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Inside This Issue: Science and Technology

Modern science and technology are the themes for this issue of *Lutheran Mission Matters.*

What we call "science" and "technology" have been pursued since ancient times. But modern iterations of science and technology have proven remarkably successful and useful, and so their impact has been vast. For countries like the United States, science and technology are essential to economics, healthcare, and communications. But because the wealthiest and most powerful nations depend so heavily on science and technology, they also have a global impact. And for these reasons, they can shape thinking and expectations.

So it is simple to say *that* science and technology are important for Christian witness and evangelism. But saying *how* is complicated. The articles in this issue offer a range of answers to this wide-open question.

Timothy Dost offers an answer grounded in the history of the Church. It is common to think of tensions and challenges when considering the relationship between science and technology and the Church. But Dost highlights several instances in which Christians readily embraced science and technology and used them to spread the Gospel and to show love to neighbors, and he encourages us to adopt the same attitude today.

Gary Locklair, Michael Knippa, and John Juedes consider various aspects of modern technology and their bearing on Christian witness. Locklair considers the theologically challenging question of artificial intelligence. Can a machine be *intelligent*? Yes, he says, but this does not compromise the concept of humanity or the Christian mission. Knippa explores the wide-ranging thought of Marshall McLuhan. He told us decades ago "the medium is the message" and spoke about the "global village" and the "electric age." Now that what he foresaw is everyday life, McLuhan's thought is worth reflecting upon for insights into evangelism today. Juedes reflects on technology in music and worship. Technology and worship music are nothing new, as the Psalms show. But both technology and worship music have changed over the centuries, and Juedes points out that we still should ask about their relationship to each other and to our witness.

John Kenney, Gillian Bond, David Berger, and I reflect on modern science and its relationship to the Christian faith and Christian witness. Kenney offers a personal reflection and testimony on faith and science, based on his own life and his calling as a chemistry professor. Bond also draws on her experience in teaching and research as she explores the intersection of faith and science as "an opportunity for cross-cultural outreach." The intersection of faith and science is Berger's theme, too, and he looks into the ways that often-unspoken assumptions shape the situation. My article looks

at science as a "natural philosophy," a descendant of pre-Socratic Greek thinking, and asks what this might mean for the message and witness of today's Christians.

As I noted before, these articles offer a range of responses to a wide-open question. So think of them as contributions to a varied and complex conversation about matters that matter to the life and witness of the Church.

Joel P. Okamoto
Editor for the Science and Technology issue
Lutheran Mission Matters

Articles

God, the Gospel, and Modern Science: Reflections on the Church's Witness and Message in a Scientific Age

Joel P. Okamoto

Abstract: Science is certainly important to the contemporary world, not least because it is indispensable to economics, health care, transportation, and communications. But it matters also for Christians because it is often taken as a natural philosophy with a definite ontology (account of what there is) and epistemology (account of knowing and knowledge). This natural philosophy is not only highly successful and influential, but also challenging to Christian faith and life. This article traces out the basic features of science as a type of natural philosophy, and suggests how it matters for faithful Christian witness.

Introduction

Science is a very important feature of life in many nations. The United States offers a good example. Children are taught about science in their schools, and many learn to be scientific in the university. Science is essential to modern technology, and in this way science is essential to industry, health care, communications, and travel. For this reason, science also is essential to economics and politics; and nearly everyone, whether he knows it or not, counts upon science to make lives longer, more productive, and more comfortable.[1] Moreover, in societies where science and technology are economically and politically vital, science does much to shape the way people think about themselves and the universe.

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For this reason alone, science also should be a very important factor for contemporary Christian life, witness, and theology. But science is also often regarded as a competitor to the Christian faith. So-called "new atheists" like Richard Dawkins, Daniel Dennett, and Sam Harris set modern science against all religious beliefs and values, including Christian ones.[2] But they stand out only for the virulence of their polemic against religion. What they share with many more moderate people is the view that science tells us how the world really is. For them, the word "science" stands for a reliable way to learn the truth about the world. Consequently, religious claims that contradict these facts are, as far as we know, false. And so a sense of competition and conflict between science and most religions, and definitely the Christian religion, cannot be avoided.

Christians sense this as much as anyone. Tim Keller, pastor of widely-known Redeemer Presbyterian Church in New York, talks about the supposed competition in his book, *The Reason for God.*

> Over the years at Redeemer I've talked to many people trained in science and biology who were very wary of orthodox Christian belief. One young medical student said to me, "The Bible denies evolution, which most educated people accept. It bothers me terribly that so many Christians, because of their belief in the Bible, can take such an unscientific mind-set." His concern is quite understandable.[3]

Keller's findings are consistent with those that David Kinnaman reported in his book, *You Lost Me*. "Millions of young Christians perceive Christianity to be in opposition to modern science."[4] In other words, they find the Christian faith to be "antiscience," and it forces even them into an all-important dilemma. Kinnaman quotes a scientist who put it clearly:

> Every week, I am contacted by young Christians who tell me their faith cannot survive their interest in science. They feel the church has forced them into an either-or decision—either they can stay true to the Christian faith or become an intellectually honest scientist.[5]

This kind of situation adds urgency for Christians to deal with science and its implications for life, witness, and theology today.

Science as Natural Philosophy

To pursue this undertaking, the first task is to be clear about the meaning of the word "science," because it has several common uses, including these:

- *Science as a set of topics and findings*, such as "physics," "chemistry," and "astronomy." This is how science is commonly taught in school. Science in this sense conjures up equations like "F=ma," the periodic table,

microscopes and slides, and experiments like Galileo is supposed to have performed at the Leaning Tower of Pisa.[6]

- *Science as a particular systematic method for understanding and getting around in the world*. According to a local St. Louis television program on the Anheuser-Busch Research Pilot Brewery, "Beer can be many things. It can simply be a beverage, a hobby, a social icebreaker, or all the above. But first and foremost, the art of brewing beer is a science."[7] Science as this method assumes that everything is made of more fundamental stuff—ingredients—and that everything works according to some definite rules. Science proceeds by a method of trial and error, trying to ascertain not only what does work, but also what does not. It could be difficult to figure out the basic ingredients or the underlying rules or the appropriate experimental tests, for example, if you were trying to figure out the recipe for a certain brand of cola or of fried chicken. A process of "reverse engineering" would have to go into it. But these are practical difficulties, not fundamental problems or questions. Newton and Einstein arrived at their theories of gravitation through much more involved efforts, but their approach to understanding the world was no different than what diligent brewers, bakers, and cooks do in their search to develop a new beverage or dish.
- *Science as the definitive systematic method for understanding and getting around in the world*. This is science as "natural philosophy," which is what modern science was often called before the nineteenth century. The assumptions and procedures of the method are the same as outlined in the second use above, but "science" in this view specifically seeks a comprehensive account of the world—the entire universe—and not just of a beverage or dish.

It is this third type, namely, science as natural philosophy, that I am highlighting.[8] It certainly includes findings and theories, but it is far more. Science as natural philosophy is what Tim Keller and David Kinnaman were concerned about and, as I contend, what Christian missiology (among other aspects of theological reflection) should be concerned about too.

Science as natural philosophy is . . . what Christian missiology (among other aspects of theological reflection) should be concerned about. . . . Why? Because science as natural philosophy challenges Christianity fundamentally.

Why? Because science as natural philosophy challenges Christianity fundamentally. The Christian faith, life, and witness presuppose a particular story of everything: a story of the one true God and

Father of Jesus Christ and His creation. Science as natural philosophy offers a different story of everything. Therefore, it is fundamentally incompatible with the Christian faith; and if Christians can see their way forward about their message and mission when science as natural philosophy is an important factor, then they will be in an excellent position also to deal fairly with science in other senses.

This natural philosophy aspect can be traced all the way back to the Presocratic philosophers.[9] For example, in her book, *Plato at the Googleplex*, Rebecca Newberger Goldstein explained how the first Ionian philosophers—men like Thales and Anaximander—"would themselves have made excellent scientists."[10] This is because of their assumptions and their views about what we really know.

First, they made two assumptions about the universe: (1) that everything is made of more fundamental stuff—ingredients; and (2) that everything works according to some definite rules. Goldstein called the first assumption "materialism." This is the conviction "that there is some fundamental kind of stuff that's uniform throughout all the myriad phantasmagoria that we perceive."[11] Thales, for example, thought water was the fundamental stuff. Today, by contrast, it is essential to believe that everything consists of fundamental particles: atoms and their constituents. "Essential," moreover, is not a rhetorical flourish. Physicist Richard Feynman made this point at the outset of his lectures on physics, the most well-known of the twentieth century:

> If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generation of creatures, what statement would contain the most information in the fewest words? I believe it is the *atomic hypothesis* (or the atomic *fact*, or whatever you wish to call it) that *all things are made of atoms—little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another*. In that one sentence, you will see, there is an enormous amount of information about the world, if just a little imagination and thinking are applied.[12]

Feynman went on for several pages applying "just a little imagination and thinking" to convey some of the information in this one sentence, and then he concluded:

> *Everything is made of atoms*. That is the key hypothesis. The most important thing in all of biology, for example, is that *everything that animals do, atoms do*. In other words, *there is nothing that living things do that cannot be understood from the point of view that they are made of atoms acting according to the laws of physics*. This was not known from the beginning: it took some experimenting and theorizing to suggest this hypothesis, but now it is accepted, and it is the most useful theory for producing new ideas in the field of biology.[13]

Feynman's mention of "the laws of physics" takes us to the second assumption: *that everything works according to some definite rules.* According to Feynman, understanding the rules that govern the world constitutes understanding the world:

> We can imagine that this complicated array of moving things which constitutes "the world" is something like a great chess game being played by the gods, and we are observers of the game. We do not know what the rules of the game are; all we are allowed to do is to *watch* the playing. Of course, if we watch long enough, we may eventually catch on to a few rules. *The rules of the game* are what we mean by *fundamental physics.* Even if we knew every rule, however, we might not be able to understand why a particular move is made in the game, merely because it is too complicated and our minds are limited. If you play chess you must know that it is easy to learn all the rules, and yet it is often very hard to select the best move or to understand why a player moves as he does. So it is in nature, only much more so; but we may be able at least to find all the rules. Actually, we do not have all the rules now. (Every once in a while something like castling [a chess move] is going on that we still do not understand.) Aside from not knowing all of the rules, what we really can explain in terms of those rules is very limited, because almost all situations are so enormously complicated that we cannot follow the plays of the game using the rules, much less tell what is going to happen next. We must, therefore, limit ourselves to the more basic question of the rules of the game. If we know the rules, we consider that we "understand" the world.[14]

Goldstein called this belief "naturalism," the belief "that a small number of fundamental laws underlie all the ceaseless changes."[15] This insight may be the most important contribution ever to modern science. As Goldstein explains,

> Of all the conceptions that made science possible, none is more essential than what the physicist and historian of science Gerald Holton called "the Ionian Enchantment": the intuition that nature is governed by a small number of laws which account for all the vast complexity that we observe in the physical universe. This enchantment, if enchantment it be, ensorcels all of science. . . .
>
> Science simply cannot subject the Ionian nomological intuition to doubt and still remain science. Should an observation clash with what scientists have heretofore believed was a law of nature, the scientific response is never to consider the possibility that we'd gotten the Ionian intuition wrong; rather, the scientific response is that we got that particular natural law, or cluster of laws, wrong. . . . It is a fundamental condition of doing science that nothing that we could possibly observe would count as a violation of the Ionian Enchantment, at least that part of the Ionian Enchantment that posits the nomological character of physical reality. Nothing would count as evidence

> that our physical reality is ungoverned by physical laws. Rather the scientific response would be that we hadn't formulated the laws correctly.[16]

Before we turn to the other features of modern science, it is worth noting the precise form that materialism and naturalism have taken, because it has had such a profound influence. It is a *mathematical* form. This is unsurprising, given that the first major exponents of modern science—Copernicus, Kepler, and Galileo—were firmly convinced that nature itself was mathematical, and that Newton's remarkable breakthrough spelled out the "mathematical principles of natural philosophy."[17]

To see its effect, consider children learning mathematics, starting with "1+1=2." They learn to see the world as consisting of simple, inert objects. They learn this by learning that adding and subtracting and multiplying and dividing work as well for counting pennies and dollars as for counting sheep and pieces of pizza. It does not matter what one is trying to count; it's all the same for mathematics. Everything is reduced to simple, inert objects for the sake of counting. It's the same with geometry, and once you have mastered these skills, a great deal of practical mathematics simply consists of shortcuts and approximations. (What, after all, is algebra but generalized elementary arithmetic?)

The materialism and the naturalism of modern science are both mathematical. The fundamental stuff consists of simple, inert objects in fields of force; and the fundamental rules locate everything in mathematical form either with equations or by numerical approximations and probabilities. This is what Copernicus and Kepler did in their astronomy, and what Galileo and Descartes extended with their mechanics and mathematics, and to which Newton advanced to unparalleled heights by formulating a theory of motion that gave exact definitions to and equations for mass, space, and time. (And to accomplish this, he also invented calculus.)

Later work, including the theory of relativity and quantum mechanics, along with contemporary biological sciences, represent incredible advances, but they all hold to the same assumptions. They all view the world in just this materialist and naturalist way.

Moreover, because of the successes of science, it has fundamentally affected economics, not only in mechanization and computational controls, but also in finance, management, and planning, as well as in health care, agriculture, communications, and travel. And because science matters fundamentally to all these things, we teach our children to see the world as consisting of simple, inert objects, starting with "1+1=2."

What this view of the world implies is that matters of value and quality are subjective. "Color" does not exist in nature, but rather reflects how each being responds to certain wavelengths of light. "Heat" and "sound" do not exist in nature but rather reflect how each being responds to faster and slower vibrations. "Beauty"

and "goodness" do not exist in nature but rather reflect how each person responds to his surroundings and reflects on his prospects. And so on and so forth.

To be sure, this view of the world emerged for other significant reasons. It arose at the same time as the civil and ecclesial authorities in the West schemed and fought their way into obsolescence. Today it sounds premodern to believe something simply because the Church said that it is to be believed, or to believe that rulers reign by divine right. That is because those beliefs *are* premodern. Their abandonment in the seventeenth century marked a massive shift in Western civilization. Among other things, it prompted remarkable efforts in metaphysical and political philosophy. But the most successful philosophical movement has been the universal acceptance of scientific natural philosophy. Metaphysical movements have come and gone, while modern politics are ever-shifting and mutating, but the key features of modern science have stayed the same.

Metaphysical movements have come and gone, while modern politics are ever-shifting and mutating, but the key features of modern science have stayed the same.

From the standpoint of Christian missiology, the most important result of these developments has been a pronounced dualism. On one side, there is the physical, tangible world, composed of particles in fields of force that act according to invariant laws, a world without values and qualities. It is the world of objective facts.

On the other side, there is world of mind and soul, in which are found feeling and value and qualities. It is the world of subjective experience. In philosophy, dualism is evident in the mind-body distinction and in the fact-value distinction. In politics, dualism is demonstrated in a separation of church and state. In society, dualism is exhibited in the distinction between a managerial sphere of competition and a contrasting therapeutic sphere in which one finds affirmation and care.

This dualism marginalizes religion as a matter of course, without any substantive argument, reducing it to the private, inner, and spiritual. So science as natural philosophy, taken consistently, is directly at odds with the Christian message about God, His creation, and His coming kingdom.

Two other basic features of modern science also bear importantly on missiology. One is the approach to learning about the world, which also can be traced back to the Presocratics.[18] It has been common to say that science proceeds from observation to hypothesis to experimental testing. While this progression is sometimes the case, it is not always the case, as can be seen as far back as the Ionians. In an anticipation of modern geology's theory of plate tectonics, Thales hypothesized that the earth was

supported by water, while Anaximander, against all experience, suggested that the earth was freely suspended in space.

More significantly, all such theories were subject to critical discussion. This process was completely at odds to most schools of thought, where the function of a school is to uphold the community's teachings and protect them from criticism, not expose them to questions and counterexamples. But it was precisely this feature—what philosopher Karl Popper calls its "secret"—that allowed science's method to develop: the method of conjectures and refutations. This approach serves well any *search* for truth.

The Presocratics' assumptions about the universe and their attitude toward truth claims are certainly essential to contemporary "natural philosophy," that is, modern science. But there is more to modern science. As Feynman put it, "The principle of science, the definition, almost, is the following: *The test of all knowledge is experiment*. Experiment is the *sole judge* of scientific 'truth.'"[19] What the Presocratics lacked but the modern tradition provided was a well-developed experimental method in which all proposals would have a form that would allow them to be openly criticized and assessed. Galileo did not merely assert that bodies fall at a rate independent of their weight; his proposal could be and was tested (a test that most of us associate with the leaning Tower of Pisa). Einstein's general theory of relativity was not widely accepted (nor Einstein widely known) until it could be tested, and that was five years after it was published.

The experimental method allows science to be "self-correcting." As Goldstein explains:

> Possessing the self-correcting means to test and dispose, they prod the physical world so that the physical world gets a chance to answer back for itself in the form of experimental evidence. If science oftentimes has charged off in some altogether wrong direction, believing, say that first is to be explained by the existence of fire-stuff, phlogiston, or that life is to be explained by the existence of a life-stuff, the élan vital [life-force], then empirical testing will, sooner or later, disabuse science of such fictions.[20]

This critical and self-correcting approach to truth claims not only serves scientific ventures well, but it also implies a criticism of those who will not allow critical arguments and empirical testing to question and falsify their beliefs and message. Of course, "those" include Christians, for whom the "sole judge" of truth is Jesus Christ, as known by the testimony of the Church.

The Witness and Message of the Church in a Scientific Age

Perhaps the number who have adopted the understanding of science as natural philosophy [which for convenience I will refer simply to as "Science" from this

point] is fairly small; the influence of this view is certainly large. Moreover, the view itself is quite challenging to Christians, and we, like Tim Keller and David Kinnaman, should expect that our disposition toward it will matter to many. So Science raises several different questions for missiology.

One question concerns Christian identity: What should it mean to be a Christian? This question matters a lot in places like the United States, where, for example, politics are more determinative than beliefs or message. Christians tend to be identified with political positions on issues like abortion and homosexuality. Science also tends to be identified with specific contrary positions, leading many to think that the differences between Science and the Christian faith are decisive and to identify Christians themselves as "anti-science." Someone might object that much of this conflict is supposed rather than real. But the perception is the point.

The question of identity also matters because Science, along with modern civil politics, has tended to make religion a private and spiritual matter. In this climate, the Christian message is assumed to be a matter of personal preference and value. To a considerable extent, Christians have conformed to these expectations, stressing individual morality, personal affirmation, and an afterlife for the soul in heaven, and playing down the return of Christ, the resurrection of the dead, and the new creation.

And so, what should it mean to be a Christian? The situation calls for a "back to the basics, no messing around" answer: Christians are followers of Jesus Christ, the Son of God and Lord of all. Science poses cosmic questions to Christians, not more specialized ones about salvation or authority in the Church or even morality. These questions are important, but they are secondary.

Science poses questions about the nature of the universe and the proper means to ascertain the truth about it. For those convinced about Science's mathematical account of the universe, salvation is something dreamed up by those who are not able to handle the truth.

Science poses questions about the nature of the universe and the proper means to ascertain the truth about it. For those convinced about Science's mathematical account of the universe, salvation is something dreamed up by those who are not able to handle the truth. The Church consists of believers in falsehoods, and morality is entirely a matter of negotiation. Christians risk irrelevance by stressing Jesus as Savior, the Bible as the inerrant Word of God, and moral absolutes, because they are not paying attention to the larger more significant issue.

Today's situation is similar that of the early Church, where there were many gods and cults and various philosophies and sages. The Christians were definitely in

the minority. They had a message that was at odds with both the Jews and Gentiles. What was it? That Jesus of Nazareth was the Son of the Creator of the universe, sent to bring about a cosmic revolution and establish the reign of this God over all things. What gave them confidence to believe this, even to the point of death? The fact that Jesus was willing to die for what He believed, and, even more, that He rose from the dead.

Their confident belief meant that the truth about all things and all people, and their disposition—their justification—are ultimately found in and through Jesus Christ, not by the Torah or other gods in the days of the first Christians, and not by Science in our day.

A second question follows immediately, and it concerns the Christian message. What should it be? The answer also follows immediately. It is not a message primarily about the right way to attain salvation, or about the Bible being the Word of God, or about the existence and importance of moral absolutes.

Neither is it a message calibrated to maintain Christian influence in society or to keep church attendance up and new members coming in. It is as Jesus Himself proclaimed: "The time has come. The reign of God is at hand. Repent and believe the good news" (Mk 1:15). The apostles took up exactly this message, whether to the Jews, as Peter did on Pentecost (Acts 2), or to the Gentiles, as Paul did on Mars Hill (Acts 17).

Paul assumed almost complete ignorance among his hearers. He began by explaining the Christian *concept* of God (not His identity). God for Christians is not another object in the universe, who might live in a temple or be identified with a figure. He is the Creator of the universe and the director of all that dwells in it. This means that all human beings are His creatures and therefore subject to His judgment, which, Paul says, is soon to be visited upon them. The proof of this is the resurrection of the one appointed to judge. At this point, the conversation breaks down, but it is clear that Paul is announcing, "The time has come. The reign of God is at hand." And it is also clear that his next move would have been: "Repent and believe the good news."

Now, these answers about what a Christian is and what message Christians should stand by do not mean that they are the only things to say about Christian identity and the Christian message. One can and should say many things. These answers are not meant to exclude them. Rather, they are intended to point out the fundamental positions on these vital topics, which means that, however we portray ourselves and whatever we say, they ought to be consistent with these views, not confusing, irrelevant, or contrary to them.

Doing this is straightforward, but it may also be difficult. It is straightforward because it is not hard to see what is consistent and what is inconsistent. It may be difficult because it may show many Christians that what they are doing now is

confusing, irrelevant, or just plain wrong, and because bringing ourselves into proper alignment is a task of *formation*, not simply *information*.

After all, we want to *do* something, not just *know* many things. For example, the mission of the Church in a scientific age—one in which the idea of God is up for grabs—requires us to identify not only ourselves but also our God. Doing this is straightforward, because it goes with confessing Jesus as the Son of God and as Lord: our God is the God and Father of our Lord Jesus Christ. But despite the Scriptures and the worship of the Church, not many Christians possess this *information*, and still fewer operate with it. The same holds for sin, justification, sanctification, grace, forgiveness, and the Word of God. So there is a lot of work to be done both in preparing for evangelism and in mission thinking.

The mission of the Church in a scientific age—one in which the idea of God is up for grabs—requires us to identify not only ourselves but also our God.

A third question is: How should Christians view the relationship between Science and the Christian faith? One option is *total repudiation of Science*: have nothing to do with Science, and denounce it entirely as false, misleading, and harmful. This approach is not just wrong but impractical. Science has too much to do with everyday life to easily disown it.

Another option is *total capitulation to Science*: assume the place that Science allows to religion as a private, personal, subjective affair. This is practical—and practiced—but it is just wrong, because the Christian message and faith are not merely private, personal, and subjective.

A third option sees *Science and the Christian faith as complementary*. This approach follows the example of the first modern scientists: Copernicus, Kepler, Boyle, Newton, and others who firmly believed that the new science was consistent with the Christian faith (as they understood it).[21] This approach, moreover, mirrors the example of the early and medieval Church's use of Greek philosophy. This option regards Science as useful in its sphere, dealing with "all things visible," as the Nicene Creed puts it, and believes that the Christian faith, including its biblical interpretation, can include it in some way.

The caveat "in some way" is both important and tricky. It is important because Science should fit the Christian faith, not vice versa. The proper direction of fit must be maintained. But it is also important because Science itself should not escape critical examination.

A good example of such examination comes from philosopher Thomas Nagel in his book *Mind and Cosmos*. The subtitle tells you what it is about: "Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False."[22]

Nagel takes issue with the assumption of modern science that mind and consciousness are very late and wholly accidental features of the universe. He contends, "Mind is not just an afterthought or an accident or an add-on, but a basic aspect of nature."[23] He argues, from the naturalism of science, the assumption that the world is itself rational and that we are capable of knowing this. These facts mean that "mind" ought to belong to the basic convictions of science.

> The intelligibility of the world is no accident. Mind, in this view, is doubly related to the natural order. Nature is such as to give rise to conscious beings with minds; and it is such as to be comprehensible to such beings. Ultimately, therefore, such beings should be comprehensible to themselves. And these are fundamental features of the universe, not byproducts of contingent developments whose true explanation is given in terms that do not make reference to mind.[24]

Now, as Nagel himself is quick to point out, this does not lend itself necessarily to any theistic conception of the universe. But he is using the assumption of naturalism—with the unquestioned fact that all of us know ourselves to be conscious and rational—to call into question the mathematical conception of the universe: that everything is composed of simple, inert stuff, as Science today assumes.

The other side of the "in some way" is that there are several challenging topics for Christians and Science: the age of the universe; the origins of life; common ancestry of species; human uniqueness; consciousness; free will; rationality; and the nature of the soul. Current Science proposes something like this: that the universe as we know it is over thirteen billion years old, originating from a single point; that life developed out of the material of the universe in an unguided way; that human beings and their mental lives are products of this development. Human beings share a common ancestry with other life, and they are unique only in the way that every other form of life is unique. The mind and the soul are all explained as biological phenomena, like digestion. Consciousness, free will, and rationality are illusory.

At some point, nearly all Christians are troubled with this account. The trouble, however, starts at different points in the story and for different reasons for different people. For example, some, like so-called "young earth creationists," are troubled over the age of the universe, but others accept "theistic evolution."

This much is clear: most Christians view the complementarity between Science and their beliefs and story as *critical*. And it should be. But important challenges and work remain.

I will mention only one point related to the usual challenges that Christians find. They should not be surprised or concerned that the universe does not give clear testimony to their God. Because of original sin, they may be troubled by the ambiguity, but sin is no excuse. The biblical witness of Genesis, the Psalms, and Job show that the universe was created by the Word of the Lord, even though Science

may find something very different. But there is no necessary conflict between the belief that God created *ex nihilo*—out of nothing—and finding by observations and theorizing something very different. The operative word here is "different." The Scriptures and science do different things and therefore, of course, may well give different answers. There is a good theological reason that Christians should not be troubled by this, that they should assume immediately neither that science is wrong nor that Genesis should be interpreted figuratively. Creation ultimately answers to God the Creator, not to us.

Science, as we have noted, makes certain assumptions and sees what it finds. It tries to do the best it can with the world, and that is why it has been so successful and useful. But the world is one thing; God is quite another. To say God created out of nothing includes confessing His utter freedom. "Whatever pleases the Lord he does, in heaven and on earth, in the seas and all deeps," says the Psalm (135:6 ESV). Christians should acknowledge this by recognizing that the universe looks as it satisfies *Him*, not as it might satisfy us and our scientific ventures and theological puzzles. Unlike human creators, God can make a 12-year-old whiskey, a 12-year-old tiger, and a 13.77 billion-year-old universe, whenever it pleases Him, including 15 minutes ago. And if He does so, it will be a 12-year-old whiskey, a 12-year-old tiger, a 13.77 billion-year-old universe, even if He did do it 15 minutes ago. The important issue for Christians is not the age or the how, but the fact God did it to give it all meaning and purpose (Heb 11:1–2). Only the eyes of faith can see that.

A fourth question is about our disposition: How should we engage others in a scientific age? The answer is easy and sufficient: We should be honest, open, inviting, fair, confident. This, however, turns out to be more easily said than done, which is why the question is important.

Like everyone else, Christians often find it difficult to accept that there are others who see and understand the world differently, much less deal with them fairly. As a result, Christians, like everyone else, tend to treat others as if they were stupid or bad. This attitude explains why many shy away from discussing religion, politics, money, sex, race, and their favorite books, music, and TV shows.

But Christian mission requires us to do better. Doing better means recognizing that others will see and understand the world differently, or they will be impressed by other ways of seeing and understanding the world. Whether those "other ways" be Science or Buddhism or paganism, we should "always being prepared to make a defense to anyone who asks you for a reason for the hope that is in you; yet do it with gentleness and respect" (1 Pt 3:15 ESV).

As for concrete advice in doing this, psychologist Jonathan Haidt points us in a useful direction in his book *The Righteous Mind*.[25] According to Haidt, for each of us "Appearance is usually far more important than reality." When asked "for a reason," we automatically justify ourselves; "we lie, cheat, and justify so well that we

honestly believe we are honest"; and "we can believe almost anything that supports our team."[26] He lines up a persuasive array of examples and studies to make his point.

But Haidt also calls attention to the work of psychologists Jennifer Lerner and Philip Tetlock on decision-making and accountability.[27] As generally believed, people think more carefully when they know they will have to justify themselves. But *how* do they think more carefully? It depends. Lerner and Tetlock identified two kinds of careful reasoning.

On the one hand, there is "confirmatory thought," which "involves a one-sided attempt to rationalize a particular point of view." It "takes place in the service of self-justification." In other words, we do it to make ourselves look good.

