

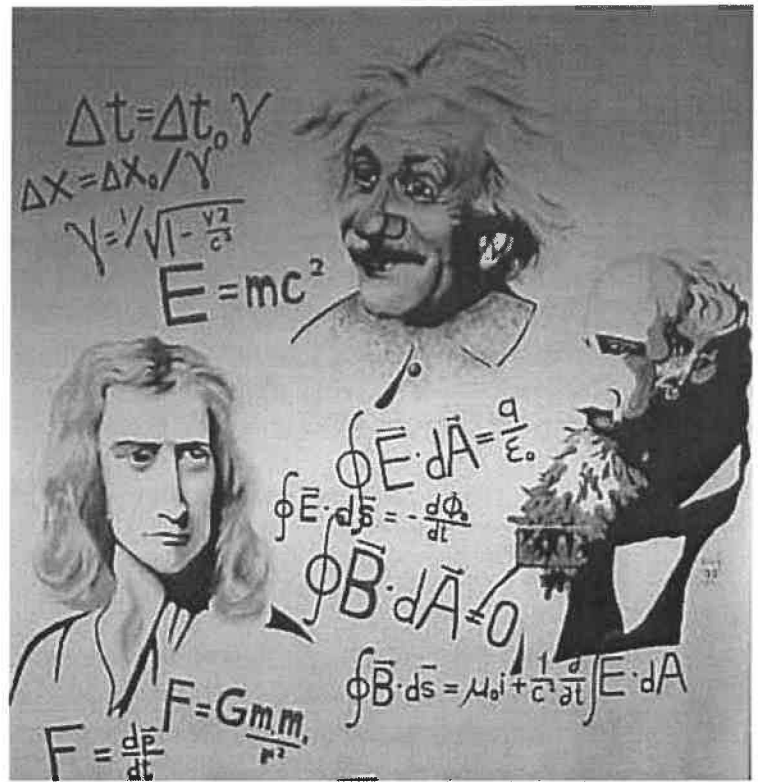
# James Clerk Maxwell

(June 13, 1831 - November 5, 1879)

## and Why Read Biographies

Sean Bird  
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for ACMS Conference  
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*“Maxwell can be justifiably placed with Einstein and Newton in a triad of the greatest physicists known to history”<sup>1</sup>*



*“From a long view of the history of mankind – seen from, say, ten thousand years from now – there can be little doubt that the most significant event of the 19<sup>th</sup> century will be judged as Maxwell’s discovery of the laws of electrodynamics.”*

– Richard P. Feynman

*“One scientific epoch ended and another began with James Clerk Maxwell”*

– Albert Einstein

*“...many think that Maxwell’s study of the particles of Saturn’s rings led him directly and inevitably into the realm of kinetic theory of gases, in which so much of his life was spent. However this may be, when he crossed the bridge from Astronomy to Physics he left behind him for ever the prospect of becoming a great astronomer - but only to become the greatest mathematical physicist the world has seen since Newton.”*

– Sir James Jeans 1931<sup>2</sup>

*“His name stands magnificently over the portal of classical physics, and we can say this of him; by his birth James Clerk Maxwell belongs to Edinburgh, by his personality he belongs to Cambridge, by his work he belongs to the whole world.”*

–Max Planck, physicist<sup>3</sup>

<sup>1</sup>Graves, Dan. *Scientists of Faith*. Grand Rapids, MI: Kregel, 1996. pg 151.

<sup>2</sup>O'Connor, J.J. and Robertson, E.F. “A visit to James Clerk Maxwell’s house.” *Scottish Index*. Nov 1997. School of Mathematics and Statistics, University of St. Andrews, Scotland. 16 March 2002 <[http://www-groups.dcs.st-and.ac.uk/%7Ehistory/HistTopics/Maxwell\\_House.html](http://www-groups.dcs.st-and.ac.uk/%7Ehistory/HistTopics/Maxwell_House.html)>.

<sup>3</sup>Coppedge, David. “The World’s Greatest Creation Scientists from Y1K to Y2K.” *Bible & Science Library*. 2000. Master Plan Productions. 31 May 2005 <[http://creationsafaris.com/wgcs\\_3.htm#maxwell](http://creationsafaris.com/wgcs_3.htm#maxwell)>.

## Why read biographies

The study of the lives of others is commended by Scripture. “Brothers, join in imitating me, and keep your eyes on those who walk according to the example you have in us” (Phil. 3:17).<sup>4</sup> The Puritan Richard Baxter agrees with this keeping your eyes on others: “The world is better able to read the nature of religion in a man’s life than in the Bible.”<sup>5</sup> The Bible sets before us positive and negative examples of how to live a complete life of faith in the Rock of Christ Jesus. Philippians 4:8-9 gives the positive:

“Finally, brothers, whatever is true, whatever is honorable, whatever is just, whatever is pure, whatever is lovely, whatever is commendable, if there is any excellence, if there is anything worthy of praise, think about these things. What you have learned and received and heard and seen in me—practice these things, and the God of peace will be with you.”

