James Clerk Maxwell's Refusal to Join the Victoria Institute

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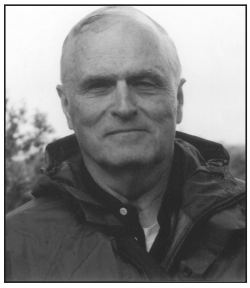

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Thanks to his enduring theory of electricity and magnetism and his unique statistical approach to gases, as well as numerous other contributions in areas ranging from color vision to cartography, James Clerk Maxwell is generally regarded as the greatest physical scientist of the nineteenth century. Maxwell's personal correspondence and reflective writings clearly demonstrate that he was a serious evangelical Christian with a profound understanding of theology. Nevertheless, he turned down numerous invitations to join the Victoria Institute, which was founded in the 1860s to defend "the great truths revealed in Holy Scripture" against the flood of opposition coming from science and biblical criticism. This paper will explore the influences in Maxwell's life and the circumstances surrounding the formation of the Victoria Institute that combined to lead him to spurn the invitations to join the Institute.

The growing influence of scientific naturalism outside the church and biblical criticism within it alarmed many evangelicals.

James Clerk Maxwell's lifetime (1831 to 1879) spanned the first two-thirds of Queen Victoria's reign, during which time he established "his special place in the history of physics alongside Isaac Newton and Albert Einstein."[1] During this same era, the growing influence of scientific naturalism outside the church and biblical criticism within it alarmed many evangelicals. In particular, the widely discussed *Essays and Reviews* in 1860 and the early volumes of Bishop Colenso's *Pentateuch* in 1862 were cited as threats to confidence in the Bible by a group of evangelical clergy and laypeople and a minority of university professors who united to form the Victoria Institute in 1865. Their purpose was "to defend the truth of Holy Scripture against oppositions arising, not from real science, but from pseudo-science."[2] They clearly spell out what they mean by pseudo-science: cosmological and geological theories which sincere scientists may believe to be true, but which contradict a literal reading of Holy Scripture "must be merely pseudo-science, that is, a false interpretation of nature."[3]

Maxwell's lifelong friend and biographer, Lewis Campbell, reports that Maxwell was frequently invited to join the Victoria Institute, and he records the formal invitation of March 1875, which reads in part:

> Sir I have the honor to convey the special invitation of the President and Council to join this Society among whose members are His Grace the Archbishop of Canterbury, and other prelates and leading ministers, several professors of Oxford and Cambridge and other universities, and many literary and scientific men.[4]

The secretary, Francis Petrie, went on to say he had included "a short paper of the objects of the Society which now numbers 580 subscribing members and associates."[5] (This paper may have been the document "*Scientia Scientiarum*" referred to below.)

Maxwell sketched his negative reply in an incomplete rough draft penned on the initially blank last page of the invitation letter. There he indicated some reasons for his refusal that will be discussed in this paper.

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The record of his personal and scholarly writings suggests additional doubts and reservations he would have had about the early Victoria Institute. Three of the possible reasons for his refusal will be examined: (1) the militant tone of the early Victoria Institute documents; (2) Maxwell's broad evangelical views; and (3) Maxwell's view of the relationship between science and theology.

The Militant Tone of the Early Victoria Institute Documents

In the first issue of the *Journal of the Transactions of the Victoria Institute*, the founding committee, which adopted the name Provisional Council of the Victoria Institute, described the four circulars and the two preliminary meetings of 1865 which laid the groundwork for the First General Meeting of the Victoria Institute on May 24, 1866. Also presented was a 25-page, unsigned, document called "*Scientia Scientiarum*" which provided a detailed rationale for the Institute.[6]

"*Scientia Scientiarum*" made clear that the founders of the Victoria Institute were reacting to two significant publications that appeared in the early 1860s and which highlighted the impact and extent of theological liberalism in Great Britain. The first, *Essays and Reviews* (1860), contained papers by six liberal clergy-scholars (Frederick Temple, Rowland Williams, Henry Bristow Wilson, Benjamin Jowett, Baden Powell, and Mark Pattison) and one layman (Charles W. Goodwin).[7] These authors cited the need to modify biblical interpretation in light of historical criticism and the current findings of science so that Christianity could remain a viable faith for contemporary educated people. They argued that the moral authority of the Bible could be maintained only if it could be scrutinized like any other book. Charles W. Goodwin, a distinguished Egyptologist, lawyer and judge, was specifically condemned by the Victoria Institute founders for his paper "The Mosaic Cosmogony," in which he argued that the nebular hypothesis as understood by current geologists was seriously at odds with the Genesis creation account.

The second alarming publication was by Bishop John Colenso of Natal in 1862 and consisted of three volumes of a critical examination of the *Pentateuch* that eventually extended to seven volumes.[8] Bishop Colenso had served in Natal since 1853 and had produced a Zulu language grammar and dictionary as well as having translated instructional books, and large parts of the Bible. Answering the questions of his "intelligent Zulus" led him to the conclusion that a large portion of the Pentateuch was not historical. To make their point, the Victoria Institute founders quote him directly as saying, "the elementary truths of geological science flatly contradict the accounts of the Creation and the Deluge."[9]

These challenges provoked a defiant response from the founders of the Victoria Institute in the "*Scientia Scientiarum*" document. In reaction they laid down a no-nonsense, black-and-white logic for the operation of their organization:

> If science and Scripture are at issue, plainly one of them is wrong—untrue … it is perfectly clear that men must naturally range themselves either upon the side of Scripture or of science … They cannot believe equally in both. They must hold to one or the other … Those who rather distrust the deductions of science than the statements of Scripture are invited to join the new Society … it may obviously be objected … that [this] assumes science to be at fault … the assumption truly represents the state of mind of those who propose to pursue this course … they do distrust science and do not distrust the Scriptures.[10]

They go on to paint a simplistic picture of science that omits any sense of an exploratory process in which final judgment on theories is often delayed:

> The nebular theory was adopted by the geologists from the astronomers while indifferent to whether it was true or false … Consider … how much valuable time has been lost for science … while this untenable theory has been blindly entertained.[11]

The attitude of the Victoria Institute founders is in striking contrast to Maxwell's sophisticated approach to

Figure 1. The Victoria Institute Seal, which appears on the copies of the publication *The Journal of the Transactions of the Victoria Institute*. Used with the permission of the Secretary to the Trustees of the Victoria Institute. Faith and Thought is the Institute's current operating name. Its web site is www.faithandthought.org.uk and its correspondence address is 110 Flemming Avenue, Leigh on Sea, Essex SS9 3AX, UK. Currently the Institute has a number of US members and welcomes greater interest from the States.

