originally addressed and the ongoing nature of inspiration for subsequent generations and Science is accepted as a genuine and productive tool for comprehending nature in the light of its capacity to correct itself as new concepts are discovered. There are times when ideas (for example, those related to origins) may have to be held in tension but more progress in informing each other's paradigm will be achieved this way compared to that outlined in the two previous approaches which attempts to distort one paradigm in order to reach agreement with the other. It is worth taking note of Boyle's observation that in relation to topics such as origins that are likely to be elements of truth beyond reason but not against reason in both Scripture and Science. The integrated Approach may be illustrated as follows.

## THE INTEGRATED APPROACH



What distinguishes human kind from the rest of the creation is its capacity to step out of itself, out of its world, to examine it; that is, its capacity to detach itself from its immediate environment to ask questions about that environment. Even though philosophers remind us that this detachment is not complete, the scientific enterprise fundamentally depends on it for generating knowledge and this detachment process has proved itself very successful in expanding our knowledge of ourselves and the world. However, human beings also need to attach themselves again to their world and Creator to form sustaining relationships and communication networks. The Genesis account in Scripture talks about their attachment in relation to God searching out Adam and Eve, our representatives, and creating a Sabbath in order to enjoy fellowship with God and his creative works. This is why Boyle regarded both the reading of Scripture and the reading of Nature as acts of worship. To make the scriptural record which is one of attachment conform to the scientific record which is one of detachment destroys the meaning of the Genesis account; and likewise making the scientific account conform to the scriptural account destroys the meaning of Science. That is, the complete self, made in the image of God, paradoxically has two components overlaid on one another in coexistence, one of attachment and one of detachment, just like God is transcendent (detached) and immanent (attached). It is in this sense that the integrated approach is consistent with the way God has revealed himself in Scripture (transcendent and immanent) and in the way humankind reflects the image of God (detached and attached).

I believe this model of Scripture and Science, developed in the light of the writings of Robert Boyle, might enable Seventh-day Adventists to make a unique contribution to Creation theology and the origins debate. This is because of the denomination's emphasis on the Sabbath. The unique contribution could possibly revolve around regarding the Sabbath as a time for integrating our detached and attached selves by examining the world God has made through the marvelous discoveries of Science in addition to spending time in communion with God and significant others. Both activities are forms of worship. The whole episode becomes one of praise, adoration, connectedness, and belonging between us, others and our God and between God and his creation. Lesslie Newbigin (1995) likens the process of attachment to that of an unfolding story. The story doesn't have the carefully prescribes and ultimately predictable definitions that characterize a process of detachment such as in Science. It unfolds over time leaving the future somewhat open but we know it ultimately brings completeness. This model of the Sabbath is more consistent with the worship model of Boyle than the apologetic model which resembles more than of an arsenal for war than a temple for worship. The integrated model of the Sabbath anticipates a concern for the environment and for relationships and addresses the concerns of writers like Palmer (1993) who emphasize the negative contribution of Science from a post-modern perspective.

### Boyle and the Chemistry Curriculum

Philosophers (Palmer, 1993) have criticized Science and Science Education for its fragmentation of the education and social agenda by almost a sole concentration on its objective or detached status at the expense of more human relationship approaches. This is a legitimate criticism but I don't think it can be solved by conformist approaches which seek to change Science into a subject with socio-political agendas. I think the integrated approach suggested in the work of Boyle offers a more hopeful future for Science Education. This approach which integrates the science paradigm with a religious/social paradigm through a coexistence which allows for the separate existence of each paradigm but wit a dialogue between the two is more likely to succeed. Interdisciplinary settings provide good examples of such an approach. As far as the chemistry curriculum is concerned the model developed by Salter Chemistry (University of York Science Education Group, 1994) in the UK approaches this integration. This curriculum is built around social/technological issues facing young people today with the chemistry introduced in a way to shed light on the issue. The important feature of the curriculum is that it doesn't water-down the chemistry content or change it into a social agenda and likewise the social agenda is not changed to accommodate the chemistry content.. The development of a similar curriculum which addresses spiritual/personal/faith issues as well is a great but important challenge. Such a curriculum would almost invariably need to address some of the historical/philosophical issues in the development of chemistry. These issues are now open for scholarly debate through the International History, Philosophy, and Science Teaching Group and their journal, Science and Education. This journal recently devoted whole editions to Science and Religion (Matthews, 1996) and to Galileo and Science Education (Matthews, 1999). These articles provide some useful ideas for inclusion in a science curriculum. A possible means of approaching a chemistry curriculum that integrates social/religious values with chemistry might be to address topics such as:-

1. *Drugs and their impact on family, social, and spiritual life.* Students would like at how drugs are made synthetically; how their structure and properties are related; and would discuss their biological chemistry once incorporated into the body. The unit could also address how behavior is related to chemistry and

what the implications are for social and spiritual well-being. The nature of addiction and detoxification could also be addressed.