While 1 Corinthians 10:6 warns with the negative example of the Israelites in the wilderness: “Now these things took place as examples for us, that we might not desire evil as they did.” The Pythagoreans are an obvious illustration of mathematics becoming an idol. “Do not be idolaters as some of them were” (1 Cor. 10:7). But from the context of the 1 Corinthians 10 passage, we need to be particularly aware of negative examples coming from the covenant community. How and what Christians think about is of immense importance. That is why it is helpful to have authors like John Byl who has us be on our guard against the assertions of a modern day quantum physicist who became an Anglican theologian. “Although Polkinghorne professes to be a theist, his truncated view of reality must surely be rejected by any serious Christian.”<sup>6</sup>

Paul further admonished the Corinthians, “Be imitators of me, as I am of Christ” (1 Cor 11:1). In the preface of a biography, Jonathan Edwards notes that his subject is not free of imperfections. “The example of Jesus Christ is the only example that ever was set in the human nature, that was altogether perfect; which therefore is a rule to try all other examples by; and the dispositions, frames and practices of others must be commended and followed no further, than they were followers of Christ.”<sup>7</sup>

“There are two ways of representing and recommending true religion and virtue to the world, which God hath made use of: the one is by doctrine and precept; the other is by instance and example: Both are

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<sup>4</sup>Scripture quotations are from The Holy Bible, English Standard Version, copyright © 2001 by Crossway Bibles, a division of Good News Publishers. Used by permission. All rights reserved.

<sup>5</sup>Winslow, Ola Elizabeth. John Eliot: Apostle to the Indians. Boston: Houghton Mifflin Company, 1968. Quoted on the page after the title page. Eliot (1604-May 20, 1690) was a pastor, missionary and translator in the Massachusetts Bay Colony.

Cross reference this quote with James 1:26-27, “If anyone thinks he is religious and does not bridle his tongue but deceives his heart, this person’s religion is worthless. Religion that is pure and undefiled before God and the Father is this: to visit orphans and widows in their affliction, and to keep oneself unstained from the world.”

<sup>6</sup>Byl, John. The Divine Challenge on Matter, Mind, Math and Meaning. Edinburgh: The Banner of Truth Trust, 2004. pg 79.

<sup>7</sup>Edwards, Jonathan. “An account of the life of the reverend Mr. David Brainerd.” Norman Pettit ed. Works of Jonathan Edwards, the Life of David Brainerd. Vol. 7. New Haven: Yale University, 2002. pg 91.

abundantly used in the holy Scriptures...God also in his Providence has been wont to make use of both these methods to hold forth light to mankind, and inducement to their duty, in all ages: He has from time to time raised up eminent teachers, to exhibit and bear testimony to the truth in their doctrine, and oppose the errors, darkness and wickedness of the world; and also has from age to age, raised up some eminent persons that have set bright examples of that religion that is taught and prescribed in the Word of God; whole examples have in divine providence been set forth to public view. These have a great tendency to engage the attention of men to the doctrines and rules that are taught, and greatly to confirm and enforce them; ... and above all, when these bright examples have been set by eminent teachers in a variety of unusual circumstances of remarkable trial; and God has withal remarkably distinguished them with wonderful success of their instructions and labors, consisting in glorious events that have been in many respects new and strange.”<sup>8</sup>

Such an instance we have in James Clerk Maxwell. In the pattern of Second Timothy 2:2, we need to entrust the exemplary lives<sup>9</sup> of those in the past to those in the future, so the lessons will not be forgotten. So let us read and teach biographies as we teach students mathematics that they may witness the successful integration of the Christian faith and scientific/mathematical pursuits.

### James Clerk Maxwell’s philosophy of study

“I believe, with the Westminster Divines and their predecessors ad Infinitum that ‘Man’s chief end is to glorify God and to enjoy him for ever.’”<sup>10</sup>

James Clerk Maxwell gives this as the basis, or foundation, of all intellectual pursuits. In answer to how to enjoy the Lord, Maxwell states, “That happiness is indissolubly connected with the full exercise of these powers in the *intended* direction... In order to advance, the soul must converse with things external to itself.” In this same address he wrote regarding mathematics and other disciplines,

“I am also persuaded that the study of  $x$  and  $y$  is to men an essential preparation for the intelligent study of the material universe. That the idea of Beauty is propagated by communication, and that in order thereto human language must be studied ... In every branch of knowledge the progress is proportional to the amount of facts on which to build, and therefore to the facility of obtaining data. In the Mathematics this is easy. Do you want a quantity? Take  $x$ ; there it is!—got without trouble, and as good a quantity as one would wish to have. And so in other sciences,—the more abstract the subject, the better it is known. Space, time, and force come first in certainty. These are the subjects in Mechanics. Then the active powers, Light, Heat,

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<sup>8</sup>Ibid, pg 89-90.