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science. He saw it as a slow process requiring patience:

> It is the particular function of physical science to lead us to the confines of the incomprehensible and to bid us to behold and receive it in faith, till such time as the mystery shall open.[12]

Such a view found little to resonate with in the strident tones struck in "*Scientia Scientiarum*."

Another feature of the "*Scientia Scientiarum*" document that would have disturbed Maxwell was its treatment of two of his scientific friends and guides who were confessing Christians. After making the charge that "the erroneous theories of the eminent have held their ground against the sounder views of less-reputed individuals,"[13] the author(s) cite a series of exchanges between one of the most eminent geologists of the era, Adam Sedgwick, professor of geology at Cambridge, and Sir William Cockburn, Dean of York, who is described as a "practical geologist." Cockburn began with a "straightforward attack upon the nebular theory" at the 1844 meeting of the British Association for the Advancement of Science. Professor Sedgwick replied to the effect that "these theories, if rightly understood, would confirm the truths of revelation."[14] Cockburn was not satisfied with Sedgwick's reply and continued to prod him and the Geological Society, eventually making the following challenge:

> You say that there are geological facts which prove the long existence of the world through many ages. I say there are no such facts … Produce, then, some one or more of these facts; and if I cannot fairly account for them without supposing the very long duration of the earth, I am beaten! I am silenced! But if you do not produce such facts … confess, or let your silence confess, that the whole doctrine of a pre-Adamite world has been a mistake.[15]

Because Sedgwick and the Geological Society leaders would not publish their letters to Dean Cochburn or enter into other forms of public debate, the "*Scientia Scientiarum*" author(s) depict them as faint-hearted and weak, too willing to adopt the scientific theories of the day and too timid to take on scripturally conservative challengers.

Maxwell's father, John, was an acquaintance of Sedgwick, and in a letter to his son soon after Maxwell began his undergraduate studies at Cambridge in 1850 he asked, "Have you called on Professor Sedgwick at Trinity … Sedgwick is a great Don in his line, and if you were entered into Geology would be a most valuable acquaintance; and, besides, not going to him would be uncivil …"[16] When Maxwell returned to Cambridge as professor of experimental physics in 1871, Sedgwick was still a faculty member. He died in 1873 and was honored by burial in the chapel at Trinity College.

Even closer family ties existed between the Clerk Maxwells and another Scottish family, the Thomsons. The senior member of that family, James Thomson, had been professor of mathematics at Glasgow University since 1832. His oldest son, William, entered Peterhouse College at Cambridge in 1841 and graduated in 1845, second in his class. William Thomson was appointed to the chair of natural philosophy at Glasgow University in 1846 where he remained until his retirement in 1899. In 1892 he was made a peer of the realm and took his seat in the House of Lords as Baron Kelvin of Largs.

Before Maxwell enrolled at Cambridge in 1850, the younger Professor Thomson was one of a number of people his father consulted about the suitability of colleges at Cambridge for his son.[17] After graduating in 1854, Maxwell remained at Cambridge for another year coaching pupils and studying for his Fellowship exam. During this time, his interest in electricity and magnetism grew in no small part as a result of correspondence with William Thomson. In his usual witty way, he summarized his debt to Thomson in a letter to him.

> I do not know the Game laws and Patent laws of science … but I certainly intend to poach among your electrical images, and as for the hints you have dropped about the "higher electricity," I intend to take them. At the same time, if you happen to know where anything on this part of the subject is to be found it would be of great use to me.[18]

Given this close personal and professional friendship between William Thomson and James Clerk Maxwell, the scorn heaped upon Thomson by the author(s) of "*Scientia*

Scientiarum" would certainly have put Maxwell off. Referring to Thomson's papers on the thermal history of the sun and the earth, the author(s) asserted:

> Recent theories put forward by Professor Thomson … assuming an intense heat in the sun are utterly irreconcilable with the Newtonian hypothesis … Professor Thomson's theory destroyed the possibility of the sun being the theoretical centre of the solar system, if universal gravitation be anything like a plausible foundation.[19]

These criticisms of Thomson's papers by the "*Scientia*" author(s) seem to be based on a simplistic understanding of the state of matter in the sun. They noted that Newton's theory of Universal Gravitation requires the sun to be about 350,000 times more massive than the earth and that astronomical measurements indicate its volume is about 1,400,000 times that of the earth. "An intense heat in the sun" seems to be misinterpreted to mean the sun is in a high temperature gaseous state of density so low that within its measured size it can contain a mass only 1,000 times that of the earth, only a small fraction of the mass required. It is ironic that Thomson's attempts to deduce the thermal history of the sun and earth showed that they were formed much more recently than assumed by some of the more prominent contemporary geologists,[20] a result that should have been welcomed by the Victoria Institute founders. A further irony is that Professor Thomson was invited to give the Annual Address to the Victoria Institute in 1897 and more or less restated the positions he took in his papers in 1862.[21]

Maxwell's Broad Evangelicalism

The mid-nineteenth century was an era of turmoil for the established churches of Great Britain. The Disruption of 1843 in one of the churches in which Maxwell was raised, the Church of Scotland, resulted in the departure of a significant number of laypeople and clergy to form the Free Church. The immediate cause of the split was the unchecked authority exercised by aristocratic patrons in the selection of parish clergy; however, the evangelicals who withdrew had already been deeply distressed by the spread of theological liberalism within their national church. The other church dear to Maxwell's heart was the Church of England, which was also torn by theological discord. Maxwell's discussion of the situation in letters written while an undergraduate at Cambridge led his father to make the following complaint:

> Your dissertation on the parties in the Church of England goes far beyond any knowledge. I would need an explanatory lecture first, and before I can follow the High, Broad, and Low through their ramifications.[22]

A brief, simplified sketch of the parties his father listed will help to explain Maxwell's place in the theological spectrum.

