CLASSIS

THE QUARTERLY JOURNAL OF THE
ASSOCIATION OF CLASSICAL & CHRISTIAN SCHOOLS

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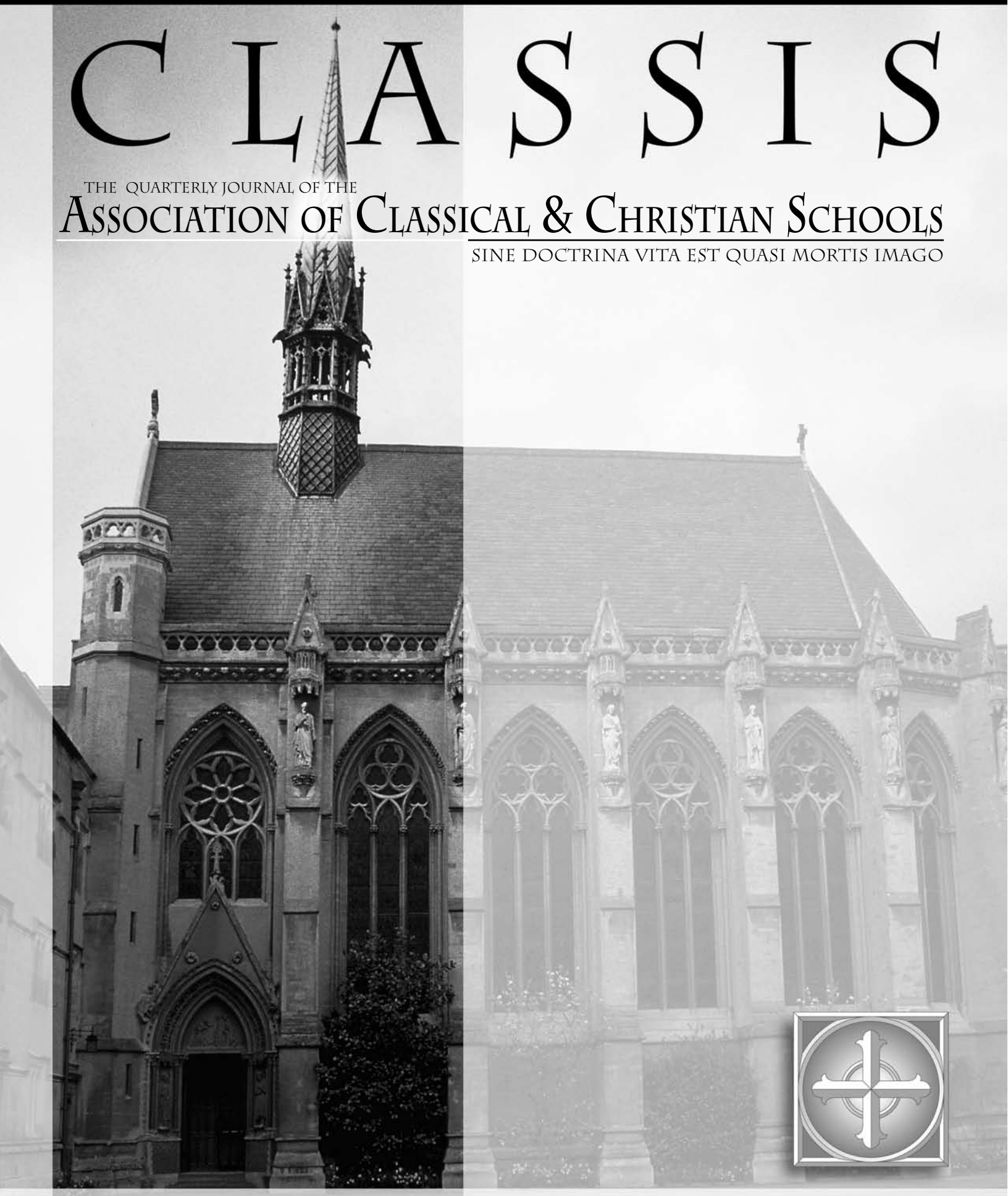

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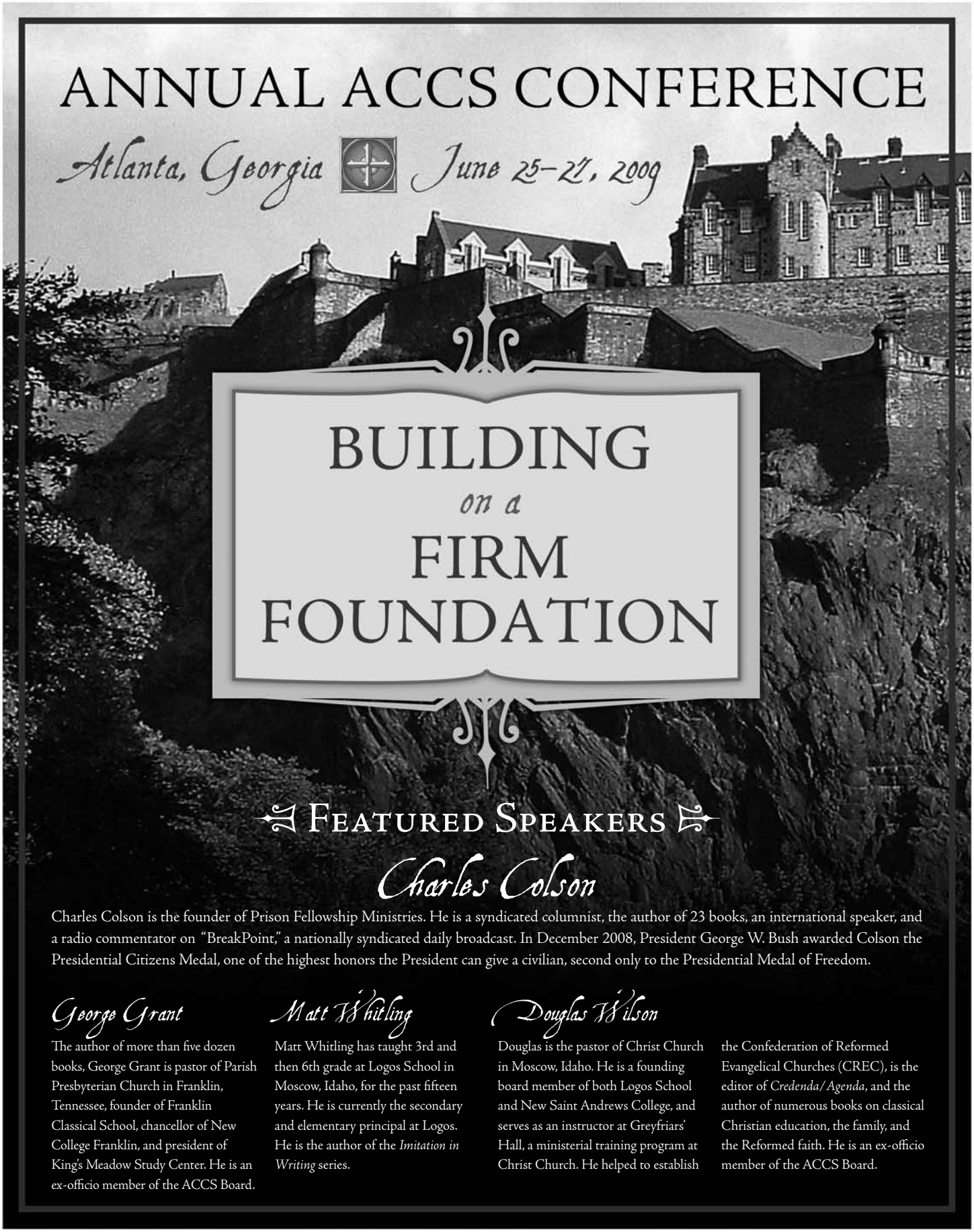