On the other hand, there is "exploratory thought," which "involves even-handed consideration of alternative points of view." It "takes place in the service of optimizing a judgment/decision."[28] In other words, we engage in exploratory thought to seek out and make clear the truth. These two modes of reasoning are easy to understand and recognize. The key question for our purpose (and many others!) is this: When are we disposed to engage in exploratory thought? It turns out that it depends on how you view your audience. As Haidt summarizes it,

> Accountability increases exploratory thought only when three conditions apply: (1) decision makers learn before forming any opinion that they will be accountable to an audience; (2) the audience's views are unknown, and (3) they believe the audience is well informed and interested in accuracy.[29]

The lesson for Christian witness is straightforward, and not only for a scientific age. We should always understand ourselves ahead of time to be accountable to others when dealing with them. We should assume that we really don't know how they view and understand things. We should expect them to be well informed and interested in the truth.

Endnotes

[1] Of course, the best that a significant proportion of the world's population can do is hope to be able to count on science and technology in this way.

[2] See especially Richard Dawkins, *The God Delusion* (New York: Houghton Mifflin, 2006); Daniel Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon and Schuster, 1995), and *Breaking the Spell: Religion as a Natural Phenomenon* (New York: Viking Press, 2006); and Sam Harris, *The End of Faith: Religion, Terror, and the Future of Religion* (New York: W. W. Norton and Company, Inc., 2004).

[3] Timothy Keller, *The Reason for God: Belief in an Age of Skepticism* (New York: Dutton, 2008), 87.

[4] David Kinnaman with Aly Hawkins, *You Lost Me: Why Young Christians Are Leaving Church . . . and Rethinking Faith* (Grand Rapids: Baker Books, 2011), 131.

[5] Ibid., 132.
[6] There is no clear evidence that Galileo actually performed this particular experiment, but as a thought experiment it is important for what it can show.
[7] *SciTech Now*, July 13, 2016. The Nine Network of Public Media, St. Louis, MO, http://www.ninenet.org/blogs/scitech-now/scitech-now-july-13-2016/.
[8] These types are just that: types. They have been imagined for the sake of making a messy and fluid situation more orderly. No one type should be expected actually to consistently fit any one profile.
[9] See John Burnet, Karl Popper.
[10] Rebecca Newberger Goldstein, *Plato at the Googleplex: Why Philosophy Won't Go Away* (New York: Pantheon Books, 2014), 29.
[11] Ibid.
[12] Richard P. Feynman, Robert B. Leighton, and Matthew Sands, *The Feynman Lectures on Physics: Mainly Mechanics, Radiation, and Heat* (Reading, MA: Addison-Wesley Publishing Company, 1963) 1–2.
[13] Ibid., 1–8, 9.
[14] Ibid., 2–1.
[15] Goldstein, *Plato at the Googleplex*, 29.
[16] Ibid., 30–1.
[17] An excellent account is given by E. A. Burtt in his book *The Metaphysical Foundations of Modern Science*, 2nd rev. ed. (New York: Doubleday, 1954).
[18] See especially Karl Popper's essays "Back to the Presocratics" and "Conjectures and Refutations" in *Conjectures and Refutations: The Growth of Scientific Knowledge*, Routledge Classics edition (London and New York: Routledge: 2002).
[19] Feynman, *The Feynman Lectures*, 1–1.
[20] Goldstein, *Plato at the Googleplex*, 25.
[21] The orthodoxy of Newton, for example, is widely questioned, while Kepler was excommunicated by the Lutheran Church for his rejection of the doctrine of the Sacrament of the Altar. But for this point, heterodoxy may be ignored.
[22] Thomas Nagel, *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature Is Almost Certainly False* (Oxford and New York: Oxford University Press, 2012).
[23] Ibid., 16.
[24] Ibid., 17.
[25] Jonathan Haidt, *The Righteous Mind: Why Good People Are Divided by Politics and Religion* (New York: Pantheon Books, 2012).
[26] Ibid., 75, 82, 85.
[27] Haidt relies especially on Philip E. Tetlock, "Social-functionalist frameworks for judgment and choice: The intuitive politician, theologian, and prosecutor," *Psychological Review* 109 (2002): 451–472, from which he takes the term "intuitive politician"; and Jennifer S. Lerner and Philip E. Tetlock, "Bridging Individual, Interpersonal, and Institutional Approaches to Judgment and Choice: The Impact of Accountability on Cognitive Bias," in *Emerging Perspectives on Judgment and Decision Research*, ed. Sandra L. Schneider and James Shanteau, (New York: Cambridge University Press, 2003), 431–457.
[28] Lerner and Tetlock, "Bridging," 438.
[29] Haidt, *The Righteous Mind*, 76. See also Lerner and Fetlock, "Bridging," 440–449.

Odd Bedfellows? Churchly Employment of Science and Technology

Timothy P. Dost

Abstract: Although there are exceptions, the church has generally used both science and advances in technology seamlessly to spread the Gospel and promote the Word of God more generally. This article explains this through several examples: the use of technology in spreading information through visual art and architecture, and eventually printing; the use of science to affect the world view and argue for who was right, given the evidence from the creation, particularly in the structure of the solar system; the use of science to prove that there was logic and order to the creation, supported by a mathematical foundation. In addition, the article briefly touches on other topics such as education, healthcare, and other areas the church has used to carry out its work and foster its message, that also support science and technology.

"Science, Technology, and the Church" seems like a subject that might involve much controversy and many contradictions. Certainly one can point to areas of dispute, both between the church and these outside disciplines, as well as within the church on the matters that are sometimes at issue. As has often been said, "The squeaky wheel gets the grease"; and so these contradictions might be seen too prominently. Could there not perhaps also be areas that should draw our attention, in which the church, science, and technology have worked harmoniously and seamlessly with one another, particularly in the church's adoption of science and technology in its daily practice, as well as in its promotion of science through its fostering of education?

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This article will explore several examples of situations in which the church enthusiastically adopted findings of science or advances in technology, including cases in which such adoption made a difference between surviving and not surviving. In some cases, flexibility in the use of new technologies was a boon. For example, it allowed parachurch organizations to accomplish tasks that had been hindered by entrenched church bureaucracies and traditional solutions and practices. In pursuit of these points, I have chosen the following subtopics:

- Information science and the preservation of ideas—stained glass, Gutenberg, the power of the printing press, and the survival of dissenters.
- Science and technology as disruptor and enhancer of church authority—Copernicus and the Lutherans who spread his work.
- Science and technology as witness to order in God's Creation—Kepler, Newton, and the role of mathematical modeling in ratifying an orderly universe and God.

The second and third topics will be handled together and treated broadly in the form of an essay. Given the space limitations, it will also be something of a cook's tour.

First, what might be said about the preservation and dissemination of ideas and how the church used technology, even early on? One factor not taken seriously enough by people living in Western culture today is that most of the people within the church for most of the time it has been in existence could neither read nor write. If they were literate, for the vast majority, it was at only the most basic level.[1] Of course, this led to a more highly developed ability to memorize, in some cases to commit complex poetry to memory in one hearing; but not everything was reduced to poetry, nor was every book readily available in the language of the people. Until the development by Gutenberg of the movable type printing press (at least in the West) in the 1440s, all books and documents were painstakingly hand copied. Furthermore, in order to ensure that some people could read the few documents available, a more or less universal language among literate scholars was employed—Latin. It was the language of the Vulgate Bible (although when Jerome translated the Vulgate, it was simply the language of the people), and it allowed at least someone (usually the priest) in most locales to understand what the Bible said and to translate and interpret it for others.

However, the inability to read presented a problem for the people and their literacy in God's Word. The church solved this problem through the use of technology, specifically through the use of elaborate depictions in stained glass and other visual arts. Tremendous technological problems had to be overcome to make stained glass windows in the medieval period. First there were chemical problems with getting the vibrant colors into the basically clear silica (sand) that the glass was made of. Second, as all glass was blown at the time (there was no plate glass) and therefore curved, the matrix of the glass in the window, along with its lead framework to mount the individual pieces, was quite complex and heavy. The glass

had to be broken up into quite small pieces to appear flat, and so the framework had to be thin yet strong to allow the colors to predominate and keep the windows relatively light.

Furthermore, there was the problem of mounting the windows, which in some cases were more than 33 feet high, involving the use of precise technology and mathematics. In fact, the whole transition in the twelfth and thirteenth centuries from the relatively short (usually 40 to 50 feet) Romanesque style of cathedral, in which the weight of the walls and roof were borne on the stone walls' own structure, to the Gothic with its transfer of weight of the roof to flying buttresses and the cathedrals' attendant dramatic increase in height, to about 150 feet in some cases, presented a major scientific and technological challenge that the church enthusiastically embraced.

In addition, the Romanesque style required thick walls and small windows, leaving the interior dark, while the Gothic afforded the opportunity for large portions of the walls to be made up of windows, creating a bright and airy interior infused by a riot of light and color.

Patterned stained glass windows told the stories of the Bible, a book many of the people could neither read nor understand. Here were depicted the major sins and the grace of Christ with His sacrifice on the cross. Here was the Trinity, both in symbol and in depiction. Here were the patriarchs and the apostles, as well as prominent saints of the church. And to add to the stained glass, there were statuary and altarpieces, sometimes with changeable art, dramatically telling the seasons of the church and its major figures and events.

Printing, with its expanded audience, different parameters of copying error, and economy of scale, would soon make much clearer the message of the church. Gutenberg's first significant project on his printing press was a Latin Vulgate Bible, with the first copies coming out in 1454 or 1455. God's Word would be beautifully reproduced, and what a wonderful print job it was! The pages were clear and the text was carefully checked for errors. Here was a Bible, in its approximately two hundred initial copies, that more people could begin to afford and read.[2]

Printing was more precise in that, once a text had been carefully checked for errors, relatively error-free text was then reproduced many times. However, a new kind of hazard also crept in; for if an error were reproduced, it was then replicated many times. Printing also became somewhat controversial. As long as it was under the control of the authorities and the documents that they approved of were reproduced, everything was fine. However, there were also economic factors in printing, as well as subject matter in conflict with established authorities, such that ideas not approved by authorities were reproduced and spread in ways that were significantly amplified and uncontrolled when compared to previous times.

It could be stated, for example, that without the printing press there would have been no Reformation, or at least it would have assumed a quite different form and progress from what occurred. Ideas popular with the people or held by the Reformers, but in conflict with the papacy and authorities, could nonetheless be spread abroad. It was much more difficult to suppress what the authorities considered heresy when it was reproduced so easily, a problem Martin Luther himself also encountered with those of different visions of Reformation than his own, as in the cases of Andreas Carlstadt or Thomas Müntzer.

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Desiderius Erasmus, the chief Renaissance humanist figure and scholar of Luther's day, once he found out that his press had published one of the Reformer's pieces, saw to it that they would publish no further works by Luther. Following his return from the Wartburg, Luther, in turn, would see that the writings of Carlstadt received the same banned treatment in Wittenberg.

The papacy also had problems with the press in Luther's Germany. When the papal emissaries wished to publish the bull of excommunication against Luther in 1520, it took them four months to find a willing publisher, for the Reformer was so popular (and profitable). Finally, in desperation, they set up their own press in the territory to get the job done. Their comment in their report on the matter was telling. When asked about the delay they replied, "Nine tenths of the people favor Luther, the last tenth despise the Pope." As a result, rather than having only two months to deliberate his excommunication, as stated in the original document, Luther actually received six months.

Certainly the press played a role in the survival of reformers and their ideas, but it had a further salutary effect. It encouraged literacy, particularly in the vernacular languages of the people. Because of the relative cheapness of printed documents, the Reformers and others began to see the advantages of a literate population, attuned to God's Word in their own language. After all, Latin was not the original language of the Bible, and so why not produce Bibles in German, English, and other languages, now made economically possible?

This in turn would foster an educated and enlightened laity, capable of differentiating between the truth of God's Word and critical errors. The Reformation and later the Counterreformation placed a tremendous premium on learning and

literacy, in the one case to defend doctrine from the text of Scripture, in the other the teaching of the Catholic Church that depended more on a blend of tradition and Scripture. Literacy contributed to a rise in individualism and general learning and would lead to the contributions of both Pietism and the Enlightenment.

Of course, this tradition of information spreading continues in the church, as it tends to innovate in this area without much friction. Hymnals, worship programs, newsletters, tracts, publishing houses, and real time projection of worship are all further examples of innovation in this area.

A second example of how science and technology were adopted and used by the church is found in the struggles that arose as a result of the heliocentric theories of Copernicus. As the topics are difficult to separate without telling the story twice, I will also deal with the third topic in this section—the notion of science and technology as establishing mathematical models that ratified an orderly universe made by God. Here we see one side or the other using knowledge to foster its point of view, or to undermine the point of view of those in opposition to them, or sometimes to undermine their own position in opposing the patently obvious, when there was no scriptural reason to do so. Here there were deeper presuppositions at stake, including the central role of mankind in the universe and the fixity of the Earth in the cosmos. If the Earth were not the center of the solar system and universe, what then was special in the eyes of God about the men and women who inhabited the planet?

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Nicholas Copernicus was a Polish Catholic thinker who introduced the heliocentric theory of the cosmos to the Europe of the day. He had arrived at the idea that the Sun was the center of the universe some thirty years before he published it at a time when he was close to death in 1543. The problem with the sky from an observational standpoint was not the stars, which moved steadily over the course of the year to return to their original positions and provided a comfortingly stable background. It was rather the planets, those pesky wanderers, that were at issue.

Had the planets proceeded smoothly against the background of stars, there would have been no real problem explaining their movements through the then current theory that the Earth was the center of the universe; however, they occasionally and apparently unpredictably reversed their motion against the stars, and often at irregular speeds, something called retrogression. And this was true of only certain planets: Mars, Jupiter, and Saturn.[3] Mercury and Venus were also

difficult to explain, but did not show the same kind of apparent retrograde motion, instead moving back and forth across the sky in close proximity to the Sun.

With the Earth at the center of things, the motion of the Sun and the background stars were easily explained, as if they were mounted on two crystalline spheres. This neo-Platonic system of spheres was designed to create an elegant solution to the need for an orderly universe, based on the perfected form of the sphere. And yet it became more and more complicated as observation became more precise, a trend disturbing to those who sought order in the universe.

Copernicus' solution was simpler and more elegant. He stated that the planets, including the Earth, revolved around the Sun in circular orbits at different distances, and that the Earth turned on its axis. The Moon orbited the Earth, about every 28 days. Mercury and Venus, with orbits within and faster than the orbit of Earth, always were found near the Sun and so were always seen near sunrise or sunset. Furthermore, they did not reverse direction in the normal way of the outer planets, as they were always moving faster than Earth and always within its orbit.[4] Mars, Jupiter, and Saturn were outside the orbit of the Earth; and so when the Earth was catching up to them, they appeared to move backwards against the sky. When the Earth was moving opposite them, on the other side of the Sun, for example, they appeared to move forward. Of course, there was a small problem that would be soon revealed about this system as well. It still depended on circles inscribed in spheres. The planets' motion was in fact slightly elliptical.

But it was not the Catholics who advanced Copernicus' theories; it was rather the Lutherans at Wittenberg and elsewhere whose point of view on Creation advanced the notion that the universe was one of natural order that could be explained by elegant and orderly mathematics. In a certain sense, this amounted to an attack on the scientific works of Aristotle, particularly his *Physics*, a move that would have been approved by the Renaissance humanists, including Luther himself in his early career,[5] among the Reformers.

Andreas Osiander, the Lutheran theologian and controversialist, contributed the preface to the publication of Copernicus' theory and saw to it that it received attention. Philip Melanchthon adopted Copernicus' view early on, but with modifications. He did not so much adopt the naturalist theories presented but rather left the power to accomplish such things to the unseen work of God.

The new heliocentric theory was also used to teach mathematics at Wittenberg. Out of this curriculum came Tycho Brahe, who considerably advanced the observational precision of the measurement of planetary motion, and Johannes Kepler, who provided a somewhat flawed mathematical proof for heliocentrism, that nonetheless balanced out. He correctly employed elliptical orbits, with the Sun at one focus of the ellipse, and explained the differing speed of the planets in their orbits by positing that they moved more rapidly when closer to the Sun and more slowly when

further away along their ellipse.[6] This mathematical constancy worked well with the Lutheran view of the First Article of the Creed and left-hand kingdom theology of consistent natural order and would also have worked well with the order appreciated by Calvinists as well.

Kepler corresponded with Galileo Galilei, a Roman Catholic, who also admitted to being a Copernican, and who, with his new telescope, contributed observational evidence of the new model (phases of Venus and moons of Jupiter), as well as experiments with gravity (lighter and heavier objects fall at the same rate in a vacuum) in its support. When Galileo attempted to use Scripture to justify his conclusions, he was ordered not to write on Copernicus' views again. It was this introduction of Scripture to the arena of controversy that caused the Catholic Church's reaction and subsequent condemnation of the scientist. In other words, as long as his research remained in the realm of nature, his theories were considered acceptable, perhaps even laudable; but the use and interpretation of Scripture by a layperson was too Lutheran a move and resulted in his subsequent condemnation, inquisition, and trial on the matter by Catholic authorities.

Eventually, it would be Sir Isaac Newton who more harmoniously brought together religious, cosmological, and mathematical views in his laws of motion, with a model more thorough going and appealing to the burgeoning Enlightenment position that there were natural laws established by God that the creation followed. Subsequent generations often were of the opinion that science could advance just fine apart from theology and that the mathematical modeling stood quite elegantly autonomously, without the need to introduce religion or God.[7]

Subsequent generations often were of the opinion that science could advance just fine apart from theology and that the mathematical modeling stood quite elegantly autonomously, without the need to introduce religion or God.

Here we can see how science and technology contributed to the establishment of competing world views by different church bodies, and the eventual condemnation of one of these views by Roman Catholicism, leading to the house arrest of one of the great minds of science, Galileo. Heliocentrism was promoted by some, notably Lutherans and other Protestants, eventually leading to a perceived threat to the Catholic authorities through the scriptural edits of Galileo and what eventually would be a more mechanistic view from Newton.

These changes in turn allowed for a divorce of scientific and theological perspectives during and following the Enlightenment. Of course, one can also see in these examples the work of various figures to establish order in the universe through mathematical modeling. Until the Enlightenment enshrined the individual and in

some cases pushed God off to the side, a secondary purpose of this modeling (besides supporting the theory in question) was to provide evidence of an orderly universe of elegant consistency that must have had a personal Creator—God.

I have explored a couple of prominent examples of how the church made use of science and technology, both for the establishment of its own positions and for the spread of the Word and the Gospel of Christ. Other avenues of adoption of science and technology by the church could also be readily explored. For example, the church was indirectly responsible for much of the advancement of science, as it founded the universities and hospitals where many of its practices and discoveries were established.

Parachurch organizations also played a prominent role in the adoption of technological advances; mission societies often used the latest advances in moving their work forward. Catholic nuns and Lutheran deaconesses were often trained as nurses, compassionately bringing antiseptic practices and individualized care to bear on the sick and dying. Groups like the Red Cross, founded by Clara Barton, provided more adequate care for the sick and dying on the battlefield and on the home front. Electronic sound amplification was quickly adopted by others so that the Word of God might be spread, not to mention the significant roles of radio and television with their ability to reach many to expand ministry by churches adaptable enough to have a vision for what could be done with these new media.

Just because there is some antipathy on the part of some Christians to some aspects of science should not blind people to the significant use the church has made of the knowledge, discipline, and products of science's general endeavors.

Individual Christians turned the assets gained from secular developments in technology and science into contributions to Christian causes, both at home and overseas. John D. Rockefeller, for example, spent much of his early career giving away money to causes of Christian universities, as well as to outreach overseas; others created foundations that supported both civic society and Christian causes. Many other examples of the ready adoption of technology and science in the advance of the cause of the Gospel could be adduced.

Just because there is some antipathy on the part of some Christians to some aspects of science should not blind people to the significant use the church has made of the knowledge, discipline, and products of science's general endeavors. Who could envision a situation where the church would not use the fruits of aerodynamics to fly missionaries overseas, or of the internet to maintain communications with them? It will be essential to the advancement of Christ's church that it continue to be

open to adopting appropriate and applicable advances in science and technology in its work of proclaiming the Gospel.

Endnotes

[1] I think this is forgotten today when we consider some Majority World missions as well as people within our own congregations who may be functionally illiterate due to poor vision, or just being too young or uneducated to read. Traditional liturgies used to compensate for this by repetition, which people could then use to memorize what was said and in that way participate.
[2] Two hundred or so copies may not seem like very many, but there were soon imitators and Bibles in Latin became more readily available.
[3] Uranus, Neptune, and Pluto would not be discovered for some time to come, and so they are not discussed here; but they would have had the same general issues of retrogression, at least in the case of Uranus and Neptune. The case of Pluto is more complex, as it does not lie on the same plane in space as the other planets and has a much more pronounced elliptical orbit, sometimes coming nearer the Sun than Neptune. There has been recent controversy about Pluto, and it is currently demoted to a sort of sub planet status.
[4] They do appear to reverse direction as they move back and forth near the Sun, but this does not look the same as typical retrogression.
[5] Renaissance humanists were completely different from the later secular humanists who arose out of the Enlightenment. The former were concerned with the study and spread of the nobility and the values and rhetorical practices of classical antiquity; they were also invariably practicing Christians, most of whom were serious about their faith. Secular humanism makes God at best optional and in many cases simply enthrones mankind and individuals, leading to agnostic and atheistic points of view.
[6] The equality and order of their motion were explained through the equal areas their paths took up per unit of time, when considered from the standpoint of the object compared to the focus of the ellipse that they orbited around. In other words, to get the same size area wedge in orbit per unit time, faster motion along its orbital path would be required when it was closer to its focus, slower motion when it was further away.
[7] I am indebted for confirmation of some of the detail in this section to the online article by Edwin Rose, "How important was religious affiliation to the reception of the Copernican account of the universe in the sixteenth and seventeenth centuries?" written for *Athens to Los Alamos: Science in the Ancient and Modern Worlds (HIH-260)*. Accessed September 2, 2016. http://gorffennol.swansea.ac.uk/wp-content/uploads/2014/09/Edwin-Rose-How-important-was-religious-affiliation1.pdf.

Intelligent Computers in a Christian Worldview

Gary Locklair

Abstract: Thinking Machines! The inflection given when speaking these two simple words can invoke fear, excitement, concern, wonder, skepticism, or hope. This article explores the question of intelligent computers from a Christian worldview perspective. Both the origin and purpose of artificial intelligence are reviewed with an emphasis on how the field should be viewed and shaped within a Christian perspective. Answers to two fundamental AI questions will be presented: Can/will computers be intelligent, and can/will computers be equivalent to human beings?

Many people already believe that computers are intelligent. It is a confusing situation since computers appear to be intelligent. Imagine you are ready to buy a new Z06 Corvette. You wonder out loud to your neighbor, "I wonder what my monthly payments will be after a sizable down payment, seeing that I only have to finance $100,000 at 3.5% over five years?" If your neighbor was able to immediately calculate the answer ($1,819), you would surely be impressed and might respond, "You're quite intelligent." Imagine that you are lost in a strange city and stop to ask for directions. If the person helping you immediately drew a map showing 18 turns and the mileage between each to reach your destination, you would be dumbfounded by the stranger's intelligence. Of course, computer systems do these things all the time. The reason computers appear intelligent is due to the application of information theory. The information is being produced, ultimately, by intelligence, that is, intelligence infused into the computer system by intelligent people. Computers possess some attributes of their human creators. Because human intelligence is "behind" the creation and use of a computer system, the system reflects some appearance of intelligence.

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People

People are the most important aspect of a computer system because today people provide the intelligence of the system. Hardware and software together form a tool created by human intelligence and put to practical application by human intelligence. Although computers appear intelligent, their current intelligence is a reflection of the human intelligence used in their creation and use. Can computers truly be intelligent on their own?

When users work with an application package, they are reaping the benefits of the intelligence supplied by the programmers, information technologists, and computer scientists that created the system. The information produced by the algorithms is a result of the intelligent acts of all these people, along with the user, who must supply useful data. Programming captures the human thought process. When an application package is created, the algorithms are a reflection of how the programmer would solve the problem.

What's unique about people vis-à-vis problem-solving? The unique attributes of people, such as intelligence and creativity, are difficult to quantify but easily seen and understood. Children are natural born problem solvers. Children naturally love to explore and understand, as demonstrated by their favorite question: "Why?" There are powerful heuristic qualities "built in" to human beings.

Why are people intelligent and creative? The answer is that people were created in God's image. An omniscient, omnipotent God formed people with attributes similar to His own, but to a lesser degree.

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Will computers think and be intelligent as people are? This is the active research question in the field of Artificial Intelligence. In order to understand the field of AI, we need to investigate its origins.

It was not long after the first true computers were completed in the 1940s that computer scientists began asking the question: "Can a computer do other tasks besides number crunching?" In 1956 a seminal conference on AI was held at Dartmouth, where a number of computer scientists exchanged ideas and developed an informal research agenda. The organizers of the conference declared, "Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."[1]

The initial successes of the 1960s seemed to confirm the organizers' statement. By the 1960s, there were computer systems that could play a game of checkers and even defeat human opponents. In the 1960s Joseph Weizenbaum created the ELIZA system, which attempted to mimic a Rogerian psychotherapist. Some "sessions" of interaction were so successful that they led their human patients to believe they were interacting with a human being and not a computer. Examples such as these led to high hopes for AI. In the 1970s there were many predictions of thinking machines "just around the corner." One prediction was for the emergence of "robot servants" by the next decade! By the 1980s, there was the realization that general intelligence was an extremely difficult problem. By this time, the field of AI had split into two distinct camps.

Weak AI

One group of AI researchers decided that the "general intelligence" problem was either intractable or else not practical. Instead of creating machines that were autonomously intelligent in general, researchers in weak AI focused on simulating intelligent behavior in more narrowly defined areas. The goal of weak AI research has been realized and today can be seen in expert systems, as one example.

An expert system is a software application package that simulates the intelligent behavior of a human expert in a specific, narrow field of knowledge. Expert systems exist for many diverse fields, including medical diagnosis. A medical diagnosis expert system will accept symptoms as input and then produce a diagnosis as output. In other words, it is performing the same task as a human health care provider in the narrow field of medical diagnosis. Because an expert system accepts input, performs processing, and produces output, it is similar to any other software system. There are two distinguishing characteristics of an expert system worth noting: First, an expert system has a knowledge base. Similar to a database, a knowledge base contains the set of many, pertinent facts about the job or task. Secondly, an expert system has an inference engine. The inference engine applies rules of logic to the problem in order to select relevant facts and "reason" about them. The expert system is able to generate conclusions based upon the contents of the knowledge base and the rules of the inference engine.

One purpose of an expert system is to assist people. Originally, medical diagnostic expert systems were created as an aid for health care professionals. Because most doctors have not encountered every known disease, an expert system can aid them in diagnosing conditions that they have not before encountered. The expert system provides expert assistance with greater productivity and efficiency. Another purpose of an expert system might be to replace people. While this sounds outlandish, it is, of course, part of the advancement of a technological society. Many people would not want their doctor replaced by an expert system; yet there are

numerous tasks performed more productively and efficiently by computers every day. In the twenty-first century, no one is concerned because human elevator operators began to be displaced by automated systems in the early twentieth century. If an expert system can fly a commercial airliner with the same effectiveness as a human pilot, is it farfetched to predict that one day airplanes will not have pilots?

Currently, a number of companies are researching autonomous vehicles. Today there are cars that drive themselves without the "assistance" of a human being. Some believe that in a few years autonomous cars will be common on the highways of the United States. Would you ride in a driverless car? Would you want to drive around other driverless cars?

Given the current state of computer science, I suspect that few people would fly on an airplane controlled exclusively by an expert system. Given the realities of bugs and the relative inflexibility of algorithms, the system does not appear to be robust. A word processor's crashing and losing a document is one thing; the crashing of an expert system onboard a commercial airplane is quite another. Yet, the point of AI research is to "break out" of the algorithmic mold and create systems that can reason about even unexpected situations and react accordingly. In other words, AI hopes to replace algorithms with heuristics such that computer systems can think and reason as humans do.

Strong AI

While the proponents of weak AI focus on simulating intelligent behavior in specific areas, the proponents of strong AI strive to create computers that are autonomously intelligent. One objective of strong AI research is to create thinking machines via human equivalence.

Because algorithms are somewhat inflexible, software applications are somewhat inflexible. Current generation software is not very robust; that is, current software is not able to respond to unforeseen circumstances. Strong AI researchers hope to overcome this problem by creating systems that are autonomously intelligent. A weak AI expert system that cannot "adapt" to new situations is not the ideal candidate to substitute for a pilot on a commercial airliner! However, an intelligent computer system that could react as a human being might be a candidate to fly airplanes autonomously.