Figure 2. Photograph of James Clerk Maxwell at Cambridge in 1855, holding his color top. Used with the permission of the Master and Fellows of Trinity College, Cambridge.

To facilitate discussion of the religious outlook of sophisticated nineteenth-century scientists, one scholar has distinguished between the "conservative" perspective of Cambridge professors Adam Sedgwick and William Whewell (geology and moral philosophy) and the "liberal" outlook of astronomer John Herschel and mathematicians Charles Babbage and Baden Powell with respect to their views of the Bible, natural theology, and miracles.[23] Theological "conservatives" of the nineteenth-century Church of England came in two very distinct varieties. High Churchmen (also referred to as Tractarians, Anglo-Catholics, or Puseyites) flourished as a consequence of the Oxford Movement of the 1830s. They sought authority for their rites and practices in the traditions and scriptural interpretations that evolved over the long history of the institutional church, and formulated their theology along Roman Catholic lines. The other "conservative" party was the Low Churchmen or Evangelicals, who traced their roots back through the Wesleys and Whitefield to the Protestant Reformation, the Church Fathers, and ultimately to the New Testament Church. They claimed the Bible as understood by the individual believer as the prime authority on which to base their beliefs and worship. The doctrine of the Atonement and the centrality of preaching in worship were particularly emphasized.

These two "conservative" parties in the Church of England had leaders who usually publicly opposed scholarship that questioned the historical accuracy or inspiration

Two important aspects of [Maxwell's] beliefs [are] First, … he maintained an unswerving trust in Christ's atonement and love throughout his life and he continually identified himself with moderate evangelical thought. Second, the scope of his reading and correspondence and his circle of friends … eagerly embraced … theologians and skeptics alike.

of the Bible; however, they were often seriously at odds over the issues of ritual and the appointment of bishops. The evangelical social reformer and philanthropist Anthony Ashley-Cooper, the seventh Earl of Shaftesbury, who was the first president of the Victoria Institute, has been described as dedicated "to a constant battle against 'this frightful heresy, this leprous system' of Puseyism."[24]

The "liberal" clerics who made up the Broad Church party pursued the goal of including a wide range of theological viewpoints within the Church of England. Having abandoned both Church and Bible as sources of authority, they appealed to concepts that ranged from intuition and internal assurance to patterns in the lives of saints past and present and even to forms of mysticism. Liberal clergy, in signing the Thirty-nine Articles (the official doctrinal statements of the Church of England) and in reciting the services of the church, were in effect subscribing to at least some doctrinal statements that were at odds with their personal beliefs. Their consciences gained a measure of relief when Parliament passed the Clerical Subscription Act of 1865 that seemed to modify the assent implied in clerical oaths.[25] As stated in the previous discussion of *Essays and Reviews*, liberals were particularly motivated by the desire to make their revised version of Christianity fit with the historical and scientific ideas that prevailed in mid-nineteenth century Britain.

In this paper, Maxwell's theological outlook has been called "broad evangelicalism" to try to capture two important aspects of his beliefs. First, his personal correspondence and the comments of his friends both testify that he maintained an unswerving trust in Christ's atonement and love throughout his life, and he continually identified himself with moderate evangelical thought. Second, he eagerly embraced what he judged to be fruitful thought by all manner of theologians and skeptics alike and included them in his circle of friends.

Maxwell's letters, especially those to his wife, reveal his extensive knowledge and understanding of Scripture. In part these characteristics trace back to his mother's encouragement to memorize long Scripture passages in early childhood. While a preteenage student at Edinburgh Academy in the early 1840s, Maxwell usually attended both St. Andrew's Presbyterian and St. John's Scottish Episcopal churches on Sundays, where he was respectively under the teaching of Rev. Thomas Jackson Crawford and Dean Edward Bannerman Ramsey, both of whom were evangelicals. At Cambridge, many of his close friends were committed evangelicals, many of whom later took leading places in the Church of England. For much of his adult life, he was a ruling elder in the Corsock[26] and Parton[27] Presbyterian churches, which were near his family estate, Glenlair, in the Galloway district of southwest Scotland. Thus, it is clear that in nearly every stage of his life, James Clerk Maxwell was enfolded by the godly influences of friends and family.

However, Maxwell's evangelicalism was more than cultural. During his Cambridge undergraduate studies, he visited an evangelical rector, C. B. Tayler, and his family in the summer of 1853. Maxwell was suddenly taken seriously ill and during his recovery under the care of this pious family, he gained "a new perception of the Love of God."[28] This event has been interpreted as a conversion experience by one historian.[29] In short passages in his personal correspondence, Maxwell made clear the depth of his faith. In a later letter to Rev. Tayler, he wrote of his personal moral situation:

> I maintain that all the evil influences that I can trace have been internal and not external, you know what I mean—that I have the capacity of being more wicked than any example that man could set for me, and that if I escape, it is only by God's grace helping me to get rid of myself, partially in science, more completely in society—but not perfectly except by committing myself to God as the instrument of His will, not doubtfully, but in the certain hope that that Will will be plain at the proper time.[30]

He clearly understood his own sinfulness and his personal need of God's grace and guidance.

In a letter to Miss Katherine Dewar in May 1858 (just before their marriage in June 1858), he related his enthusiasm for an expository sermon by his friend Rev. Lewis

Campbell delivered to the parish Campbell was serving in the south of England:

> In the afternoon … Lewis preached on "Ye must be born again," showing how respectable a man it was addressed to, and how much he, and all the Jews, and all the world, and ourselves, needed to be born from above (for that is the most correct version of the word translated "again"). Then he described the changes on a man new-born, and his state and privileges. I think he has got a good hold of the people, and will do them good and great good.[31]

His synopsis of the sermon leaves no doubt that his grasp of the doctrine of regeneration is in accord with mainstream evangelicalism.

