

2012

The Redeemed Scientist

Aaron R. Hutchison

Cedarville University, ahutchison@cedarville.edu

Follow this and additional works at: http://digitalcommons.cedarville.edu/faculty_integration_papers

 Part of the [Chemistry Commons](#), [Higher Education and Teaching Commons](#), [Practical Theology Commons](#), and the [Social and Philosophical Foundations of Education Commons](#)

Recommended Citation

Hutchison, Aaron R., "The Redeemed Scientist" (2012). *Faculty Integration Papers*. 9.
http://digitalcommons.cedarville.edu/faculty_integration_papers/9

This Integration Paper is brought to you for free and open access by DigitalCommons@Cedarville, a service of the Centennial Library. It has been accepted for inclusion in Faculty Integration Papers by an authorized administrator of DigitalCommons@Cedarville. For more information, please contact digitalcommons@cedarville.edu.

The Redeemed Scientist

Aaron Hutchison
Assistant Professor of Chemistry
Cedarville University

I am a dedicated Christian, with absolute faith in the infallibility of scriptures and the presence of God in his creation. However, I also view myself as a scientist, a person who utilizes the framework of the scientific method to gain knowledge of the nature of our world, and an educator, who seeks to impart that knowledge to the students God places before me. Therefore, I am faced with the task of attempting to integrate my Christian faith with both my teaching and my scientific research.

This process, known in academic circles as faith-learning integration, was defined by Hasker¹ as “a scholarly project whose goal is to ascertain and develop integral relationships which exist between the Christian faith and human knowledge”. This goes beyond simply being a good Christian and a good scholar; any Christian in any career is commanded to honor the Lord through fine performance on the job. The task of integration involves, at its deepest level, discovering and publicizing the inherent connections between the truth found in the various academic disciplines and the truth that is presented in God’s Word. It is implicit within Hasker’s definition that these connections exist and need only to be found by the researcher. Therefore, as pointed out by Holmes², the task of the Christian researcher is not so much pure integration as reintegration, a restoring of the perspective that man should have had and has lost due to his fallen state. Within the physical sciences, this means finding God’s fingerprints within the framework of nature itself. A redeemed scientist today, just as Newton did in his day, views “the universe as a cryptogram set by the Almighty”³ and like Kepler, today’s godly scientist confesses to his Lord “I rejoice in the works of your hands”.⁴

A strong case can be made that the Christian faith was a key component in the birth and development of the physical sciences in the western world.^{5,6} Greek philosophy tended to downplay the importance of the physical, with Plato arguing that ideas were more important than material things and Aristotle, while placing a greater emphasis on the natural world, believing that only the whole of something, not its constituent parts, could be studied and that sweeping conclusions could be accurately drawn from very minimal data.⁷ In fact, the famed conflict between the Catholic Church and Galileo was based upon the Church’s embrace of Aristotle, not an attempt to defend anything written in scripture.⁸ Therefore, Greek views of nature were not a fertile ground for the development of a systematic study of natural processes. The pantheistic views found in the East were even worse soil for the growth of science; if one believed that nature was the creation of many independent gods, there was no reason to expect consistency within it and if there is no consistency in nature, studying it is a waste of time. Even worse, many of these cultures held that nature itself was divine, making an attempt to understand it essentially blasphemous hubris.⁹

The Christian worldview, on the other hand, provided a rational basis for the development of the natural sciences. Christians believed that nature was the creation of a personal, knowable God and was intended to convey His glory. Furthermore they held

that man had been given dominion over this world and that the act of studying it was exercising that dominion. They felt that this study was worthwhile because God was rational and therefore what he did would be understandable. The universe should follow orderly and comprehensible processes. It would have been perverse for God to have made man as a rational being, commanded him to subdue nature, then made nature utterly incomprehensible or disorderly and God is not perverse. This connection has been made by Nobel Laureate chemist Melvin Calvin, who wrote in *Chemical Evolution*:

As I try to discern the origin of that conviction [that the universe is ordered], I seem to find it in the basic notion discovered 2000 or 3000 years ago, and enunciated first in the Western world by the ancient Hebrews: namely, that the universe is governed by a single God, and is not the product of the whims of many gods, each governing his own province according to his own laws. This monotheistic view seems to be the historical foundation for modern science.¹⁰