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Computer Intelligence

Can computers be intelligent? The key term demanding definition in this question is "intelligent." Defining the term "intelligent" is a difficult task. Common dictionary definitions of intelligence usually include statements such as the ability to learn, understand, or deal with new situations; the ability to apply knowledge to manipulate the environment; and the ability to think abstractly. One approach to defining intelligence is to provide a framework of associated activities. In a hierarchical fashion, intelligence is seen to include activities such as thinking, reasoning and understanding (higher order), learning (middle order), and remembering and computing (low order). With this hierarchy constructed, it is now a straightforward process to assess whether computers can be intelligent.

Computers currently are unequaled at performing the low order activities of intelligence. Computers can compute and remember in ways far superior to people. The fastest computers at the beginning of the twenty-first century operate in the range of 10 teraflops (trillions of operations per second). For example, one special IBM RS/6000 SP computer can perform 12 trillion multiplications in a single second. It is difficult for a human being to fathom this computational speed, much less attempt to match it! Computers can also remember vast quantities of data. The previously mentioned IBM RS/6000 SP has been connected to a storage system with a capacity of 160 terabytes. It is estimated that 160 trillion bytes is enough storage to encode the entire information content of the United States Library of Congress—twice! Some researchers believe that human beings do store every experience they have throughout their lifetime. If this is true, then the human storage capacity is very great. However, as we all know, even if we store much, we often have trouble with recall (especially during a test)! Even if a person could remember as much as a computer, the computer can still recall (locate) the requested data more reliably than a person.

To illustrate the importance of definitions, consider the mid-twentieth century view that computers were "giant brains." Computer scientist Edmund Berkeley's 1949 book, *Giant Brains or Machines That Think*, illustrates the fundamental role definitions play in problem solving. Berkeley wrote, "A machine [computer] can handle information; it can calculate, conclude, and choose; it can perform reasonable operations with information. A machine [computer], therefore, can think."[2] If the definition of thinking (or intelligence) is limited to the low order activities, as Berkeley's is, then a computer is indeed an intelligent, thinking entity. If one's definition of intelligence is computation and memory, then a computer is super-intelligent, truly a giant brain. However, intelligence is more than just the low order attributes. Therefore, twentieth century computers did not actually think.

The situation is tricky to analyze, however. Consider another statement of Berkeley: "When you and I add 12 and 8 and make 20, we are thinking." Does

addition require thinking? It is true that human beings both think and add, but does addition require human level thinking? No. A calculator can add two numbers, yet a calculator is not a thinking entity. Berkeley assumed that addition required thinking, and thus a device that performs addition is thinking. However, there is a known algorithm for addition, and both Wilhelm Schickard and Blaise Pascal created mechanical devices to implement the addition algorithm in the seventeenth century. These mechanical devices were not thinking when they added; they were merely following the rules encoded in their mechanisms. The manner in which one defines terms is important for understanding and answering questions.

What about the middle order activities associated with intelligence? How do computers stack up against people? Computer scientists have actively investigated game playing for decades, as it provides a backdrop for understanding the learning process and ultimately determining if a computer system can possibly learn. Computer scientists have constructed systems that do learn over time. There are chess-playing systems that learn to play better chess with experience. A system that initially moves its queen to unprotected squares may lose its queen to the opponent. If the system loses the game, an analysis may reveal that losing the queen was a turning point in the game. The system will respond by remembering not to position its queen on an unprotected square; that is, it will have learned how to play better chess. Learning strategies are important to systems that need to exhibit intelligent behavior.

Is this learning? On the one hand, computer systems are certainly able to autonomously learn within a specific domain, such as the confines of a chess game. On the other hand, people can learn about things for which they have had no prior "programming." Consider the following scenario: A person knows how to play chess but is unfamiliar with the game of checkers. Checkers and chess share some similarities and some differences. A person knowledgeable in chess could certainly watch a few games of checkers being played and learn how to play the game. A chess-playing computer system could not merely "watch" a game of checkers and then play checkers; it would have to be re-programmed to play checkers. The goal, then, is to develop computer systems that can learn autonomously, without outside intervention or re-programming.

In 1997, a chess-playing computer system, IBM's "Deep Blue," beat the reigning world chess champion, Garry Kasparov. IBM's supercomputer relied partly on AI techniques and partly on brute-force computational speed to play world champion chess. The central chess-playing algorithm in Deep Blue is an evaluation function that assigns a numerical ranking to each possible move and resulting board position. At first, it may appear that chess should be a simple game for a computer. The computer merely lists all possible moves and then chooses the best one. Unfortunately, there are too many possible moves to compute in a reasonable amount of time. Deep Blue employed a combination of expert intelligence (known moves,

piece values, valuable regions, etc.) along with the ability to analyze 200 million moves per second. Because there are too many possible paths to search, Deep Blue employs a selective, rather than a brute force, search function. "Promising" paths are identified and followed while "unlikely" paths are ignored. The "intelligence" is found in the selection function, which is partly pre-coded and partly a learned response.

Were the designers of Deep Blue world champion chess players themselves? The answer is no. Some believe that the creators of an exceptional computer chess-playing system must have been exceptional chess players, but this is fallacious. The computer scientists designing Deep Blue certainly understood the game of chess. However, the system they created played better chess than the designers because of the hardware capabilities (raw speed), coupled with the software abilities (intelligent search algorithms). Again, the productivity and efficiency advantages of computerized problem-solving are clearly demonstrated. These advantages were the direct result of the human intelligence behind the problem solving process.

Fifteen years after Deep Blue, another IBM supercomputer, Watson, beat the best human beings at the game of *Jeopardy!*, a game show that requires a deep understanding of language. The object is to correctly state the question related to the answer that is given. According to IBM, Watson is a cognitive system that understands natural language.

> "*Jeopardy!* was selected as the ultimate test of the machine's capabilities because it relied on many human cognitive abilities traditionally seen beyond the capability of computers, such as:
>
> - the ability to discern double meanings of words, puns, rhymes, and inferred hints;
>
> - the capacity for extremely rapid responses;
>
> - the ability to process vast amounts of information to make complex and subtle logical connections.
>
> In a person, these capabilities come from a lifetime of participation in human interaction and decision-making, along with an immersion in pop culture."[3]

Intelligent Computers

Will future computers be intelligent? Yes. Admittedly I can't be certain of my answer, but I do believe that computers can be intelligent. One reason for my optimism is the creative and innovative spirit of human beings.

Bill Gates in his book, *The Road Ahead*, relates a story that is probably apocryphal, but nonetheless, enlightening. According to this story (which others have

identified as a myth), the head of United States Patent Office declared in 1899 that the office should close because everything that could possibly be invented had already been invented.[4] Of course, there have been a few new inventions since the end of the nineteenth century! Human beings are wonderfully creative, and I'm not willing to bet against human ingenuity.

Some Christians are startled when I claim that computers can possibly be intelligent. There is certainly nothing unbiblical about the possibility. God created intelligent entities, including human beings. As the pinnacle of His creation, we have been endowed with a (tarnished) image of Him. Part of that image is reflected in our creativity. Computer systems already *appear* intelligent. The possibility of human beings creating truly intelligent systems seems likely. Notice, however, the vast difference between "intelligent computer" and "human equivalent system" (the objective of Strong AI research). An intelligent computer system would not be human equivalent. People are intelligent, but what makes us human is much more than mere intelligence; it is our soul and spirit created in the image of God that makes us human.

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Human Equivalence

Will you live on in the mind of a computer? This was the provocative title of one of the earliest popular-level accounts of Strong AI.[5] Will computers eventually be human equivalent? The key word in this question is "human." The answer to the question depends upon a worldview and how that worldview defines "people." This objective of strong AI research is vastly different from the "intelligence" objective. Because it involves worldview issues, there are a variety of opinions on the issue.

Computer scientist Hans Moravec, who Michael Hirsh quoted in his AP wire story, believes that computers will become human equivalent. Moravec believes that human consciousness is the result of naturalistic brain processes. The bundle of neurons known as the brain produces the mind and human consciousness. Essentially, the hardware of the brain is analogous to computer hardware, as both are built out of switches. According to Moravec, as soon as computer technology is advanced enough, it will be possible to capture human consciousness and download a person's living essence into a computer. Moravec's worldview profoundly influences his answer to the "human equivalence" question. Moravec's naturalistic, materialistic worldview is evident in his statement regarding origins: "We owe our

existence to organic evolution. But we owe it little loyalty." According to Moravec, human beings are just material beings, and the brain is the result of a continuous, naturalistic process (evolution). If this were true, then it would indeed be possible to produce human equivalence in a machine.

Mathematician Roger Penrose disagrees with Moravec. Penrose's work has challenged the typical Strong AI view that the mind is produced from an interconnected system of neural networks. Penrose claims that Strong AI via present computer systems cannot in principle duplicate the workings of the human brain. Penrose argues that consciousness exists outside the realm of computability, as the human mind can conceive some problems which are not computable. There do exist entities (both in mathematics and "reality") which we know to be true but which cannot be proven or calculated. Penrose does not believe that an algorithmically-based computer can capture the human essence. Penrose's worldview is very similar to Moravec's; however, it is naturalism with a twist. For Penrose, quantum mechanics is the "missing link" that makes naturalism work. While Penrose is correct in stating that human consciousness is outside the realm of computability, he does not see that the "missing link" is something outside of the physical universe, namely a transcendent God. It is not the mysticism of "quantum mechanics" that accounts for the human mind; rather, it is the inherent "image of God" that is responsible for our inimitable minds.

Computer scientist Fred Brooks presents an alternative viewpoint. According to Brooks, the Maker (the Triune God) gave humanity a number of inherent attributes, one of which is the gift of sub-creation. Brooks refers to these unique human attributes as "birth day gifts" since they were imparted to the original human beings at their birth, as recorded in Genesis 1.[6] Sub-creation is the ability and call of creative, rewarding work. J. R. R. Tolkien casts light on the concept of human creativity as sub-creation in the poem "Tree and Leaf":

> Although now long estranged,
> Man is not wholly lost nor wholly changed,
> Disgraced he may be, yet is not dethroned,
> and keeps the rags of lordship once he owned:
> Man, Subcreator, the refracted Light
> through whom is splintered from a single White
> to many hues, and endlessly combined
> in living shapes that move from mind to mind.
> Though all the crannies of the world we filled
> with Elves and Goblins, though we dared to build
> Gods and their houses out of dark and light,
> and sowed the seed of dragons—'twas our right
> (used or misused). That right has not decayed:
> we make still by the law in which we're made.[7]

As Tolkien reminds us, we are creative because we were fashioned by a creative God, and we still maintain an image of our Creator, although now tarnished as the result of sin. While Tolkien demonstrates the gift of sub-creation in the creation of fantasy, Dorothy Sayers extends the gift of sub-creation to all forms of human creativity. Sayers' work, *The Mind of the Maker*, demonstrates a "division of labor" for creation.[8] Sayers demonstrates the role of each Person in the Trinity in creation: Father as Idea; Son as Energy; and Spirit as Power. The Father conceived the creation Idea, envisioning the whole from beginning to end, even before it physically existed. The Son provided the Energy to call the creation into existence. The Spirit's Power enables us to interact with and understand the creation. This three-fold concept of Idea, Energy, and Power is reflected in how people sub-create in literature and the arts.

Brooks ultimately extends the gift of sub-creation to the work of computer science. Rather than invest time and energy in creating AI, Brooks argues for an investment in IA (Intelligence Amplifying). Brooks believes that Strong AI sent the discipline of computer science off in a wrong direction. Brooks' thesis is that IA > AI; that is, an Intelligence Amplifying (IA) system can better any AI system. For example, even though Deep Blue beat Garry Kasparov in chess, if we arm Garry Kasparov with a sophisticated IA chess playing system, the combination of the human and the computer (IA) will surely beat the computer (AI) alone. Brooks identifies computer scientists as toolsmiths and claims that their delight is found in fashioning power tools and amplifiers for users' minds. Brooks's Christian worldview leads him to the proper conclusion, and he rightfully decries the tremendous waste of money and human talent in the pursuit of human equivalence.

Because the "human equivalence" goal of strong AI depends upon a worldview, we must find the *true* worldview as revealed in the Bible in order to lay the foundation to answer the question. What is a human being, and who defines what people are? There are radically different answers depending upon the worldview framework employed. According to a humanist worldview, people are merely physical entities whose existence is a cosmic accident resulting from a naturalistic, evolutionary origin. If this worldview were true, then the strong AI goal would be achievable. If people are just a bunch of organic switches (the brain is just a computer made out of meat), then it is certainly possible to capture the essence of human beings in a computer system. According to the Christian worldview, people were specially created in the image of God. People are not just physical entities but possess a soul and spirit that reflect that now tarnished image.

The goal of strong AI research is eternal life. Consider these quotes from the AP wire story[9]:

> "If you can survive beyond the next 50 years or so, you may not have to die at all—at least, not entirely."

> "In an astonishingly short amount of time, scientists will be able to transfer the contents of a person's mind into a powerful computer, and in the process, make him—or at least his living essence—virtually immortal, Moravec claims."
>
> "MIT's Gerald J. Sussman, who wrote the authoritative textbook on artificial intelligence, agreed that computerized immortality for people "isn't very long from now."

Will you live on in the mind of a computer? The answer is no. God is the author and creator of life. Only God can create a human soul. The sad part of the story for those who accept a naturalistic worldview and have placed their hope in Strong AI is that eternal life is already available! As Jesus declares: "For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have **eternal life**" (Jn 3:16, emphasis added).

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So, we have a great message to share. Our hope is not in AI but in the Creator.

Conclusion

Computers can be intelligent. While many people believe computers are already intelligent because they appear intelligent, the possibility of computers being truly intelligent is real.

Even if computers are intelligent, it does not mean they can be human equivalent, since intelligence does not equate to "human being." There is much more to being human than merely intelligence. At the forefront is the fact that people were created in the image of God.

Christians can use computers as powerful problem-solving tools. If, or when, computers become truly intelligent, they will be even better tools. The Christian mission of making disciples is more important than ever. While some will falsely cling to the hope of a man-made eternal life, we have a timeless message that can bring true hope to the world. Thank God that eternal life does not depend upon a bug-ridden AI system created by fallible human beings! Jesus declared, "I am the way and the truth and the **life**. No one comes to the Father except through me" (Jn 14:6, emphasis added).

Endnotes

[1] See http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html and http://www.livinginternet.com/i/ii_ai.htm.

[2] Edmund Callis Berkeley, *Giant Brains; or, Machines that Think*, 6th ed. (New York: Wiley, 1949), 5.
[3] http://m.ibm.com/http/www-03.ibm.com/innovation/us/watson/science-behind_watson.shtml
[4] William Gates, *The Road Ahead* (New York: Viking, 1995).
[5] Michael Hirsh, "Will You Live on in the Mind of a Computer?", AP wire story, June 1987; original source: June 14, 1987 edition of *Milwaukee Journal*, page 1J.
[6] Fred Brooks, "Computer Scientist as Toolsmith II", *Communications Of The ACM* 39, no. 3 (March 1996), http://www.cs.unc.edu/~brooks/Toolsmith-CACM.pdf.
[7] J. R. R. Tolkien, *On Fairy Stories* (New York: HarperCollins, 2008).
[8] Dorothy Sayers, *The Mind of the Maker* (San Francisco: HarperCollins,1987), 35–45.
[9] Hirsh, "Will You Live on in the Mind of a Computer?"

Features of Human Anatomy: Marshall McLuhan on Technology in the Global Village

Michael Knippa

Abstract: Technology is reshaping our individual human experience and wider society on a near daily basis. An interesting, and useful, source through which we can examine these changes is Marshall McLuhan. In particular, his famous phrases "The Medium is the Message" and "The Global Village" can illuminate both our inseparability from technology alongside the deep extent to which various technologies shape us and our world far more than we often realize. The gift of this point of view is a deeper awareness of pervasiveness and ongoing influence of technology, which raises many dangers, challenges, and opportunities for the Church.

In our current cultural climate, unanimity is perhaps more mythical than a unicorn, especially when it comes to political matters. So it was surprising that in 2013 the Supreme Court unanimously ruled to extend the protection from unreasonable search contained within the Fourth Amendment to cell phones and smartphones. The court's opinion, written by Chief Justice Roberts, states that such devices "are now such a pervasive and insistent part of daily life that the proverbial visitor from Mars might conclude they were an important feature of human anatomy."[1] As we shall seek to explore, Chief Justice Robert's words about the mythical Martian's observations are indeed not far from the mark.

(Herbert) Marshal McLuhan did not live to see the age of the cell phone.[2] Born in 1911, McLuhan studied at the University of Manitoba and received a PhD from Cambridge University. He converted to Catholicism as an adult, though he rarely made direct theological statements in his public works.[3] He held positions at several Catholic universities before settling at the St. Michael's College, part of the University of Toronto. He died in 1980. He was deeply influenced by a fellow Canadian, Harold Innis,[4] the writings of James Joyce,[5] and taught Father Walter Ong, whose subsequent work explored many of McLuhan's concerns and interests.[6] McLuhan's technical area of study and teaching was literature, but his work defied such tight categorization; he explored widely and commented upon all manner of

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issues: history, economics, marketing, war, education, and above all else, technologies or, as he preferred to call them, "mediums." In his prime, McLuhan was both praised as the "oracle of the electronic age" and derided by many of his scholarly peers as a charlatan.[7] Undoubtedly, this was partly due to the fame he enjoyed during the 1960s.[8] Also his style, which was aphoristic and generalized rather than systematic and detailed, annoyed many, as did his penchant for mercurial statements.[9] By the end of his life, the spotlight had moved on and it seemed that McLuhan's fifteen minutes of fame had passed.[10]

Over the pasts two decades, though, McLuhan's thoughts and musing upon technology (which he interchangeably called "medium" or "media," a convention that will be observed throughout this paper) and its effects upon humanity have come to enjoy a renewed attention and appreciation.[11] He was anointed the "patron saint" of *Wired* magazine in the 1990s,[12] and many argue that McLuhan foresaw the coming of the Internet decades before its arrival.[13] He had a keen sense that Western society was undergoing a gigantic transition between two ages, moving from the "mechanic" age of the past into the "electric age" of the present and future. One of his books began with the following:

> The medium, or process, of our time—electric technology—is reshaping and restructuring pattern of social interdependence and every aspect of our personal life. It is forcing us to reconsider and reevaluate practically everything we thought, every action, and every institution formerly taken for granted. Everything is changing—you, your family, your neighborhood, your education, your job, your government, your relation to "others." And they're changing dramatically.[14]

Many continue to feel the prescience of these words and are likewise drawn to McLuhan's insights into the new world that seemingly continues to confront and confound us daily.

How McLuhan sought fundamentally to draw attention to what he felt was chronically and routinely ignored: the importance and effect of mediums (technologies) themselves, irrespective of the content they are conveying.

McLuhan's influence lives on particularly through his famous maxims. One of the most well-known is the phrase "the global village" (to which we will later return).[15] But, by far, McLuhan's most commonly known, and commonly misunderstood, insight is his famous quip "the medium is the message."[16] This phrase first appeared in his book *Understanding Media* and, once coined, was often adapted in various forms and also applied in a variety of ways.[17] This multiplicity has not helped shake the perception that McLuhan seems to be saying, bluntly, that content is irrelevant. Yet this is not

the case![18] Rather, with this pithy phrase, McLuhan sought fundamentally to draw attention to what he felt was chronically and routinely ignored: the importance and effect of mediums (technologies) themselves, irrespective of the content they are conveying.[19] This is the simplest, and most often missed, meaning of the maxim: Look at the frame not just the picture, or, more precisely, look at the impact of the frame itself.[20] Paying close attention to the effect of technologies themselves led McLuhan to gain at least four insights into the effects of technology that we shall briefly examine before turning toward his explorations of the "electric age" in "the global village."

Mediums Matter: Media Affects Content

The classic example of the first implications of "the medium is the message" is the debate between Richard Nixon and John Kennedy in 1960. The story goes that those listening to the radio thought that Nixon had won the day while those watching the debate on television perceived Kennedy to be the winner.[21] Clearly, the medium through which the debate was observed had an effect on the content of the debate and its interpretation.

"Any medium has the power of imposing its own assumption on the unwary" McLuhan warned.[22] People often use technologies obliviously or assume that different mediums are interchangeable in a one for one manner. Nothing could be further from reality:[23] TV is different from radio, the written manuscript is different from the printed book,[24] the airplane is different from the cruise ship.[25] Each medium has its own rules and "grammars" of form and interpretation that it imposes upon its content.

Opening Our Eyes: Any Content Is Itself a Medium

McLuhan would push his fundamental insight further. It is not just that the medium affects content, but that, ultimately, "the 'content' of any medium is always another medium."[26] As he put it, "the content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph."[27] In this musing is a key lesson that McLuhan offers: technology is all around us, hiding in things that we have long ago ceased to think of as "technological." As the initial novelty of any new technology wears off, it becomes "part of the furniture" as it were, just "the way things have always been." In slipping from our attention, we fail to see how deeply technological our lives already are, even as we, perhaps, lament the latest "new" thing. For McLuhan, the idea of returning to a pre-technological world is beyond impossible—it is inconceivable. Even those who forsake the latest

Technology is all around us, hiding in things that we have long ago ceased to think of as "technological."

technologies (whatever they may be) still depend upon clothing, shelter, the wheel, and some form of language itself,[28] all of which are, in McLuhan's analysis, mediums in and of themselves.

Getting Personal: Technology Changes Humanity

We are now in a position to take McLuhan's catchphrase a deeper still, as McLuhan the media critic becomes McLuhan the anthropologist. McLuhan argued that mediums not only shape content but also have deep impact upon their human users. This notion is most clearly seen in the subtitle of McLuhan's 1964 book *Understanding Media: The Extension of Man*.[29] For McLuhan, each new medium that human beings invent and utilize is nothing but an extension of humanity in a literal sense. In other words, for McLuhan all technology is a part that is added humanity to enlarge or prolong it.[30] He offered simple illustrations of this thesis: clothes are an extension of the human skin, the wheel is an extension of the human foot, weapons are the extension of the human fist.[31] As the human person is extended, his human experience changes: "Any technology tends to create a new human environment . . . technological environments are not merely passive containers of people but are active processes that reshape people and other technologies alike."[32]

With this in mind, we can see that Chief Justice Robert's observation of the cell phone's being "an important feature of human anatomy" is a deeply "McLuhanian" statement. The smartphone extends our voice through its microphone, our hearing through its speakers, our eyes through its camera, and our brains through its memory and circuitry. Leaving aside discussions of transhumanism, McLuhan challenges us to realize that technology is not simply something exterior to our humanity, but an interior, central, and inescapable part of it.[33]

Perhaps the most popular and less cryptic translation of "the medium is the message" is this: "We shape our tools, and our tools shape us."[34] This recognition, or at least the feeling of its effects, has led many to reject or revolt against different technologies throughout history. McLuhan was keenly aware of this and did warn against the mindless adoption of technology: "We are all robots when uncritically involved with our technologies."[35] Yet McLuhan was no Luddite.[36] His prescription was not retreat, but rather intentional understanding of technologies and their effects, which he thought could lead to more enlightened use of technology itself. His clearest statement of this prescription came in an interview in which he claimed that "the central purpose of all

[McLuhan's] prescription was not retreat, but rather intentional understanding of technologies and their effects, which he thought could lead to more enlightened use of technology itself.

my work is to convey this message, that by understanding media as they extend man, we gain a measure of control over them."[37] This "measure of control," in McLuhan's view, was not just personal, but also meant to be societal.

Going Global: Mediums Change Societies

Ultimately, McLuhan used "the medium is the message" to become a cultural anthropologist. Just as each unique medium changes the individual human experience, so it also collectively alters the human culture that it inhabits. "When technology extends one of our senses, a new translation of culture occurs swiftly as the new technology" is adopted.[38] It was this thesis that allowed McLuhan the widest possible latitude in his explorations. He argued that the phonetic alphabet gave its users a vast advantage over cultures that employed pictorial or hieroglyphic writing systems.[39] Similarly, he argued that the printing press was the harbinger of the industrial revolution and led to the homogeneous and standardized cultures that had their zenith in the twentieth century.[40] To put it simply, our technologies shape our sense of our world, our expectations, hopes, and fears, who we are as individuals and how we live together as a people. He states this most clearly, and most expansively, in his book *The Medium is the Massage* (which, teasingly, tells the point—the medium is the "mass age"): "All media work us over completely. They are so pervasive in their personal, political, economic, aesthetic, psychological, moral, ethical, and social consequences that they leave no part of us untouched, unaffected, unaltered."[41]

Our technologies shape our sense of our world, our expectations, hopes, and fears, who we are as individuals and how we live together as a people.

Now that we have seen the extent to which McLuhan promoted his most famous insight, as it relates to content all the way to societal structures, we are in a better position to explore the insights that he offered about the new human experience and cultural experience that our latest technologies are bringing forth.

Toward the "Electric Age" in "The Global Village"

As noted above, McLuhan had a keen sense that humanity was undergoing a massive transition from mechanistic toward electronic technologies, or what he termed "the electric age."[42] Fundamentally for McLuhan, electronic technology was an extension of nothing else than the human central nervous system, that is, of the human brain:

> The Western world is imploding. During the mechanical ages we have extended our bodies in space. Today, after more than a century of electric

> technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time so far as our planet is concerned.[43]

For McLuhan, electric technologies have the ability of virtually transporting the brain to every corner of the globe or, we might even say today, the universe. Humanity now has the ability to become, in a sense, "disincarnated." Once man is freed from the restrictions of the body, of time, and of space, McLuhan saw that everything in the electric age occurs at the speed of NOW. To use his exact words, there is an "all-at-onceness" in the electric age.[44] As a result, the electric age is one in which old barriers, such as time, space, borders, and long-established social divisions and norms, collapse with regularity and, for some, alarming speed. [45]

Here we can return to McLuhan's notion of "the global village," a catchphrase McLuhan used to expose and explore the shrinking of the world by electric technologies.[46] Whereas McLuhan thought that the mechanistic age was one of independence, the dawning electric age was the reverse, one of ever-increasing interconnectedness.[47] McLuhan put it this way: "[I]n the electric age, when our central nervous system is technologically extended to include us in the whole of mankind and to incorporate the whole of mankind in us, we necessarily participate, in depth, in the consequences of our every action."[48] We see this reality daily in our news cycles and in our globalized economy, but perhaps even more in the extent to which human politics, institutions, and thinking have turned, on the one hand, toward global problems with attendant quests for "global" solutions[49] and, on the other hand, to ever more specific attention upon marginal or esoteric groups and ideas.[50]

McLuhan thought that the mechanistic age was one of independence, the dawning electric age was the reverse, one of ever-increasing interconnectedness.

An image that McLuhan used to describe the new situation of humanity was that of the nomad and the tribe. "Man the food-gatherer reappears incongruously as information-gatherer. In this role, electronic man is no less a nomad than his Paleolithic ancestor."[51] Inherent in this description is McLuhan's idea that all new technologies are essentially disruptive, breaking apart our previous ways of being. In McLuhan's view, the mechanistic age and its mediums formed people who were individualistic, nationalistic, and isolated—people, in other words, who had broken away from the "tribal" groupings that characterize most oral societies.[52] Now, though, electric technology was disrupting the certainties of the mechanistic age, and humanity was undergoing a vast rebalancing. McLuhan argued that this process would be inherently violent, since people would have to redefine themselves in the midst of all-at-onceness change.[53] He noted that "discarnate man, deprived of his physical body, is also deprived of his relationship to natural law and physical law . . . [and] identity."[54] In their quest for a new identity, McLuhan thought that information

nomads would variously band together, forming "a new state of multitudinous tribal existences."[55]

Thus "the global village," in McLuhan's estimation at least, is not necessarily a peaceful place of tribal harmony. It is a rather place of "terror."[56] First, this is because "terror is the normal state of any oral [tribal] society, for in it everything affects everything all the time."[57] Everything, from an economic downturn in one country to a war in another, could unsettle or endanger everyone else. In the electric age, there seems to be no escape from this. Second, McLuhan simply observed that "when people get close together, they get more and more savage and impatient with each other."[58] Proximity, in a broken world at least, is no guarantee of peace. The divisiveness and outright violence that fills much political and civil discourse these days, in McLuhan's framework, is rooted in technologies that are inevitably shrinking the size of our world and increasingly granting us the opportunity of disagreement.

Finally, McLuhan was also quick to foresee one of the chief concerns of the electric age that is being realized in our time: continuous surveillance.[59] In one of his writings, he even went so far as to frame this problem in theological language:

> Electrical information devices for universal, tyrannical womb-to-tomb surveillance are causing a very serious dilemma between our claim to privacy and the community's need to know. The older, traditional ideas of private, isolated thoughts and actions—the patterns of mechanistic technologies—are very seriously threatened by new methods of instantaneous electric information retrieval, by the electrically computerized dossier bank—that one big gossip column that is unforgiving, unforgetful and from which there is no redemption, no erasure of early "mistakes."[60]

Whether by government or private firms seeking economic gain, electronic technology gives outside powers direct access precisely to what is most interior to us—our central nervous systems, and by extension, our inmost thoughts.[61] This affects not only privacy, as McLuhan notes, but also how we now socially express our moral judgments as a society. To put it bluntly: The public stockade is back; only this time, when you do wrong (which we will all do, at some point) you are on display in front of the whole global village.[62]

The public stockade is back; only this time, when you do wrong (which we will all do, at some point) you are on display in front of the whole global village.