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Charles Colson

Charles Colson is the founder of Prison Fellowship Ministries. He is a syndicated columnist, the author of 23 books, an international speaker, and a radio commentator on "BreakPoint," a nationally syndicated daily broadcast. In December 2008, President George W. Bush awarded Colson the Presidential Citizens Medal, one of the highest honors the President can give a civilian, second only to the Presidential Medal of Freedom.

George Grant

The author of more than five dozen books, George Grant is pastor of Parish Presbyterian Church in Franklin, Tennessee, founder of Franklin Classical School, chancellor of New College Franklin, and president of King's Meadow Study Center. He is an ex-officio member of the ACCS Board.

Matt Whitling

Matt Whitling has taught 3rd and then 6th grade at Logos School in Moscow, Idaho, for the past fifteen years. He is currently the secondary and elementary principal at Logos. He is the author of the *Imitation in Writing* series.

Douglas Wilson

Douglas is the pastor of Christ Church in Moscow, Idaho. He is a founding board member of both Logos School and New Saint Andrews College, and serves as an instructor at Greyfriars' Hall, a ministerial training program at Christ Church. He helped to establish the Confederation of Reformed Evangelical Churches (CREC), is the editor of *Credenda/Agenda*, and the author of numerous books on classical Christian education, the family, and the Reformed faith. He is an ex-officio member of the ACCS Board.

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Sine doctrina vita est quasi mortis imago

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CLASSIS

CLASSIS is a quarterly journal of articles and book reviews designed to support and encourage schools around the world which are recovering classical Christian education. Hard copies are available to ACCS members and by subscription.

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God's Creation

by Patch Blakey

Is there a place for mathematics and science in classical Christian schools?

In the 38th chapter of the book of Job, the Lord begins His examination of that ancient patriarch.

"Where were you when I laid
the foundations of the earth?
Tell Me, if you have
understanding.
Who determined its
measurements?
Surely you know!
Or who stretched the line
upon it?
To what were its foundations
fastened?
Or who laid its cornerstone,
When the morning stars sang
together,
And all the sons of God shouted
for joy?" (Job 38:4-7)

In the passage quoted above and following, the Lord goes on to interrogate Job on the extent of his personal knowledge with regard to not only the depths of the oceans, but also snow, hail, rain, and ice; the sources of light and darkness; the innumerable stars and their constellations. The Lord continues to challenge Job's limited knowledge of the animal kingdom, of lions, ravens, oxen, and even ostriches. He asks Job how they are all fed when their young are crying for food.

As for mathematics, the Lord's statement above implies an exact understanding of size, location, proportion, and time. All of these link directly to our understanding of arithmetic, algebra, geometry, trigonometry, calculus, and beyond. The sheer scope of God's creation is far too great for men to probe in detail in a single lifetime, and probably more than we will be able to comprehend over the course of a thousand generations. But it all bears careful study and examination now.

The whole of God's creation was proclaimed "good" upon the completion of the sixth day. Our world is a vast treasure of knowledge, from the minutest particles that form an atom to the expansive vastness of the universe. Nothing is neutral in God's created order. It can't be, because it was all created by Him. Everything points back to Him as its ultimate source. This also means that matter is good, contrary to the gnostics who think that only the spiritual realm is where true reality resides. But we know better. After all, Jesus Christ sits enthroned with a resurrected physical body, the first fruits of what we will become in the next life following our promised resurrection from the dead.

I am thankful for the articles in this issue of *Classis* because I think the authors have collectively done an excellent job of pointing to the pressing requirement that all ACCS schools must pursue the study of math and science as part of their understanding of the nature of God and of His creation.

Help ACCS Get *CLASSIS* to Teachers

We are planning more issues of *CLASSIS* like this one with content that we hope will be of interest to teachers, as well as to administrators, board members, and parents.

Please send an email address for any staff members who would like to be added to our *Nuntiata* mailing list, so that we may keep them informed. Send them to admin@accsedu.org.

All editions of *CLASSIS* are available at the ACCS website at http://www.accsedu.org/283200.ihtml.

***Patch Blakey** is the executive director of ACCS.*

Improving Science in Classical Christian Schools

by Lory Hundt

"We're not alone!" This sounds like a line from a science fiction movie, but it has current application to the state of science education in our classical Christian schools. It is no surprise to hear from many administrators that we need to improve our science courses in the classical Christian schools, as this is the case across our country, in both public and private schools. We are not unique in that sense. What is unique is how we answer the question, "How do we improve science in our classical Christian schools?" The answer is simple: we teach classically and "Christianly." But what does that look like?

Once you put words down on paper, you open yourself up for criticism, like Pandora's box that unleashed sickness, trials, and finally hope. Opening this can of worms is potentially volatile. I'm willing to open up on the topic of teaching science if that helps to stimulate discussion.

Though simple, the answer is not easy since science as a particular subject has been placed on a worldwide pedestal. Our challenge is to live up to the preconceived ideas of just what science is and then determine what it should look like. As classical Christian teachers, we have to teach all subjects with classical pedagogy under the authority of Christ.

Although most Christian schools claim to teach all subjects under the authority of Christ, many schools, perhaps under pressure from parents or professionals, adopt the view that science can only be good if taught like the government schools. After all, the Bible and other courses will cover the Christian worldview. I remain amazed at the number of science teachers that still separate, in their minds and practice, science from the rest of the liberal arts. I would posit that the government schools have been the ones to dummy down the sciences by teaching a reductionist viewpoint.

In teaching science classically we need also to remember that science is part of the liberal arts, to be taught as such and not treated as the unwanted "step-child."

I am not suggesting that we totally divorce ourselves from current modern science education as we do have some goals in common. We do not have to reinvent the wheel, but we certainly need to realign it.

Let me address three points for the reformation of science instruction. We need to be more classical in our methods and have less of a "current science" orientation. We need to be more Christian in our study of science, rather than secular. And we need to be responsible to make it happen in our science classrooms.

The National Research Council (NRC) in their National Science Education Standards (1996) began with the statement, "This nation has established as a goal that all students should achieve scientific literacy." For the NRC that literacy revolves around two key elements: that students develop the abilities necessary to do scientific inquiry and that they develop understandings about scientific inquiry. Those are good, but not good enough. With classical education we know it is more than acquiring a set of technical skills.

We must consider carefully our curriculum and our sources, which ought to be distinct. When looking at some classical Christian schools' curriculum for science, I've found that the objectives for the course followed the table of contents straight from a science textbook—verbatim. We need to recognize that we should not be slaves to a textbook and the textbook writer's agenda. Textbooks are tools.