2. *Clean air and social responsibility.* This unit could ask students to address the chemistry associated with the running of a motor vehicle and its impact on the environment. A cost analysis could be included and what driving habits would need to change to reduce the pollution level by x%. How is our social responsibility related to the creation story in Genesis?

3. *Chemistry and good and bad design.* This is an interesting but challenging topic. There is a beautiful example of a natural chemical factory found in the bombardier beetle discussed by Michael Behe in his book, *Darwin's Black Box* (1996). This beetle manufactures a hot chemical, which can be sprayed at predators, in a remarkable way. Students could discuss the chemistry and calculate such quantities as heat and temperature of the fluid. Some associated challenging questions could be: -What makes the design irreducibly complex? Did the design exist before the Fall and if so what could it have been used for? Was the design a result of the Fall? Is it a good design used for wrong purpose?

### Conclusion

This article has shown how Science and Scripture are built, according to Boyle, on the same epistemological features of revelation, reason, and experience but with different relative contributions from each. This gives rise to distinct and similar characteristics for Science and Scripture. Boyle argues that true integration is only achieved if these distinct characteristics are trained because only then can a true dialogue between Science and Scripture take place. This integration mirrors that of our human person and that of our Maker in that it blends that which detaches to that which attaches. It is argued that such model informs the development of science curricula, the origins debate, and Sabbath theology by focussing on worship and relationship rather than division and conflict. In this context, let Scripture sing its song; let Science sing its song; so that as they sing together we will ultimately hear the beautiful harmony of a choir.

References and Bibliography

- Behe, M.(1996). Darwin's Black Box: The Biochemical Challenge to Evolution. New York: Simon and Schuster.
- Boyle, R. (1661). Some consideration touching the style of the Holy Scriptures, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.2. Hildersheim:Georg Olms.
- Boyle, R. (1663). Some consideration touching the usefulness of Experimental Natural Philosophy, First Part, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.2. Hildersheim:Georg Olms.
- Boyle, R. (1674). The excellency of theology compared with natural philosophy, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.4. Hildersheim:Georg Olms.
- Boyle, R. (1675). Some consideration about the reconcileableness of reason and religion, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.4. Hildersheim:Georg Olms.
- Boyle, R. (1681). S discourse of things above reason, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.4. Hildersheim:Georg Olms.
- Boyle, R. (1686). A free inquiry into the vulgarly received notion of nature, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.5. Hildersheim:Georg Olms.
- Boyle, R. (1690). The Christian Virtuouse, First part, in T. Birch (Ed). (1965). The works of the Honorable Robert Boyle. Vol.5. Hildersheim:Georg Olms.
- Burnet, G. (1692). A sermon preached at the funeral of the Honorable Robert Boyle at St. Martins in the Fields. London.
- Canale, F. (1999). Reason and Revelation and the search for truth. A paper delivered at the 24<sup>th</sup> International Seminar on the Integration of Faith and Learning. Andrews University, Michigan.
- Clausen, B. (1997). An Adventist Approach to Earth origins, in H. Rasi (Ed). Christ in the Classroom, 20, pp. 379-388.
- Matthews, M. (Ed). (1999). Religious and Science Education. Science & Education, 5(2).
- Matthews, M. (Ed). (1999). Galileo and Science Education. Science & Education, 8(2).

Morris, R. (1998). *Achilles in the Quantum Universe-The definitive history of Infinity*. London: Souvenir Press.

Newbigin, L. (1995). *Proper Confidence*. Grand Rapids: W. B.Eerdmans.

Palmer, P. J. (1993). *To know as we are known*. New York: Harper Collins.

University of York Science Education Group. (1994). *Salter's Advanced Chemistry*. Oxford: Heinemann Educational Publishers.

Wojcik, J. (1997). *Robert Boyle and the Limits of Reason*. Cambridge: Cambridge University Press.