Reflections

McLuhan's insights offer a way of seeing technology that, though contestable in its broad generalizations and lack of detail, is

inherently useful.[63] The gift of his point of view is a deeper awareness of pervasiveness and ongoing influence of technology upon the human person and society. It is precisely in the mundaneness, or returning to Chief Justice Robert's words, in the "pervasive and insistent part" that technology plays in all our lives that blinds us to the deeper ways in which it shapes our human experience. McLuhan seeks to open our eyes toward this because he believes ignorance of this reality is ultimately destructive. [64] Yet he does not counsel retreat in the face of technology, but rather intentional awareness leading to a deeper understanding that in turn results in more thoughtful engagement with technology.

Surprisingly, given the many concerns he had about "the global village," McLuhan could in turn be hopeful about the "electric age."[65] At the same time, he warns us toward a deep sense of humility in the extent of our understanding. He was fond of saying "we see through the rear view mirror. We walk backward into the future."[66] This humility was tied into McLuhan's evaluation of how far along we truly are into the "electric age." In the 1960s, he stated that, "We are today as far into the electric age as the Elizabethans had advanced into the typographical and mechanical age." [67] Certainly we may be further down the road, but I think McLuhan would say these are still early days. Far more is ahead of us. The time to think about it all is, of course, NOW.

How does reconciliation work in a world where our technologies make it ever harder to forgive or forget? What does forgiveness look like within a "global village," where our actions and therefore, inevitably, our sins impact not only those near to us but also our neighbors who just happen to live across the globe? How can the Christian community resist the violence that technological disruption tends people towards? How does the Church serve, teach, and gather the new "tribes" of our times around Christ? How does the Gospel speak into a world of "terror" and surveillance, where most people are consumed with worry, fear, and suspicion? Are Christians themselves too oblivious to the technologies that fill and shape their lives? What should the Church make of the "disincarnate man"?[68] These are some of the questions that McLuhan's work presents to the Church in this "electric age."

How can the Christian community resist the violence that technological disruption tends people towards?

These questions should perhaps spur Christians toward a deeper evaluation of what their own tradition has thought and said about technology, particularly within the Scriptures. McLuhan himself mentioned Psalm 115 in his public works and noted with eagerness that "the psalmist insists that the beholding of idols, or the use of technology, conforms men to them."[69] Like the people of the Old Testament, we, too, are prone to look towards technology as the source of our identity, security, and

meaning.[70] When we do so, our tools end up shaping and controlling us far more than we care to admit or are often even able to realize. There is truly nothing new under the sun. And yet, in McLuhan's estimation, clothes are a medium, and it was clothes that God provided to Adam and Eve in their broken state.[71] There is, it seems, a tension that must be held: when it comes to technology neither total (ignorant) embrace nor total (impossible) rejection can be embraced.

Finally, McLuhan's insights offer us a surprising, and hopeful, vantage point for deeper insight into the interaction of the Christian community as a whole with technology. Specifically, Lamin Sanneh's landmark work, *Translating the Message*, has drawn critical attention to the centrality of translation in the spreading of the Gospel.[72] With Marshall McLuhan's insights in view, we are in a position to expand upon this point. The Christian Church has and continues to demonstrate an extreme trust that the message of the Word can be translated not only into different languages but also into different mediums. From manuscript to print, from stained glass to spoken word, from Instagram to Internet, from radio to the big screen, the Word of the Lord continues to go forth. In so doing, Christians also demonstrate a tacit conviction that, as Robert Kolb has put it, "This medium, Jesus of Nazareth, is also the message itself."[73] What Kolb's brief insight ultimately offers the Church is a crucial beginning point for all reflections from a Christian perspective—namely that it is ultimately in Christ that all things hold together. While the change and disruption of new mediums naturally create fear, dread, and worry within people, Christians can forsake such reactions in the confidence that Christ has given through His promise that "and surely, I am with you always." Indeed, it is exactly this promise that has likely enabled the Church to continuously adopt and adapt technologies of all sorts in service of the unending message of Christ. Thus, rather than with apprehension and dread, Christians can engage the technological change confronting us today from a position of hope, excitement, and discovery.

The Christian Church has and continues to demonstrate an extreme trust that the message of the Word can be translated not only into different languages but also into different mediums. From manuscript to print, from stained glass to spoken word, from Instagram to Internet, from radio to the big screen, the Word of the Lord continues to go forth

Endnotes

[1] *Riley v California.* 573 U. S. 9 (2013).

[2] For a brief contemporary biographical sketch, see the introduction in Raymond Rosenthal ed., *McLuhan: Pro and Con* (Baltimore: Penguin Books, 1969), 15–22. For full biographies, turn to Philip Manchard, *Marshall McLuhan: The Medium and the Messenger* (Cambridge, MA: MIT Press, 1998) or W. Terrence Gordon, *Marshall McLuhan: Escape into Understanding* (New Work: Basic Books, 1997). For a more recent treatment, see Douglas Coupland, *Marshall McLuhan: You Know Nothing of My Work* (New York: Atlas & Co. Publishers, 2010).

[3] After his death, McLuhan's son Eric published a series of letters, conversations, and private musings about faith and Christianity. See Eric McLuhan and Jacek Szklarek eds., *The Medium and the Light: Reflections on Religion by Marshall McLuhan* (Toronto: Stoddart, 1999). See also Gordon, 219–225.

[4] McLuhan called his book *The Gutenberg Galaxy* nothing more than "a footnote of explanation" upon Innis's *Empire and Communication.* Marshall McLuhan, *The Gutenberg Galaxy* (New York: New American Library, 1969 c. 1962), 65. [Hereafter *GG*].

[5] McLuhan declared that "*Finnegans Wake* is the greatest guidebook to media study ever fashioned by man." See R. Pollack, "Understanding McLuhan," *Newsweek*, February 28, 1966, 56.

[6] See especially Walter Ong, *Orality and Literacy* (New York: Routledge, 1982).

[7] For a brief view of the varied reaction he received, see Richard Kostelantz, "Understanding McLuhan (In Part)" *New York Times Review of Books* (Jan. 29, 1967). Online archived version available: https://www.nytimes.com/books/97/11/02/home/mcluhan-magazine.html. For an admittedly "hostile" critique, see Johnathan Miller, *Modern Masters: Marshall McLuhan*, ed. Frank Kermode (New York: The Viking Press, 1971). See also the varied reaction in Rosenthal, *McLuhan: Pro and Con.*

[8] He had a cameo in Woody Allen's *Annie Hall*, a feat few academics have matched.

[9] For instance, in a collection of essays for and against his views, he began by stating: "I am an investigator. I make probes. I have no point of view. I do not stay in one position. . . . I DON'T EXPLAIN—I EXPLORE" [emphasis original]. See Gerald E. Stearn gen. ed., *McLuhan: Hot & Cold* (New York: New American Library, 1967), xii. It is also said that when one critic rejected his ideas he replied: "You don't like those ideas? I got others."

[10] "The September 26, 1970 issue of *The New Yorker* ran a cartoon of a young woman saying to a man as they left a cocktail party, 'Ashley, are you sure it's not too soon to go around parties saying, 'Whatever happened to Marshall McLuhan?'" Manchard, 232.

[11] See, for example, Paul Levinson, *Digital McLuhan: A Guide to the Information Millennium* (New York: Routledge, 1999); Robert K. Logan, *Understanding New Media: Extending Marshall McLuhan* (New York: Peter Lange, 2010); and Adrian Athique, *Digital Media and Society: An Introduction* (Cambridge, UK: Polity, 2013), Ch. 2.

[12] They wrote of him, "In the tumult of the digital revolution, McLuhan is relevant anew." See Gary Wolf, "The Wisdom of Saint Marshall, the Holy Fool," *Wired*, Jan. 1, 1996. Online archived version available: http://www.wired.com/wired/archive/4.01/saint.marshal_pr.html.

[13] "It is no extravagation to say that McLuhan also predicted the internet." William F. Baker, "'Fifty years in the Global Village': Remembering Marshall McLuhan on his 100th Birthday," *The Nation*, August 4, 2011: https://www.thenation.com/article/fifty-years-global-village-remembering-marshall-mcluhan-his-100th-birthday/.

[14] Marshall McLuhan, Quentin Fiore, *The Medium is the Massage* (New York: Bantam Books, 1967). This book is composed in a non-traditional format and has no assigned page numbers. As a result, all further quotations from it will hereafter be *MM.*

[15] A hint of the ideal first appears in *GG*, where McLuhan mused "the globe has contracted spatially, into a single large village" (262). The two-word phrase appears in Marshall McLuhan, *Understanding Media: The Extension of Man* (Cambridge, MA: 1994 c. 1964), "Our specialist and fragmented civilization of center-margin structure is suddenly experiencing an instantons reassembling of all its mechanized bits into an organic whole. This is the new world of the global village" (93). [Hereafter *UM*]. After this, McLuhan utilized the phrase liberally, both in book titles and his prose. See, for example, Marshall McLuhan, Quentin Fiore, *War and Peace in the Global Village* (New York: McGraw Hill, 1968). [Hereafter *WP*]. This phrase is certainly among the most fitting three-word summaries of our globalized age.
[16] *UM*, 7.
[17] "The medium is the massage," "the medium is the mass age," and 'the medium is the mess age" were all alternative ways that McLuhan expressed and explored the maxim.
[18] This idea was put to McLuhan most pointedly when an interviewer asked him if the content of Hitler's speeches had meant nothing. McLuhan unequivocally stated that "By stressing that the medium is the message rather than the content, I'm not suggesting that content plays no role—merely that it plays a distinctly subordinate role." See Eric Norden, "The Playboy Interview: Marshall McLuhan," *Playboy*, March 1969. Online archived version available: http://web.cs.ucdavis.edu/~rogaway/classes/188/spring07/mcluhan.pdf [Hereafter *PI*].
[19] "Those who are concerned with the program 'content' of media and not with the medium proper, appear to be in the position of physicians who ignore the 'syndrome of just being sick.'" *UM*, 64.
[20] This expression is adapted from John M. Culkin, SJ, "A Schoolman's Guide to Marshall McLuhan," Raymond Rosenthal ed., *McLuhan: Pro and Con* (Baltimore: Penguin Books, 1969), 247.
[21] Kayla Webley, "How the Nixon-Kennedy Debate Changed the World," *Time*, Sept. 23, 2010, http://content.time.com/time/nation/article/0,8599,2021078,00.html.
[22] *UM*, 15.
[23] Many technology companies experienced this reality very recently, as they had to transition the websites they built for personal computers towards the technology of smartphones that many now use to access the Internet.
[24] Elizabeth Eisenstein has demonstrated how print technology differs drastically from that of the manuscript. See, for example, Elizabeth Eisenstein, *The Printing Press as an Agent of Change: Communications and Cultural Transformations in Early Modern Europe* (Cambridge, UK: Cambridge University Press, 1979).
[25] "The traveler now turns to the airways, and thereby ceases to experience the act of traveling." *UM*, 94.
[26] *UM*, 8.
[27] Ibid.
[28] "Each mother tongue teaches its users a way of seeing and feeling the world, and of acting in the world, that is quite unique." *UM*, 80.
[29] "The personal and social consequences of any medium—that is, of any extension of ourselves—result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology." *UM*, 7.
[30] "All human tools and technologies, whether house or wrench or clothing, alphabet or wheel, are direct extensions, either of the human body or our senses. Computers are extensions of our brains. As extensions of our bodies, tools and technologies give us new leverage and new intensity of perception and action." Marshall McLuhan, Harley Parker, *Counterblast* (New York: Harcourt, Brace & World, Inc. 1969), 38. [Hereafter *CB*]
[31] *MM*.

[32] *GG*, 7.
[33] In McLuhan's thought, the means by which technology (extensions of humanity) reshape the human experience is through changing the balance of the human sensorium (taste, touch, smell, hearing, and sight). Any technology tends to extend (that is, increase) some senses while suppressing or "numbing" others. For a simple example, consider that you went down the same road twice, but the first time you drove a car and the second time you rode a bike. In the car, you would depend heavily upon your visual sense to detect signs (speed limits, stops signs, yield signs), pedestrians, and above all else, other cars. On the bicycle, however, you would hear the pedestrians, feel the wind slowing your progress, and perhaps even smell nearby factories or restaurants. These two technologies would yield extremely different human experiences of the same piece of road.
[34] Contrary to many citations attributing these words to McLuhan himself, this phrase actually emerged from John Culkin's summary of McLuhan. He originally stated it as "We shape our tools and thereafter they shape us." Culkin, 248.
[35] *CB*, 18.
[36] "I see no possibility of a worldwide Luddite rebellion that will smash all machinery to bits, so we might as well sit back and see what is happening and what will happen to us in a cybernetic world. Resenting a new technology will not halt its progress." *PI*.
[37] Ibid.
[38] *GG*, 54.
[39] "No pictographic or ideograms or hieroglyphic mode of writing has the detribalizing power of the phonetic alphabet." *GG*, 32.
[40] "Printing was the first mechanization of an ancient handicraft and led easily to the further mechanization of all handicrafts." *GG*, 58.
[41] *MM*.
[42] "Today we live on the frontier between five centuries of mechanism and the new electronics, between the homogeneous and the simultaneous. It is painful but fruitful." *GG*, 172.
[43] *UM*, 7.
[44] *GG*, 81. Cf. "Ours is a brand-new world of allatonceness. 'Time' has ceased, 'space' has vanished. We now live in a global village . . . a simultaneous happening." MM.
[45] "Our electric extensions of ourselves simply by-pass space and time, and create problems of human involvement and organization for which there is no precedent." *UM*, 105. Cf. "With the extension of the nervous system itself as a new environment of electronic information, a new degree of critical awareness had become possible." *WP*, 20.
[46] "The effect of extending the central nervous system is not to create a world-wide city of every-expanding dimensions but rather a global village of ever-contracting size." *CB*, 40.
[47] "Our extended faculties and senses now constitute a single field of experience which demands that they become collectively conscious. Our technologies, like our private senses, now demand an interplay and ratio that makes rational co-existence possible. As long as our technologies were as slow as the wheel or the alphabet or money, the fact that they were separate, closed systems was socially and psychically supportable. This is not true now when sight and sound and movement are simultaneous and global in extent." *GG*, 14.
[48] *UM*, 4.
[49] Consider McLuhan's description of the "TV child," whose horizons mirror that of the generation that is now called "digital natives": "You must remember that the TV child has been relentlessly exposed to all the 'adult' news of the modern world—war, racial discrimination, rioting, crime, inflation, sexual revolution. . . . He's been orbited through the TV screen into the astronaut's dance in space, been inundated by information transmitted via radio, telephone, films, recordings and other people." *PI*.

[50] "The shock of recognition! In an electric information environment, minority groups can no longer be contained—ignored. Too many people know too much about each other. Our new environment compels commitment and participation. We have become irrevocably involved with, and responsible for, each other." *MM*.
[51] *UM*, 283. Later on, he elaborates more: "Men are suddenly nomadic gatherers of knowledge, nomadic as ever before, informed as never before, free from fragmentary specialism as never before—but also involved in the total social process as never before; since with electricity we extend our central nervous systems globally, instantly interrelating every human experience." Ibid, 358.
[52] "Printing the Bible in the 15th century meant religion without walls. But unexpectedly it raised the towering walls of vernacular nationalism and individualism, for print upset corporate and liturgical worship. Although printing was the first mass media, it isolated the reader and the student as ever before." *CB*, 124.
[53]"The fantasy violence on TV is a reminder that the violence of the real world is much motivated by people questing for lost identity. . . . On the frontier everybody is a nobody, and therefore the frontier manifests the patterns of toughness and vigorous action on the part of those trying to find out who they are." Marshal McLuhan, "A Last Look at the Tube" *New York Magazine*, March 17, 1978.
[54] Ibid.
[55] *PI*. To see the foresight of this insight, consider a recent article from *The Economist* that explores the complexity of the "Melungeons," a small ethnic group from Appalachia. The author notes that "Whereas formerly 'Melungeon' was a slur to be renounced, it has become an allegiance to be embraced . . . they are emblematic of a 21st-century urge to belong." "Down in the Valley, Up on the Ridge: An American Mystery," *The Economist*, August 27, 2016. This is but one of a thousand examples of (re)tribalization.
[56] "Uniformity and tranquility are not hallmarks of the global village; far more likely are conflict and discord as well as love and harmony—the customary life mode of any tribal people." *PI*.
[57] *GG*, 44.
[58] Marshall McLuhan in an interview with Mike McManus, *The Mike McManus Show*, Television, TV Ontario, 1977.
[59] "As our senses have gone outside us, Big Brother goes inside." *GG*, 44.
[60] *MM*.
[61] "Once we have surrendered our senses and nervous systems to the private manipulation of those who would try to benefit from taking a lease on our eyes and ears and nerves, we don't really have any rights left. Leasing our eyes and ears and nerves to commercial interests is like handing over the common speech to a private corporation, or like giving the earth's atmosphere to a company as a monopoly." *UM*, 68.
[62] See, for example, Jon Ronson, *So You've Been Publicly Shamed* (New York: Riverhead Books, 2015).
[63] Considered Elizabeth Eisenstein's nuanced treatment of McLuhan: "By making us more aware that both mind and society were affected by printing, McLuhan has performed, in my view at least, a most valuable service. But he has also glossed over multiple interactions that occurred under widely varying circumstances." (Eisenstein, 129).
[64] This was McLuhan's pinnacle concern. He warned: "there can only be disaster arising from unawareness of the causalities and effects inherent in our own technologies." *GG*, 302.
[65] "Personally, I have a great faith in the resiliency and adaptability of man, and I tend to look to our tomorrows with a surge of excitement and hope. . . . We live in a transitional era of profound pain and tragic identity quest, but the agony of our age is the labor pain of rebirth." *PI*.

[66] *MM*.
[67] *GG*, 9.
[68] McLuhan expressed deep concern on this point toward the end of his life in a letter to Clare Boothe Luce. He stated, "Discarnate man is not compatible with an incarnate Church" (Gordon, 219).
[69] *UM*, 45. For a deeper explication of this theme and its centrality to the Old Testament in particular, see G. K. Beale, *We Become Like What We Worship: A Biblical Theology of Idolatry* (Downers Grove, IL: IVP Academic Press, 2008).
[70] Just try taking a person's cell phone away, even for a short time.
[71] Gn 3:21.
[72] Lamin Sanneh, *Translating the Message: The Missionary Impact on Culture* (New York: Orbis Books, 2009).
[73] Robert Kolb, *The Christian Faith: A Lutheran Exposition* (St. Louis: Concordia Publishing House, 1993), 139.

Music Technology, Worship, and Missions

John P. Juedes

Abstract: Church leaders debate about the use of music in churches and missions. This is often framed in terms of theology and practice. Actually, music *technology*, *not theology*, both causes and provides answers to the debate. Music technology, that is the kinds of instruments and how they are used, is constantly changing and strongly affects music used in the church. The different types of music technology used in various cultures and the trend toward globalization of music present special challenges for missions. Understanding how music technology works and changes provides a basis for answering questions, such as, "What music is 'sacred' or 'secular' now? What will be in twenty years? What music is too secular for church use? Are refined hymns better than simple choruses? How is music influenced by, and used to spur open air evangelism? How has recent music technology expanded worship options and weakened denominational control? What valid and competing values have, and always will, drive conflict over church music?"

Church leaders continually debate about the use of music in churches and missions. The debate is often framed as discussion of theology and practice. Actually, music technology is the key, unrecognized cause of the debate; and understanding how it works and changes provides sound basis for discussing, evaluating, and making decisions on use of worship music.

1. What is music technology?

The science of physics is used to examine how sounds are produced in order to achieve various pitches (frequencies), durations, timbre (the nature of the sound), and combinations that are "music to our ears." Our desire to make pleasing music is a gift of the Creator.

How we produce sound is music technology, which affects the kinds of music we make. It varies by place, people, culture, and the history of accumulated

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technology. We learn music from nature and culture, and so worship music varies from one culture to the next. Music technology constantly changes. Even "historic" instruments like organ sounded and were played very differently over the centuries.

The diversity of music technology brings both joy and conflict to the church. We enjoy music in worship because it inspires, guides, and expresses love for God. Naturally occurring aspects of music, such as the rhythm of drums and the pentatonic scale (the black keys on the piano) unite people of different cultures. Other aspects of music are unique, and so learning the music technology of other cultures enhances our experience.

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Differences in music tech also prompt conflict. Our music may sound strange and displeasing to another culture, which can cause stress in the relationship. We may have trouble reproducing someone else's music in our technology. Music differences provide an extra challenge to cross-cultural evangelism.

2. How does music technology in a given time and place affect the kinds of worship music we are able to use?

The tech we use enables or hinders use of certain kinds of music and affects how effective and satisfying it is. Problems arise when the music tech available doesn't fit well with the kinds of music we want to use.

The organ (and even piano) is extremely advanced and expensive technology. The organist needs to be fluent in a second language, namely music notation, and practice thousands of hours to smoothly translate the notation to music. Organs are expensive to build, buy, and move. Because the organ produces complex and beautiful music, pastors and missionaries like to carry music written for it into churches and third-world missions which have very few or no musically trained members and no money for such sophisticated tech.

How can one use complex music in places that do not have such complex tech? There are three answers to this problem.

One answer is to use automatic music technology to substitute for organ and organist. Most people think self-playing music is recent, appearing with CD, mp3, and midi. In fact, automatic music dates back to the 1700s in the form of barrel organs. Barrel organs worked like music boxes, which have a revolving cylinder with metal studs that pluck tuning forks. "Barrels," cylinders with interchangeable covers (seven to fifteen could be loaded at once), had studs that tripped levers,

causing air to flow into pipes. Most churches in the 1700s used only four or five tunes.[1]

This is one reason so many hymn lyrics (and tunes) were written in Common Meter (CM), Short Meter (SM), and Long Meter (LM). A given tune could be used with literally thousands of lyrics (John Newton wrote six thousand; Charles Wesley eight thousand) without having to invest in more barrels. Fifteen of the seventeen songs written by Isaac Watts and included in *Lutheran Worship* are in CM, SM or LM. (LM has been a common form in poetry for a millennium.) Hymns multiplied as composers wrote more tunes for existing lyrics, and authors wrote more lyrics for existing tunes.

Modern tech such as midi and mp3 allow more, as well as more complex, tunes to be used. However, if there is a large difference between the music tech of the church leaders and the new converts, learning will be harder and produce frustration.

A second, but detrimental, answer is to insist on using technically complex music without the means to reproduce it or receptive people. Some third-world churches are induced to use chants, hymns, and choir pieces that are beyond their training as musicians and worshipers. The result is unsatisfying worship.

Churches that I visited in Kenya lacked basic music technology that Western churches take for granted. They had no hymnals, photocopiers, instruments (other than drums), musicians, or acquaintance with four-part harmony or music notation. Music written for complex music tech is ineffective in such settings. I have found that, even in the West, some people decline to join choirs because they find four-part notation to be intimidating.

The third answer is to use mostly indigenous music and technology. Ministry in a different culture means adapting not only to different customs and mindsets, but often to different music technology as well. It requires more wisdom and patience to develop local musicians than to impose Western music, but yields benefits.

3. How does music technology advance ministry and missions?

Missions have always used modern technology for evangelism. The apostle Paul followed the network of Roman roads, sailed, used the marketplace (agora) to engage people, and used books as well as scrolls. Missions now use high tech communications, including the Internet, e-mail, radio, TV, cell phone, satellite, digital files, and social networking.

Music technology has dramatically advanced in the last half century. Digital music partners with digital communications to distribute—widely and quickly—evangelistic, teaching, and worship content. Thus, technology helps to unify the global church and helps churches in remote areas to mature more rapidly.

Globalization of Western music affects church music too. Many Westernized cultures, such as Taiwan, now enjoy "fusion" music, which combines traditional forms with Western pop and soft rock music. Thus, they easily adopt contemporary Christian worship music written for this technology and find old hymnody harder to incorporate.

4. What is the link between music technology and revival?

Revival in the historical sense refers to mass movements in which large numbers of people come to faith or have their faith enlivened. Revivals of faith bring revival of worship as well. The Reformation introduced the popular hymn with verse, melody, and meter; the Oxford Movement in England (1833–1841) overcame resistance to hymn singing in the Anglican Church; the Great Awakening spurred hymn writers such as Isaac Watts; the English revival in the late 1800s popularized brass bands; and the Jesus Movement of the 1970s introduced praise music and bands. Most revivals popularized new or neglected worship music technology.

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Maranatha songs (an arm of Calvary Chapel) show a progression from low tech revival music to higher tech church music. The earliest edition of *Praise Chorus Book* (1983)[2] was full of short praise songs, ideal for impromptu gatherings in homes and parks, led by guitar, and sung from memory before songbooks were available. About eighty-nine of the first one hundred songs in the book have only one verse, or two verses which are nearly identical (like Negro spirituals). Most of the eighty-nine were a single Bible verse set to music almost verbatim, which is one reason a second verse wasn't added; other passages didn't have the right number of syllables to fit the melody. Today Maranatha songs are longer, with verses, refrains, and bridges because Calvary chapel worship has moved from fluid revival settings to scheduled services in church buildings with video projection and coordinated bands. Some "Jesus People" formed a new denomination, Calvary Chapel, while others dispersed to various churches and took Jesus Movement music with them.

5. What kinds of music are too secular to use in the church?

Every kind of music technology is secular. "Traditional" church music and instruments were developed in the secular world but used in the church long enough to be considered sacred. All musical forms and instruments were once rejected as too secular but over time were sanctified for church use. Music technology, church art, sermon styles, administration, and teaching techniques all change over time, largely in step with society.

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The organ was once seen as too immoral for sacred use. Roman Empire Christians who heard the organ during gladiator combat, Puritans who prohibited and destroyed organs because they were popular in taverns and palaces,[3] Pietists disgusted by organ in opera, and Roaring Twenties fundamentalists who avoided movie houses would be mortified to learn that the organ is now the gold standard for sacred music. The organ was also fully at home in 1970s rock and roll.

Congregational churches in 1770 allowed flute, clarinet, oboe, bassoon, guitar, and violoncello, but not violin, because it was used for dancing.[4] Handel's *Messiah* was initially condemned for bringing secular opera into the church, and composers such as Handel and Mozart wrote more secular music than sacred music, using the same styles. Johann Bach is honored as a Lutheran who wrote chorales, but he also composed secular dance suites and cantatas on topics like Greek mythology.

Some things criticized as flamboyant performance, such as lead singers in praise bands, are actually part of the technology. In a typical band, drums keep the instruments in sync, lead guitar plays chords, bass guitar adds harmony, and keyboard plays strings to add flow. What's missing? Since none of the instruments play melody, the human voice necessarily serves as a melody instrument for worshipers to follow.

6. What, after all, is "sacred music?"

The term "sacred music" describes a particular kind of European classical music, composed using specific music technology for use in the church. But "sacred" at its core means "dedicated to religious purpose." Almost all music technology is developed in secular settings by technicians and musicians. But any music

technology can be dedicated to religious purpose and used to worship God, which makes it "sacred." Worship is rooted in the heart rather than technology.

The church has a treasure trove of useful experience and music. Tech has developed far beyond the practice of allowing no instruments at all (*a cappella* literally means "in the manner of the chapel," in contrast from *cantata*, which is singing accompanied by instruments). We can draw resources from this toolbox to fit many needs and settings.

This article purposely avoids discussing theological concerns, because concerns that are expressed as theological are often actually a reluctance to accept new music technology and have little to do with theology. Since this article focuses on music technology, it addresses only the *format* of lyrics in so far as they are affected by the type of music, not the *content* of the lyrics themselves. Lyrics that some people call inferior are actually just tailored to the format of certain music technology (more on this below).

7. What is secular or sacred now? What will be twenty years from now?

"Secular" and "sacred" are very subjective and constantly evolving terms. What makes an instrument "sacred"? Is it sacred when common in churches but not in secular settings?

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Organists are in short supply. The American Guild of Organists now has 17,000 members but projects that it will have only 8,700 members in twenty years (2035) and 6,900 members in 2045.[5] Liturgical churches—including Lutheran, Roman Catholic, Episcopalian and Methodist—use organs in worship. These four denominations have a combined 80,000 churches in America, and so the number of churches able to offer live organ music is falling dramatically.