The comprehensiveness of textbooks is an illusion that can never be accomplished. The book *America's Lab Report: Investigations in High School Science*[1] points out, "In the ongoing debate about the coverage of science content, the American Association for the Advancement of Science (AAAS) took the position that curricula must be changed to reduce the sheer amount of material covered." This is a statement similar to what we hear in classical pedagogy, "teach less, but deeper."

The New Atlantis: A Journal of Technology and Society[2] (Spring 2005) published an article entitled "Science Education and Liberal Education" by Matthew B. Crawford. He points out that when it comes to textbooks "from a publisher's perspective, the important thing is that every conceivable topic be mentioned." This is a good selling point for the

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publisher. He also stated, "The Third International Mathematics and Science Study found that the average U.S. middle school textbook covers 50 to 65 topics, while texts in Japan include only five to 15 topics and German textbooks cover an average of seven topics. The superficial treatment of dozens of topics comes at the expense of students' conceptual understanding." We're the country that thinks more is better. Take time to consider fewer topics.

Our pedagogy for teaching classically should differ from the current science practices of simply a "transmission of information" to students. Where the secondary goal for the government schools is to prepare a future scientific and technical workforce, we should work to develop students who can think, reason, and articulate well. This requires student engagement in a variety of ways. I don't mean in the sense that we employ salesmen-type tactics, as Crawford puts it, "assimilating science to their untutored priorities," but that we engage students either through Socratic dialogue or through the old Hebrew method—of which the headmaster of the school where I teach has been training our faculty and has termed this the "parabolic method." This means engaging in conversation where the students start with concrete ideas, carry the ideas into more abstract concepts, then bring it back to concrete, practical application. Students ask questions and help to answer their own questions, which makes it clear that the students actually understand the material.

It is important that we continually incorporate logic in the science class. Our students must learn to recognize foolish reasoning, recognize the fallibility of common sense, discover hidden premises, and discern unsound conclusions. Darwinian subtleties are to be found everywhere! Students find the hunt for the subtleties a fun challenge.

In teaching science classically we need also to remember that science is part of the liberal arts, to be taught as such and not treated as the unwanted "step-child." We must be deliberate in our selection of and creation of our curriculum—not slaves to a textbook (you really need to read Michael Crawford's article). And we must engage our students in a way that they are able to apply logic and articulate their understanding of the material. We can not afford to be clones of the government school curriculum. I taught science for almost 20 years in the government schools; often times it led more to trivial pursuit, standardized test prep, or lab tech school than it did to lifelong learning and providing the tools for learning and understanding.

It is obvious that we need to teach Christianly, as this isn't in our name just to haul in the crowds; however, this may be deeper and richer than we realize. It's not about using a Christian textbook or throwing in a good scripture verse here and there just to make it different from government school. No, I would say that we are even to be distinguished from other Christian schools that rely strictly on Christian textbooks.

Of course, we should take the non-reductionist view of science and help students to recognize truth, beauty, and goodness in the particulars and the whole. There is something noble in scientific intellectual pursuit. It is not about being pragmatic, mastering nature, or determining functionality, but about the discovery of order and beauty and stewardship. There is intellectual gratification to be had, although this is not necessarily a universal motivation. As Crawford points out, some are not susceptible to such pleasures. Nevertheless, it should be pursued.

Although there are some scientists who would say that worldview should not influence science, we are Christians and therefore, worldview instruction must be integrated into the sciences. If science is nothing but unbiased, empirical facts that stand on their own, why are there so many arguments among scientists? It is because many scientists are aware of the unspoken inclusion of philosophy, but most don't admit it. However, Charles Darwin wrote, "I am quite conscious that my speculations run beyond the bounds of true science." With so many people believing in neo-Darwinism, materialism, rationalism, atheism, the list could go on, we cannot run and hide. We should be reading the secular writings of Poincaré, Darwin, Draper, Singer, Einstein, Kuhn, Hawking, Dawkins and many others. Students need to see, confront, and critique these thoughts. My school has implemented Philosophy of Science as the senior capstone course in the science track after biology, chemistry, and physics.

The University of Notre Dame has an excellent degree program which few schools have, although it is beginning to spread across the country, in the area of the History and Philosophy of Science (HPS). Worldwide research through the International History and Philosophy of Science Teachers Group based out of New South Wales (predominantly university level) has shown empirically over several decades that a greater

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understanding of science is gained when science is taught in context including the history and philosophy of the time period. This should be integrated into all science classes at every level including the grammar stage.

In teaching Christianly, we must point to goodness, truth, and beauty in the created order, determine what is good stewardship and totally immerse students in the epistemology, philosophy, history, and worldview of science.

As for practical application, there is one major dilemma that classical Christian teachers share. Do we adopt a "good" secular textbook and supplement it with worldview and continually point out presuppositions, or do we adopt a "weak" Christian textbook and supplement it with additional "science?" Your curriculum committee and headmaster should assist in that decision. Teachers who have a good mastery of their subject usually depart from the textbook anyway. (I'll say this again—you need to read Crawford's article in the *New Atlantis*.)

Active student participation in laboratory investigation is vital to any science program. Students need the experience in order to help them understand concepts. Connections will be made that might not otherwise with strictly textbook encounters. A laboratory is not necessary as long as they use cognitive and manipulative skills associated with the formulation of scientific explanations and theories.

Teachers can supplement curriculum with DVDs from the Discovery Channel Store (http://shopping.discovery.com), Answers in Genesis (http://www.answersingenesis.org/), The Teaching Company (http://www.teach12.com), and the Access Research Network (http://www.arn.org/). At the Access Research Network you will find an excellent resource, a DVD titled the "Darwin Bicentennial Celebration: A Retrospective Look at the Origin of Species" (formerly titled "The Rhetoric of Charles Darwin") by John Angus Campbell—an agnostic, but a leading authority on Darwin. Every Christian should watch this interview. Often, we watch DVDs during lunch in order to fit them into the curriculum.

Another practical method is taking students to debates and lectures in the area. One of my colleagues and I took the students to the Dawkins/Lennox debate (http://www.dawkinslennoxdebate.com) last year...only an 18-hour round trip. It was worth it to hear the students say, "We thought the best part of this trip was going to be the van ride, but it wasn't, it was the debate! That was amazing!" They recognized they had the ability to argue against Dawkins. We also attended a series of lectures on Pascal at The Christian Study Center of Gainesville which caters to students at the University of Florida.

In order to improve science in our classical Christian schools, we must recognize the need is real; recognize what it means to be classical with science which requires going above and beyond the "normal" scope of science; and teach Christianly, purposely experiencing the joy in the pursuit of understanding. We need to teach clearly and cogently the application of a Christian worldview as well as discerning the worldviews of others. We need to do all of this without letting up on the rigor of scientific pursuit. It's that simple.

Now that I'm finished with this article, I'm taking my class fishing for planaria. If I've given you hope, you may contact me at lory.hundt@bereanacademy.org. to answer any questions.You are not alone.