Throughout much of the history of science, many scientists have been devout Christians and seen no conflict between their discipline and the pursuit of scientific knowledge. I have already cited Newton and Kepler on this issue and during the development of my own field, chemistry, this lack of conflict is also found. Robert Boyle, a major researcher on the properties of gasses and an early proponent of atomic theory (albeit well before it was known as atomic theory) made no secret of his devout faith and was staunchly opposed to any effort to explain nature completely apart from God. John Dalton, widely considered the “father of atomic theory” was a devout Quaker. In recent times, however, this concept of integration has become quite controversial.

Today it is commonly argued in mainstream scientific circles that physical science and faith are two completely separate spheres with little or no overlap.^{11,12} It is not considered impossible for a person to be both a Christian and a scientist, but it is considered impossible for such a person to integrate their faith with their academic life. For example, a popular physical science textbook states “To mix the religious and the scientific ways of looking at the world is good for neither”.¹³ The well-respected magazine *Scientific American* praised the head of the US Genome Project Francis Collins for striving “to keep his Christianity from interfering with his science and politics” and approvingly noted that “Researchers and academics familiar with Collins's work agree that he has separated his private religious views from his professional life”.¹⁴ The National Academy of Sciences has stated that “Religion and science are separate and mutually exclusive realms of human thought”.¹⁵ The late Stephen Jay Gould has been one of the leading proponents of this view; in fact it is the primary focus of his book “Rock of Ages”. His arguments were summarized in the article “Nonoverlapping Magisteria” in which Gould states:

The net of science covers the empirical universe: what is it made of (fact) and why does it work this way (theory). The net of religion extends over questions of moral meaning and value. These two magisteria do not overlap, nor do they encompass all inquiry (consider, for starters, the magisterium of art and the meaning of beauty). To cite the arch clichés, we get the age of rocks, and religion retains the rock of ages; we study how the heavens go, and they determine how to go to heaven.¹⁶

In essence, Gould is arguing that there can be no integration of a scientific discipline with religious belief because the two speak to totally different spheres of existence. He grants that religious beliefs have authority in the realm of moral order but does not feel they can authoritatively speak to anything within the realm of nature. To Gould, it is no more possible for a person to integrate faith in God with the practice of science than it would be to integrate Aesop's fables with chemical research.

Obviously, I feel that this view is entirely wrong; if I did not, I would hardly be at Cedarville University writing a paper on the integration of faith and my discipline. However, it should not be dismissed out of hand; it is coming from highly educated men and women who are at the top of their fields. Therefore, the question must be asked; how can so many experts be so wrong? I believe the problem lies in a question of epistemology and philosophy; people such as Gould have misunderstood both the nature of science and acquisition of knowledge.

For the purposes of this paper, I would like to acknowledge that there are many complex and varied theories of knowledge in existence and then, as a mere scientist dipping his toe in these waters, set them aside in favor of a simplified model. For my ends, the simple Webster's dictionary definition of knowledge as information acquired will suffice. It is possible for the information we learn to be incorrect and therefore one can gain false knowledge under this definition. For this paper, I would like to break this knowledge down into two categories: primary knowledge being information gained from a source external to us and secondary knowledge being information acquired by the exercise of our reason upon primary knowledge. The raw data resulting from a scientific experiment would constitute primary knowledge, while the scientist's interpretation of it would constitute secondary knowledge. It seems to me that there are two main ways in which humans gain primary knowledge beyond the basic instincts of life that we are all born with: revelation and observation. Revelation can be broadly defined as any information one gains by having it related by an outside entity. For example, if by some chance a reader was to actually learn something new from this paper, that would be primary knowledge gained by revelation. Observation, on the other hand, is the acquisition of information via one's own senses, which is the foundation of science.