The number of churches that use guitar (and perhaps electric keyboard) is much greater, although the number is hard to estimate. Many of these churches buy the Church Copyright License from Christian Copyright Licensing International (CCLI), which enables them to legally copy lyrics of new praise songs. (Traditional churches that use only hymnals don't need this service). Fully 160,000 churches have this license,[6] double the number of liturgical churches. Correspondingly, the number of songs written for sacred use on guitar is many times those composed for organ.

Both the supply of, and demand for, organists is decreasing. But the latter is being replaced by a growing demand for skilled musicians who can lead praise bands, suggesting that there are already many more churches that use guitar for

worship ("sacred" use) than organ and that twenty years from now the guitar will be *the* sacred music instrument (rivaled by piano), and live organ virtually unknown.

Churches commonly accept piano for sacred use. But piano is just as common in bars and casinos and drives rock songs like Jerry Lee Lewis' "Great Balls of Fire." So common use isn't a reliable benchmark for what is sacred and secular. Perhaps the worship technology people grew up with largely forms their idea of what is sacred and secular music. By that standard, many more Christians today already consider guitar or keyboard sacred, rather than organ.

8. Should we adapt secular songs for sacred use?

The Salvation Army often wrote Christian lyrics to popular hits such as "Champagne Charlie is My Name." A Lutheran example is Martin Luther's adaptation of a German song, (translated) "From Foreign Land to You I Come," for "From Heaven Above to Earth I Come." (A new tune was later composed.) Both songs are antiphonal conversations. In the secular song, a man poses a riddle to a maiden who must answer correctly or give up her garland if she's wrong; in Luther's hymn, an angel announces the birth of Christ, and the believer responds. A 1571 German hymnal "Street Songs, Cavalier Songs, Mountain Songs, Transformed into Christian and Moral Songs" did the same. Bach's tune for "O Sacred Head, now Wounded" came from a love song, "Mein G'müt ist mir verwirret." To some degree these hymns were popular because "churches had gone above the heads of the common people."[7]

The Army wanted new believers to join in worship immediately, without requiring them to overcome the hurdle of learning new (and boring?) hymns. Luther and the reformers wanted to inspire people to worship rather than hear priests and choirs perform it. Adapting secular songs helped bridge the gap, although this became less needed as people learned hymns.

Adapting secular songs often causes debate among church leaders (but apparently not among new believers) about its appropriateness. Supporters emphasize inspiring new believers to worship by using familiar tunes, while critics emphasize teaching new believers to be separate from the world by learning hymns. New believers learn new tunes either way, but secular tunes provide an inspirational transition to a new life of worship.

9. How did outdoor evangelism affect church music?

Since the Day of Pentecost, evangelists have preached the Gospel to large groups in the open air, and music has often been a part of this. Most unbelievers are found outside church walls, evangelists prefer neutral settings and during revivals, crowds are too large for churches. Ben Franklin described George Whitefield's

preaching to twenty thousand people at once on Philadelphia streets, and Billy Graham often preached to crowds of one hundred thousand. Sometimes church authorities did not approve of the evangelists and did not allow them to use church facilities.

Outdoor music introduced a major problem. How do you produce music loud enough for tens of thousands of people to hear and sing along with? The Salvation Army overcame this obstacle by assembling brass bands. In its heyday in the 1880s, the Army was a bold evangelistic force. They paraded through bad neighborhoods, making as much musical noise as possible, attracting hearers and hostility from bars, brothel keepers, and constables (and took pleasure in getting arrested for disturbing the peace). They wanted seekers and new believers to be able to sing along with the Army just as they did in singing halls and so wrote Christian lyrics to popular songs like "Champagne Charlie is My Name," a song about a generous, high class drunk. [8]

Salvation Army "officers" composed a large body of sacred music disguised as tunes for a new worship music technology: marching bands. Would Johann Bach or Paul Manz consider band music to be "sacred?" Trombone choirs (church brass bands that play in four parts) are wildly popular in Germany now, with 110,000 players in six thousand choirs. They began a century ago during a Protestant revival movement in which services were held outdoors. [9] Brass and wind instruments are loud, relatively easy to learn (Army "soldiers" are still required to learn instruments), portable, and can be played together as a band for more volume.

But how can anyone use more complex (and less portable) music tech, such as piano and organ, or quieter and more portable music tech, such as guitar, in open air where sound is lost to the environment? Wealthy societies of the twentieth century solved this problem and dramatically changed worship music with electronic amplification. While we may not think of amplification as music tech, it may be used more for music than anything else, on radio, mp3 players, television, church sound systems, arenas, and stadiums. The magic of electronic amplification is that it can be used with quiet instruments and even make encoded music (CD, mp3, midi) hearable.

This new music technology led to a conflict between those who love older tech, such as organ, and those who are inspired by guitar. Guitar had been a poor choice for large groups because it is too quiet, especially when playing single-note melody rather than chords.

The Jesus Movement was a massive revival in America in the 1970s, bringing many hippies to faith, and enlivening young people raised in what they saw as staid churches. Many Jesus People helped breathe new life into the LCMS, because many Lutherans had their faith enlivened in the Jesus Movement, were motivated to become leaders, and brought new worship forms in the church. Like other revivals,

the Jesus Movement revived church music by using new music technology, electronic amplification, and guitar.

The new music tech was condemned by critics. Supporters answered, "Why should the devil have all the good music?" words which have variously been ascribed to Martin Luther, George Whitefield, and Salvation Army founder William Booth.[10] Guitars and drums were condemned as secular, yet revolutionized church music, led by Jesus Movement musicians and Calvary Chapel.

This led to a new body of church "hymnody" (Jesus people called it "praise music") that spread like wildfire to virtually every denomination and place on earth. While traditionalists may call Western liturgy and ancient hymnody "ecumenical," it is praise music that is ecumenical today. Music subscription services, e-mail, and the Internet make it possible that praise songs can be written one day, translated into hundreds of languages the next, and used by churches around the world within the week. Calvary Chapel songs are more ubiquitous than Isaac Watts and have been a unifying influence in the Christian Church worldwide. Secular American and evangelical Christian music is so prevalent today that praise music is like a "second language" in many churches around the world. Globalization happens in business, secular music, and church worship.

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Electronic amplification is supported by other music technology, including photocopiers and video projection. Once upon a time, an obsolete technology, hymnals, was needed to enable worshipers to sing along with complex lyrics. Denominational leaders commonly controlled what went into hymnals and "new" music was introduced every thirty to forty years when a new hymnal was published. Photocopiers and projection enable churches to use very new and varied songs without going through denominational filters and printing delays.

The new body of songs written for guitar fit sometimes uneasily with older technology. Not all hymns written for organ work well with guitar, and not all guitar songs play well on organ. By slightly changing the structure (like deleting bridges) and arrangement, it's possible to make praise songs sound like piano hymns, enabling traditional churches to use both in "blended" services.

10. Can just anybody do church music today?

Amplification helped make guitar a new instrument of choice and democratized church musicianship. Organ and piano require much music education, because pianists must read the language of music notation and practice extensively. Guitars

are popular partly because they are accessible. Guitarists need not learn music notation. Instead, they use "lead sheets" or "chord charts" that note chords with letters such as A or F#. Guitar chords are easier to learn than picking out melodies, and guitars are cheap and portable.

Poorer neighborhoods have less music education, because it's costly, and substitute the less complex technology, guitar. Many churches offer guitar classes to develop new musicians and include them in praise bands to give them low-stress experience. (New solo pianists find playing alone in church services stressful, while apprentice guitarists can play with experienced ones with less fear of embarrassment.) Composing music is also easier on the guitar, since composers need little formal music education.

We tend to enjoy layers of sound, and so the simple lead guitar attracts other instruments to supplement it, including bass guitar, rhythm guitar, drums, keyboard, strings (often played on keyboards), and sometimes woodwinds. While some criticize this as "performance," it is a way musicians honor God with multifaceted music and the effect is like organ "stops" that emulate varied instruments. It seems that some who criticize "performance" in church unfairly imply that musicians are more concerned with impressing people than with worshiping God.

Democratization of church music is one result of using guitars, amplification, and publishing tech. Almost anybody can play an instrument, compose music, print "throw-away" hymnals, and lead worship. Sophisticated musicians may see this as either "dumbing down" sacred music or as enabling more people to use their worship gifts.

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11. How can we use music to attract people to the church?

Music-making and song writing has always been central to worship and is rooted in Hebrew temple worship. Other religions, such as Islam, do not have a tradition of music in corporate worship. Muslims gather at mosque to recite together

the same brief, scripted, and choreographed prayer that they recite individually five times every day.

On the other hand, because music is pleasing, it attracts people to the church. The struggle is *practical*—how to make music attractive given the technology and skills we have, as well as *spiritual*. That can raise the question: At what point does the technology become an end in itself rather than a means of drawing people to Jesus Christ and praising God?

In evangelism, Christians often use music both as an attractive force and as a way to preach the Gospel. From George Beverley Shea at Billy Graham crusades to Rapper TobyMac at Calvary Chapel, evangelistic concerts (a key part of its evangelistic strategy), the Gospel is preached in different styles to draw non-Christians. The music technology used is different and chosen with the intended audience in mind. If Calvary Chapel substituted Shea, the unbelievers they wanted to reach would not come. Choosing music is a technological choice, not just a theological choice.

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I think that the heritage of four-part harmony (SATB) is one factor that hinders males from singing more enthusiastically. SATB means that the melody is always sung in the soprano range, above the comfort level of male voices, something women don't realize. I would like to see what would happen to men's singing if melodies were played in a lower range with driving "march" timing.

12. Is complex hymnody better than simple songs?

Humans tend to consider complex to be better than simple. Most of us would rather travel by Lexus than mountain bike. The Lexus provides power, speed, and luxury. But which would you choose if you had to travel over a hill without roads?

Simple praise songs are sometimes derisively called "7/11"—seven words sung eleven times. Are lyrically and musically complex hymns better than simple songs? It depends on which music technology is available and the purpose of the song. Where music technology is simple, it's usually best to pick simple songs to match. My classes in Kenya liked "Swing Low Sweet Chariot" and "King of Kings and Lord of Lords." "Swing Low," like Kenya's indigenous songs and Negro spirituals, was written for just a drum and learned by rote rather than read in a hymnal. The words are repetitious so that a refrain and simple hand motions can remind singers of lyrics they're about to sing. Since my Swahili was nearly nonexistent, my favorite Kenyan song, "*Mungu etu newa upendo*," was repetitive too.

At home, when I need an extra song during communion distribution without accompaniment or written lyrics, everyone can join in "Were You There?", "Let Us Break Bread Together," or "Father, I Adore You." When we did Sunday services using only little-known Negro spirituals, there was a tremendous response and we continue to use some of them. Even when instruments are available, a simple song can carry deep meaning. In certain congregations, many people don't read well or have poor vision and thus have trouble singing complex lyrics. To some people, too much complexity feels stilted and cerebral rather than heartfelt. Worship leaders need to be sensitive to their people.

Whether we use historic hymns or contemporary praise songs, we follow the model of the Reformation, which introduced man-made lyrics and tunes in popular styles that replaced monophonic chants sung by priests and choirs. Chants did not have the elements we think of as song-poetry, meter, rhyme, and harmony. What is known technically as the "chorale" (metrical hymnody) became the format almost all churches use today, with melodies and metered lyrics, poetry written by men and not only words from Scripture. Verses repeat using the same tune, and harmony was added soon after, making tunes more interesting and enabling singing in parts. ("Polyphony" technically refers to multiple independent melodies which occur at the same time, but it is also used for instruments like pianos which can play more than one note at a time.) Several instruments often played together, which is one reason meter and rhythm (and often drums) are important.

The church across the ages has had radically different opinions about the acceptability of complex music. Calvin and Zwingli thought that interesting music distracted people from worship, and churches still have different opinions on just how interesting it should be and which music technology should be used. What appears to be simple music may be complex. A century ago musicians like James Weldon tried to write down Negro spirituals in music notation in order to preserve them. Weldon lamented that they never "set down the anarchic harmonies which they heard. In fact, they had no classification for these sounds or even comprehension of them as harmonies."[11] The same was true of complex rhythms.

Praise music often is written with a wide-ranging accompaniment, rather than the four-part harmony often found in hymn arrangements. This may frustrate worshipers who like to sing parts, but it makes the harmony more interesting. Praise music often also has bridges, which function like a second refrain, which adds interest.

13. Why is changing technology so hard for some people?

Churches resist changing from one music type to another for many reasons. Many are satisfied with the tech they use or may think that adding another requires

rejecting their own. For others, the learning curve is steep, and so the musicians, music, instruments, and skills may be unavailable or beyond reach.

Resistance to change may be part of a larger picture. The Council of Trent rejected Lutheran (Reformation) congregational singing, hymn format, polyphony, popular songs and instruments other than the organ[12] and required that Gregorian chant be retained. But this was part of Trent's rejection of Reformation doctrine and practice as a whole. Some resist change because they don't realize that it entails change in music technology rather than theology.

Circumstances may overcome resistance to change. New church members or evangelists bring new skills into the church. If the music language of the church or mission differs too much from that of potential converts, the church is likely to decrease in numbers, prompting the church to change to keep from shrinking or to make missions more effective. Revivals help overcome resistance because worship renewal always accompanies faith renewal.

14. What is the future of new music technology in the church?

It is said that the book of Psalms is the songbook of the church. However, it is more properly the *lyric* book of the church, because it includes no music. The *music* book of the church is constantly being written, updated, and enlarged. The types of music supplement rather than compete against one another.

The music book of the church will continue to grow following the pattern of the last thousand years. Music technology will continue to develop, enhancing current instruments and modes and creating new ones. For example, today's organ is the product of centuries of technological development, while the electronically amplified praise band is new. The pattern reveals that revivals introduce new technology into the church in a sudden and widespread fashion.

We can expect future revivals to introduce new music technology, but we can't predict exactly what kinds because we don't know where revivals will occur or what music tech will be common then. For example, if the next revival occurs in rave settings, the next wave of church music could be electro-acoustic house music based on drum machine loops. The music could be played through Internet capable, optical head mounted display, enabling worshippers to have a virtual reality experience of worship with their church while physically being anywhere in the world. It would be reality in the sense that they would sing and listen together with their church in real time but virtual in the sense that they

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would only feel that they were together in one place. This music technology could be valuable to Christians who are spread out due to geography (sparse population) or to demographics (such as oppressive Muslim or communist nations). If this sounds strange, remember that it would have sounded no less bizarre if nineteenth-century organists had been told that the next waves of church music would be trombone choirs and amplified praise bands.

New worship music technology will have to meet certain parameters. It will have to be singable, express the heart, loud enough to lead large congregations, have a large number of musicians willing and able to play it, and a large segment of Christians must adopt it as their desired mode of worship.

The pattern will continue: Current church music will continue to be refined, musicians will develop new music tech, revivals will suddenly introduce new tech into the church, the church will be in conflict until the new music tech is widely accepted, a new kind of church music based on the new tech will be added to the centuries-old music book of the church, the new style will be refined, and the cycle will start all over again. The pattern is predictable, though the practical details are not.

Missions (evangelism) and new music tech go hand in hand. One can make the case that the advent of the praise band actually accelerated world missions. Much of the world has embraced Western pop music, which is centered on the same kind of amplified guitar-centered ensemble embodied in the praise band. This embrace enabled the globalization of praise music even as the church has expanded around the world.

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15. What principles guide our use of music technology?

Values and principles guide worship music and are often in tension. We want to glorify God with quality music employing the best of our skills, yet we don't want to fall into the trap of performance for its own sake. We like to use all our "secular" (Luther would say "vocational") skills to support the church and honor God, without sacrificing true, doctrinally sound worship. We want to help new converts and old members to worship using familiar forms, but also learn other music from the rich storehouse of two thousand years of church music. We want to benefit from the spiritual dynamism of revivals to revive worship while still benefiting from the forms of the past. We want to adapt worship music to culture just as we adapt teaching methods, leadership styles, and art, without losing Scriptural integrity. We want to use Scripture and theology to vet church music, while realizing that many

music choices boil down to differences in music technology and have little or nothing to do with theology or worldview.

Those who are musically "bi-cultural" (bi-technological) and others who are "mono-cultural" need to accept one another's orientation to worship music. It is not useful or accurate to phrase it as theologically right or wrong ways to worship or even as best or worst, as though all music must be ranked and defective forms rejected.

Jesus Christ said that the wise man "brings out of his treasure what is new and what is old" (Mt 13:52), a principle that can be applied well to music technology in the church. The diverse music book of the Christian Church offers just the right kind of instruments and music for every kind of setting and will continue to expand to meet the needs of the church and mission.

Endotes

[1] William Rice, *A Concise History of Church Music* (Nashville: Abingdon, 1964), 51.
[2] *Praise Maranatha Music Chorus Book* (Maranatha Music, distributed by Benson Co, Nashville, TN, 1983).
[3] Arthur Hutchings and C. Henry Phillips, *The Singing Church: An Outline History of the Music Sung by Choir and People* (Hamden, CT: Archon Books, 1969), 142.
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Privilege, Tragedy, Doubt, Science, and Faith—a Personal Story

John W. Kenney, III

Abstract: This is a personal autobiographical essay by a Lutheran college professor who is also a practicing research scientist, but who is neither theologian, nor philosopher, nor pastor. If you are looking for rigorous, sophisticated, and compelling arguments regarding the interface between the Christian faith and science, the existence and character of God, the divine inspiration and inerrancy of the Bible, and the veracity of Christ's claim to be Lord and Savior, let me assure you that these arguments do indeed exist and are well worth reading and pondering, but this is not the place to find them. What I've written is intended to be a personal account of my encounters with and explorations of the faith-science interface over the years set against the unfolding backdrop of my life.

Who I am today: I am a professor at Concordia University in Irvine, CA, a small Lutheran (LCMS) liberal arts university, where I teach, mentor, and lead student research in chemistry and chemical physics. I also give chapel messages and counsel students regarding their faith, life, and careers. But the real story is not where I now am but the circuitous route I took to get there. Let me start by saying it is a flat-out miracle that I am a professor at Concordia and that I, a most reluctant adult convert, am a Christian. For over a decade—the decade in which I graduated from high school and earned my undergraduate and doctoral degrees—I was a hard-core unbeliever. Much to my own surprise, I suffered the consequences of doing too much reading—especially C. S. Lewis, Augustine, Pascal, and, of course, the Bible—and slowly but inexorably returned to the Christian faith, fighting it all the way. It also didn't help my unbelief that many family members and friends were praying for me without ceasing. And, finally, God lovingly delivered some unpleasant circumstances along the way to drive me beyond the end of my rope and directly into

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His arms. All I can say is that God must possess both an enormous sense of humor and an otherworldly patience, not to mention a great love for me, to have this hard-headed ex-sceptic and foot-dragging convert back in the fold, professoring at Concordia and writing this article!

The Danger of Abundant Blessings: Until 1968, I led what can only be described as a privileged and protected life. I was raised in a wonderful Christian home by highly educated parents who loved each other and who cherished their children. Moreover, our family lived in the spectacular natural beauty of the rural American west. My father's intelligence, drive, and wise financial stewardship afforded us a most comfortable standard of living. My mother took great joy in cooking delicious meals and providing a well-kept home for the family. Doing well in school came easy for me, as did physical activity. I could run, hike, and ride my bike for miles. I went to church regularly with my parents. I said prayers before meals and before bedtime. I had a Bible on whose cover was inscribed my name in gold type. We celebrated Christmas and Easter. I regularly attended youth group fellowship activities. Of course, I took my many blessings for granted. What did I need God for? I already had it all! As I moved through my high school years, the Christian faith seemed increasingly contradictory, inconsistent, and irrelevant to my entitled mind: a tangled cobweb of old stories and myths bereft of any power to induce meaningful changes. Science, in contrast, provided tangible evidences of its power, its logical coherence, its verifiable reality, and its practical value to society. I well remember our family's driving across the Nevada desert late at night in the 1950s when an above-ground nuclear bomb explosion at the Nevada Test Site, over 300 miles away, lit up the entire southern sky. Now that was real, observable, verifiable power in which I could believe!

I took my many blessings for granted. What did I need God for? I already had it all! As I moved through my high school years, the Christian faith seemed increasingly contradictory, inconsistent, and irrelevant to my entitled mind. . . . Science, in contrast, provided tangible evidences of its power, its logical coherence, its verifiable reality, and its practical value to society.

Tragedy: September 3, 1968. A personal tragedy in a year of tragedies destroyed my already wavering faith. My father, a scientist and industrial entrepreneur of deep Christian faith—bright, articulate, principled, admired, energetic, enthusiastic; role model, leader, friend, beloved husband, wonderful father—lay dead of cancer. Earlier in that fateful year, Martin Luther King, Jr., and Robert F. Kennedy lay dead of gunshot wounds inflicted by assassins. In the rice paddies and jungles of Vietnam, bullets, bombs, rockets, and napalm snuffed out lives—theirs and ours—at a

prodigious rate, especially during the Tet Offensive. Demonstrations and protests sprang up on college campuses across the nation. Blood ran in the streets of Chicago during the Democratic National Convention. How could a good, loving, all-powerful God possibly allow all of this? As far as I could see, God, if indeed He did exist, either didn't care about the sufferings of humanity or He didn't have sufficient power to rescue humanity from its sufferings. And if He did exist, I was exceedingly angry with Him for taking my father away. While my father was alive, his arguments for the faith provided an unfailingly provocative, logical, and insightful counterpoint to the heresies of that time period, but they failed to persuade me. What did persuade me was the grim reaper, death, who took my father's life, his virtue, his love, and his apologetical skill away from me just two weeks after my eighteenth birthday. My father's death devastated my mother, left my younger sister without her beloved daddy, and catapulted me into the abyss of unbelief. Moreover, the tragedy of death in my own family mirrored the tragedy of deaths in our country and throughout the world in 1968. Unless compelled by my mother or unless shamelessly using church-sponsored events as a way to meet girls, I did not darken the door of a church for over a decade as my unopened Bible gathered dust.

Divine clues: But even in the horrific blackness of 1968, clues were in place that I would later follow on my journey back to faith. God also cloaked and protected the inner recesses of my mind and heart so, when the time eventually came, I could follow these clues back into the fold. What were these clues? First, I knew through the example of my parents that at least some smart, educated people, even scientists, embraced the Christian faith. Second, I knew who Jesus Christ was, and I also knew the Bible. I also benefited from regular exposure to worship and prayer as a child. Third, my parents were Godly and mirrored the love of God in the way they loved each other and the way they loved me and my sister. And fourth, our family's love of the outdoors resulted in me being deeply exposed to the beauty and grandeur of creation throughout my childhood: snow-capped mountain peaks, rushing river water, trembling aspen leaves, and tendrils of the Milky Way stretched across the night sky. In a city slum beneath a pollution-filled sky or in a filthy, overfilled jail or refugee camp in a third-world country, one might well be excused for concluding that God can't possibly exist. In vivid contrast, even in the darkest days of my unbelief, the exquisite alpenglow touching the peaks of the High Sierras at twilight moved me to the depths of my soul and left me awestruck at the magnificence of the world in which I lived.

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Success, failure, and restoration—an encounter with unmerited Grace: There are those like me who abandon the Christian faith because of misfortune. Others don't want to be shackled by God's commandments. They seek to enjoy their sins without any pangs of guilt or inhibition. While I encountered many hedonistically inclined people in high school, college, and graduate school who eagerly sought to free themselves from the commandments, this lifestyle held no attraction for me. I believed in the value of skills acquired through hard work and practice. I was a seeker of knowledge and deep understanding, meaningful friendships, and true love, not excess and dissipation. I was praised for being "more godly" than most believers. If I edited the word God out of the Ten Commandments or just assumed the word God meant an abstract power, they made sense, just like the laws of physics made sense. I felt much more comfortable personally around Christians than non-believers, even though intellectually I found myself more in the camp of the unbelievers. For a time, I was quite successful in college and graduate school: honor roll student, scholarship winner, award winner, acclaimed teaching assistant, and successful researcher.

Then God lovingly (in the tough love sense) let my life come apart in graduate school. My research foundered. Relationships fell apart. My grades suffered, and my health wavered. I left graduate school for a while and supported myself by working in a service station. By any reasonable human standard, I had messed up totally in my graduate school experience. I came to realize I was not godly at all, but sinful to the very core of my being. This awareness devastated me. Then an amazing thing happened. An opportunity to go back to graduate school and finish my dissertation miraculously opened up. Shortly thereafter, an opportunity opened up for me to receive a postdoctoral appointment, following the completion of my Ph.D., in a world-class research laboratory. I knew beyond a shadow of a doubt that I didn't deserve nor did I earn these opportunities. They were being given to me, for reasons I did not understand at the time, as unearned gifts I had done nothing to merit. I found it very difficult to accept these gifts because with the acceptance came, in effect, a confession of my sinful nature and a need for supernatural help that I could not possibly obtain on my own merits.

I began reading the Bible and going to church again, not to pick up girls, but to put my life back together. This return to faith was not a noble, carefully reasoned step, but an act of desperation. I knew I needed help. I had nowhere else to turn but to God, to the Christian faith my parents had so lovingly exposed me to as a child. Like many others, I wondered why so many bad things had happened to a "good person" like me. Now, a far more difficult question presented itself. Why were some very good things happening to me, a truly bad, undeserving person? As I considered the glory and grandeur of the universe from the microscopic to the cosmological scales as I knew from science, I was led back to my childhood realization that God the Creator exists: a God of surpassing intelligence, knowledge, creativity, artistry,

and power. From the blessings I received when I didn't deserve them and couldn't possibly earn them, I was led to the truth that God—specifically the God/Man Jesus Christ—is a God of grace, infinitely good and infinitely loving, always ready to forgive and restore.

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The big transition: Just how did I make the transition from viewing myself as a good person deserving a blessed, trouble-free life to seeing myself in the sober light of truth as a bad person desperately needing undeserved forgiveness and restoration? God cleverly appealed to my scientific training. Wherever I looked in my unbelieving life, the story was the same—different girlfriends, different cities, different universities, different research advisors, different research opportunities, all of exceedingly high quality; yet, despite the most noble of intentions and the most excellent of opportunities, I always seemed to end up hurting and disappointing others and squandering incredible blessings. The data made sense only if I assumed the source of the problem was not with other people and other circumstances but with me. I had done experiment after experiment—changing everything but me—and nothing had worked out. My only choice and my only hope was to change radically, and only God could make the changes in me that needed to be made.

Two lives: My personal story as an adult scientist thus encompasses two separate lives—one lived apart from God and another lived with God. At the core of my abandonment of the Christian faith as a young adult was my total inability at the time to negotiate my way through the apparent contradiction inherent in tragedy. How could God possibly be good if He allowed my father, a very good man, to die? How could He let disease, assassination, mob behavior, and war claim the lives of countless other good men? Either God was not good, choosing not to deploy His power to stop bad things from happening, or he was powerless to prevent evil. I wrestled with this problem for years. But eventually the danger of reading too much caught up with my unbelief. I was reading Blaise Pascal's *Pensees* when I came across this startling passage: "Contradiction is a poor indication of truth. Many things that are certain are contradicted. Many that are false pass without contradiction. Contradiction is no more an indication of falsehood than lack of it is an indication of truth." Pascal is cautioning us not to make too much of contradictions. When our knowledge is incomplete, which is almost always the case, contradictions are bound to arise. It's a good bet to say that God's knowledge and

power far exceed ours, and, despite the incredible pace of scientific discovery, this will always be the case.

When our knowledge is incomplete, which is almost always the case, contradictions are bound to arise. It's a good bet to say that God's knowledge and power far exceed ours, and, despite the incredible pace of scientific discovery, this will always be the case.

An accident thrusts my young daughter into the abyss of contradiction: To get at the meaning of death, illness, and tragedy in our lives and perhaps to better appreciate the magnitude of the loss felt by those who loved Jesus as they watched Him die on the cross, let me share this true family story, a parable if you please, in which my young daughter plays the role of a person experiencing tragedy and I play the role of Jesus. The setting is in the kitchen. My wife has taken some home-baked cookies out of the oven and placed them in a heavy glass bowl on the kitchen counter. Our daughter Charlotte, who has just learned how to walk, goes into the dining room, carries a small stool over to the kitchen counter, climbs up, and grabs the bowl. It is too heavy for her. She tumbles to the kitchen floor, bowl still in her tiny hands, whereupon the bowl shatters and Charlotte's face smashes down into the broken glass. I rush over to Charlotte, pulling her up away from the glass shards, not knowing how severely she is injured. I turn her over to look at her face and neck. There are no life-threatening arterial wounds. Her eyes are undamaged. I thank the Lord in a quick prayer. However, she has sustained a severe laceration to her face that will need immediate emergency surgical attention.

At the hospital, the plastic surgeon and his assistants lay out little Charlotte on the operating table. They ask me to scrub up and join them. The surgical team cleans and probes the wound, preparing it for suturing. Charlotte squirms with pain and fear. Her eyes lock on mine, and through her eyes, she asks, as clearly as if she said the words, "Daddy, why are you, who love me so much, letting these strangers hurt and torture me?"