<sup>9</sup>Another prime example of a well integrated life of faith in Jesus Christ, is the most prolific mathematician of all time, Leonard Euler (1707 - 1783). Despite blindness and other adversity Euler advanced every field of mathematics and physics while maintaining daily family worship and piety. For biographical sketches and to observe Euler’s instruction of physics grounded on a Biblical Christian Worldview see Euler, Leonard. Letters of Euler to a German Princess. Bristol, England: Thoemmes Press, 1997. For other mathematicians see the author’s web page: <http://covenantchristian.org/bird/links/mathphysc/calcpphys.htm>

<sup>10</sup>Campbell, Lewis and Garnet, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 158. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. Reprinted by permission of Sonnet Software, Inc.

Electricity, etc.=Physics.”<sup>11</sup>

A popular physics t-shirt reads, “And God said,” followed by Maxwell’s equations, “and there was light.”<sup>12</sup> Maxwell would actually have us be more careful with our exegesis. Consider the admonition he gives to the Bishop of Gloucester and Bristol in 1876, just a few years before his death:

“there is a statement printed in most commentaries that the fact of light being created before the sun is in striking agreement with the last results of science (I quote from memory). I have often wished to ascertain the date of the original appearance of this statement, as this would be the only way of finding what “last result of science” it referred to. It is certainly older than the time when any notions of the undulatory theory became prevalent among men of science or commentators. 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 æther, the vehicle of radiation, and not actual light, whether from the sun or from any other source. But I cannot suppose that this was the very idea meant to be conveyed by the original author of the book to those for whom he was writing... I should be very sorry if an interpretation founded on a most conjectural scientific hypothesis were to get fastened to the text in Genesis, even if by so doing it got rid of the old statement of the commentators which has long ceased to be intelligible. The rate of change of scientific hypothesis is naturally 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.”<sup>13</sup>

Again Maxwell goes on to explain and gives a motivation for the study of the works of God, “I think that each individual man should do all he can to impress his own mind with the extent, the order, and the unity of the universe, and should carry these ideas with him as he reads such passages as the 1st Chap. of the Ep. to Colossians (see Lightfoot on Colossians, p. 182<sup>14</sup>),

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<sup>11</sup>Ibid, pg 158-159.

<sup>12</sup>A variation of this is available at <http://www.scienceteacher.com/physics.html>

<sup>13</sup>Campbell, Lewis and Garnet, William. *The Life and Times of James Clerk Maxwell*. London: Macmillan and Company, 1882. pg 393-394. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. online pg 203.

<sup>14</sup>Providentially finding a copy of J.B. Lightfoot’s 1875 commentary on Colossians in a small used Christian book store, I excitedly turned to page 182 as Maxwell suggests and read the following which pertains well to the purpose of ACMS:

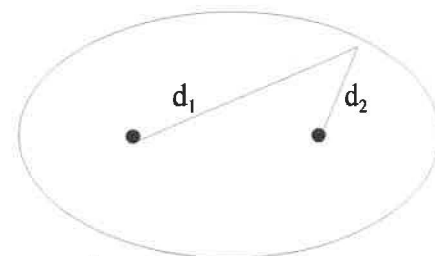
“The heresy of the Colossian teachers took its rise, as we saw, in their cosmical speculations. It was therefore natural that the Apostle in replying should lay stress on the function of the Word in the creation and government of the world. This is the aspect of His work most prominent in the first of the two distinctly Christological passages. The Apostle there predicates of the Word, not only prior, but absolute existence. All things were created through Him, are sustained in Him, are tending towards Him. Thus He is the beginning, middle, and end, of creation. This He is, because He is the very *image* of the Invisible God, because in Him dwells the *plenitude* of Deity.