ENDNOTES

[1]National Research Council of the National Academies, *America's Lab Report: Investigations in High School Science*, ed. Susan Singer, Margaret Hilton, and Heidi Schweingruber (Washington, DC: National Academies Press, 2006).

[2] Matthew Crawford, "Science Education and Liberal Education," *The New Atlantis: A Journal of Technology and Soceity*, (Spring 2005), http://www.thenewatlantis.com/publications/science-education-and-liberal-education

What Schaeffer Academy Is Doing in Upper School Science

by Philip Arant

The Need for Excellence in Science

A physics student in a classical and Christian school sits down to take a mechanics test. After completing the typical grammar questions of recalling certain terms and equations, and the typical logic questions of applying those equations in solving word problems, he then encounters the following rhetoric test question:

"Great are the works of the Lord; they are studied by all who delight in them." Psalm 111:2

"You are seated in a gathering of somewhat sophisticated adults watching a World Series baseball game on TV. In response to a batter hitting the ball over the outfield fence for a home run, one of the people in the group wonders out loud how fast the ball must have been going right after the bat hit it in order to barely make it over the fence such a far distance away. Another person in the group, knowing that you are trained well in mechanics, turns to you and asks you to explain the physics involved in the baseball's travel. Write a detailed response, clarifying all the factors involved."

Not only must the student express exceptional understanding of the phenomenon in question, he must also now clearly, concisely, and persuasively communicate this understanding in terminology his audience can grasp. Learning is pushed towards fruition.

Science utilizes observation and measurement to uncover the regularities inherent in our physical environment. With a Christian and classical approach to education, we naturally provide our students with both the ideological and historical foundations to science. Ideologically, we begin with understanding the creational basis of uniformity revealed in the Scriptures. No other foundation remotely justifies a science class. Historically, we realize that most of the recent and rapid advances in scientific discovery blossomed within the biblical context of Western culture–particularly in Europe. Individuals such as Copernicus, Galileo, Kepler, Newton, Faraday, and Maxwell all operated from an understanding of created order. Because an intention for creation was presupposed, uniformities could be anticipated.

Often with an emphasis on the humanities, many classical and Christian schools lightly esteem the equally potent value of science in their curriculum. The discipline of science carries a wonderful fit for the teacher to apply classical methodology as well as disclose the necessity of Christian truth. Students not only need to be taught formal deductive skills of proper rational reasoning in logic class, but also formal inductive skills of proper observational reasoning in science class. Because of the predictability inherent in created design, properly organized studies must trump human testimonial. In this we guard against error pressed upon us by manipulative rhetoric. Have you ever been urged to try a certain remedy as a consequence of listening to several glowing reports? "After just two applications my rash was gone!" These testimonials may be true, yet we can test them against a close approximation to God's testimonial of creation by utilizing inductive reasoning. Students need to understand what an adequate study looks like. They need to recognize good science.

Facility and Curriculum at Schaeffer Academy

The commitment to pursue excellence in science at Schaeffer Academy (in Rochester, Minnesota) has prompted many developments over the past several years. Both the school board and many parents have communicated expectations that the school should display a noticeable community footprint in scientific disciplines. Along with the challenges that these expectations bring, the school's development director has worked to secure an exceptional level of donated resources to begin building a program capable of providing the facilities and the hands-on experiences so desirable for instruction.

Schaeffer Academy currently has a 7th through 12th grade enrollment of 144 students. We utilize two science labs: one a wet lab for 7th grade life science, 9th grade biology, and 10th grade chemistry; the other a dry lab for 8th grade physical/earth science, 11th grade Physics I, 12th grade Physics II and Advanced Placement (AP©) physics. Each lab has a floor space of about 1270 square feet and both utilize six lab stations,

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each seating four students to put our class maximum at 24.

Choice of science curricula has been a painstaking process at Schaeffer Academy. Though an overtly Christian textbook would be preferred, most of our upper school science courses do not utilize this avenue due to insufficiencies in meeting our academic criteria. As a result we depend upon the teacher as the primary resource for biblical integration. The student must merely be brought to the place of its constant recognition. I often make annotations in my lesson notes when a noteworthy convergence of divine handiwork should be recognized in class. Otherwise it is assumed to be the air we breathe. The teacher constantly gestures toward that assumption (Acts 17:28).

Within the various programs available on the market for high school curriculum augmentation, Schaeffer Academy has decided to utilize the AP© Program offered by the College Board. With one goal of providing AP© in at least physics and chemistry, we have been gradually upgrading our lab equipment and curricula to an introductory college level. Thus far we have begun using *Chemistry, 6th Edition* by Zumdahl & Zumdahl[1] for our chemistry textbook and *College Physics, 6th Edition* by Serway & Faughn[2] for our physics textbook. Both curricula have been found to be excellent resources and include nice multimedia offerings that provide students with many visuals to help understand the phenomenon of creation being studied. The textbooks are then used as an organizing entity for the teacher to "lean upon" in nurturing a love for learning in the students.

Because the AP© effort in physics has already been launched, efforts have been made to provide students with the laboratory equipment necessary to construct more sophisticated hands-on inquiries that are required for our AP©status. We currently use hand-held computer dataloggers provided by PASCO Scientific that can print out graphs and accommodate sensors capable of measuring just about every imaginable physical phenomenon. In this way the student has the tools to venture out into discovery rather than only mimicking phenomena. A rather sophisticated lab portfolio can subsequently be produced.

Though the current goal to upgrade the chemistry labs to an AP© level will not be attempted for another two years, various add-on chemistry sensors that are compatible with the PASCO datalogger can be purchased at that time at a minimal cost.

There are currently no plans in place to augment our biology program to the AP©level because of the need to address the myriad of issues presented by the macro-evolutionary commitment of AP©level textbooks. We are currently using a Bob Jones curriculum and hope to expand the opportunities in biology further within the next few years. One opportunity we have offered that allows students to advance in their academic life-science applications is our participation in local research mentorship programs. Here a student is required to accomplish 60 hours of work alongside a medical technician and regularly present a log of work and the accomplishments.

Classical Methodology

At Schaeffer Academy we attempt to create a dialectic dynamic in the classroom while utilizing the seven laws of learning in order to broaden the grammar, logic, and rhetoric capabilities of the students. The notes I have established for every daily lesson include as many thought-provoking questions as I can creatively produce. This is a reservoir I have–always searching how and when to deliver. I try never to launch into a new topic unless a student has answered some targeted question that would provide a springboard for that topic. This insistence helps create a healthy give-and-take dialectic, which lends wonderfully to the joy of learning. For example, in order to introduce Coulomb's law of electrostatic force, I first ask the students about the nature of Newton's law of gravitational force. The striking parallels of God's designed order help create a familiar "launch pad" for understanding the new concept. If a student draws a blank, I solicit a little help from a friend and then come back to see if the initial blank now can give pursuit to thinking. No one can hide in my class. Everyone is required to think.

Another emphasis within our science effort is participation in Rochester's regional science fair. Here the student is required to exercise good rhetorical skills before an audience in explaining their project. The spectators then are asked to question various features of the project to which the presenter must respond. Each year a handful of students have advanced to the state level for Minnesota. Enthusiasm increases due to the testimony of those who have succeeded.