"Because I love you and you need medical attention" is the answer, but there is no way I can communicate this to her at that instant in the operating room in a way she could possibly understand.

In baby Charlotte's pleading eyes, my behavior in the hospital seemingly contradicts everything she knows about me and all that she has experienced in our father-daughter relationship. The surgical procedure that ultimately resulted in a perfectly healed, almost invisible scar was, in the operating room, a truly horrible experience for Charlotte. Death, illness, and tragedy cannot, I think, be understood in the immediacy of the moment, but only in a broader context in this life or perhaps

only in the light of eternity in Heaven. Only at that level can the contradiction be resolved. On this side of Heaven, we must trust in God's character, as expressed so beautifully in John 3:16 ("For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish bud have eternal life") when we face death, illness, and tragedy that we cannot possibly understand in our humanity. Joseph's statement to his brothers about returning good in response to evil, "You meant harm to me, but God intended it for good" (Gn 50:20), is another excellent example of how God turns the bad we can't understand into a good we never expected, resolving a host of contradictions. In a fallen world, God's inherent goodness and His great love for us, may, at times, be expressed in terms of difficult and unpleasant circumstances that we, like baby Charlotte, can't possibly understand within the limits of our humanity.

Contradiction in science: In the first decade of the twentieth century, two new theories—quantum mechanics and relativity—burst upon the scientific community. Quantum mechanics beautifully describes the behavior of matter at the sub-atomic, atomic, and molecular levels. Relativity provides an elegant series of predictions regarding the behavior of matter and energy at velocities approaching the speed of light. However, quantum mechanics and relativity are most difficult to reconcile with one other, a problem that has been worked on for over a century with only limited success. The two theories, each of which has proven to be extremely powerful within its domain of applicability, seem to contradict one another at numerous points. In experimental science, contradictions often arise when an incorrect assumption or a key missing fact renders experimental results contradictory.

A story to illustrate this fact comes from my research laboratory. It involves both a key missing fact and an experimental flaw that took us months to finally figure out. We wanted to do some experiments with a larger molecule comprised of an atom (A) and three other smaller molecules (B). This larger molecule is conveniently symbolized as AB_3. We attempted synthesize and study samples of AB_3 in thoroughly cleaned and dried apparatus comprising Pyrex glass (used in oven-safe casserole dishes), Teflon plastic (used in non-stick frying pans), and stainless steel (used in many kitchen utensils because it neither rusts nor corrodes). In other words, our apparatus was made out of what we thought were non-reactive, chemically inert materials. Moreover, we had much experience that confirmed to us the chemical inertness of these materials, both in the laboratory and in our kitchens.

However, in an experiment/control test in which we looked at the properties of atom A, molecule B, and large molecule AB_3 separately—with all other conditions, we thought, being the same—colors of A, B, and AB_3 did not turn out the way we expected. Our experimental results contradicted our theory. After many other tests failed to reveal the problem, we finally discovered that the colors came out consistently when we replaced all stainless steel apparatus with apparatus comprised solely of Pyrex and Teflon. As it turned out, molecule B was reacting with the iron in

the stainless steel of our original apparatus, giving a different color than we expected. This unexpected color was, in actual fact, the characteristic color that analytical chemists have used for decades to detect the presence of trace amounts of iron in materials by the addition of molecule B. The take-home message is that exceedingly careful scrutiny of the facts and the experimental procedures giving results that contradict the theory is in order; it's easy to be fooled and to get derailed, even when you are being careful. As Einstein famously said, "Subtle is the Lord."

Science and the Christian Faith: Religion is the opium of the people. Smart people don't believe in God. God is a fantasy that ignorant people, poor deluded suckers, believe in. The common misconception of the post-modern times in which we now live hinges on the assumption that "smart" science and "stupid" faith are inherently and irrevocably contradictory. You can't have them both. One or the other must necessarily be rejected. It turns out that nothing could be further from the truth. Within science itself, quantum mechanics and relativity are simply too useful and too powerful, despite their apparent contradictions one with another, to throw either one of them away. We are thus compelled to carry on with the difficult and as yet far from complete task of working through the apparent contradictions and seeking a reconciliation that both preserves their distinctive insights and integrates them into a larger whole.

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The same can be said about science versus the Christian faith. Much of the supposed science/faith conflicts from which contradictions arise disappear when precise definitions and clear logic are imposed. For the honest intellectual, not to believe in God imposes far more logical difficulties than it purportedly solves. Did the elegance of the laws of physics, the exquisite fine-tuning of the fundamental physical constants, e.g., the charge of an electron or the speed of light, the organizational masterpiece of the periodic table, and the remarkable geometrical precision of molecular structure, just happen without purpose or plan? And why, as Nobel Laureate Eugene Wigner phrases it, is mathematics so unreasonably effective in science? Johannes Kepler, the Lutheran astronomer and mathematician who deduced that planetary orbits were ellipses, had the answer, which, in various forms, has been voiced over the centuries by many of the greatest scientists who ever lived: "The chief aim of all investigations of the external world should be to discover the rational order and harmony which has been imposed on it by God and which He revealed to us in the language of mathematics."[1]

Even when we understand something well, like the rotational kinetic energy of the Earth about its axis, we, as a human race, are not in possession of enough energy to stop our nights and days even if we wanted to induce such a disaster. When we look beyond our solar system and beyond our own galaxy, the sheer magnitude of the energy and power evident on the cosmological scale dwarfs not only the capabilities of humanity but also its very imagination. Multiple strands of evidence seem to lead to the conclusion that an incredibly bright, unimaginably powerful creator—a mathematical genius—is at work creating and sustaining the universe. Consider, as just one example of many that could be cited, the exquisite simplicity of Newton's gravitational force law and Coulomb's law of electrostatic force. For both laws, the force diminishes with a mathematically perfect reciprocal distance squared relationship. Nature seems to be incredibly fine-tuned in other ways. The magnitudes of the fundamental physical constants such as the speed of light, the mass of a proton, or the charge on an electron seem to be especially well chosen to create a universe, our universe, with unique and amazing properties, not the least of which is our ability as human beings to exist in it and think about it! This evidence contradicts the assumption made by many that God doesn't exist or has no power. But this is a contradiction that can be resolved if we join with the Psalmist in saying what our own observations and our own hearts confirm: "The heavens are telling the glory of God and the firmament declares His handiwork" (Ps 19:1).

Divine design or cosmic crapshoot: Science in the twenty-first century is confronted with a fundamental contradiction in which order, purpose, and design are seemingly pitted against randomness, disorder, and blind probability as contestants. Are life as we know it and the cosmos as we find it the products of blind, chance interactions without meaning or purpose? Or, alternatively, are we looking at something of profound significance that is exquisitely tuned and carefully planned? I side with divine design. There is simply too much order in the cosmos for it all to be explained away via chance. It must also be pointed out that what we perceive to be random chance may not be random at all. Perhaps God moves both behind and in front of a screen which we, in our ignorance of higher reality, incorrectly call random chance. Could we not be like the prisoners described in Plato's Allegory of the Cave, who have only seen shadows and assume these to be reality? But this much is sure: Between my understanding and God's understanding must necessarily exist a vast gulf far beyond my capability to negotiate. As we consider this gulf, it seems fitting to include this observation of G. K. Chesterton: "The riddles of God are more satisfying than the solutions of man."[2]

Hydrogen, hubris, and humility: Success in science tends to breed pride and arrogance, giving credence to the patently erroneous belief that science is well on its way to unlocking all of the secrets of the universe. In truth, we scientists see through a dark and distorted glass. The unknown dwarfs—and will continue to dwarf—that which we know. A half century ago, physicist John Rigden wrote a much quoted

essay titled, "H stands for Hydrogen and Humility."[3] In the essay, he chose the example of hydrogen, the simplest element in the periodic table, to make the point that our scientific understanding of the cosmos is far, far from complete. Starting with Bohr, whose quantum theory of the hydrogen atom seemed to provide a complete description of atomic structure and atomic spectra at the time, generations of physicists have added refinement after refinement and experiment after experiment to Bohr's supposedly ultimate model of atomic hydrogen. Moreover, the odds are exceedingly good that we will never cease to discover new things about atomic hydrogen in the future. This example should be taken as a cautionary tale by those who would dare to claim that they've finally arrived at the complete and definitive scientific understanding of a topic in science. Science is inherently limited and inherently incomplete. And, curiously enough, good science invariably creates more new questions than it answers. Neither God nor God's creation are in danger of being found out, exposed, or revealed in totality by science, now or in the future.

Science is inherently limited and inherently incomplete. And, curiously enough, good science invariably creates more new questions than it answers. Neither God nor God's creation are in danger of being found out, exposed, or revealed in totality by science, now or in the future.

Asleep under a miracle: As crazy at it seems, the very magnificence of the universe and its divine origin can lull the scientist to sleep. In the familiar intimacy of the laboratory or observatory, we scientists are tempted to take for granted the incredible, amazingly ordered, undergirding network of creation—which we know in part as the laws of physics, chemistry, and cosmology—that make possible the very experiments we are doing and the very measurements we are making. Why do we live in a universe that manifests an ordered, consistent reality in which the scientific method actually works? Why is this universe so mathematically elegant and so seemingly fine-tuned for us to be who we are and do what we do in science? For me as a scientist and believer, I have the great privilege to see the imprint of the divine throughout creation. However, in my unbelieving years, I, along with many other unbelieving scientists, tended to think operationally. How do these molecules interact with one another in a chemical reaction? How can this force be used to change the geometry of a molecule? I, as an unbeliever, simply did not ask why the force was what it was, who created the force or what, ultimately, caused molecules to behave as they did.

Closing bet—Pascal's Wager: Pascal in his famous wager points out if you bet God exists but He actually doesn't, the worst that will happen to you as a believer is that you will have lived a godly life guided by the Ten Commandments, the best and

most practical rules of living ever devised. If, however, God does exist and He is who He says he is in the Bible, you win everything: the best possible earthly life plus the guarantee of a blessed eternal life Heaven. In contrast, if you bet against God's existence, you may do well for a time on Earth, but the odds are that you are setting yourself up to be disappointed in temporal life and excluded from Heaven. You lose in both the temporal and eternal realms. To bet on God, then, is the smart bet with the best "payout odds" for time and eternity, for scientist and layman, and for good times and bad here on Earth. It's also the surest of sure bets. I assert that the cumulative evidence for God's existence as provided by science, as articulated by Scripture, and as attested to by secular history is so great that the scientist or the layperson can bet on God with the confident hope—not of having a trouble-free life—but most certainly of winning the biggest jackpot of all in this world and the next: Jesus Christ.

Endnotes

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Where Faith and Science Meet: An Opportunity for Cross-Cultural Outreach

Gillian M. Bond

Abstract: How should we as Christians respond to science? How should we interact with scientists and others whose worldviews are shaped or impacted by science? These are important questions if we are to equip Christians to nurture the faith of other believers and to share the faith with unbelievers. All too often, however, responses within Christendom range from shifts away from sound theology, to attempts to change science, to fear and/or hostility. However well-meaning, such approaches are detrimental and are based on fundamental misunderstandings of science. A clearer understanding of science is necessary for a faithful alternative based on cross-cultural communication.

We all know that we live in a scientific age. Science[1] shapes many practical aspects of our lives, from food production, to medicine, to communication, to transportation. Yet, we find a remarkable lack of consensus and often a good deal of confusion about what this means for the Christian faith and the Church, among churched and unchurched folks alike.[2] Because science seems to address so many of our practical needs, does it become our ultimate source of hope or even our ultimate authority? Does it shape our faith, our worldview, our ethics, or our understanding of who we are? We, as Christians, are not of this world, but we are definitely still in it; and so it is important that we be prepared to address such questions—both in conversation with our brothers and sisters in the faith and as we share the reason for

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the hope that is in us with those who are unchurched or de-churched.

There is a common public perception of conflict at the interface between the church and science, regardless of what that interface *should*, and sometimes does, look like. I would suggest that this conflict is rooted in common fundamental misconceptions of what science is and how it functions. It's exacerbated by a variety of resulting inappropriate responses from well-intentioned Christians.[3] We will look at some of the manifestations of hostility or at least mistrust between faith and science, then examine what science is and how it functions in order to see whether the conflict has any merit, and finally consider what might be a better way to approach the faith-science interface.

First, however, we should agree that there is no single view that Christians have of science or *vice versa.* Christians' reactions to science range from fascination to fear, trust to suspicion, excitement to hostility. Most lie somewhere between these extremes, while some Christians simply take science for granted, not thinking much about it except as consumers. The reactions of scientists to Christians and Christianity in many ways run a similar gamut. And, to be sure, many scientists are Christians.

Conflict at the Interface

This conflict, whether real or perceived, can result in real casualties and presents a series of important issues for Christians to address. For example, David Kinnaman has identified antagonism between the church and science as one of the factors alienating young adults from the churches in which they were raised (based on the results of Barna research). He cites the following comment from a young man who had left the faith: "To be honest, I think that learning about science was the straw that broke the camel's back. I knew from church that I couldn't believe in both science and God, so that was it. I didn't believe in God anymore." Kinnaman goes on to argue that

> Issues of science are one of the significant points of disconnection between the next generation and Christianity. Many times churches are unprepared to help young adults navigate an increasingly complex world where scientific breakthroughs seem to happen every day. This lack of preparation is due in part to the perceived long-running culture war between science and religion that has been fought, on various battlegrounds, for centuries. Might it be that the church is so used to being science's debate opponent that we've forgotten how to be anything else?[4]

While Kinnaman's observation is significant, it describes only one aspect of the problem. It is not simply a generational issue confined to younger adults or the next generation. As important as those demographic groups are, we do a grave disservice to God's people if we think that is as far as the issues extend. It has been my

experience that many adults of all ages have questions about faith and science. Some question their understanding of Scripture, and ultimately their faith, because they believe it is threatened by science. Some anguish over how to respond when unbelieving friends or family members attack their faith along these lines: "How can you believe that [existence of God, Scripture, the Christian faith]? I believe in science." Sadly the latter scenario is all too common among older adults with disaffected family members, often in middle age themselves, who seem to view their older relatives as having had little science education and therefore easy targets.

There are two main areas in which churches across denominational lines are generally not equipping their members to interact with science: faith and witness—and that covers a lot of the Christian life! There are several pitfalls that can beset churches. For example:

- Some discourage their people from engagement with science on the basis that they might be corrupted by it. This approach fails both to address the natural curiosity of those living in a culture permeated by science, and to teach them how to answer questions they may already have or may hear from others. It also denies them possible witness opportunities.
- Some attempt to prepare their people to dispute scientific theories that do not support the witness of Scripture and/or to use science to prove aspects of Scripture. This is at best a mistaken and often a dangerous tactic, as we will see below once we have looked at how science functions.
- All too often, churches take an adversarial stance towards science and scientists, with little evidence of gentleness or respect *contra* 1 Peter 3:15, which does little to foster communication and opportunities for witness.
- Another common strategy is for churches to start accommodating their theology to fit current theories in science, which does little to support the faith of believers and may ultimately undermine what is presented as the Good News of Jesus Christ. We will see a twentieth-century example below, which had a devastating effect on people's willingness even to hear or read Scripture for a long time in England. Again, as we see how science functions, I will also argue that this type of move is unnecessary.

Miracles have often been dismissed because they cannot be demonstrated "scientifically," i.e., empirically under controlled experimental conditions, and because they cannot be explained by science. The dismissal is coupled with an assumption that anything that cannot be demonstrated and/or explained by science cannot be objective truth.[5] Therefore, the conclusion is that miracles are impossible, and miracle accounts are regarded either as objectively false or as figurative or fictional. Such thinking has had profound implications for the interpretation of Scripture. The Enlightenment (and responses to deism, in particular) heralded an era of attempts to "prove" what one might variously call the truth or the historicity of

Scripture, particularly with regard to miracles, which in turn led many to dismiss miracles—including the Incarnation and the Resurrection, divinely orchestrated Creation, and sometimes of the very existence of God.

For example, Hans W. Frei has observed, with regard to the deistic controversy in the eighteenth century, that "The immediate question was whether there are good grounds for believing in the actual occurrence of the miraculous events constituting the indispensable evidence for historical revelation. How authoritative, in short, how well attested are biblical accounts, especially those of miracles, since the natural presumption in a 'scientific age' is obviously against them?"[6] By the middle of the twentieth century, Rudolf Bultmann claimed, "It is impossible to use electric light and the wireless and to avail ourselves of modern medical and surgical discoveries, and at the same time to believe in the New Testament world of spirits and miracles."[7] And again: "An historical fact which involves a resurrection from the dead is utterly inconceivable!"[8] Even in this postmodern age, the notion still persists that anything that cannot be demonstrated and/or explained by science cannot be real or objectively true in the physical world.

When science is pitted against religion such that miracles, or supernatural events in general, are discounted because we live in a "scientific age," it elevates science to the rule and norm of objective truth. In a sense, the concept of objective truth is *redefined* to mean only that which science can demonstrate and/or explain, and which science currently accepts. But is this true to how science actually works?

When science is pitted against religion such that miracles, or supernatural events in general, are discounted because we live in a "scientific age," it elevates science to the rule and norm of objective truth.

There is one overarching assumption that is common to all of science: the assumption that the physical world always works in the same way. In other words, we assume that the laws of nature work consistently and do not change. In many ways, this corresponds to a common-sense understanding of routine day-to-day existence. For example, long before the era of modern science, people recognized that certain things were good to eat while others were poisonous, and this finding did not change from day to day. We know that mistletoe berries are poisonous, and we expect that they will still be poisonous next week! This assumption is fine for describing how God has created the physical world to function in general, but it makes it impossible for science to describe, let alone prove, the miraculous—which would include creation and all the other miracles, especially Jesus' resurrection.

Is it compatible with the Christian faith to assume that the laws of nature do not change? The answer depends on whether one believes that anything can ever happen contrary to the laws of nature. If the answer is no, then the two are obviously irreconcilable (at least without some kind of Bultmann-style "demythologizing"). If, however, one believes in a God who has created our physical reality to function in a certain way on a day-to-day basis, but who may on occasion choose to act differently in this world, i.e., a God who also works miracles, the two are perfectly compatible. Miracles are the exception rather than the rule,[9] and there is no problem with a Christian's assuming that the physical world works consistently the rest of the time. In fact, we do that all the time in our everyday lives. Thus, it is possible for any of us as Christians to be scientists, without rejecting the miracles that Scripture describes. We understand that the almighty Creator is capable of intervening in our physical existence in extraordinary ways. We also realize that miracles can serve as His signs to communicate certain things to us (as in Jn 2:11; 4:54; 20:30), simply because they are miraculous.

It is possible for any of us as Christians to be scientists, without rejecting the miracles that Scripture describes. We understand that the almighty Creator is capable of intervening in our physical existence in extraordinary ways.

The assumption that the physical world always works consistently renders science incapable of proving the Bible. For example, consider Jesus' turning the water into wine (Jn 2:1–11). If we could travel back in time and analyze that wine, what would we expect to find? The Creator formed it from water, which required transmutation of the elements. Would we expect it to contain DNA like regular wine[10] even though it was not made from grapes? Indeed, would we expect its composition to resemble that of wine at all, since it was not made from grapes? Alternatively, if it did not resemble wine, then how would we know we were analyzing wine? The same argument applies to all the miracles in Scripture. Expecting to prove (or disprove) miracles by laboratory experimentation is as meaningless as expecting to listen to a CD on a sundial! And of course Scripture tells us that we walk by faith and not by sight (2 Cor 5:7). If science could prove the Scriptural account, why would we need the gift of faith that Jesus Himself commends (Jn 20:26–29)?

A Science Studies[11] Perspective on What Science Is and How It Works

Philosopher of science Karl Popper describes modern science and technology as having been inspired by an idea expressed by Descartes and Bacon—both Christians:

> At the heart of this new optimistic view of the possibility of knowledge lies the doctrine that *truth is manifest*. Truth may perhaps be veiled. But it may reveal itself. And if it does not reveal itself, it may be revealed by us. Removing the veil may not be easy. But once the naked truth stands revealed before our eyes, we have the power to see it, to distinguish it from falsehood, and to know that it *is* truth.[12]

Descartes spoke of the truthfulness of God, according to which God would be deceiving us if what we see clearly and distinctly to be true were not true; thus, His truthfulness makes truth manifest. Bacon spoke of the truthfulness of nature, according to which nature is an open book that we cannot misread if we read with a pure mind, from which flowed his theory of inductive reasoning. Scientific knowledge came to be seen as advancing by inductivist methods—by generalizations from observations to experiments to universal laws. Unfortunately, the ideas of these devout men have helped to pave the way for some of the present-day tensions between science and faith. Even though understandings of science itself have changed, these themes still linger below the surface: the optimistic view of nature as an open book and the idea that God would be deceiving us if what it appears to tell us were not true.

The twentieth century witnessed the development of philosophy and sociology of science. In particular, Popper challenged the earlier description of science. Hume had already pointed out that induction cannot be logically justified and had instead proposed a psychological theory of induction to account for belief in physical laws, but Popper proposed an alternative involving trial and error, or "conjectures" and "refutations,"[13] which challenged the idea that science is simply built up from observations. He argued that every observation is made within some frame of reference, and the interpretation of it is an iterative process that involves both development and testing of hypotheses. Popper developed his criterion of testability as a criterion of demarcation between what is science and what is not, suggesting that it is "easy to obtain confirmations, or verifications, for nearly every theory—if we look for confirmations." A genuine test of a theory, on the other hand, is an attempt to refute it. Irrefutable theories are metaphysical, not scientific,[14] and thus of no interest to empirical science. However, that does not render them untrue. Science purports not to be metaphysical, but this claim holds only so long as it restricts itself to what is testable/refutable, which raises questions with regard to multiverse theories.[15] Popper's criterion does not mean that every scientific theory (or "law") is true—or that science gives (or will ever give) us a complete understanding of how the natural world works. Moreover, it also means that science cannot rule out the existence or activity of God.

The second half of the twentieth century brought substantive changes in the understanding of how science works. In particular, the idea of a single universal scientific method was largely abandoned following the work of Thomas Kuhn, who

described the producers and validators of scientific knowledge as members of *scientific communities*.[16] Members of these communities share a "sub-culture" that has many commonalities with regard for example to education, technical literature, areas of interest, etc.

Members of any such community share a "paradigm," the nature of which may go through three distinct phases. The "pre-science" phase is in essence a time when the community is trying to develop an interpretive framework for its observations. It is followed by the "developed" or "normal science" phase, which is commonly very productive because a shared paradigm has developed that identifies challenging puzzles and supplies clues to enable their solution. During this phase, Popper's falsifiability criterion does not apply. If results are obtained that do not conform to the paradigm, they are typically seen as the researcher's error rather than as a refutation of the paradigm. "Revolutionary science" is characterized by a "crisis" (generated by a build-up of anomalous results) resulting in a shift to a new paradigm. Paradigm *shifts* may be large or small and affect large or small (say ≤ 25) groups of scientists.

Paradigms encompass shared generalizations; shared beliefs in particular models (which help to determine what are acceptable explanations and puzzle-solutions); shared values (regarding judgment of, for example, acceptable accuracy, margins of error, plausibility, consistency, or simplicity); and shared exemplars.[17] In a sense, paradigms can be regarded as shared examples that help scientists to see similarities between different situations that would allow for application of the same interpretive framework.[18]

Jan Golinski describes the subsequent development of constructivism, which "directs attention systematically to the role of human beings, as social actors, in the making of scientific knowledge."[19] Constructivism has built on aspects of Kuhn's analysis, as well as on other studies, such as the work of Collins and Pinch.[20] Their work on scientific controversies supported the idea that scientists do not simply develop ideas from unambiguous evidence or logical deduction from prior beliefs; rather, they make practical judgments related to their sub-culture. Replication was shown to be a more complicated process than often assumed. In normal scientific work, scientists typically trust the work of other scientists, particularly those within their "core set" or sub-culture, and do not test it. Thus, replication is typically incidental, as results and their interpretations are applied in other work. Failures to replicate data are first attributed to experimental differences or experimenter error. Overall, constructivism shows that the practice of science "involves grappling with the material world, not just engagement with purely social entities. But it is not reduced to a process of revealing preexistent 'reality.'"[21,22] Scientific communities are in essence interpretive or hermeneutical communities, using two "texts": the natural world, which they interrogate through experimentation or modeling, and the community narrative, which is applied during normal science but only really

interrogated during periods of crisis; and then often only a small part of the community narrative is interrogated.

An Alternative Approach to the Faith-Science Interface

Science is a great blessing that God has used as a means to improve the quality of earthly life for many people, and for that we should give Him thanks; however, it is also not a panacea. It is geared to solving puzzles and problems, but it does not address such questions as meaning, e.g., *why* we are here, *why* the cosmos is as it is, or the foundations of ethics. It is not sufficient to address all of our problems or solve all of our interesting puzzles; and, like the other blessings we receive, it is vulnerable to misuse in this fallen world, which is all the more reason that we need faithful Christians who are also good scientists.

For the most part, science strives to describe physical reality, and here it is helpful to retain Popper's view of objective truth, which does not preclude truth in metaphysics. Thus, like Popper, we see science as striving towards objective truth, while realizing that scientific knowledge is not always objective truth, nor is it the source of all objective truth. In fact, both the scientist and the biblical exegete strive to interpret texts: one the natural world and the other the Scriptures. The inductive nature of science results in an inability to allow for the possibility of discontinuities in the operation of natural laws, i.e., miracles; it is not that these cannot occur, but rather that science simply cannot describe them. It does not address metaphysical questions.

The view that science invalidates any objective truth claims of miracle accounts is rooted in a misconception of what science is and how it works. Thus, Christians should not see it as a threat to their faith if science predicts something different from what Scripture records. Rather they can look *with the eyes of faith* at what science predicts would have happened had God not done something miraculous, the classic example being the Resurrection. First, science would not have predicted or explained how Jesus could leave the tomb alive. Second, if there had been someone around with modern laboratory equipment and able to take tissue samples, what could they have found? If the tissue looked like human tissue, they would doubtless have concluded that He had not died; if it did not, then the first suggestion would probably have been experimental error.

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The chief battleground we see now is in the area of origins; and, in fact, on the science

front, the main thrust is now common ancestry based on genomic studies. But again, how can science predict what creation would have looked like initially? One hears the argument that God would not have created things to "look old," which, of course, harks back to Descartes and Bacon. But such an application of manifest truth (a) cannot account for the way that scientific knowledge actually develops (unless perhaps we want to assume that all earlier scientists somehow had less pure minds than later ones), (b) assumes the current theories to be manifest truth, and (c) presumes that we can know the mind of God (perhaps better than He does). Yet, Scripture does not always show Him doing what we would expect.

It is clear from the science-studies literature that science is performed by and within communities that share common paradigms and methodologies for generating and interpreting data, something that I also observed in my own working experience. It is important, therefore, to consider encounters with scientific communities as cross-cultural encounters. Attempting to equip a Christian (young or old, but let us take a college student as an example) to go out and challenge the science in scientific communities of which they are not a part is potentially a recipe for disaster. The Christian student is challenging that community without being a part of it or sharing its sub-culture; his perspective is based on a paradigm that the community does not own or acknowledge. It is likely to end up with the student's being marginalized on the campus and the scientific community's closing ranks and, depending on the strength of the attack, seeing Christians as either ridiculous or threatening. If the attack is sufficiently strident, they will also likely perceive Christians as, well, un-Christian.

Science is performed by and within communities that share common paradigms and methodologies for generating and interpreting data. . . . It is important, therefore, to consider encounters with scientific communities as cross-cultural encounters.

Does this mean that we abandon or compromise our beliefs? Of course not! But it does suggest a different approach to this type of cross-cultural outreach. Scientists (and others who are confused into thinking that science and faith are incompatible) are people for whom Christ died and rose, many of whom still need to hear the Good News of Jesus Christ. Our Lord bids us to love our enemies, and that includes even the most antagonistic. Most scientists, however, are not antagonistic unless attacked! There is a mission field out there on our doorstep, which too often churches have ignored, attacked, or provided with a compromised Gospel. Let us by the grace of God be the people we should be and see the interface between faith and science as a place, not for war or fear, but for offering an opportunity for cross-cultural outreach.

Endnotes

[1] I use science as an umbrella term here to include both science and engineering, since they share many common features in underlying assumptions and methods of practice; the boundaries between them are increasingly blurred in many areas; and both generally contribute extensively to the practical benefits to society that the public commonly associates with science.

[2] That many people in the LCMS have questions about the relationship between science and faith is evidenced by the fact that the Commission on Theology and Church Relations (CTCR) was called upon to produce its recent report on the topic: *In Christ All Things Hold Together: The Intersection of Science and Christian Theology* (St. Louis: LCMS, 2015).

[3] I have lived much of my working life at the interface of faith and science, including more than twenty years as a faculty member (and also a Christian) in the field of materials science and engineering, before being commissioned and serving as a deaconess. This has afforded me extensive opportunities to observe the attitudes and stereotypes that often characterize this interface, as well as the challenges and opportunities it presents.