The high regard Maxwell had for the Bible is indicated in the recollections of a Cambridge student of the 1870s:

> At Clerk Maxwell's we did our papers in the dining-room and adjourned for lunch to an upper room, probably the drawing-room, where Clerk Maxwell himself presided. The conversation turned on Darwinian evolution; I can't say how it came about, but I spoke disrespectfully of Noah's flood. Clerk Maxwell was instantly aroused to the highest pitch of anger, reproving me for want of faith in the Bible! I had no idea at the time that he had retained the rigid faith of his childhood, and was, if possible, a firmer believer than Gladstone in the accuracy of Genesis.[32]

It is clear that Maxwell did not accept the position common to many liberals of his day, namely, that exceptional and mysterious events in the Bible must be deleted to accommodate sophisticated Victorians.

Throughout his life, Maxwell consciously developed the intellectual as well as devotional dimensions of his faith. Lewis Campbell, his friend and biographer, notes that after church he "loved to bury himself in works of the old divines."[33] He also read extensively and critically works of contemporary theology, philosophy, and history. His many letters to his friends and family contain lists of books he was reading, with thoughtful comments about many of them. What is particularly noteworthy is the attention he gave to non-evangelical thought and his respect for serious challengers and the positive aspects of their work. For example, Lewis Campbell remembers discussing with him J. Macleod Campbell's 1854 book on the Atonement, which contained ideas that had earlier been condemned by some evangelicals as heretical. Maxwell's reaction was "we want light."[34] In a letter to Lewis Campbell in 1857, he remarked upon reading Henry T. Buckle's controversial *History of Civilization in England*, one of the first "scientific" histories, that it is "a bumptious book, strong positivism … but a great deal of actually original matter, the true result of fertile study …"[35]

Maxwell also was critical of some forms of evangelicalism. The Disruption of 1843 had split Maxwell's own church, the Church of Scotland, when a large group of evangelicals departed to form the Free Church. A brief thought about this event appears in one of his letters.

> The ferment about the Free Church movement had one very bad effect. Quite a few young people were carried away by it; and when the natural reaction came, they ceased to think about religious matters and became unable to receive fresh impressions.[36]

This comment about the effects of Free Church enthusiasm reflects his uneasiness about excessive emotionalism in Christianity.

It is clear that Maxwell did not accept the position common to many liberals of his day, namely, that exceptional and mysterious events in the Bible must be deleted to accommodate sophisticated Victorians.

Another aspect of Maxwell's theological outlook came from his close friendship with a number of theological scholars who did not fit the evangelical mold. His close friend from his days at Edinburgh Academy and his eventual biographer, Lewis Campbell, was an ordained minister in the Church of England but spent most of his life as a Greek scholar at St. Andrew's University. In his undergraduate days at Oxford, Campbell was deeply influenced by the liberal theology of his tutor, Benjamin Jowett.[37] Jowett was one of the churchmen who contributed an article to the book *Essays and Reviews*, the work by theological liberals referred to previously as having helped to provoke the formation of the Victoria Institute.

As an undergraduate at Cambridge, Maxwell was closely connected with Fenton J. A. Hort, the theologian and Greek New Testament scholar. They met through their election to the Select Essay Club, also known as the "Apostles," a club of twelve of the best minds among Cambridge students whose goal was to learn "from people of the most opposite opinions."[38] When Maxwell returned to Cambridge as a professor in 1871, he joined with Hort, B. F. Westcott, J. B. Lightfoot and other faculty to form

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another scholarly club to discuss speculative questions.[39] In addition to the compilation of an accurate New Testament text by Hort and Westcott, these three great Greek New Testament scholars were members of the committee that produced the Revised English Version of the New Testament of 1881 and wrote commentaries and textual criticism that was not always welcomed by contemporary conservatives.[40]

However, the theologian who had the greatest influence on Maxwell was Frederick Dennison Maurice known for his spiritual leadership of the Christian Socialist Movement and his Broad Church theological views. His teachings emphasized the centrality of a personal relationship between a loving God and humanity. Maxwell made many references to Maurice in his letters to his family and close friends, some of which were critical of a number of Maurice's theological positions.[41] Nevertheless, Hort observed that he thought that reacting to Maurice gave Maxwell "considerable aid in the adjustment and clearing up of his own beliefs on the highest subjects."[42]

Maxwell's study of and eventual friendship with Maurice was significant for him in a number of ways. In 1854 Maurice founded in London a Workingmen's College to provide a university level education for clerks and artisans. Soon his followers began similar institutions in other cities. The Workingmen's Colleges were practical outcomes of Maurice's belief in the moral basis of education and the Church's obligation to serve all of society. Maxwell was inspired by Maurice's vision and gave considerable time to evening classes and derived much satisfaction from teaching for over ten years in the Workingmen's Colleges in Cambridge, Aberdeen, and finally London.

Maxwell's spirit of toleration for differing theological views within the Church is traceable at least in part to Maurice and Julius Hare. Maurice's emphasis on the love of God led him to be "obsessive in his search for spiritual unity within society and a determined enemy of the traditional causes of dissention."[43] Maurice in turn was strongly influenced by Julius Hare, his most influential Cambridge teacher and later his brother-in-law. After leaving his post at Cambridge, Hare became Archdeacon of Lewes and in that role wrote numerous sermons addressed to the Anglican clergy in which he lamented the prevailing evangelical spirit that led so frequently to accusations of heresy.[44] In a letter to one of his aunts, Maxwell commented, "I have been reading Archdeacon Hare's sermons which are good."[45] Having imbibed Maurice's spirit of toleration, Maxwell would frequently remark to his friend Lewis Campbell, "I have no nose for heresy."[46]

Another one of Maurice's principles which parallels Maxwell's philosophy was

> a fearless regard for truth, … a protest against isolating the Christian faith from science and philosophy, and the necessity of meeting and dealing with all doubts and questions in a frank and honest way.[47]

Maxwell declared his personalized version of this principle in a letter to Lewis Campbell written just before he came to know Maurice well. He wrote:

> The Rule … is to let nothing be wilfully left unexamined. Nothing is to be holy ground … Now I am convinced that no one but a Christian can actually purge his land of these holy spots … Christianity—that is, the religion of the Bible—is the only scheme or form of belief which disavows any possessions on such a tenure.[48]

Lewis Campbell often referred to Maxwell's evangelical world view, but he also noted that Maxwell was never "completely identified with any particular school of religious opinion."[49] Maxwell himself identified with evangelical principles when he confessed to Campbell in a letter that "I believe with the Westminster Divines and their predecessors *ad Infinitum* that 'Man's chief end is to glorify God and to enjoy him forever.'"[50] Nevertheless, Maxwell was not dismayed by challenges to the traditional literal interpretations of Scripture, and he seems to prefer a Church where the tares and wheat grow together to one where charges of heresy enforce a strict orthodoxy. In contrast to Maxwell's view, the Victoria Institute seemed to be setting up a "holy ground" in their defense of prevailing literal interpretations of Scripture, particularly the Mosaic writings.

Maxwell's View of Relations between Science and Theology

The last sentence in Maxwell's draft of his reply to the Victoria Institute invitation is incomplete, but it seems to be starting a thought about the nature of scientific knowledge.

> For it is the nature of Science, especially of those branches of Science which are *continually spreading into unknown regions to be continually* …[51]

A hint at how he might have continued these thoughts is found in his Inaugural Lecture given at Marishal College, Aberdeen, in 1856. He has a picturesque view of the ever increasing, ever changing, and ultimately limited nature of scientific knowledge.

> While we look down with awe into these unsearchable depths and treasure up with care what with our little line and plummet we can reach, we ought to admire the wisdom of Him who has so arranged these mysteries that we can first find that which we can understand at first and the rest in order so that it is possible for us to have an ever increasing stock of known truth concerning things whose nature is absolutely incomprehensible.[52]

Maxwell's references to the "unsearchable depths" of the natural world, the "little line and plummet" of the investigator, and the "truth concerning things whose nature is absolutely incomprehensible" reflect the fact that he recognized the conditional and provisional nature of most scientific knowledge. When he was a nineteen-year-old student at Cambridge, he reflected on human knowledge using an interesting mathematical perspective:

> The true logic for this world is the Calculus of Probabilities … Understanding, acting by the laws of right reason, will assign to different truths … different degrees of probability. Now, as the senses give new testimonies continually … it follows that the probability and credibility of their testimony is increasing day by day, and the more man uses them the more he believes them … When the probability … in a man's mind of a certain proposition being true is greater than that of its being false, he believes it with a proportion of faith corresponding to the probability … When a man thinks he has enough of evidence for some notion of his he sometimes refuses to listen to any additional evidence pro or con, saying "It is a settled question."[53]

Thus, according to Maxwell, scientific knowledge undergoes a continual process of refinement not only with respect to its form but also with respect to its certainty.

Maxwell's reluctance to link the particulars of shifting scientific thought with biblical interpretation is shown in letters he exchanged in 1876 with Anglican Bishop C. J. Ellicott (who was an accomplished New Testament scholar with whose writings Maxwell was acquainted). The Bishop asked Maxwell whether he agrees with the theologians who claim that creation of light on the first day and the sun on the fourth day "involves no serious problem." Maxwell replied as follows:

> If it were necessary to provide an interpretation of the text in accordance with the science of 1876 (which may not agree with that of 1896), it would be very tempting to say that the light of the first day means the all-embracing aether … But I should be very sorry if an interpretation founded on a most conjectural scientific hypothesis were to get fastened to the text in Genesis … The rate of change of scientific hypothesis is naturally so much more rapid than that of biblical interpretations, so that if an interpretation is founded on such an hypothesis, it may help to keep the hypothesis above ground long after it ought to be buried and forgotten.[54]

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But perhaps the most surprising part of Maxwell's views was expressed in his Victoria Institute reply in the sentence that immediately precedes the sentence fragment discussed above.

> But I think that the results which each man arrives at in his attempts to harmonize his science with his Christianity ought not to be regarded as having any significance except to the man himself and to him only for a time and should not receive the stamp of a society.[55]

Thus, for Maxwell, any reconciliation of the particulars employed in the current formulation of science with religious beliefs is subjective and transitory and has little enduring value. Such efforts, when poorly done could even bring reproach. For example, Maxwell was especially scornful of the use of the aether concept in *The Unseen Universe*,[56] a book written by his friends and fellow evangelical scientists, Peter Guthrie Tait and Balfour Stewart. They speculated that the presence of a second aether would form the basis of an eternal, invisible universe where human

souls receive their form and which provides "continuity" with the physical universe thus explaining the immortality of the soul. The immense popularity of *The Unseen Universe* did not deter Maxwell from ridiculing it in a review in *Nature*. He used an ironical reference to the anti-materialism in one of the dialogues of the idealist philosopher George Berkeley.

> We shall therefore make the most of our opportunity when two eminent men of science … have betaken themselves to those blissful country seats where Philonous long ago convinced Hylas that there can be no heat in the fire and no matter in the world.[57]

Maxwell's belief that "in physical speculation there can be nothing vague or indistinct"[58] led him to point out that the authors of *The Unseen Universe* were suggesting "a question far beyond the limits of physical speculation."[59]

Although Maxwell expressed his considerable doubts about the objective value of linking biblical interpretations with contemporary scientific theories, he did not call for the divorce of theology from science or science from theology.

Although Maxwell expressed his considerable doubts about the objective value of linking biblical interpretations with contemporary scientific theories, he did not call for the divorce of theology from science or science from theology. As he said in the Aberdeen Inaugural Address:

> Those who intend to pursue the study of theology will also find the benefit of a careful and reverent study of the order of creation.[60]

Likewise in his reply to the Victoria Institute he commented:

> I think Christians whose minds are scientific are bound to study science that their view of the glory of God may be as extensive as their being is capable of.[61]

He seems to call for continual interaction between the theologian and the scientist, but does not favor a detailed harmonization of their respective insights.