“This creative and administrative work of Christ the Word in the natural order of things is always emphasized in the writings of the Apostles, when they touch upon the doctrine of His Person. It stands in the forefront of the prologue to St John’s Gospel: it is hardly less prominent in the opening of the Epistle to the Hebrews. His mediatorial function in the Church is represented as flowing from His mediatorial function in the world. With ourselves this idea has retired very much into the background. Though in the creed common to all the Churches we profess our belief in Him, as the Being ‘through whom all things were created,’ yet in reality this confession seems to exercise very little influence on our thoughts. And the loss is serious. How much our theological conceptions suffer in breadth and fulness by the neglect, a moment’s reflexion will show. How much more hearty would be the sympathy of theologians with the revelations of science and the developments of history, if they habitually connected them with the operations of the same Divine Word who is the centre of all their religious aspirations, it is needless to say. Through the recognition of this idea with all the consequences which flow from it, as a living influence, more than in any other way, may we hope to strike the chords of that ‘vaster music,’ which results only from the harmony of knowledge and faith, of reverence and research...linking our scientific instincts with our theological beliefs.”

just as enlarged conceptions of the extent and unity of the world of life may be of service to us in reading Psalm viii.; Heb. ii. 6, etc.”<sup>15</sup>

### Maxwell's achievements

Over the course of his life James Clerk Maxwell did impress his mind with the order and unity of the universe. While still a young boy, at the age of 14, he wrote a paper on ovals. Here he generalized the famous definition of an ellipse (seen in the figure to the right) by defining an oval as  $md_1 + nd_2 = k$ , where  $k$  is a constant. Ovals are therefore egg shaped, but if  $m$  and  $n$  are equal to 1 then the curve is an ellipse. He presented this, his first paper, *On the description of oval curves, and those having a plurality of loci*, to the Royal Society of Edinburgh on 6 April 1846.<sup>16</sup>



He went on to explain the composition of Saturn's rings (1855-1857), the kinetic molecular theory of gas (1859-1878), color photography (1861), the perception of color (1849-1870), and thermodynamics (1870). Maxwell had begun thinking about the question of Saturn's rings with Peter Tait<sup>17</sup> in 1847 while they were students together at Edinburgh Academy. Maxwell mathematically showed in 1857 in *The Motion of Saturn's Rings*, one of the approximately 100 papers he produced in his life, that Saturn's rings cannot be solid, or shearing stress due to differences in gravitational force would cause it to break apart. Maxwell described the rings as being "something like the siege of Sebastopol conducted from a forest of guns 100 miles away, and 30,000 miles from the other, and the shot never to stop, but go spinning away round a circle, radius 170,000 miles."<sup>18</sup> For his essay he won the Adam's prize and it was commented by the President of the Royal Astronomical Society and British Association that this "is one of the most remarkable applications of mathematics to physics that I have ever seen." But "stability can only be achieved if the rings consisted of numerous small solid particles."<sup>19</sup> His work with Saturn's rings directly lead to the development of the kinetic theory of gases.

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<sup>15</sup>Ibid, pg 394-5. Online pg. 203. Consider also Maxwell's comments that, "I think that men of science as well as other men need to learn from Christ, and I think that Christians whose minds are scientific are bound to study science that this view of the glory of God may be as extensive as their being is capable of." pg 405. Online pg 208.

<sup>16</sup>O'Connor, J.J. and Robertson, E.F. "James Clerk Maxwell." *History Index*. Nov 1997. School of Mathematics and Statistics, University of St. Andrews, Scotland. 16 March 2002 <[http://www-groups.dcs.st-and.ac.uk/%7Ehistory/Mathematicians/Maxwell\\_House.html](http://www-groups.dcs.st-and.ac.uk/%7Ehistory/Mathematicians/Maxwell_House.html)>. Descartes had done some similar work earlier.

<sup>17</sup>A testimony to their friendship and sense of humor is witnessed from the result of when in a mathematical work produced by P.G. Tait, J.C. Maxwell's initials coincidentally appeared:  $JCM = dp/dt$  (from Newton's 2<sup>nd</sup> law, force is equal to this differential change in momentum with respect to time). From then on in their correspondence Maxwell would sign off with  $dp/dt$ . See the postcard in Figure 8 of Ian Hutchinson's "James Clerk Maxwell and the Christian Proposition." <http://silas.psfc.mit.edu/Maxwell/maxwell.html>

<sup>18</sup>O'Connor, J.J. and Robertson, E.F. "James Clerk Maxwell." *History Index*. Nov 1997. School of Mathematics and Statistics, University of St. Andrews, Scotland. 16 March 2002 <[http://www-groups.dcs.st-and.ac.uk/%7Ehistory/Mathematicians/Maxwell\\_House.html](http://www-groups.dcs.st-and.ac.uk/%7Ehistory/Mathematicians/Maxwell_House.html)>.

<sup>19</sup>Ibid.