The effort expended in growing our science program has benefited our students greatly at Schaeffer

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Academy. This is a "science-heavy" world we live in that has lost touch from an ideological justification for such. We want to give our students the tools and the backbone to influence our culture back toward the Biblical context from which it has so profited. I encourage more classical and Christian schools to investigate ways to commit resources for such an endeavor.

ENDNOTES

[1]Steven Zumdahl & Susan Zumdahl, *Chemistry*, 6th ed. (Boston: Houghton Mifflin Co., 2003).

[2]Raymond Serway & Jerry Faughn, *College Physics*, 6th ed. (Thomas Learning, 2003).

Francis Bacon and the Scientific Method:

Bringing Home the Bacon

by Dr. Jeffrey Barclay

Consider this syllogism:

Major premise: real science applies Francis Bacon's inductive reasoning.

Minor premise: the scientific method is real science.

Conclusion: the scientific method applies Francis Bacon's inductive reasoning.

This kind of Aristotelian, deductive syllogism represents the means early scientists used to deduce new truths. Eventually, scientists from both the Muslim East and Christian West expanded this practice by combining rational arguments with investigative observations.[1] But syllogisms were not capable of managing the many sub-premises of increasingly complex analyses. This also meant expectations of empirical experimentation and independent substantiation were now going to be weighed against the intuition of medieval natural philosophers.

With the Renaissance came thinkers like Francis Bacon and his stubborn commitment to empiricism. Bacon's *scientific method* was explained in his *Novum Organum*. Bacon was adamant that hypotheses emerge from investigation, "which ought only to give definiteness to natural philosophy, not to generate or give it birth."[2]

Fast forward to my lifetime. I was doing research in marine biology. Shipping companies spend millions of dollars each year removing barnacles and other marine invertebrates from the bottoms of their boats. I intended to discover an environmentally acceptable way to stop their growth. In the great tradition of capitalism, I was going to bring home some "bacon" as the grateful owners of those vessels shared a portion of their savings with me!

Francis Bacon's intent was for man to utilize rational induction as a tool in fulfilling God's dominion mandate from Genesis 1:28.

I conducted carefully designed tests on marine ecosystems inhabiting ship hulls. Exercising experimental controls, I meticulously applied the scientific method. With exacting scrutiny I recorded what could keep what from growing where. As a budding scientist I knew others, not the least of which were my professors, would seek to reproduce and validate my claims.

Francis Bacon argued for inductive study. "The best demonstration by far is experience, if it goes not beyond the actual experiment."[3] "If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties."[4] In so many words, Bacon's scientific method told me (and all scientists before and after me), "Jeff, you can't claim to know how to safely keep the hulls of ships free of fuel-robbing invertebrates, until you have repeatedly kept similar hulls free of fuel-robbing invertebrates in similar conditions."

Bacon, noting syllogism's limitations due to a lack of experimental empiricism wrote in his *Rerum Novarum* (1605) that Aristotle was a bond-servant to his logic. According to Bacon this rendered Aristotle's syllogisms "contentious and well nigh useless."[5] Bacon argued the only knowledge of importance was empirically rooted in *hypothesis, experimentation, observation, conclusion*, and independent *verification*. He was convinced his method would make a better world for man by eventually disclosing all that is hidden in the universe.

On the title page of Francis Bacon's *Instauratio Magna* is the image of a ship.[6] The ship is tacking through the legendary Pillars of Hercules. These pillars symbolized the ancients' perceived limits of human discovery. Through unsullied experimentation, Bacon asserted mankind was going to claim new "ports" of human advancement.

Bacon's proposal evoked a sense that the study of nature was preferred, as opposed to a study of God, since nature is observable and God is not. Bacon believed the goal of knowledge was mastery. Since his Christian doctrine taught man cannot and

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should not seek mastery over God, as God already masters man, it was reasonable for him to declare, "Certainly nature is a more suitable scientific preoccupation than God."

As science has helped secularize Western culture, some historians argue Bacon advocated secularization. Stephen A. McKnight's book, *The Religious Foundations of Francis Bacon's Thought*[7], refutes this view: "Bacon's program was grounded in genuine and deeply felt religious convictions." I have come to recognize Bacon's religious convictions to be what gave him the security and confidence to advocate rigorous scientific analyses. In *Of Superstition,* Bacon recorded, "The times inclined to atheism … they were civil times. But superstition has been the confusion of many states…"[8] Bacon's remarks should be viewed as a Reformation-influenced acknowledgment that religion, even canonized religion, when misapplied through human predisposition, can kick up a blinding dust.

Bacon's *Of Atheism* also contains a clarifying thesis, "…a little philosophy, inclineth man's mind to atheism; but depth in philosophy bringeth men's mind around to religion."[9] Most convincingly, the title page from *Instauratio Magna* included Daniel 12:4, "Many will pass through and knowledge will be increased." Bacon, recognizing his Christian faith had settled the big questions of life, death, and eternity, was now ready to proceed to new horizons of naturalistic inquiry.

Francis Bacon's intent was for man to utilize rational induction as a tool in fulfilling God's dominion mandate from Genesis 1:28. "If a man endeavor to establish and extend the power and dominion of the human race… the empire of man depends wholly on the arts and sciences. We cannot command nature except by obeying her. "Man, as the minister and interpreter of nature, is limited in action and understanding by his observation of the order of nature; neither his understanding nor his power extends further than his knowledge."[10] Referencing back to my barnacle research, my work was going to explain how man could "obey" the ecosystem on boat bottoms. Through that understanding, boat owners could "take dominion" of those creatures and extend power over that niche of nature.

A lesser referenced, but of no less importance in our day, was Bacon's postulate describing intellectual fallacies. They were described in his *Novum Organum* under four headings. Using Biblical terminology he named them idols.[11]

Bacon called the first *Idols of the Tribe*. These are the tendencies of all men to exaggerate and distort. Eventually these imaginings gain dignity and become mingled with enough facts until the "new combination" becomes inseparable. This may explain Bacon's epitaph which is said to be a summary of his entire philosophy. It reads, "Let all compounds be dissolved. "[12]

The second classification Bacon titled *Idols of the Cave*. These are the peculiars of individual education, experience, environment, and temperament. The title page of Bacon's *New Atlantis* (1626) showed Father Time lifting a female figure from a dark cavern. This was generally understood to be truth rescued from the cave of biased personal intellect.

A third category was *Idols of the Marketplace*. This referred to the problems of language. For Bacon the semantics of science should be accurate and universal. In spite of Latin's singular use in the scientific reporting of his day, Bacon pointed out that deceit and misapplication of words hindered empirical explanations of data.

Bacon's final division was *Idols of the Theatre*. These were abuses of sophistry and false learning. These false philosophies are rehearsed into believability. Then their erroneous merit is rewarded by being cheered on the world's stage.

These days we would benefit from a fresh introduction of Bacon's idols to *things scientific*. Scienticism has pressed the theory of evolution. A bevy of books have responded to explain why a theory, whose proposed results have never been repeated in a laboratory, can be popularly treated like a law.