For Maxwell a more profound issue than harmonization was specialization. In contrast to the preponderance of non-specialists in the Victoria Institute, Maxwell acknowledged and welcomed the professionalization of science:

> As the boundaries of science are widened, its cultivators become less philosophers and more specialists … This is the inevitable result of the development of science, which has made it impossible for any one man to acquire a thorough knowledge of the whole …[62]

This view is in sharp contrast with the viewpoint of the "*Scientia Scientiarum*" author(s) who lament the fact that "the sciences have been too much separated and the great majority have devoted their minds to the details of some narrow speciality."[63] One aspect of this professionalization was the early nineteenth-century struggle led by some of Maxwell's older Cambridge faculty colleagues like Adam Sedgwick and William Whewell, who maintained their commitment to the Christian faith while arguing the right to develop scientific ideas free from restraints imposed by theologians or churches.[64]

Maxwell also respected the professionalism developing in theology. Through their writings or in some cases by personal interaction, Maxwell knew the theologians of his day. He even expressed at times his preference for the company of those interested in theological matters to those whose exclusive focus was science.[65] Like Newton he dedicated a considerable portion of his intellectual efforts to matters of theology but unlike Newton he did "not wish to be set up as an authority on subjects (such as historical criticism) which, however interesting to him, he had not had leisure to study exhaustively."[66]

Furthermore, Maxwell's perception of the independent value of both science and theology led him to a different conclusion than the founders of the Victoria Institute as to what was the crucial theological issue of the last half of the nineteenth century. For the Victoria Institute founders, it was the fact that many prominent scientists and theologians were no longer conforming their scientific theories to traditional, more or less literal interpretations of the Bible. For Maxwell, it was the rising influence of scientific naturalism, which implied a diminishing influence for theology and religion.

Scientific naturalism was being skillfully mixed with scientific popularization by the masterful rhetoric and persuasive writing of scientists like John Tyndall, Thomas Huxley, and a host of others both in and out of the "X Club."[67] For these men, science was the only truth-seeker and problem-solver humankind needed. Religion and its theology were

nothing but a source of obscurantism and obstruction. As historian Colin Russell has described their plan:

> Religion was not allowed to usurp the role of science but science (or scientific naturalism) was to take every opportunity to invade the territory of religion.[68]

Tyndall boldly asserted the strategy in his famous Belfast Address to the British Association for the Advancement of Science in 1874:

> We claim and we shall wrest from theology the entire domain of cosmological theory. All schemes and systems which thus infringe upon the domain of science must … submit to its control and relinquish all thought of controlling it.[69]

Maxwell answered Tyndall's outrageous claims for the supremacy of science indirectly through a humorous poem published under a pseudonym in a popular Scottish magazine in 1874. A few lines from the poem illustrate its tenor:

> *From nothing comes nothing, they told us,*
> *nought happens by chance, but by fate;*
> *There is nothing but atoms and void,*
> *all else is mere whims out of date!*
> *Then why should a man curry favour*
> *with beings who cannot exist,*
> *To compass some petty promotion*
> *in nebulous kingdoms of mist?*[70]

The founding committee of the Victoria Institute spelled out in "*Scientia Scientiarum*" that their primary concern was to promote an immediate and literal agreement between scientific theory and biblical theology. In contrast, Maxwell summed up his theological expectations concerning the process of doing science in a poem he wrote while a Cambridge undergraduate, which reads in part:

> *Teach me so Thy works to read*
> *That my faith – new strength accruing –*
> *May from world to world proceed,*
> *Wisdom's fruitful search pursuing;*
> *Till, Thy truth my mind imbuing,*
> *I proclaim the Eternal Creed,*
> *Oft the glorious theme renewing*
> *God our Lord is God indeed.*[71]

Maxwell's participation in the development of scientific understanding was for him an act of worship, part of a careful reading of God's revelation in nature.[72]

Concluding Remarks

In summary, James Clerk Maxwell's refusal to join the Victoria Institute first of all stemmed from its narrow defensive aims and its inclination to turn on men who Maxwell saw as Christian comrades. Second, its theological banner was planted far to the right of Maxwell's broad evangelicalism. Finally, Maxwell's view of the growing professionalism of science and theology led him to oppose

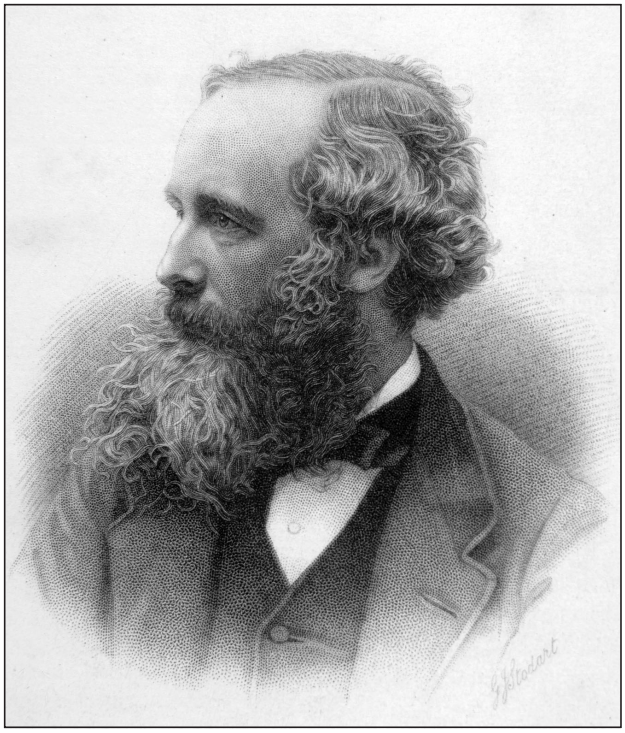

Figure 3. Steelplate engraving by Stodart after a photograph by Fergus of Greenock which appeared as a frontispiece in Campbell and Garnett's *The life of James Clerk Maxwell.* By courtesy of Edinburgh City Libraries.

scientific naturalism without trying to reestablish the dominion of theology over science.

In a larger sense, James Clerk Maxwell's refusal to join the Victoria Institute can be interpreted as symptomatic of harmful flaws in the outlook of both the Victoria Institute and Maxwell himself. The Institute initially adopted a perspective that proved to be too narrow and thus limited its effectiveness. On the other hand, the toleration that Maxwell typified was so broad that it nullified most attempts at church discipline in matters of theology.