In 1859, after a year and a half engagement, James married Katherine Mary Dewar, the daughter of the Principal of Marishal College where Maxwell taught. In this, Maxwell's 28<sup>th</sup> year, at a meeting of the British Association for the Advancement of Science he presented some results of the kinetic theory. "He concluded that gas viscosities are independent of pressure, and that they increase approximately with the square root of the absolute temperature."<sup>20</sup> In 1860, Maxwell was appointed to the chair of Natural Philosophy at King's College in London. Here he worked with his wife in their attic doing experiments measuring the viscosities of gases.

The next year Maxwell gave a demonstration of color photoimaging, in which he was probably the first person in history to produce a colored image of an object. (Herschel and Becquerel had taken photographs of the spectrum in 1842 and 1843, respectively.) He projected red, green, and blue light using three black and white positive transparencies. This process is the basis of our modern color photos, but it took 90 years for this to become commercially viable. It was Maxwell who showed red, green and blue are the primary colors of light, and using color blind individuals, he showed that these colors are the three our eyes perceive.<sup>21</sup>

One of Professor Maxwell's four books was published in 1870. His *Theory of Heat* was a lucid and popular book, seeing 11 editions. It gave a clear explanation of thermodynamics and included some basic equations which have hence been referred to as "Maxwell relations."<sup>22</sup>

Although Maxwell was involved in many fields of mathematics and physics, he is most known for his electromagnetic theory and its application to light. "In the course of his mathematical work Maxwell found that the velocity of electromagnetic waves is 186,000 miles per second." This relationship to the calculated speed of light by Roemer provided great evidence of the success of the mathematics he had discovered.<sup>23</sup>

James Clerk Maxwell's equations for electromagnetism have revolutionized the world. He presented these in *Treatise on Electricity and Magnetism* in 1873. They have hence "enabled scientists to accomplish wonders with electrical and magnetic phenomena. Not only are these equations profound [summarizing the work of all who have gone before him], comprehensive, and effective, they are also extremely beautiful and symmetric."<sup>24</sup> It has been said that they demonstrate "the marvellous power of pure thought, aiming only at the satisfaction of

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<sup>20</sup>Laidler, Keith J. "The Genius of James Clerk Maxwell Part 2. Colour, Saturn's Rings, a Demon, and a Radiometer." University of Ottawa. 6 April 2002 <<http://www.science.uwaterloo.ca/physics/p13news/maxwell.html>>.

<sup>21</sup>Ibid.

<sup>22</sup>Ibid.

<sup>23</sup>Kline, Morris. *Mathematics and the Search for Knowledge*. New York: Oxford U Press, 1985. pg 140.

<sup>24</sup>Nickel, James. *Mathematics: Is God Silent?* Vallecito, CA: Ross House, 2001. pg 219.

intellectual desires (e.g. beauty, order, symmetry), to control the external world.”<sup>25</sup> These equations are “possibly the most beautiful equations until then formulated in theoretical physics.”<sup>26</sup>

$\vec{E}$  and  $\vec{B}$  are the electric and magnetic fields, respectively. The first and third equations in the box below<sup>27</sup> are dot product, leaving the other two involving cross products with vector solutions.

$$\begin{aligned} \nabla \cdot \epsilon_0 E &= \rho \\ \nabla \times \frac{B}{\mu_0} &= \frac{\partial}{\partial t} \epsilon_0 E + J \\ \nabla \cdot B &= 0 \\ \nabla \times E &= -\frac{\partial}{\partial t} B \end{aligned}$$

$\nabla = \frac{\partial}{\partial x} \vec{i} + \frac{\partial}{\partial y} \vec{j} + \frac{\partial}{\partial z} \vec{k}$ . The permittivity of free

space  $\epsilon_0 = \frac{1}{c^2 \mu_0} = 8.854 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$ , and the permeability of

free space is the constant  $\mu_0 = 4\pi \times 10^{-7} \text{ T}\cdot\text{m}/\text{A}$ .<sup>28</sup>  $\rho$  is the charge

density and  $\vec{J}$  is the current density with dimensions of current per unit area.<sup>29</sup>

$$\vec{J} = \sum_i N_i q_i \vec{v}_i$$

Maxwell, being an advocate of quaternion notion in physics, wrote many of his theorems quaternion form, using the vector operator gradient, or grad,<sup>30</sup> where  $\nabla$ , read *del*, is the partial derivative in each of the three components as shown above. It was Sir William Hamilton who first discovered vectors and quaternions. Yet Maxwell’s application of them standardized their use and “today nearly all branches of classical and modern physics are represented using the language of vectors. Vectors are also used with increasing frequency in the social and biological sciences.”<sup>31</sup>

<sup>25</sup>Campbell, Lewis and Garnett, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 156. Cited in James Nickel’s Mathematics: Is God Silent?, pg 219-220.