[4] David Kinnaman, *You Lost Me: Why Young Christians Are Leaving Church and Rethinking Faith* (Grand Rapids: Baker, 2011), 132–133.

[5] Throughout this document, I will use "objective truth" in the sense of correspondence to fact.

[6] Hans W. Frei, *The Eclipse of Biblical Narrative: A Study in Eighteenth and Nineteenth Century Hermeneutics* (New Haven: Yale University Press, 1974), 53.

[7] Rudolf Bultmann *et al.*, *Kerygma and Myth: A Theological Debate*; trans. Reginald H. Fuller (New York: Harper and Row, 1961), 5.

[8] Ibid., 39.

[9] I am speaking here of physical miracles, such as the raising of the dead (prior to our Lord's return), water being turned into wine, or the parting of the Red Sea.

[10] Techniques for DNA extraction from wine have been a subject of study in recent years to identify the grape varieties used.

[11] History, philosophy, and sociology of science.

[12] Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (New York: Basic Books, 1962), 5.

[13] Ibid., 33–47.

[14]Ibid., 257.

[15] See, for example, the manuscript on "Parallel Universes" by Max Tegmark (currently a faculty member at M.I.T.), which can be downloaded from http://space.mit.edu/home/tegmark/multiverse.pdf. Most science does not branch out into such largely untestable directions; when it does, one has to ask whether science is encroaching on metaphysics.

[16] Thomas S. Kuhn, *The Structure of Scientific Revolutions: Fourth Edition* (Chicago: University of Chicago Press, 2012), 175–180.

[17] Ibid., 182–186.

[18] Ibid., 189–197.

[19] Jan Golinski, *Making Natural Knowledge: Constructivism and the History of Science* (Chicago: University of Chicago Press, 2005), 6–7.

[20] Ibid., 22, 27–30.

[21] Ibid. 203.

[22] Osborne suggests that: "Many doubt Kuhn's pessimism about truth-seeking in philosophy and science" whereas Mohler describes postmodernists as "arguing that neither revelation *nor the scientific method* is a reliable source for truth." Grant R. Osborne, *The Hermeneutical Spiral: A Comprehensive Introduction to Biblical Interpretation* (Downers Grove, IL: IVP Academic, Second Edition, 2006), 507. In: Köstenberger (ed.), *Whatever Happened to Truth?* (Wheaton, IL: Crossway, 2005), 58.

Science vs. Religion or Religion vs. Religion?

David O. Berger

Abstract: Metaphysical assumptions underlying science vary through time and by culture. Perceived conflicts between "modern" science and Scripture are most likely to involve theories of origins of life and the universe. Basic to the issues at hand is understanding that certain underlying assumptions and philosophies, such as uniformitarianism and materialism, are not science but belief systems. Christians do well to draw attention to the ever-changing paradigms of origins, contrast them with the unchanging Word found in Scripture, and let the Spirit do the "heavy lifting" of creating faith.

Does the perception of a conflict between modern science and God's Word as recorded in the Scriptures present difficulties for evangelism and mission work? The short answer is, "It can, but it need not." A helpful first step is to define at least two key terms: "perception" and "modern science."

Perception implies a perceiver, whose understanding of the world is born of a mixture of knowledge and often hidden or unacknowledged assumptions. Increasing both knowledge and awareness of underlying assumptions in regard to theology (Scripture) and science should help to minimize perceived conflicts and to see both as gifts of God—complementary, not conflicting.

A definition of science is essential and may be addressed in several ways: What do scientists do? What is science for? Why do people engage in scientific pursuits? A short list would include the following: (1) observe, measure, and analyze the properties and interactions of matter and of physical phenomena; (2) use the results to (a) predict events and trends, e.g., the location of a spacecraft two years after launch, tomorrow's or next week's weather; (b) develop useful products, e.g., steam engine, vaccines to prevent disease, solar panels to generate electricity, communication devices. To be sure, we must not ignore the human drive to acquire knowledge for the sake of knowledge, that is, to understand the natural world regardless of the immediate usefulness of that knowledge.

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If we date modern science (N.B. "modern" implies that science changes through time) from roughly the late Middle Ages or early Renaissance in the West, its initial fundamental assumptions were that the universe was created by a Supreme Intelligence (God) and that the laws that govern its operations are intelligible, discoverable, and useable by man, a rational being and the crown of His creation. The assumptions related to creation by God gradually lost ground with the approach of the so-called Enlightenment, as reason became increasingly unmoored from its Source. In the last half of the nineteenth century—the "age of Darwin"—reason had not only become unmoored, but it was eventually assumed to have evolved along with the brain through purely material or physical processes. Yet, scientists who held—and still hold—this view continued to operate with the assumption that the human mind, a mass of matter formed by material processes, can stand apart from its material origin and substance and examine physical phenomena, understand them, and make use of the findings (more on materialism below).

All this is "broad brush" history, and significant exceptions to Enlightenment thinking persisted in scientists who remained rooted in their scriptural Christian faith: Faraday, Maxwell, Mendel, Babbage, Carver, Millikan, to mention a few prominent names from the post-Enlightenment and the age of Darwin.

Origins: Science of a Different Kind

Note that our informal definition of science does *not* include conjectures about the origin of life and the universe, commonly known as the theory of evolution or origins science. While one can make inferences about the material world in the past based on observations of material phenomena in the present, they remain just that: inferences, in the realm of conjecture. To be sure, some inferences are more reliable than others. For example, paleontologists might learn about the dietary habits of earlier inhabitants of a region by examining cave wall paintings or the remains of animal parts near what appear to be cooking facilities. They might arrive at defensible conjectures about sacrificial customs from engravings on or near what appear to be altars. Yet, these will remain conjectures, albeit conjectures that might approach reasonable certainty.

Historical science, such as that used in theories of origins, depends on special approaches to verifying and falsifying conclusions, sometimes referred to as abductive reasoning. No laboratory experiment can duplicate and verify changes over long spans of time. Instead, to establish that an event in the past had a specific cause, the evidence must demonstrate, first, the presence of the cause and its capacity to produce the effect and, second, an absence of other possible causes that could have had the same effect. It is a high hurdle, and one can see that certain assumptions are likely to come into play.

One such assumption is that natural laws and processes operate, and have operated over time, in much the same way and at the same rates as they do today, i.e., the present serves as the key to the past. The term "uniformitarianism" is often used for this assumption. For example, certain dating methods, such as radiocarbon and radiometric, are based on the assumption of a specific rate in the decay of an element over time, as well as on an assumed original amount of the element in the material being analyzed. A companion assumption or, more accurately, philosophical position, is "materialism" (sometimes referred to as "naturalism"), a form of monism that holds that matter (and energy, a form of matter) is the fundamental substance in nature and that all phenomena, including mental phenomena and consciousness, are, and always have been, in essence, interactions of matter and operate within the bounds of physical laws. It is largely these two positions that underlie theories of origins.

The philosophical stance of materialism, however, forces certain questions about origins. Are matter and energy eternal? If not, what is their source and how did they come into existence? If yes, why is there something rather than nothing? Did life forms on Earth arise spontaneously from a combination of inorganic elements under fortuitous conditions? If so, how can that be demonstrated or repeated experimentally? If not, what is their origin? What are the odds that highly complex, information-rich, self-reproducing life forms originated spontaneously from inorganic materials? Does empirical evidence support gradual development over time into higher forms through random mutations or does it support intelligent design? If the latter is proscribed and the former assumed, can interpretation of the data be objective?

Science, Assumptions, and Philosophical Positions

To pause here, we should note that perceived conflicts between modern science and the Bible are almost certain to be, at the root, conflicts between (1) the assumptions and philosophical positions that underlie certain interpretations of data and observable phenomena and (2) the biblical record, specifically of Creation and the Flood. It will be helpful to consider briefly how evolutionists interpret data and arrive at conclusions. In doing so, bear in mind that materialism (or naturalism) is not science, but a philosophical (some would say, religious) position.

Perceived conflicts between modern science and the Bible are almost certain to be . . . conflicts between (1) the assumptions and philosophical positions that underlie certain interpretations of data and observable phenomena and (2) the biblical record, specifically of Creation and the Flood.

I must admit that much of my understanding, like that of most non-scientists, of the story (or stories) of evolution is based upon accounts for the educated reader in such publications as *National Geographic*, *Scientific American*, and *Smithsonian*. Others may get their perspectives on evolution from such American TV science popularizers as Bill Nye or Neil deGrasse Tyson.

One recent issue of *Smithsonian* included an article on small animal fossils in Arizona that reveals basic features of evolutionary thinking:

> "The *Revueltosaurus* had been held up as the best record of a late-Triassic ornithischian [bird-like] dinosaur," says Sues. "It was the crown jewel. And then, all of a sudden, poof! It just disappeared." The *Revueltosaurus* revelation led Park and others to reclassify other creatures that had been regarded as early dinosaurs, and so the number of officially recorded dinosaur fossils from the Triassic period has plummeted.

A few sentences later, we read:

> It's not clear why these small, sleek dinosaurs eventually evolved into enormous Jurassic beasts. "We really don't know yet," says Sues. The transformation seemed to happen around 200 million years ago, just after another massive extinction. "We think that extinction was due to an unprecedented episode of volcanic activity."[1]

Two characteristics of evolutionary theory and the scientific research connected with it are manifested in this brief excerpt:

> 1. Discovery of new data or re-interpretation of previously examined data requires revising prior conclusions.
>
> 2. Non-uniform, e.g., catastrophic, events in nature are needed to explain otherwise inexplicable phenomena.

Regarding the former, in a recent article on the discovery of human remains in a cave in South Africa, David Strait of Washington University is quoted as asserting that

> Of course, we should try to do things well, but science should operate by falsifying possibilities. We narrow down the possible truths to get a better idea of what happened in the past, and there is always the possibility for new data to emerge that change everyone's thinking.[2]

It is fair to inquire about the *modus operandi*: Aside from agreement on the basic assumptions that only material explanations of origins, including the origin of life, are allowed and that the universe and life evolved over billions of year, on what specific supporting details of field findings and interpretations do evolutionary geologists and paleontologists in their respective disciplines universally agree? What happens when new data falsifies the interpretations on which they have previously agreed? Can any interpretation or conclusion be regarded as definitive?

Note that *constant change*, resulting from the discovery of new data or revised interpretations of existing data, is considered a positive characteristic of how evolutionists work and think. Consider fossils, for example: Fossils are present-day artifacts, but what can they tell us about the past? Some animals and plants have died and been preserved in various states of completeness. Some fossils are of extant animals or plants; others are of extinct fauna and flora. Those with soft bodies required an event that resulted in their rapid burial and influx of sediment and minerals to preserve their form before decay set in. That much might *reasonably be assumed* from how fossils form and appear today. (Yes, fossils can, and usually do, form rapidly and still form today.) However, interpretations of fossil data that entail *age or inferences about intra- or inter-species evolution in time past will always be in the realm of "falsifiable" (changeable)*, i.e., neither verifiable nor repeatable by experiment under laboratory conditions.

New data have also resulted in major reinterpretations of how evolution supposedly works, e.g., punctuated equilibrium, to explain observed large gaps in (assumed) development within a species or from one species to another. That is, the understanding of how evolution itself progresses is subject to change. A helpful principle to remember in this context is that Scripture is God's unchanging Word. Historical science, specifically evolutionary theory, entails constant change resulting from discovery of new data and reinterpretation of existing data.

Scripture is God's unchanging Word. Historical science, specifically evolutionary theory, entails constant change resulting from discovery of new data and reinterpretation of existing data.

In contrast to historical or origins science, falsifiability in the hard sciences and technology focuses on observable, quantifiable results. For example, tests reveal that a certain chemical compound is more effective in treating a disease than a compound currently in use. Experiments indicate that an organic substance may eventually replace some silicon applications in computers. A question of "truth" is not involved (cf. Strait's comment above). Rather, falsifiability answers questions such as, "What works? What doesn't work? What works better?"

Not All Data and Evidence Are Equal

Regarding the falsifiable "possible truths" of evolution, it seems that certain alternatives to these truths, i.e., alternative interpretations of the data, are to be rigorously excluded, especially from public institutions of education. If falsifiability is a central feature of the scientific method, why are some causes, e.g., the catastrophe of a worldwide flood, excluded from the "possible truths" to explain

certain geological phenomena? Is it that some geological evidence, or interpretation of the evidence, does not qualify simply because there is also a corroborating historical record (evidence) in a biblical narrative? Many geological phenomena and fossils—both their formation and the composition and locations of large beds—may be more reasonably explained by a cataclysmic worldwide flood than by uniform processes over millions of years; yet such an explanation is categorically excluded by those who insist on a uniformitarian materialist approach to historical science. Is that a mark of objectivity?

How are we to explain the increasing evidence for intelligent design (ID), e.g., in the irreducible complexity of the internal operations of a cell? Could there be a purely material cause for the intricately coded information in DNA, the transmitter of heredity? The more that is discovered about the structure and workings of a cell and the details of heredity and reproduction, the more difficult it is to ascribe the amount and complexity of information stored in cells to purely material causes. The scriptural assertion is clear in this regard: "For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse" (Rom 1:20). Indeed, this assertion rings truer today than ever before. It is hard not to conclude that exclusion of certain evidence is based on fear that not only interpretation of the details is falsifiable, but also that the very assumptions and philosophical positions that underlie evolutionary theories are falsifiable as well.

Many highly qualified scientists who profess the Christian faith reject the philosophy of materialism and the uniformitarian assumptions that underlie theories of evolution, as well as interpretations of data that posit a universe billions of years old and gradual development of life forms from a "primordial soup" to rational beings. Are these scientists to be marginalized in academe? Some have been. Is that how real science operates? Or are such actions a sign that a materialistic approach to the origin of life and the universe is really a belief system (religion) masquerading as science that must be defended at all costs?

Finally, some scientists, such as progressive, or old-earth, creationist, Hugh Ross, propose various "hybrid" approaches to evolutionary interpretation of data and the scriptural Creation and Flood accounts (see Addendum II below). The result is most often to give credence to certain aspects of origins science, such as multi-billion-year age estimates of the earth and universe, while rejecting other aspects, such as "amoeba to man" organic evolution. A principle to keep in mind is that thorough-going, i.e., materialist, evolutionists are not interested in compromise by accepting certain aspects of the Creation and Flood accounts in Scripture, much less an omnipotent Creator. Compromise *is* expected, however, of those who would reconcile non-theistic origins science (macro-evolution) with Scripture.

The Bottom Line

It should be clear that there is no reason for the Christian to be intimidated by ever-changing interpretations of data based on philosophical positions and assumptions that leave God out of the picture of origins. Ultimately, however, regardless of apologetic arguments and evidence that challenge the materialistic historical science of origins, effective and convincing as they may be, for the Christian, the authority is Scripture, where the accounts of Creation and the Flood are consistently referred to—notably by Christ, Himself—not only as historical events, but as *acts of God with profound significance for the Gospel message and the life of faith.* The Creation account in Genesis reverberates powerfully and meaningfully throughout the Old and New Testaments. Genesis 3 lays the foundation of the Messianic (Christocentric) content of the Scriptures and the saving work of Christ, the last Adam. Baptism is linked to the Flood and the preservation of Noah and his family in the Ark (1 Pt 3:20–21).

Regardless of apologetic arguments and evidence that challenge the materialistic historical science of origins, effective and convincing as they may be, for the Christian, the authority is Scripture, . . . not only as historical events, but as *acts of God with profound significance for the Gospel message and the life of faith.*

In evangelism, as in other realms of the life of the Christian, God's revealed Word speaks for itself. It, not the present, is the key to the past. Indeed, it is the key to the present as well. It is the final authority. While Christians may be able to refute faulty assumptions and break down philosophical barriers to "clear the way," so to speak, for witnessing to and proclaiming the Gospel, it is the power of the Spirit in the Word that does the heavy lifting in creating faith.

Verbum Domini manet in aeternum

Endnotes

[1] "Dawn of the Dinosaur," by Brian Switek, *Smithsonian*, 46:11 (April 2016), 86. Hans-Dieter Sues is Curator of Vertebrate Paleontology and Chairman of the Department of Paleobiology at the Smithsonian Museum of Natural History.

[2] Kate Wong, "Mystery Human," *Scientific American*, 314:3, (March, 2016), 37.

Resources

The number of resources on the subject of the biblical versus materialistic treatment of origins can be overwhelming. Below are a few helpful places to begin. The Kelly volume, written by a systematic theologian with a strong grasp of science, is one of the most helpful. Meyer's treatment of ID includes a bonus: a clear,

relevant overview of the history and philosophies of science. In addition to the recent booklet issued by the LCMS Commission on Theology and Church Relations, titles by two Lutheran authors, Klotz and Zimmerman (both scientists and theologians), are somewhat dated but still relevant. Another current Lutheran author to consider is Dr. David Menton (Professor emeritus, Washington University School of Medicine). Some of his writings are in the Ham volume cited below.

Books

Axe, Douglas. *Undeniable: How Biology Confirms our Intuition that Life Is Designed*. New York: HarperOne, 2016.
Chaffey, Tim, and Jason Lisle. *Old Earth Creationism on Trial: The Verdict Is In*. Green Forest, AR: Master Books, 2008.
Ham, Ken. *The New Answers Book 4: Over 30 Questions on Creation/Evolution and the Bible*. Green Forest, AR: Master Books, 2013.
Hunter, Cornelius G. *Darwin's God: Evolution and the Problem of Evil*. Grand Rapids, MI: Brazos Press, a division of Baker Book House Co, 2004.
Hunter, Cornelius G. *Darwin's Proof: The Triumph of Religion over Science*. Grand Rapids, MI: Brazos Press, 2003.
Kelly, Douglas F. *Creation and Change: Genesis 1.1-2.4 in the Light of Changing Scientific Paradigms*. Fearn, Ross-shire: Mentor, 2010.
Klotz, John W. *Genes, Genesis and Evolution*. St. Louis, MO: Concordia Pub. House, 1972.
Lutheran Church—Missouri Synod. *In Christ All Things Hold Together: The Intersection of Science & Christian Theology /a Report of the Commission on Theology and Church Relations, the Lutheran Church—Missouri Synod*. 2015. Available free online: http://www.lcms.org/ctcr/resources [under "Other Resources"]
Meyer, Stephen C. *Signature in the Cell: DNA and the Evidence for Intelligent Design*. New York: HarperOne, 2009.
Morris, Henry M. *That Their Words May Be Used Against Them: Quotes from Evolutionists Useful for Creationists*. Green Forest, AR: Master Books, 1997.
Morris, John David, and John Clement Whitcomb. *The Global Flood: Unlocking Earth's Geologic History*. Dallas, TX: Institute for Creation Research, 2012.
Sarfati, Jonathan D. *Refuting Compromise: A Biblical and Scientific Refutation of Progressive Creationism (Billions of Years) as Popularized by Astronomer Hugh Ross*. Green Forest, AR: Master Books, 2004.
Whitcomb, John Clement, and Henry M. Morris. *The Genesis Flood: The Biblical Record and Its Scientific Implications*. Phillipsburg, NJ: P & R Publishing, 2011.
Zimmerman, Paul A. *Darwin, Evolution, and Creation*. Saint Louis, MO: Concordia Pub. House, 1972.
Zimmerman, Paul A. *Creation, Evolution, and God's Word*. St. Louis, MO: Concordia Pub. House, 1972.

Periodicals

Creation Research Society. *Creation Research Society Quarterly*. [Ann Arbor, MI]—scholarly, technical articles
Institute for Creation Research. *ICR Acts & Facts*. [San Diego, CA]—popular treatments

Internet resources (very selective)—(https:// requires copying and pasting address)

http://creation.com/

http://www.discovery.org/id/

http://www.icr.org/creation-biology

https://answersingenesis.org/creation-vs-evolution/

https://world.wng.org/2016/06/challenging_darwin (*World Magazine* overview of recent publications that take the scriptural record of origins seriously)

Addendum I—Excerpts from a Web Site Provide Examples of Evolutionists' Thinking

Some evolutionists are sensitive to the religious and moral implications of materialistic evolution, even if their attempts to explain and assure those who accept the biblical account of Creation often lack specificity or accuracy. Readers are urged to access the selection of remarks below in context online and interact intellectually and scripturally with the claims and positions. A sample interaction (the author's) appears in italics under Miller's comment on Genesis.

All quotations below are taken from the LiveScience web site at the links below:

(1) "The questions of purpose are not part of science. How you interpret the results of science is up to you, and it's based on your theological and philosophical inclinations." [Lawrence Krauss, a physicist at Case Western Reserve University in Ohio]

http://www.livescience.com/9355-intelligent-design-ambiguous-assault-evolution.html

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(2) "While denying that [intelligent design] is religiously motivated, ID proponents often portray evolution as its own kind of religion, one that is atheistic and materialistic, whose converts no longer cast their eyes towards heaven but who rather seek to build heaven here on Earth using their scientific knowledge.

"The implication is that by destroying the idea that Man is the paragon of God's creation, evolution robs life of meaning and worth. And by limiting God's role in creation, evolution opens up the terrifying possibility for some that there is no God and no universal moral standard that humans must follow.

"Barbara Forrest [philosopher at Southeastern Louisiana University] thinks this is just silly. 'Where did immorality come from before Darwin figured out natural selection?' she asked. Far from robbing life of meaning, Forrest believes that it is ***because*** of evolution that we are capable of living meaningful lives.

"'It's evolution that gives us the advanced nervous system we have so that we can interact with our environments at a highly conscious level,' Forrest said.

"Miller thinks such claims are also self-fulfilling. 'You have essentially told people that if that Darwin guy is right, there is no God, there is no morality, there is no law you are obliged to obey,' Miller told ***LiveScience***. 'I don't know of any evolutionary

biologists who would say that, but I do hear a lot of people on the other side saying it.'"

What's at stake

"On its website, the American Association for the Advancement of Science (AAAS) stated that allowing ID into public schools will 'undermine scientific credibility and the ability of young people to distinguish science from non-science.'

"[Kenneth] Miller thinks the stakes are much higher than that.

"In addition to sowing confusion about what constitutes proper science, ID has the potential to drive people away from science. If classrooms are allowed to become theological battlegrounds, then schoolchildren will basically be told that science is hostile to new ideas and that scientists believe in a ludicrous theory that negates the very existence of God.

"'Evolution is not opposed to religion unless people make it so,' Miller said. 'The message of evolution is that we are just as Genesis told us, we are made out of the dust of the Earth and that we are united in this web of life with every other living creature on the planet, and I think that's a fairly grand notion.'"

http://www.livescience.com/9355-intelligent-design-ambiguous-assault-evolution.html

[*Regarding Miller's take on what Genesis "told us": First, Moses wrote that God created plants and animals with His Word. God's fashioning of man from the dust of the Earth, rather than "[uniting] him in this web of life" with other creatures, makes man unique. Man—male and female—was created in God's image. Adam was formed from the dust and brought to life by the very breath of God (Gn 1:27; 2:7). The creation of Eve from Adam is also unique (Gn 2:21–22). That human beings and animals share certain physiological characteristics reflects the economy and unity of God's creative work.* DOB]

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(3) "Several parents won a lawsuit against a Pennsylvania school district in 2005 that had added the controversial theory of 'intelligent design' to its curriculum. Unlike the theory of evolution which is taught at most schools as a fact-based science, 'intelligent design'—as argued by the plaintiffs—was nothing more than a philosophy predicated on the Judeo-Christian belief that the logical sequences found in nature are not random happenings or surprising mutations, but deftly managed events created by a greater omniscient and omnipresent intelligence with a specific plan. In short, the work of God."

http://www.livescience.com/11316-top-10-intelligent-designs-creation-myths.html

Addendum II—The RTB (Reasons to Believe) Model of Hugh Ross

Hugh Ross (PhD in astronomy, University of Toronto) might be classified as an old-earth, or progressive, creationist in that he accepts the multi-billion-year estimates of the age of the universe and Earth and understands the days of Creation as eras during which "God successively transformed Earth and the solar system through six major creative stages in preparation for human habitation. During this time he successively layered increasingly advanced plant and animal life to maximize support for humanity's global expansion and civilization" (Ross, Hugh. *More Than a Theory: Revealing a Testable Model for Creation*. Grand Rapids, MI: Baker Books, 2009, p. 76). Ross has written several books and maintains a web site that provides more information about his approach to interpreting the scriptural accounts of the Flood (a local event) and Creation.

http://www.reasons.org/

From the "Reasons to Believe" web site:
"While in college, Hugh committed himself to faith in Jesus Christ. After his study of big bang cosmology convinced him of a Creator's existence, curiosity led him to test religious 'holy books' for scientific and historical accuracy. Only the Bible passed the test, therefore persuading him of Christianity's validity. Later, Hugh was surprised to discover how many people believed or disbelieved in Christ without checking the evidence. Prompted by family, friends, and colleagues, he founded Reasons to Believe in 1986, to bring scientific evidence for Christianity to light.

"More than 25 years later, Hugh leads a team of scholars who keep tabs on the frontiers of research with the goal of demonstrating that sound reason and scientific findings—including the very latest discoveries—consistently support rather than erode, confidence in the biblical God. Hugh shares this message through numerous books—including *Navigating Genesis*, *Hidden Treasures in the Book of Job*, and *Why the Universe Is the Way It Is*—as well as articles, videos, and podcasts."

[*Note that Dr. Ross was convinced by "big bang cosmology . . . of a Creator's existence" and that his approach is to test the Bible for scientific and historical accuracy. These assumptions and methods underlie his "Reasons to Believe" model of blending the scriptural Creation account and evolution. For a sampling of primary sources, see below. Critiques of Ross's approach may be found in the books by Chaffey and Lisle and by Sarfati in the list of "Resources" above.* DOB]

Selective Bibliography:

Ross, Hugh. *Creation and Time: A Biblical and Scientific Perspective on the Creation-Date Controversy*. Colorado Springs, CO: NavPress, 1994.

Rana, Fazale, and Hugh Ross. *Origins of Life: Biblical and Evolutionary Models Face Off*. Colorado Springs, CO: NavPress, 2004.
Ross, Hugh. *Creation As Science: A Testable Model Approach to End the Creation/Evolution Wars*. Colorado Springs, CO: NavPress, 2006.
Ross, Hugh. *More Than a Theory: Revealing a Testable Model for Creation.* Grand Rapids, MI: Baker Books, 2009.

Finally, a recent overview of the fraught relationship between scriptural revelation and the realm of scientific theories and interpretation may be found in the essay cited below. While original sin is the ostensible topic, the treatment encompasses broader theological themes. One caveat is that the author uses the terms “science” and “scientific” without reference to the underlying metaphysical assumptions that affect interpretation of physical data.

Madueme, Hans. “The most vulnerable part of the whole Christian account: original sin and modern science,” in *Adam, the Fall, and Original Sin: Theological, Biblical, and Scientific Perspectives.* Grand Rapids, MI: Baker Academic, 2014, pp. 225–249.

Encountering Mission

Pastor, what about . . . ?

John F. Perling

Abstract: People in conversation about the promises of God in Jesus Christ wonder whether these promises can be reconciled with commonly accepted scientific natural laws. Their faith leader seems an obvious resource from whom they feel they ought to be able to get integrated answers to questions which overlap science and faith. Pastors, however, are amateurs relative to science. Apologetic approaches among Christian faith leaders are complicated by various approaches the Word of God as well as their facility with scientific approaches to knowledge. Current apologetic resources do not attempt an integrated approach to knowledge. Such approaches prose mission challenges today. The article presents one experience as a case study attempting to retain a lively conversation with a family struggling between life in the church and holding a scientific worldview.

The Lutheran pastor who is also a trained scientist is certainly a rare commodity. Having attended both Lutheran parochial and public schools through high school, I received the basic general education in science including general earth science, biology, chemistry, and physics. In science, I was a "B" student.

As a pre-seminary liberal arts student at Concordia, St. Paul, I was required to take two general education science courses, which I dutifully packed into summer sessions. In seminary, a few elective courses touched on science as it related to beginning of life and end of life ethical decision-making, but they were electives. I had used all my electives up on exegetical and historical theology where my personal interests lay, and questions of faith and science waited on the back burner.

Those questions did not wait long. Soon after taking up my first congregational calling, members young and old alike wanted to know what answers I would give to scientific questions relative to life, faith, and faithfulness to church teaching. What does the Lutheran pastor today say about "the dinosaurs," "fossils," "climate

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change," "aliens," "light and astronomy," "Adam and Eve," "the snake in the Garden," "the Fall," and the Genesis 1–11 foundations of biblical revelation. Parishioners and neighbors alike want to hear a basic straightforward answer to what they imagine to be a straightforward question: What do you think has happened to get us where we find ourselves today, and why? The "why" furthermore includes at least two parts: Why do you think that is what happened; furthermore, how does what you believe inform your thoughts on the meaning of life? The benefits to life in the world through scientific inquiry and research and development in health and life have multiplied dramatically as we have expanded our abilities of observation and action by compounding one set of advances to achieve the next. The scientific method as a critical thinking process is certainly helpful in focusing the use of one's reason and senses; yet, as a process, it is constantly verifying and even correcting itself as new data are collected. Collected data, measurements, and calculations can all be independently verified or falsified. It is the tug of war surrounding the data which is so challenging. The Lutheran Christian for whom mission matters may find him- or herself in any number of work, social, or family contexts when the question is unexpectedly posed, "So you believe in talking snakes?"