"*Scientia Scientiarum*" and the other circulars used to promote the founding of the Victoria Institute were too narrow in several ways. First, they focused extensively on the issues involving contemporary geology and Genesis. The impact of Darwin's *Origin of Species* (1859) is never mentioned. Furthermore, the author(s) supported an explanation of geological strata in terms of Flood Geology, a viewpoint that had few adherents in the Royal Geological Society in the 1860s. Second, the view of biblical interpretation the author(s) adopted was strict literalism. They charged their opponents with being willing to "force upon" Scripture new interpretations that are nothing but the "explaining away of plain language, which requires no interpretation in order to be understood."[73] The existence of a number of distinct evangelical theological traditions each claiming to come directly from the Bible should have made the Victoria Institute founders a bit more cautious

about claiming that any portion of Scripture "requires no interpretation."

One consequence of a narrow outlook was a narrow membership. As the Secretary of the Victoria Institute pointed out in his invitation letter to Maxwell, numerous outstanding clerical figures and "many literary and scientific men" had joined. However, only a few prominent scientists who were professing evangelicals joined. In a recently published study, historian Crosbie Smith identified three informal scientific-cultural groups that vied for credibility and prominence as the concept of energy was shaped into the controlling idea of physical science.[74] Besides the devotees of a theologically liberated, professionalized science inspired by Huxley, Tyndall, and their "X Club" colleagues and the Cambridge clerical dons led by Sedgwick and Whewell, Smith identified a third, hitherto generally unacknowledged, group he called the North British Evangelicals. This group included many prominent physical scientists of the period: James Joule, William Thomson (Lord Kelvin), Peter Guthrie Tait, Fleeming Jenkin, Macquorn Rankine, Balfour Stewart, and James Clerk Maxwell. It is noteworthy that none of this group joined the Victoria Institute between the time of its founding (1865) and the formal invitation to Maxwell (1875). The failure to attract many prominent evangelical men of science clearly diminished its influence in the science-religion dialogue of the mid- to late-Victorian era. In a classic history of the Victorian Church, the Victoria Institute has received only a two-sentence reference.[75]

Maxwell's faith was basically too personal and his hesitation about speaking out concerning matters outside his area of expertise severely limited his influence at a critical time in church history.

It should be noted that the views set forth in the founding documents of the Victoria Institute were modified as the organization matured. Cambridge University physicist George Gabriel Stokes, who was one of Maxwell's undergraduate teachers and a friend and colleague in later life, succeeded the great social reformer Ashley-Cooper as President in 1886. He reflected a much changed perspective in remarks recorded in the Institute Journal.

> We all admit that the book of Nature and the book of Revelation come alike from God, and that consequently there can be no real discrepancy between the two if rightly interpreted. The provinces of Science and of Revelation are, for the most part, so distinct that there is little chance of collision. But if an apparent discrepancy should arise, we have no right on principle, to exclude either in favour of the other. For however firmly convinced we may be of the truth of revelation, we must admit our liability to err as to the extent or interpretation of what is revealed; and however strong the scientific evidence in favour of a theory may be, we must remember that we are dealing with evidence which, in its nature, is probable only, and it is conceivable that wider scientific knowledge might lead us to alter our opinion.[76]

Had he lived to read these remarks by his mentor and friend Stokes, Maxwell might have been more favorably disposed toward the Victoria Institute and its mission.

Turning to Maxwell's attitude of theological toleration, it should be noted that his willingness to take on the scientific naturalists, if only to a limited extent, is commendable. However, his failure to detect the perils of theological liberalism is lamentable. Heresy charges by more conservative evangelicals were probably too glibly raised in some instances, but there were a number of important cases in both the Church of Scotland and the Church of England in which the verdicts, in effect, tolerated views that were far from historic Christian orthodoxy. For instance, two of the contributors to *Essays and Reviews*, Rowland Williams and Henry B. Wilson, were tried in church courts for their views on inspiration, justification, and the future state of the dead. They were initially found guilty on some of the charges and sentenced to suspension for one year. On appeal, the verdict was overturned. This and other cases meant that "few clergymen, whatever they taught, were in danger of prosecution because their sermons or books contradicted the articles of religion."[77]

Maxwell's tolerant approach was shared by far too many evangelicals, and his claim to have "no nose for heresy" proved to be no virtue in Victorian Britain as theological liberalism prospered. Maxwell's faith was basically too personal and his hesitation about speaking out concerning matters outside his area of expertise severely limited his influence at a critical time in church history. ◆