<sup>26</sup>Jaki, Stankly L. Cosmos and Creator. Edinburgh: Scottish Academic Press, 1980. pg 31-32. Cited in James Nickel’s Mathematics: Is God Silent?, pg 220.

<sup>27</sup>Martin, Larry. “Maxwell’s equations in usual (differential) form.” Physics 3410 E&M Lecture Notes. 30 Aug 2000. North Park University. 8 April 2002 <<http://campus.northpark.edu/physics/phys3410/day2.html>>.

<sup>28</sup>Giancoli, Douglas C. Physics: Principles with Applications. 5<sup>th</sup> ed. Upper Saddle River, NJ: Prentice Hall, 1998. front inside cover.

<sup>29</sup>Reitz, John R., Milford, Frederick J. and Christy, Robert W. Foundations of Electromagnetic Theory. 4<sup>th</sup> ed. Reading, MA: Addison-Wesley, 1993. pg 166.

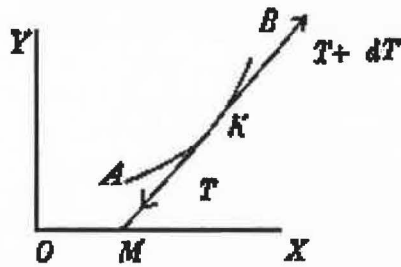
<sup>30</sup>Katz, Victor J. A History of Mathematics: An Introduction. 2<sup>nd</sup> ed. Reading, MA: Addison-Wesley, 1998. pg 752.

<sup>31</sup>Grossman, Stanley I. Calculus. New York: Academic Press, 1977. pg 658. Cited in Truth and the Transcendent: The Origin, Nature, and Purpose of Mathematic by Larry Zimmerman, 2000. pg 22.

Another amazing discovery in mathematics that found its application after Maxwell's death was his proposal of a way of generating radio waves, which he termed 'displacement current.' Many mathematical physicists of his time scoffed at both the use of vectors and Maxwell's science-fiction-like waves.<sup>32</sup> James Clerk Maxwell, with his Biblical Worldview and purpose for life of glorifying God and enjoying Him, would have found delight in discovering the works of God in mathematics long before his eyes could see a fruitful application of his mathematical discoveries. Knowing that he was created in God's image he knew that this was a means by which he was being used by God in fulfilling the cultural mandate of taking dominion for the glory of God (see Gen 1:28-30; Psalm 111:2).

### Maxwell, the poet

Besides his achievements in mathematics, Maxwell was a poet who wrote on both mathematical and literary topics. For example, in his last year at Cambridge he wrote,



An inextensible heavy chain  
Lies on a smooth horizontal plane,  
An impulsive force is applied at  $A$ ,  
Required the initial motion of  $K$ .

Let  $ds$  be the infinitesimal link,  
Of which for the present we've only to think;  
Let  $T$  be the tension, and  $T + dT$   
The same for the end that is nearest to  $B$ .

Let  $\alpha$  be put, by common convention,  
For the angle at  $M$  'twixt  $OX$  and the tension

He has even inspired others with their poetry. Hanging on a wall in the home of his birth place is the following poem written in the same style as Maxwell's:<sup>33</sup>

Energies through the ether flow,  
Waves travel to and fro,  
And with a ratio  
Their speed you measure.  
Colours yield their secret hue,  
And Saturn's rings subdued by you  
Suggest that gases  
Might be measured too.  
Science you freed  
From cramping mechanistic creed,  
And by your theory brought  
The elastic solid ether to naught,  
And changed the axiomatic basis  
Of scientific thought.

Oh Maxwell! How can I declaim  
On such a genius, such a fame,

And speak of one so very wise  
Who saw the world through splendid eyes,  
And though of such a subtle mind  
Was yet so humorous and kind?  
Yours was a mind unique and rare  
That, nurtured in a northern air,  
Struck out new paths in many ways  
Through all too short, yet fruitful days.  
How can one capture in a line  
Something so great, so pure, so fine?  
Give thanks,  
That such a man drew breath,  
And lament with all the world  
His early death.

<sup>32</sup>Wilder, R.H. "Mathematics and its Relations to Other Disciplines," *The Mathematics Teacher*, Dec. 1973, pgs 680,681. Cited in *Ibid*. pg 22.

<sup>33</sup>O'Connor, J.J. and Robertson, E.F. "A visit to James Clerk Maxwell's house." *Scottish Index*. Nov 1997. School of Mathematics and Statistics, University of St. Andrews, Scotland. 16 March 2002 <[http://www-groups.dcs.st-and.ac.uk/%7Ehistory/HistTopics/Maxwell\\_House.html](http://www-groups.dcs.st-and.ac.uk/%7Ehistory/HistTopics/Maxwell_House.html)>.