What a marvel of *the Cave, the Tribe, the Marketplace* and *the Theatre* when a theory, founded upon accident and chance, has been suggested as offering "order" to an evolved, random, and accidental universe! Bacon was commenting on poorly practiced science when he wrote, "The cause and root of nearly all evils in the sciences is this–that while we falsely admire and extol the powers of the human mind we neglect to seek for its true helps."[13]

Another current scientific controversy involves global warming. Have the inventions of science turned our planet into a warming oven? What data is trustworthy? Taken from Aphorism 46 in *Novum Organum*, Bacon confronted scientific partiality when he penned, "Human understanding, once it has adopted an opinion either as being received opinion or as being agreeable to itself, begins drawing everything else to support and agree with it.

Bringing Home the Bacon...

And though there be a greater number and weight of instances to be found to the contrary opinion, yet these it either neglects and despises, or else by some distinction sets aside and rejects, in order that by this great and pernicious predetermination the authority of its former conclusions may remain non-violated."[14]

A contemporary of Bacon, astronomer Johan Kepler, said, "As a priest of the highest God I was merely thinking God's thoughts after him." We must teach young minds that good science can be a mark of servant leadership, honesty, and Christian discipleship. "No pleasure is comparable to the standing upon the vantage ground of truth… and to see the errors… in the vale below, always to be with pity, not pride."[15] To conclude, the Lordship of Christ has eternal prospects in science. To echo thoughts from *The Second Book of Francis Bacon of the Proficience and Advancement of Learning*[16] (1605), scientific research ought not only be esteemed when it has immediate and present uses, but particularly when it reveals truths of universal and permanent consequence. These will always direct more light upon our Triune God, the one of whom is the noblest Light.

Bacon's methods do not preclude the marvel of fortuitous discoveries. (For instance, science guys like me know about how a technician accidentally discovered microwaves. The Hershey bar in his shirt pocket melted during an experiment that was supposed to be exploring the applications of radar.) Yet, properly practiced, Bacon's insistence upon empiricism will protect truths, even those as yet unknown, from manipulation, lies, and myth. It is time to bring Bacon (and our God) back home to science.

ENDNOTES

[1]D.C. Lindberg, *Theories of Vision from al-Kindi to Kepler*, (Chicago: Univ. of Chicago Press, 1976), pps. 60-67.

[2]Francis Bacon, *Novum Organum*, Aphorism 96 (1620) in Stephen McKnight, *The Religious Foundations of Francis Bacon's Thought*, (Columbia: University of Missouri Press, 2006), p. 88.

[3]Ibid., Aphorism 70, pp. 80-81.

[4]The Advancement of Learning, (1605) *The Works of Francis Bacon* (1887-1901), Vol. 3, p. 293.

[5]Francis Bacon, *Rerum Novarum* (1605), referenced in *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu/entries/francis-bacon, section 2, paragraph 2, line 2.

[6]Francis Bacon, Instauratio Magna, cover page at http://oregonstate.edu/instruct/phl302/philosophers/bacon.html

[7]Stephen McKnight, *The Religious Foundations of Francis Bacon's Thought* (Columbia: University of Missouri Press, 2005).

[8]Francis Bacon, "Of Superstition," in *The Essays*, http://ebooks.adelaide.edu.au/b/bacon/francis/b12e/essay17.html

[9]Francis Bacon, "Of Atheism," in *The Essays*, http://ebooks.adelaide.edu.au/b/bacon/francis/b12e/essay16.html

[10]Francis Bacon, *Novum Organum*, Aphorism 1 (1620), McKnight, p. 75.

[11]Manly P. Hall, *Francis and His Secret Empire*, quoted at *www.sirbacon.org/links/quotesabout.html*, entry 80.

[12]Ibid., entry 86.

[13]Francis Bacon, *Novum Organum*, Book I, Aphorism 9 in McKnight, p. 77.

[14]Ibid., Aphorism 46, pp. 80-81.

[15]Basil Montagu, *The Works of Francis Bacon, Lord Chancellor of England*, (Ann Arbor, MI: Scholarly Publishing Office, 2005), vol. 1, p. 173, referencing Bacon's "Of Truth", in *Essays* (1597).

[16]Francis Bacon, *The Second Book of Francis Bacon of the Proficience and Advancement of Learning* (1605), http://ebooks.adelaide.edu.au/b/bacon/francis/b12a/ (accessed January 16, 2009)

The Rise and Fall of Reason

by Dr. Mitchell Stokes

Genuine mathematical understanding is like a three-legged stool. Doing calculations or deriving theorems is only one of the legs. The other two legs are math's history and philosophy, respectively. I've tried sitting on a one-legged stool, and it's hard. I spent the better part of twenty years learning the grammar of mathematics–its recipes and techniques. I was good at it, too. But I felt cheated when I discovered that there was more to mathematics–so *very* much more. For example, did you know that a *mathematician* began Western civilization's millennia-long search for intellectual certainty, a search that has led to various forms of idolatry? Thales of Miletus (ca. 600 BC) was, in fact, the West's *first* mathematician. He was also its first philosopher. And its first scientist. He initiated our epistemological search by refusing to invoke the Homeric gods as the cause of natural phenomena; rather, he sought *rational* explanations for the cosmic order. Nature, he believed, doesn't behave according to the whims of erratic divine beings. On the contrary, nature is ultimately reasonable and, furthermore, humans are capable of discerning its rational structure. He passed on this belief to his pupil Pythagoras, of Pythagorean theorem fame. Pythagoras, going a step further than Thales, concluded that nature's structure is not merely rational but *mathematical*. A century or so later, Plato–himself a Pythagorean–then set the West's scientific and metaphysical agenda: describe the cosmos in mathematical terms.

Plato's pupil, Aristotle, proposed a method for meeting this challenge. In fact, it was a method by which *all* subjects could be systematically developed and organized. Or so Aristotle supposed. According to his method, each subject or "science"–whether it was mathematics, mechanics, or metaphysics–would begin with fundamental and indubitable assumptions (the *axioms*). These assumptions, in other words, must be absolutely certain. "Well begun is half done," Aristotle said in his *Politics*. From these unquestionable foundations, we then reason to further truths (the *theorems*), thereby building the rest of that particular science. Only if we're confident in our axioms can we be confident in what we derive from them–and then only if we can trust our reasoning. So Aristotle invented the discipline of logic to help with this.

...the history and philosophy of mathematics can actually tell the West's sweeping intellectual story.

Although Aristotle intended that his *axiomatic method* be used for any subject, he had modeled it on mathematics. This is because, for the Greeks, mathematics was already the standard for intellectual certainty. It still is today. For most of us.

The famous mathematician Euclid trained at Plato's Academy and so was steeped in Pythagorean ideas. He also, quite naturally, used Aristotle's axiomatic method for his *Elements* (ca. 300 BC). The *Elements* is a compilation of classical Greek mathematics and contains what we now, for obvious reasons, call "Euclidean geometry," the geometry we learned in high school. Euclid could not have possibly foreseen its influence; it became the West's intellectual archetype for the next two thousand years. And so the axiomatic method–a mathematical method–became the West's only foolproof way to certainty in any subject.