Notes

[1]P. M. Harman, *The Natural Philosophy of James Clerk Maxwell* (Cambridge: Cambridge University Press, 1998), 1.
[2]"*Scientia Scientiarum*," *The Journal of the Transactions of the Victoria Institute* 1 (1867): 5. Following the completion of this paper, a web site with the full text of "*Scientia Scientiarum*" has been discovered. The address is www.creationism.org/victoria/. The web site also attributes the authorship to James Reddie who was the founding Secretary of the Victoria Institute.
[3]Ibid., 1:7.
[4]Letter from F. Petrie, 12 March 1875, University Library, Cambridge, Add. MSS 7655, II, 95. A shortened version of the letter also appears on pages 404–5 of the Campbell and Garnett biography cited in reference 16 below.
[5]Ibid.
[6]"*Scientia Scientiarum*," 1:5–29.
[7]Henry B. Wilson, et al., *Essays and Reviews* (London: Parker and Son, 1860). An annotated critical edition has recently been published: *Essays and Reviews: The 1860 Text and Its Reading,* ed. Victor Shea and William Whitla (Charlottesville: University Press of Virginia, 2000).
[8]John William Colenso, *The Pentateuch and Book of Joshua Critically Examined* (London: Longman, Green, Longman, Roberts and Green, 1862).
[9]"*Scientia Scientiarum*," 1:8.
[10]Ibid., 1:7–9.
[11]Ibid., 1:21, 22.
[12]Inaugural Lecture, Aberdeen, 3 November 1856, *The Scientific Letters and Papers of James Clerk Maxwell*, vol. 1, ed. P. M. Harman (Cambridge: Cambridge University Press, 1990), 1:427 (hereafter cited as *Scientific Letters and Papers*).
[13]"*Scientia Scientiarum*," 1:10–1.
[14]Ibid., 1:17.
[15]Ibid., 1:19.
[16]Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell* (Cambridge: MacMillan and Co.,1882), 150. A printable version of the entire biography is available on the web. James C. Rautio, the founder and president of Sonnet Software Inc., has made it available at the following web site: www.sonnetusa.com/bio/maxwell.asp.
[17]Ibid., 146.
[18]Maxwell to William Thomson, 13 September 1855, *Scientific Letters and Papers*, 1:323.
[19]"*Scientia Scientiarum*," 1:28–9.
[20]Silvanus P. Thompson, *The Life of William Thomson* (London: MacMillan and Co., 1910), 535.
[21]Ibid., 997–8, 1095.
[22]Campbell and Garnett, *Life of Maxwell,* 194.
[23]Michael Ruse, "The Relationship Between Science and Religion in Britain, 1830–1870," *Church History* 44 (1975): 505–23.
[24]Georgina Battiscombe, *Shaftesbury, The Great Reformer, 1801–1885* (Boston: Houghton Mifflin Company, 1975), 199.
[25]Owen Chadwick, *The Victorian Church* (New York: Oxford University Press, 1966), 2:132–3.
[26]Rev. George Sturrock, *Corsock Parish Church: Its Rise and Progress* (Castle-Douglas: Adam Rae, 1899), 11.
[27]Campbell and Garnett, *Life of Maxwell*, 371.
[28]Ibid., 170.
[29]Paul Theerman, "James Clerk Maxwell and Religion," *American Journal of Physics* 54 (1986): 312–7.
[30]Campbell and Garnett, *Life of Maxwell*, 188.
[31]Ibid., 311.
[32]Karl Pearson, "Old Tripos days at Cambridge," *Mathematical Gazette* 20 (1936): 27–36, quoted in Crosbie Smith, *The Science of Energy* (Chicago: The University of Chicago Press, 1998), 307.
[33]Campbell and Garnett, *Life of Maxwell*, 321.
[34]Ibid., 431 n.
[35]Ibid., 295.
[36]Ibid., 420.
[37]John Burnet, "Lewis Campbell," in *Dictionary of National Biography, Second Supplement*, vol. 1, ed. Sidney Lee (London: Smith, Elder and Co., 1901), 300–1.
[38]Peter Allen, *The Cambridge Apostles* (Cambridge: Cambridge University Press, 1978), 4.
[39]Campbell and Garnett, *Life of Maxwell*, 366, 418, 434.
[40]Herbert Exon, "Fenton J. A. Hort," in *Dictionary of National Biography, First Supplement*, vol. 2, ed. Sidney Lee (London: Smith, Elder and Co., 1901), 443–7.
[41]Campbell and Garnett, *Life of Maxwell*, 172, 191, 192, 194, 218.
[42]Ibid., 418.
[43]Allen, *Cambridge Apostles*, 205.
[44]Julius C. Hare, *Charges to the Clergy of the Archdeaconry of Lewes: 1840 to 1854* (Cambridge: 1856).
[45]Campbell and Garnett, *Life of Maxwell*, 170 n., 184.
[46]Ibid., 322.
[47]Torben Christensen, *The Divine Order: A Study in F. D. Maurice's Theology* (Leiden: E. J. Brill, 1973), 17.
[48]Campbell and Garnett, *Life of Maxwell*, 178, 179.
[49]Ibid., 170 n.
[50]Ibid., 158.
[51]Ibid., 405.
[52]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:427.
[53]Campbell and Garnett, *Life of Maxwell*, 143–4.
[54]Ibid., 393–4.
[55]Ibid., 405.
[56]Peter Guthrie Tait and Balfour Stewart, *The Unseen Universe or Physical Speculations on a Future State* (London: Macmillan and Co., 1875).
[57]James Clerk Maxwell, "Paradoxical Philosophy," in *The Scientific Papers of James Clerk Maxwell*, 2 vols., ed. W. D. Niven (1890; reprint 2 vols. in 1, New York: Dover Publications, 1965), 2:756 (hereafter cited as *Scientific Papers)*.
[58]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:425.
[59]James Clerk Maxwell, "Ether," in *Scientific Papers*, 2:775.
[60]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:430.
[61]Campbell and Garnett, *Life of Maxwell*, 404–5.
[62]James Clerk Maxwell, "Whewell's Writings and Correspondence," in *Scientific Papers*, 2:528.
[63]"*Scientia Scientiarum*," 1:24.
[64]Ruse, "Science and Religion in Britain," 505–23.
[65]Ivan Tolstoy, *James Clerk Maxwell* (Chicago: University of Chicago Press, 1981), 56–7.
[66]Campbell and Garnett, *Life of Maxwell*, 433.
[67]J. Vernon Jensen, "The X Club: Fraternity of Victorian Scientists," *British Journal for the History of Science* 3 (1970): 63–72.
[68]Colin A. Russell, "The Conflict Metaphor and its Social Origins," *Science and Christian Belief* 1 (1989): 16–7.
[69]John Tyndall, *Fragments of Science* (New York: D. Appleton, 1875), 196–7.
[70]Campbell and Garnett, *Life of Maxwell*, 639.
[71]Ibid., 596.
[72]Martin Goldman, *The Demon in the Ether* (Edinburgh: Paul Harris Publishing, 1983), 69.
[73]"*Scientia Scientiarum*," 1:10.
[74]Crosbie Smith, *The Science of Energy* (Chicago: The University of Chicago, 1998).
[75]Chadwick, *The Victorian Church*, 2:25.
[76]George Stokes, "Note by the President on the Origin of the Books of Revelation, and of Nature," *The Journal of the Transactions of the Victoria Institute* 22 (1888–1889): 22.
[77]Chadwick, *The Victorian Church*, 2:133.