Maxwell knew the One to whom this thanks is due. This is clear from a poem he wrote during quite a busy time of exams, “A Student’s Evening Hymn.”<sup>34</sup> Stanza 7, 9, and 10:

When to study I retire,  
And from books of ancient sages  
Glean fresh sparks of buried fire  
Lurking in their ample pages—  
While the task my mind engages  
Let old words new truths inspire—  
Truths that to all after-ages  
Prompt the Thoughts that never tire.

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.

Give me love aright to trace  
*Thine* to everything created,  
Preaching to a ransomed race  
By Thy mercy renovated,  
Till with all thy fulness sated  
I behold thee face to face  
And with Ardour unabated  
Sing the glories of thy grace.

### A man of the Word

Maxwell had a profound knowledge of Scripture. At the age of eight he had memorized large sections of Milton and the entire 119<sup>th</sup> Psalm. He could give the chapter and verse for nearly any quotation from the Psalms. “A devout Christian faith and demanding mental discipline were, for Maxwell, part of the same experience.”<sup>35</sup> As he grew into manhood his faith in Christ deepened, and his conviction in the Word of God as the standard for godly teaching and living increased. In a letter to an old friend, Rev. C.B. Taylor, on February 2, 1866, Clerk Maxwell wrote,<sup>36</sup>

“Many people’s minds seem to be shut up with solemn charms, so that though they seem Christians, and know what they mean to speak about, they can say nothing. At Cambridge I heard several sermons from excellent texts, but all either on other subjects or else right against the text. There is a Mr. Offord in this street, a Baptist who knows his Bible, and preaches as near it as he can, and does what he can to let the statements in the Bible be understood by his hearers. We generally go to him when in London, though we believe ourselves baptized already.”

His biographer comments that while Mr. And Mrs. Maxwell were in London they would sometimes attend what was known as a “Nonconformist” church due to its simple style of worship. This demonstrates Maxwell’s Protestant conviction for purity in worship and doctrine. He believed Christ’s Church should not have a lot of ritual; it should be simple and regulated from Scripture alone. Also evident in Maxwell is a spirit of unity of believers, in that he was willing to go wherever the gospel is preached correctly even if the pastor did not realize the

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<sup>34</sup>Campbell, Lewis and Garnet, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 594-596. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. pg 306-308.

<sup>35</sup>Hutchinson, Ian. “James Clerk Maxwell and the Christian Proposition.” MIT IAP Seminar: The Faith of Great Scientists. Jan 1998. Massachusetts Institute of Technology. 6 April 2002 <<http://silas.psfc.mit.edu/Maxwell/maxwell.html>>.

<sup>36</sup>Campbell, Lewis and Garnet, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 345. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. pg 170.

Biblical basis for infant baptism.<sup>37</sup>

Despite his charity and unity Maxwell remained a devoted Scottish Presbyterian. “He always arranged to leave Cambridge ... in time to officiate at the midsummer communion in the kirk at Parton, where he was an elder. His liberality in his own neighbourhood was very great.”<sup>38</sup> He gave generously to the church as well as other causes.

Maxwell was definitely a Sabbath keeper. “On Sundays, after returning from the kirk [church], he would bury himself in the works of the old divines... He preferred resting on the great thoughts of other ages, though no man knew better wherein they (and scientific theories likewise) fell short of certainty; and while he was anything rather than a formalist or a dogmatist, and still clung to the belief that love remains while knowledge vanishes away, he was the enemy of indefiniteness and indifferentism, as well as of a style of preaching which, as he used to say, ‘dings ye wi’ mere morality.’”<sup>39</sup>

## Conclusion

Through all the trials and adversity of life, Maxwell stood firm in the faith and in his witty sense of humor. In his rustic childhood home he was educated by his mother who instructed him to “look up through Nature to Nature's God”<sup>40</sup> until her death to cancer at the age of 48. Having spent so much time with his mother for those first 8 years of his life, her death was particularly difficult for him, although he rejoiced even in this circumstance that she was no longer in pain. Added to this injury was the insult of having a tutor whose harshness tormented young James. He grew quite close to his father who was a member of the Royal Society and taught him much about how things work, giving some satisfaction to his son's inquisitive mind. But then when James was 25, while still in school, his father grew ill and died. J.C. Maxwell suffered personal illness when he fought off smallpox with the assistance of Katherine; he in turn nursed her during her frequent illnesses. At 48, in 1879, when his abdominal cancer was getting extremely painful, the minister who visited him was amazed by Maxwell's clarity and memory. Maxwell never complained and his kindness did not subside. The minister remarked how the illness had a profound effect on his whole being, yet he maintained “his firm and undoubting faith in the Incarnation and all its results; in the full sufficiency of the Atonement; in the work of the Holy Spirit. He had gauged and fathomed all the schemes and systems of philosophy, and had found them utterly empty and unsatisfying - “unworkable” was his own word about them -