The method's promise of assurance enticed thinkers like Descartes, Hobbes, Spinoza, Bacon, Galileo, and Newton to axiomatize their own, non-mathematical theories. With it, Newton, for example, achieved at last what the Greeks had set out to do centuries earlier, namely, to describe the rational structure of the universe with mathematics. His *Principia Mathematica* (ca. 1700) was the culmination of the scientific revolution. In the *Principia*, Newton mathematized the movements of heavenly and earthly phenomena. By assuming his celebrated three laws of motion, he derived, among other things, his law of universal gravitation. If that weren't enough, he invented calculus to help him, further supporting the view that mathematics was the ultimate path to truth.

It would be difficult to overstate the effect that Newton's achievements had on Europe's intellectual temperament. The resulting optimism in man's rational powers bordered on profligate. Odes and poems were written in Newton's honor. With mathematics–a purely *mental science*–Newton had at last revealed the secret workings of the *physical* cosmos. The mathematization of motion was the main technical

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Reason...

achievement of the scientific revolution. But more importantly, the revolution unseated traditional cultural authorities. Although the influence of the Church and the Ptolemaic system had been gradually diminishing since the Middle Ages, it was Newton's *Principia* that officially ended their rule. And so, by inaugurating reason as the final arbiter of truth, the *Principia* ushered in the Enlightenment. In fact, Immanuel Kant, the Enlightenment's unofficial spokesman (and perhaps second only to Plato in overall influence), found his primary inspiration in the successes of Newtonian mechanics. According to Kant, the Enlightenment's motto was "Have courage to use your own understanding!" The modernist spirit had come of age. But one authority survived: Euclid's *Elements*, for it was the very incarnation of pure reason.

During the 1800s, however, and roughly a hundred and fifty years after Newton's triumph, mathematicians discovered a problem with the *Elements*. Despite the fact that Euclid had begun with axioms so obvious that denying any one of them would be absurd, mathematicians found that they could replace one of these axioms with its negation (while keeping the other axioms) and still derive a perfectly consistent geometrical system. In fact, they discovered *two* such systems. These were alternative geometrical worlds in which the sum of the interior angles of a triangle *isn't* 180 degrees and "straight lines"–still the shortest distance between two points–can curve back on themselves! It's hard for us to identify with the resulting shock but bear in mind that an alternative to Euclidean geometry would have been considered as possible as a square circle.

The one consolation, though, was that ordinary Euclidean geometry described the real world. To put it differently, at least Euclidean geometry was *true*. The "non-Euclidean" geometries could still be seen–at first–as merely mathematical games, albeit disturbing ones. But in the early 1900s a new theory of gravity–Einstein's general theory of relativity–employed one of the new geometries to describe real-life physical space. Therefore, if general relativity is true, Euclidean geometry is strictly speaking *false*.

But how could this be? The *Elements* had been the paradigm of truth and certainty for over 2000 years. It's credentials were impeccable. It had been the exemplar for all knowledge. Not only that; this was *mathematics,* the one place we find *absolute* certainty. How could mathematical "truths" be false, especially a truth so obvious that it qualifies as an unquestionable assumption?

Hoping to regain the promise of certainty, mathematicians and philosophers responded to this crisis with a flurry of work (including the invention of *symbolic* logic). But no consensus was ever reached regarding the nature of mathematics.

Many skeptically-minded folks (we might call them postmodernists) were quick to take note of this, becoming overly suspicious of reason: "People have mistakenly believed that there are absolute moral standards, but there aren't even absolute *mathematical* standards. See, we told you there aren't absolute truths." Not the finest bit of reasoning, but you can appreciate the feelings behind it. Imagine you discover that your mom has been systematically lying to you your entire life. If you can't trust your mom, who can you trust? Similarly, who can you trust, if not Euclid?

So then, a second revolution had occurred, one in which Euclid himself had been overthrown. Whereas the scientific revolution resulted in excessive optimism in man's rational faculties, the non-Euclidean revolution sparked an exaggerated sense of pessimism. Both of these common attitudes exist in our culture today, schizophrenically side by side. And both can be traced back to *mathematical* revolutions. But in each case–whether extreme optimism or extreme pessimism–man is taken as the measure, either by way of his own reason or else by his own judgment *on* reason (presumably using *reason*!) Neither of these extremes should be our response, of course. Reason is a God-given tool, and we can therefore count on its general reliability, even while conceding its fallibility. The search for ultimate certainty is ultimately idolatry. Looking for this kind of certainty is simply yearning to be like God.

My real point, however, (made primarily by showing rather than by telling) is that the history and philosophy of mathematics can actually tell the West's sweeping intellectual story. Through mathematics we can see the spirits of the age. If we desire to understand Western culture (and we should), then understanding mathematics can no longer be seen as a charming option. Yet *understanding* mathematics requires more than technical acumen. As important as the grammar of mathematics is, it is only the first step towards our real goal: genuine understanding.

Book Review-Explore Evolution:
The Arguments For and Against Neo-Darwinism

reviewed by Wes Struble

Explore Evolution is a well-written book that is designed for use as a companion to high school biology textbooks. Most standard biology textbooks only provide evidence that lends support to neo-Darwinian theory. *Explore Evolution* takes a two-fold approach. For each topic (homology, fossils succession, embryology, etc.), the authors first present a summary of the standard supporting evidence for neo-Darwinian theory, then they present alternative interpretations to the neo-Darwinian view. What makes this book unique is the inquiry-based approach. In the majority of texts (especially high school biology) the authors' views come across as established fact. Critical thought is encouraged as long as it falls within the authors' neo-Darwinian interpretational paradigm. In *Explore Evolution* the students are encouraged to think critically about each of the topics presented. The book is intentionally noncommittal as to which interpretation is correct, and it is organized in such a way as to promote critical thought and interaction. Successful classical educational methods make liberal use of inquiry and debate and *Explore Evolution* fits the model well by promoting both. Take, for instance, the authors' treatment of natural selection. In the *Case For* section they begin by explaining natural selection as a theoretical mechanism that Darwin proposed to support his theory of common descent. They describe the reasoning behind Darwin's development of natural selection. This is followed by a discussion of the conditions required for natural selection. The authors then compare natural selection and artificial selection (selective breeding of animals by humans). Next the concept of "microevolution" is introduced and how the extrapolation of all these concepts would eventually lead (given enough time) to major morphological changes that would produce new types of organisms. This section ends with two classic cases sited as evidence of Darwinian evolution: the Galapagos finches and the English peppered moths. In the *Reply* section the authors provide alternative interpretations for the comparison of artificial selection and natural selection, and the potential problems of extrapolation. They offer a more complete picture of the Galapagos finches and the peppered moths by supplying evidence counter to the claims of neo-Darwinian natural selection. The authors end the section with a discussion of one of the major difficulties of neo-Darwinian theory: the problem of the information encoded in DNA. There are two parts to DNA. There are visible molecules that make up the physical structure of the molecule. Then there is the message or information coded into the molecule. Proposing a theory that explains the origin of DNA molecules without an explanation of the origin of the information is like attempting to account for the sheet music of a Mozart concerto by describing the chemistry and physics of paper and ink. Throughout the text, critical thought and evaluation are theme.