What has actually happened is not a question that allows itself to be contained in silos of competing truth. Specialization in the twentieth century has broken down the conversation between previously recognized branches of knowledge. Conversations within disciplines have become so technical that the layman is left needing rudimentary translations, and conversation among the classical branches of knowledge, the arts and sciences, seems distant and quaint. When asked theological questions impinging on scientific consensus, the pastor wants to be helpful to the neighbor, faithful to the Word of God, and at the same time not say something patently ignorant.

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The scientist's ability to gather data improves as technological advances in measuring instruments lead to more exact measurements. On the one hand, the ever-expanding collection of data bolsters the central scientific consensus; on the other hand, it always seeks to push past what is known to what is unknown, to answer more questions. As many questions settle into answers, each answer poses new mysteries, inviting the exploration to continue. Scientific conclusions are available throughout our cultural conversation and are often presented as settled wisdom: "We know from science that…." Media dissemination and public policy decisions shape our conversations on everything from gas mileage and choice of transportation to

how much a baseball player will earn in his next contract negotiation based on the spin rate of his curve ball or the launch angle and velocity of his average hit. But when the results of this settled wisdom run contrary to scriptural claims, the confessing Lutheran is left with the question, "What am I obligated by faith and sound reason to believe, teach, and confess?"

The heart of the challenge is perhaps most easily shown with evolution as the hallmark example. The scientific community holds a position with a generally unified core that accepts macro-biological evolution as the best explanation for what we observe around us today. While the core of the theory remains stable, the details and mechanisms remain under investigation as data are collected and evaluated.

Contrary to this view is a minority set of Christian resources claiming to be equally scientific but claiming also to explain the same data from within a biblical framework. Christians who are practicing scientists occasionally publish independent work which they claim cannot be published in peer-reviewed journals because it does not fit within accepted scientific theory and so is disqualified as unscientific. Members of the scientific community ridicule many of these Christian scientific efforts to the point that doubts about the usefulness of such arguments rise up persistently. To what extent can I faithfully and reasonably rely on such arguments? Are they good science, or am I setting myself up as foolish—not legitimately as a fool for Christ and His cross, but just a fool who, because he does not really know what he is talking about, is safely dismissed? In so doing I have done more damage to the cause of Christ and the Gospel because I have lost all reasonable credibility. Can I safely let these Christian agencies do my scientific thinking for me, even while they are roundly criticized by the general scientific community? I do no such thing in my work of preaching and teaching; yet, I am ill-equipped to independently verify the arguments of scientists myself.

Within the church, some advocate that Christians need only confess that God is ultimately responsible for creation, but that the mechanics and methods may be left an open question. We should not feel obligated to be dogmatic about God's means of creation, but be content to say that God is the creator. For others within the church, such an approach is considered contrary to the church's teaching and requires repentance. Scientific investigation is rejected out of hand because we already are given everything there is to know. Another approach claims that any loosening of the historicity of the events recounted in Genesis 1–11, with special emphasis on Genesis 3, throws the work of Christ into doubt as well. What do we say about Christ if we are uncertain of the problem He is said to have solved? On the other hand, isn't the incarnation of God in Christ so much more than just fixing the Fall? Isn't it a terrible simplification and diminishment of the incarnation of God in Jesus Christ to frame it simply as a response to humanity's Fall? Isn't it true that God's purposes in Christ's incarnation must find their source in eternity rather than in humanity's Fall to be worthy of God. Again, we are left with the question, "What actually

happened?" If events in Scripture did not happen as described in the earliest pages, if they are a mythical construct, then what is Christ to us and for us?

Not all theologians agree that the question of what actually happened matters to theology. Theologians may set aside historical questions and speak in terms of principles. I certainly learn from conversations with them. Still, I remain compelled to affirm a historical and perfect creation, a historical Fall from perfection, Jesus Christ's historical incarnation, death and resurrection, along with the promised *telos*—a culmination, a purpose—including both an end and a new beginning.

Such a combination of affirming scientific inquiry as a true and good gift in the created order, while at the same time affirming scriptural revelation, finds unity in God's existence, that God acts from outside the measurable universe, and that, while scientific inquiry ably discerns the governing laws and prevailing motions of the universe, God is free to intervene.

Such a combination of affirming scientific inquiry as a true and good gift in the created order, while at the same time affirming scriptural revelation, finds unity in God's existence, that God acts from outside the measurable universe, and that, while scientific inquiry ably discerns the governing laws and prevailing motions of the universe, God is free to intervene.

Most recently, a new family enrolled two teenage girls in confirmation instruction in my congregation. After the first year of instruction, the parents shared with me that their family's perspective on science conflicted too directly with the Scripture's claims and they would not be returning for the concluding year of instruction.

Terribly conflicted about how to respond, I shared with them the following observations. These observations were my own; the term "we" below speaks only for myself and my congregation, not for any publication:

> I certainly appreciate your forthrightly letting me know as soon as possible. It would be helpful to me personally as a teacher to know from either your or their perspective what it is that seems in conflict between the Scriptures and Catechism and science. If I may, let me share with you a bit of what I would have shared with them had they felt free to share their concerns with me.
>
> In short, we do not reject investigative science using the scientific method. It is an appropriate mode of critical thinking dealing with present day data and our best attempts to use reason.

A few examples may illustrate the point: We do not dispute astronomical data measured in light years or geological data measured by isotopes; the data are the data, and we certainly do not have any argument with such measurement. The point at issue is whether one must believe that if the data tell me there is a black hole in space now, there **must** have been a time in the far distant past that a star was there, instead of God's having provided the black hole when the fully-formed universe was called into being; or, if the light I see from a star millions or billions of light-years away must have originated at the point of the star instead of the light itself having also been organized by God at the time of creation. In geological matters, it is one thing to measure the half-life of carbon-14 in a sample, but it is quite another to claim that because it contains certain amount now means that there **must have been** a time when this same sample **must have** contained 100% of the radioactive element it could have had. My point in the above examples is that extrapolating into the past moves beyond what may be claimed from the current data. For example, in the realm of evolutionary biology, correlation does not prove causation. The fact that data from certain species of animals correlate does not prove that they ever had a common ancestor.

We confess on the basis of Scripture that God created the universe as a fully formed and functioning system. What we are claiming is that God exists, that He did create the universe. Scientific data provide accurate measurements in the present, and the process of extrapolating present data into the past can be logical and reasonable. Projections into the past based on present data are valid scientific exercises for the sake of understanding how substances and forces, etc., relate to one another in a **closed system**, that is, excluding the supernatural from the equation. The question is whether the historical conclusions based on the data are **true**, that is, did the events or changes actually occur? Theories of origins and evolutionary development based on present-day data are logical, reasonable extrapolations assuming a closed system with no interventions from "outside" the system.

However, the basic question is whether we actually live in a closed system, having never had any intervention from God because God does not exist. Or do we live in an open system that operates by natural, discoverable, scientific laws, reflecting an orderly God who also surprises us by entering the created order for the sake of demonstrating His care and mercy in many and various ways, from creation and miracles in general to His very specific acts in the virgin birth and the resurrection of Jesus?

In so far as that goes, then, Scripture does not conflict with the scientific method as a mode of critical thinking. We thank God that He has given

> mankind the gift of curiosity, the drive to understand His world and universe. We hope and pray that, at the end of our journey of discovery, our world will see the truth that God is at work in the whole created order.
>
> If the girls object to the possibility of any notion of the supernatural, that is, nothing exists outside of the natural world, including any notion of God, then that is something worth knowing and exploring, because human life is full of much greater possibility.
>
> If their objection is more specific to the accounts of Scripture, again more information would be helpful. In any case, it has been a pleasure to have them in class.
>
> I am, as ever, at your service,
>
> Pastor John Perling

Certainly, my attempt in the above correspondence is worthy of critique. I simply share it as an example of how pressing the need is for the church to engage scientific questions with both excellent science and excellent theology so that we can offer well-informed responses to these legitimate questions. I hope to keep learning so that the defense of my hope does not needlessly cause offense to my hearer. The cross is its own stumbling block. I do not need to add further stumbling blocks by inserting my own ignorance.

Looking into the faces of the members of my congregation—adults, college students, Sunday School and VBS students—while I share the joy of Christ with them and while their trust and hope and joy are fully apparent, there are always those moments when the question comes up, "Pastor, what about…?"

Book Reviews

INTERNATIONAL DEVELOPMENT AND PUBLIC RELIGION: Changing Dynamics of Christian Mission in South Korea. By Haemin Lee. Eugene, OR: Pickwick Publications, 2016. 131 pages. Paperback. $19.00.

The influence of religion in society has been a subject of study for many decades. Particularly, the relationship between evangelism and development work has long been a pressing topic. In the non-Western world, however, such study is a recent phenomenon. This study, based on a supervised doctoral thesis at Emory University, seeks to assess the role of religion in secular society from the perspective of the Global South, particularly Korea. Today, Christianity has the most adherents in Africa, Asia, and Latin America, where it exercises huge influence in societies. Haemin Lee explores this influence from the perspective of mission studies, sociology of religion, and anthropology of development.

A central question explored in the book is the relationship between developmental and theological ideas that motivate Korean churches to engage the public through humanitarian organizations, which Lee refers to as "humanitarian mission." With careful and in-depth explanation and demonstration, Lee concludes that humanitarian mission, which started in the early 1990s due to the socio-economic and socio-political changes in Korea, has resulted in a more comprehensive and holistic approach to mission. In other words, he argues that "the goal of Christian mission [in Korea] has shifted from being unidirectional to multidirectional, which now includes humanitarian enterprises that challenge global problems including poverty, disease, and literacy" (vii).

The strength of Lee's book resides in his analysis of the influence of Christian theology on Korean humanitarian organizations and how this theology was employed in their divergent strategies. According to Lee, the role of humanitarian organizations in Korean communities, which are holistic in nature, is informed and shaped by the theology that emerges from within the church.

Equally strong is his demonstration of the role of indigenous Korean missionaries in making Christian faith relevant to their social, cultural, and political contexts. As he puts it, his laborious research emerged out of his interest to show that the churches that have grown in Africa, Asia, and Latin America are not just "conservative, supernatural, and apocalyptic" in nature, as Philip Jenkins concluded in his book *The Next Christendom: The Coming of the Next Christianity*[1], but that they have more to offer if not refused dialogical engagement (1).

In chapter 1, Lee describes the history of Christianity, mission work, and the development of humanitarian organizations in Korea. Affirming Andrew Walls's statement that Korea and Brazil are the two missionary-sending centers of the

twenty-first century, he attempts to show the development or change in the understanding of mission among Korean Christian missionaries since the late 1970s—change from evangelical mission to a comprehensive approach that involves humanitarian activities.

In chapter 2, Lee explores the major activities and characteristics of two major non-governmental organizations in Korea, the Good Neighbor and Korean Food for the Hungry International. Here, he carefully analyzes the organizations' activities and compares them with the purely evangelical mission approach of the Korean Presbyterian Global Mission Society, with the purpose of showing the variety of Korean Christian mission. In chapter 3, he moves to the historical analysis of Protestant churches in Korea and their humanitarian mission. Covering the time from when Christianity was introduced to Korea to the present day, he attempts to show how Korean churches have moved from an evangelical mission approach to wide-ranging forms of mission, including humanitarian mission, particularly since the early 1990s.

Chapter 4 explores the various mission approaches of Korean humanitarian NGOs, the influence of varied theologies of mission that arose from different Christian church traditions (Evangelical, Mainline, Protestant, and Roman Catholic), and the interfaith dimension of Christian NGOs in Korea. Chapter 5 focuses on "the phenomenon of emerging Korean Christian humanitarian NGOs" and its socio-religious perspectives (13).

Lee concludes this extensive study with a clarifying assessment in chapter six and summarizes his finding to the reader as follows: "The rise of Christian humanitarian NGO mission in Korea has widened the spectrum of Christian mission, further opening the possibility of redefining the relationship between development and mission: from 'development and mission' to 'development as mission'" (120). Lee leaves the reader with some interesting anecdotes and subjects worth exploring further.

This book is a significant contribution to theology of mission from the perspective of the Global South. Lee's book is a new approach to understanding mission practice that has great value for the wider discussion on church, mission, and public theology. In particular, this is good reading for those wondering if theology has implications for mission and development work.

Samuel Yonas Deressa

Endnotes

[1] New York: Oxford Press, 2011.

HOUSE ON FIRE: The fight to eradicate smallpox. By William H. Foege. Berkeley and Los Angeles: University of California Press, 2011. Paperback. $24.95.

This book, written by the principal architect of the successful effort to eradicate smallpox from our world, recounts the first stages of the effort that took place in Nigeria and the greatest challenges to the effort that took place in India. It is of interest to readers of this journal as an example of how special people, who are themselves gifts of God, use the traditions of the past, together with the scientific discoveries of the modern world, to create new solutions that result in enormous blessing to the world.

The book has special interest to the readers of this journal in that William (Bill) Foege was the son of a Lutheran pastor family, who did his pre-med school studies at Pacific Lutheran University before obtaining a medical degree at the University of Washington.

It has even greater interest in that, fifty years ago in December, the first steps in the development and implementation of the strategy that would rid the world of smallpox were taken under Dr. Foege's direction while he was serving as an LCMS medical missionary at the Lutheran Church of Nigeria's Yahe Medical Center in Yahe, Nigeria. It is a story about a medical doctor and Lutheran missionaries and Nigerians working together to contain and to begin the destruction a disease that had destroyed the lives of millions of people over thousands of years.

First, a word about Dr. Foege's background. Already in medical school, his mentor encouraged him to think about global public health, a field that fit well with his personal commitment to doing "public health work in medical missions in developing countries" (p. 28). At the same time, he wanted to become involved in a biblically sound way. In his terms,

> medical work had become such a useful proselytizing tool. Churches and hospitals attract people and can leave them feeling indebted after they have received help. I always felt that was wrong. Churches should be working because of what they believe, not because of what they are trying to get other people to believe. (p. 29)

He found an ally and mentor in Dr. Wolfgang Bulle, a German medical doctor who had come to the United States after WWII and who was then serving as the director of medical missions for the mission board of the LCMS. He was convinced that there were better ways of addressing the medical needs of the Majority World than the hospital-based approach then in vogue, and he was willing to try community prevention.

As a result, Dr. Foege, his wife, Paula, and his three-year-old son, David, were posted to Yahe in the Eastern Region of Nigeria.

> Neither Bulle nor I knew exactly what I would be doing. The idea was to go there, learn the language and culture, and see what the needs were. We did have a clear picture of the goal, however: to integrate community-based prevention into a church health program. (p. 29)

Foege had not worked long in the Yahe clinic when a smallpox outbreak began. He tells the story this way:

> On December 4, 1966, Hector Ottemoeller, a longtime [LCMS] missionary in the Ogoja area, contacted me by radio. There was an outbreak of smallpox in the village of Ovirpua . . . and Hector was asking if the smallpox unit could help. Ottemoeller was a minister by training, with a patriarchal bearing enhanced by striking white hair and a white beard. His consuming interest lay in improving the lives of the people in his rural area. He was involved in agriculture and water supply schemes, although the people called upon him for health advice. Thus it was not surprising that he was the first to receive the report of a rash disease feared by all in his area. (p. 54)

Hector Ottemoeller was a senior missionary on the Nigeria field when I served there from 1978–82. God had given him an unusual ability to engage in open and trusting conversations with people who were very different from him. During my time there, he and his wife, Mary, were working as the house parents for the missionary children attending the boarding school in Jos, Nigeria, and Hector was working tirelessly with the Fulani (largely Islamic) herdsmen of Northern Nigeria. Hector had learned long ago that the African view of life was far more holistic than the strict bifurcation of life into material and spiritual aspects so popular in the West. Authentic communication of the Christian faith in Nigeria required not only words but also deeds of loving service.

In my time, Hector was deeply involved in the struggle to defeat rinderpest, a viral cattle disease that was devastating cattle herds worldwide, including Fulani herds, the sole source of livelihood of the Fulani people. It is remarkable that as a result of his commitment to Nigerian people that all should be saved, Hector played a role in the eradication of the only two viral diseases that have been wiped from the face of the earth, smallpox and rinderpest.

Dr. Foege and his co-workers quickly recognized that, indeed, they were facing an outbreak of smallpox. The standard strategy of the time was the mass inoculation of the entire population in the affected area. Foege had doubts about the effectiveness of this strategy because it had been proven time and time again that it is virtually impossible to inoculate everyone, and pockets of the disease always remained. The situation was further complicated in that quantities of smallpox vaccine were extremely limited in the Ogoja region with no hope of outside supply.

In discussions that night in a missionary's home in the Ogoja area, the strategic decision was made to vaccinate people in the villages where smallpox was already present and in the villages where, because of trade routes and family and personal relations, the disease would be likely to be carried next. To do that it was necessary to know which villages were affected at the moment and in what direction the disease was likely to move.

To gather such detailed information anywhere in the world would be difficult, especially in Eastern Nigeria, where there were no telephones and only primitive roads and tracks. However, the missionaries, working with Nigerian people they knew well and communicating via the mission's radio network, virtually within a 24-hour period were able to determine that smallpox was already present in four villages and would likely attack three others. In fact two of the three were attacked, but the virus could not gain a foothold.

How all of this looked to the missionaries on the ground who took part in the vaccination effort was described for me by Rev. Ken Greinke, who was just beginning his missionary service in Nigeria in 1966.

> Betty and I arrived in Nigeria, August 1966 and were finishing language studies with Dr. William Welmers, the UCLA linguist and world authority on West African languages. By mid-December that year, we went on an orientation tour of Ogoja. We were at a worship service at Yahe when word came of the smallpox outbreak. We, along with the Ogoja area missionaries, were co-opted into vaccination teams, using jet injection guns to vaccinate the villages surrounding the areas of reported outbreaks. I recently sent Bill Boys copies of photos showing Bill using the jet guns to vaccinate villagers [the picture on the next page of this article]. We [Bill & Ruth Boys, Betty and myself] were assigned to the Ukelle-speaking area and went out with Hector Ottemoeller and John Fajen. It was how we spent our first Christmas in Nigeria. The plan to use mass immunizations in areas immediately surrounding outbreak areas [Dr. Foege's idea] became the approach eventually adopted to address not only smallpox but later polio as well. (personal communication, August 2016)

It was Foege's strategy of vaccinating, not a whole country, but rather the people in the immediate area around the smallpox outbreak that was the conceptual breakthrough that ultimately led to the eradication of smallpox.

The second half of the book is concerned with efforts to contain and eradicate smallpox in India, the land to which Foege was sent as a kind of ultimate test of his strategy, since there were so many cases and smallpox appeared to have an intractable hold on the people of that land.

(Photo courtesy of Rev. Ken Greinke)
LCMS missionary Hector Ottemoeller vaccinates a child in a Nigerian village using a vaccination gun during the first attempt to use the surveillance/containment inoculation strategy that ultimately led to the eradication of smallpox.

The ultimate test for Foege came when the political leadership in Bihar State nearly lost its commitment to the new strategy as the number of cases increased and the state's minister of health attended what was intended to be the last strategy meeting, intending to announce that Bihar would go back to a strategy of mass inoculations. After the announcement, a young Indian physician from a poor community stood up to address the minister. "If a house is on fire in a village, no one wastes time putting water on the other houses, just in case the fire spreads. That is the mass vaccination strategy. Instead, as in the surveillance/containment strategy, they rush to pour water where it will do the most good—on the burning house" (p. 172). The miraculous happened; the minister changed his mind on the spot and gave the team the month it needed to prove the strategy.

In addition to the extraordinary story of how the strategy was first developed and implemented to eliminate an unusually virulent disease, there are countless examples of the human spirit required to make cross-cultural conversation and witness possible. In many ways, it begins with the key observation,

> Another lesson I have learned over time is to respect culture as a powerful force; when you tangle with it, culture always wins. Thus it is essential to approach any culture and its customs with respect. (p. 34)

The reader will be struck by Foege's continual curiosity, always wanting to understand new things and integrate them with what he already knew. His is an amazingly generous spirit, recognizing the contributions that others have made to his life. He recognizes also the importance of people working together, of forming organizations and coalitions to get work done. Obstacles are seen as challenges to be overcome with resources available rather than as excuses for retreat. And he never loses his confidence that in the end the ultimate goal will be reached: smallpox will be defeated.

His calling as a missionary doctor in a small medical center in Eastern Nigeria was an important step in Foege's service to the world. Over time he went on to become the head of the Center for Disease Control (CDC) in Atlanta, then the executive director of the Carter Foundation and serves now as senior fellow in the Global Health Program of the Bill and Melinda Gates Foundation.

Daniel Mattson

Lutheran Mission Matters Call for Papers
Authentically Lutheran in Every Cultural Context —May 2017

In his earliest writing Luther offers a fascinating example from his own experience of what happens when the Good News of Jesus crosses a boundary of language and culture and is proclaimed authentically in a new culture and finds its home there. The first pamphlet ever published by Luther, already in 1516, was an incomplete, anonymous little booklet in German that Luther came to call *Theologia Germanica*. By 1518, he had obtained a more complete version of the same booklet, and he brought out a new edition, this time with a preface.

In the preface Luther talks about the effect the book had on him; "no book except the Bible and St. Augustine has come to my attention from which I have learned more about God, Christ, man, and all things."[1] Luther sums up what makes the message authentic for him, "I thank God that I hear and find my God in the German tongue, whereas I, and they with me [other university scholars], previously did not find him either in the Latin, the Greek, or the Hebrew tongue. God grant that this little book will become better known. Then we shall find that German theologians are without a doubt the best theologians. Amen."[2]

An unsigned "Abstract" to A. Scott Moreau's book, *Contextualization in World Mission: Mapping and Assessing Evangelical Models (Kregel, 2012)* suggests, "*Contextualization* is the art of translating ideas into a particular situation, place or culture. It is fundamental to communication, which makes contextualization essential in missions." Few practicing Lutheran missionaries would disagree with this statement, but discussion of the topic would soon reveal a myriad of different viewpoints as to how the work should be done; who should do it; and what outcome can be expected.

Since the Lutheran and, indeed, most evangelical Protestant expressions of Christian faith are Word-oriented, it is not surprising that most contextualization efforts have focused on what Moreau (following Stephen Bevan and Robert Schreiter) calls translation models. The essential task of the translation model is to determine the pure message of the original and communicate it in a way that evokes the same response in the second culture as it did in the first.

When the agenda of the translation model is stated this way, it immediately becomes apparent that translation involves far more than finding an equivalent term in the target language that is the equivalent of the term in the original language so that exactly the same thing can be said in exactly the same way. Language is an important key to unlock culture, but the culture is always bigger than language, and language learning, especially at the beginning, needs to enable the missionary's

listening even more than his speaking, and very likely much more is required before a message is perceived as authentic.

The Editorial Committee of *Lutheran Mission Matters* plans to use its May 2017 issue to discuss the communication of the Good News of Jesus under the theme **"Authentically Lutheran in every cultural context."** What have Lutherans done and what should Lutherans do and why to call men and women into the body of Christ, the Church, that they continue to do the work and will of God in an ever-changing world? The committee invites you to contribute to this discussion.

Endnotes

[1] Martin Luther, *Luther's Works, vol. 31: Career of the Reformer I*, ed. J. J. Pelikan, H. C. Oswald, & H. T. Lehmann (Philadelphia: Fortress Press, 1999), 75.
[2] Ibid., 76.

A Note to Contributors

We welcome your participation in contributing to *Lutheran Mission Matters*. Please observe the following guidelines for submission of manuscripts.

Lutheran Mission Matters publishes studies of missiological issues under discussion in Christian circles across the world. Exegetical, biblical, theological, historical, and practical dimensions of the apostolic mission of the church are explored in these pages. (See the mission statement below.) While issues often focus on a theme, the editorial committee encourages and appreciates submissions of articles on any missiological topic.

Contributors can familiarize themselves with previous issues of *Missio Apostolica* and *Lutheran Mission Matters* at the Lutheran Society for Missiology's website (http://lsfm.global). Click on the Publications link to view PDFs of previous issues.

Book reviews: LSFM also welcomes book reviews. Submit reviews of no more than 500 words. E-mail Dr. Joel Okamoto (okamotoj@csl.edu) if interested in writing a review.

Mission Statement

Lutheran Mission Matters serves as an international Lutheran forum for the exchange of ideas and discussion of issues related to proclaiming the Gospel of Jesus Christ globally.

Formatting and Style

Please consult and use *The Chicago Manual of Style*, 16th edition for endnotes. See basic examples below and/or consult the "Chicago-Style Citation Quick Guide" (http://www.chicagomanualofstyle.org/tools_citationguide.html).

[1] David J. Bosch, *Transforming Mission: Paradigm Shifts in Theology of Mission* (Maryknoll, NY: Orbis Books, 1991), 243–255.

[2] Hans Küng, *Does God Exist? An Answer for Today*, trans. Edwin Quinn (New York: Doubleday, 1980), 184–186.

[3] Robert J. Priest, Terry Dischinger, et al., "Researching the Short-Term Mission Movement," *Missiology, An International Review* 34 (2006): 431–450.

References to Luther's works must identify the original document and the year of its publication. Please use the following model.

[4] Martin Luther, Ninety-five Theses (1517) in *Luther's Works*, ed. Harold J. Grimm (Philadelphia: Muhlenberg Press, 1957), 31:17–34.

Quotations of or allusions to specific texts in the Lutheran Confessional writings must be documented. The use of modern translations of the *Book of Concord* is encouraged. Please use the following model.

[5] Augsburg Confession V (Concerning the Office of Preaching) in T*he Book of Concord: The Confessions of the Evangelical Lutheran* Church, ed. R. Kolb, T. J. Wengert, C. P. Arand Minneapolis: Fortress Press, 2000), 40.

Direct quotations exceeding four manuscript lines should be set off from the text in an indented paragraph, without quotation marks. Omissions in a quotation should be noted by ellipsis, with an additional period to end a sentence, as appropriate.

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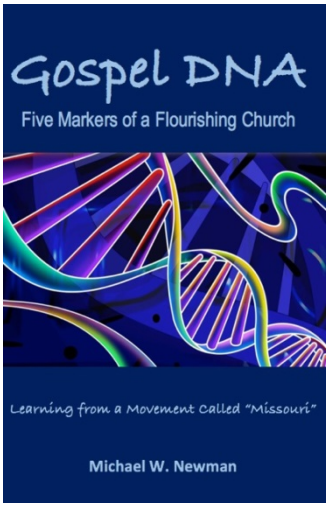
Michael W. Newman's book, *Gospel DNA: Five Markers of a Flourishing Church*



Michael Newman's presentation at the LSFM banquet in January of 2015 started the conversation about genuine Gospel DNA in the LCMS. Now you can read the book to discover God's gracious path to a flourishing church in the 21st century—embedded in the vibrant Gospel movements of our past. A discussion guide is included. A portion of the proceeds will benefit the Lutheran Society of Missiology.

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Dr. Robert Kolb came to Concordia Seminary in 1993, serving as director of the Institute for Mission Studies and Missions Professor in the systematic theology department until his 2008 retirement. He is a distinguished Reformation scholar and has written numerous books and articles on the Reformation era and on Christian mission.

Sermon Excerpt

"The Gospel for the Early Christmas Service, Luke 2[:15–20] (1521–22)."

Martin Luther

> The seventh item is that they [the shepherds] freely confess and publicly proclaim the word that was told them concerning the child. This is the greatest work in the Christian life, and for it one must be willing to risk life and limb and goods and reputation. For the evil spirit does not attack someone very vigorously if he has the right faith and lives rightly but privately and only for himself. But if someone is willing to go out and to spread the word, to confess, to preach, to praise for the benefit of others, that he does not tolerate. Therefore, Luke reports that they not only came and saw, but that they also proclaimed—not only to Mary and Joseph but also to everyone—the news concerning the child and the message they had heard on the field. Do you not think that there were many people who considered them fools and bereft of their senses because they dared, as uncouth and unschooled lay people to speak of the angels' song and message? . . . But the shepherds, filled with faith and joy, were happy for the sake of God to be considered foolish in the sight of men. A Christian does the same; for God's word must be considered foolishness and error in this world.[1]

Endnotes

[1] Martin Luther, "The Gospel for the Early Christmas Service, Luke 2 [:15–20] (1521–22)." *Luther's Works, vol. 52: Sermons II*, ed. J. J. Pelikan, H. C. Oswald, & H. T. Lehmann (Philadelphia: Fortress Press, 1999), 37.