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<sup>37</sup>To understand this position better see John Murray's book Christian Baptism or for a brief article on the subject see “The Biblical Basis for Infant Baptism” by James Scott from July-August 2000 issue of New Horizon. Available online <[http://www.opc.org/new\\_horizons/NH00/0007c.html](http://www.opc.org/new_horizons/NH00/0007c.html)>.

<sup>38</sup>Campbell, Lewis and Garnet, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 371. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. pg 193.

<sup>39</sup>Ibid. pg 321-322. online pg 160. From pg 170, online pg 104, we learn that he read John Owen and Jonathan Edwards: “Scottish Calvinism was the theological system which had most historical interest for him, and most claim on his hereditary piety. He was learned in the writings of Owen and Jonathan Edwards.”

<sup>40</sup>Ibid. pg 33. online pg 15.

and he turned with simple faith to the Gospel of the Savior.”<sup>41</sup>

About this time, Maxwell told a colleague, “The only desire which I can have is like David to serve my own generation by the will of God, and then fall asleep.”<sup>42</sup>

Maxwell is exemplary not only in death, but also in life. He loved children and would upon occasion injure himself while trying to amuse them with physical comedy. He also deeply loved his wife. Beginning before their marriage, signs of family worship were evident. Letters he wrote her show that he daily read a chapter of Scripture.<sup>43</sup> He was then able to, as Scripture says, “wash her with the water of the Word” (Eph 5:26). And with nearly his dying breath he prayed for her, “God help my poor wife.”<sup>44</sup>

But most of all, he is an example of how to do everything to the glory of God alone, as he conveyed in the few prayers we have recorded by him. Between 1865 and 1869, one who frequently visited Glenlair, the Maxwell estate, was “struck with the manner in which the daily prayers were conducted by the master of the household. The prayer, which seemed *extempore*, was most impressive and full of meaning.”<sup>45</sup> They were reflections of a mind that had been transformed by being saturated with the truth of the Word of God. Genesis chapter 1, Psalm 8 and Hebrews 2 are echoed in his following prayers:<sup>46</sup>

“Almighty God, who hast created man in Thine own image, and made him a living soul that he might seek after Thee and have dominion over Thy creatures, teach us to study the works of Thy hands that we may subdue the earth to our use, and strengthen our reason for Thy service; and so to receive Thy blessed Word, that we may believe on Him whom Thou hast sent to give us the knowledge of salvation and the remission of our sins. All which we ask in the name of the same Jesus Christ our Lord.”

“O Lord, our Lord, how excellent is Thy name in all the earth, who hast set Thy glory above the heavens, and out of the mouths of babes and sucklings hast perfected praise. When we consider Thy heavens, the work of Thy fingers, the moon and the stars which Thou hast ordained, teach us to know that Thou art mindful of us, and visitest us, making us rulers over the works of Thy hands, showing us the wisdom of Thy laws, and crowning us with honour and glory in our earthly life; and looking higher than the heavens, may we see Jesus, made a little lower than the angels for the suffering of death, crowned with glory and honour, that He, by the grace of God, should taste death for every man. O Lord, fulfil Thy promise, and put all things in subjection under His feet. Let sin be rooted out of the earth, and let the wicked be no more. Bless Thou the Lord, O my soul, praise the Lord.”

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<sup>41</sup>Hutchinson, Ian. “James Clerk Maxwell and the Christian Proposition.” MIT IAP Seminar: The Faith of Great Scientists. Jan 1998. Massachusetts Institute of Technology. 6 April 2002 <<http://silas.psfc.mit.edu/Maxwell/maxwell.html>>.

<sup>42</sup>Ibid. See Acts 13:36 (ESV) “For David, after he had served the purpose of God in his own generation, fell asleep”

<sup>43</sup>Ibid, pg 311-312. online pg 167. See also pg 320. online pg 171.

<sup>44</sup>Graves, Dan. Scientists of Faith. Grand Rapids, MI: Kregel, 1996. pg 152.

<sup>45</sup>Campbell, Lewis and Garnet, William. The Life and Times of James Clerk Maxwell. London: Macmillan and Company, 1882. pg 323. Available online <<http://www.sonnetusa.com/bio/maxbio.pdf>>. pg 160.

<sup>46</sup>Ibid.

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