This book could be a very effective tool to help accomplish the goals of classical Christian education in the science classroom whether used to enhance a teacher's understanding and application of classical methods as they apply to scientific topics or as a supplementary text for students. One caution: the authors are working from an old earth paradigm. They appear to accept the standard four to five billion years of earth history as summarized in the geologic timeline. Whether this is done by conviction or for the sake of convenience (it would be difficult to get this book into public schools with a young earth chronology) is not revealed.

Explore Evolution:
The Arguments For and Against Neo-Darwinism
by Stephen C. Meyer, Scott Minnich, Jonathan Moneymaker, Paul A. Nelson, and Ralph Seelke
Melbourne and London: Hill House Publishers, 2007. pp. 160, $39.95

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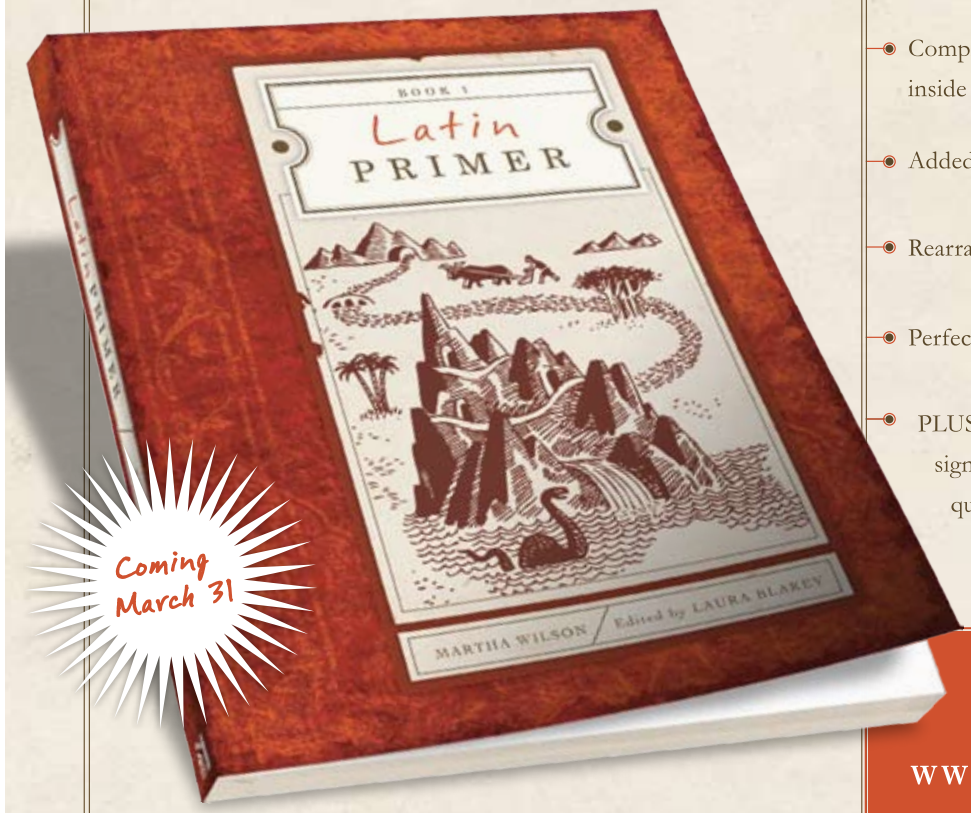

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The Proper Role of Science: Exposing Scientism

by Charles Colson

In his inaugural address, President Obama said he would "restore science to its rightful place, and wield technology's wonders to raise health care's quality." By this, many suspect he means to spend taxpayer money on embryonic stem cell research, which destroys humans at the embryonic stage.

Evidently, President Obama has been listening to those who want research funded, some because they are driven by greed but many others driven by a dangerous worldview called scientism.

Our task is to expose the flaws in scientific naturalism—not because we are against science but because we want it to fill its proper role as a means of investigating God's world and alleviating suffering within ethical boundaries.

As Nancy Pearcey and I write in our book, *How Now Shall We Live*?, scientism has its roots in Darwinism. Tufts University professor Daniel Dennett writes that Darwinism, rightly understood, is a "universal acid" that dissolves away all traditional moral, metaphysical, and religious beliefs. For if humans have evolved by a material, purposeless process, then there is no basis for believing in a God who created us and revealed moral truths, or imposing those moral views in any area of life.

Dennett is using a common tactic—using science as a weapon to shoot down religious faith. The standard assumption is that science is objective knowledge, while religion is an expression of subjective need. Religion, therefore, must subordinate its claims about the world to whatever science decrees.

Scientism assumes that science is the controlling reality about life, so anything that can be validated scientifically ought to be done. Other things are subjective fantasy—like love, beauty, good, evil, conscience, ethics.

So science, which originally simply meant the study of the natural world, has in this view been conflated with scientific naturalism, a philosophy that the natural world is all that exists.

Humans are reduced to "objects" that can be inspected, experimented on, and ultimately controlled. In 1922, G.K. Chesterton warned that scientism had become a "creed" taking over our institutions, a "system of thought which began with Evolution and has ended in Eugenics."

C.S. Lewis warned that the rise of scientific naturalism would lead to "the abolition of man," for it denies the reality of those things central to our humanity: a sense of right and wrong, of purpose, of beauty, of God.

And if we deny the things that make us truly human, by definition we create a culture that is inhuman—a culture that, for example, embraces moral horrors like the killing of humans at the earliest stage of life on the spurious grounds that doing so might cure other people's diseases. Or cloning. Or medical experiments on humans, as the Nazis conducted.

Our task is to expose the flaws in scientific naturalism—not because we are against science but because we want it to fill its proper role as a means of investigating God's world and alleviating suffering within ethical boundaries.

And it's right that we should be doing this because it was a Christian view of reality that led to the scientific method, investigating all the things God has created.

I hope that the President, in using those words, understood the difference between good science and scientism.

Charles Colson *is the founder of Prison Fellowship Ministries (PFM). This Breakpoint Commentary was originally published January 29, 2009. Breakpoint is the worldview ministry of PFM.*

Computers and Classroom Instruction

ACCS Position Paper
Approved June 27, 2001

The computer is a tool, and, like any tool, it has its appropriate place and use. ACCS recognizes the benefits of such a tool, and actively encourages its use for word processing productivity, accounting, and administration, and to assist students in some of their learning. ACCS also recognizes that computers have their deficiencies as well, including, but not limited to, relatively passive learning. ACCS strongly advocates personal, interactive, classroom instruction that conforms to *The Seven Laws of Teaching* by John Milton Gregory. Whereas personal computers can greatly aid in the accomplishment of work and studies, they are no replacement for a capable Christian instructor who loves the Lord, loves his students, loves his subject, and has a passion to communicate that love to his students. ACCS acknowledges the use of computers at school, but not for the instruction of students. ACCS favors students learning about computers and using them, but is opposed to the use of computers to instruct students. Because of the way that God has created men, ACCS believes the best means of instructing students is through a qualified human teacher on a personal level rather than by an impersonal machine. The functional use of computers is simple to learn and is accomplished easily enough at home by parents who can set guidelines for and supervise their use. In general, instruction by means of computers in classical and Christian schools is not seen as a need by ACCS.

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