Given these definitions, it is clear that the majority of our primary knowledge is actually gained by revelation. Revelation, however, has a great limitation; the knowledge one gains is only as trustworthy as the source revealing the information. Something revealed by a person known to be ignorant of the subject under discussion or known to be dishonest is obviously of dubious reliability. This is a fundamental problem for humans attempting to acquire knowledge; it is completely necessary to build upon a foundation of revealed information if our knowledge is to increase (otherwise, as just one example, every chemist would have to derive everything from the chemical reactivity of every compound to the basics of characterization for his or herself, a obviously impossible proposition) but where do we find reliable sources of revelation?

This leads to the true beauty of science not only as a method for interpreting our observations, but also of increasing the reliability of human revelation. The proper application of the scientific method suggests what observations the scientist should make so as to gain the maximum amount of useful information. Furthermore, the standards of scientific professionalism require that all of this information be satisfactorily documented

and published. Ideally, the results of the scientist's observations are trustworthy knowledge that can be relayed via revelation to other scientists. This is the distinction between scientific knowledge and other types of knowledge; true scientific knowledge stems originally from observations made in a systematic fashion and documented in such a way that the results can be verified by repetition. None of this in any way conflicts with the concept of Christianity; it is simply a very good way of organizing and verifying human observations.

A problem develops, however, when it is argued that scientific knowledge is the only reliable knowledge as to the nature of the physical world.^{17,18} This fallacy is deeply entwined with the also popular (and equally wrong) notion that all scientific knowledge must stem from a functionally naturalistic worldview. This is what the textbook cited earlier was really getting at when it referred to science and religion as different ways of looking at the world. A naturalistic worldview can be defined as one that sees nature as a closed system, with no outside interference (such as divine intervention) permitted.¹⁹ Although naturalism does not technically require that there be no God, it does require that any God that exists have no activity in His creation beyond perhaps acting as a first cause beyond the reach of science (i.e. providing the matter for a Big Bang). This concept is perfectly summed up by the great paleontologist George Gaylord Simpson:

There is neither need nor excuse for postulation of nonmaterial intervention in the origin of life, the rise of man, or any other part of the long history of the material cosmos. Yet the origin of that cosmos and the causal principles of its history remain unexplained and inaccessible to science. Here is hidden the First Cause sought by theology and philosophy.²⁰

Just based on the quotation above, one would assume that scientists, basing their results on observations backed by the full weight of the scientific method, have definitively established exactly how life originated and man arose. However, an honest look at the evidence shows that this is not the case. To see what is really occurring requires that we apply the principles articulated by Kuhn in *The Structure of Scientific Revolutions*²¹. Kuhn sees science as being defined by paradigms, a series of shared values and their inherent techniques which define a scientific community. Mainstream science today is largely defined by the naturalistic evolution paradigm: the belief that all that exists today must have developed through entirely natural processes over a vast period of time. That paradigm certainly offers an explanation as to how life originated and man arose, but the paradigm has hardly been proved beyond any reasonable doubt. In fact, as Kuhn has correctly stated²², paradigms are not "proven" in the normal sense of the word, but rather accepted by a majority of scientists. The reigning naturalistic evolution paradigm holds that on any question related to the physical world, a naturalistic answer is better than a supernatural one, regardless of the relevant evidence. This idea is inherent in the Overton definition of science²³ and is held by biochemist Richard Dickerson as the first rule of science.²⁴ The primacy of this paradigm leads to a basic belief among most mainstream scientists that only naturalistic science can provide legitimate knowledge (via observation followed by reason) as to the nature of the physical world.

Although well established in the secular scientific community, this idea is utterly fallacious. It provides no basis for its main assumption, namely that everything must

have developed through natural processes and therefore only naturalistic scientific knowledge of the physical world is trustworthy. This notion is clearly philosophical, not scientific²⁵ and therefore does not actually hold the advantages of scientific trustworthiness behind it. Furthermore, the assumption presupposes that either there is no deity or that deity has not directly communicated with mankind nor intervened in the natural world. Therefore, the Bible is assumed to be nothing but human revelation, on par with the writings of Confucious. However, if one accepts the existence of an omniscient, omnipresent, and omnipotent deity with truth as one of His fundamental attributes, then that deity is clearly the most trustworthy possible source of information. There is absolutely no reason to *per se* assume that information contained in scripture is less reliable than that coming from scientific research unless one already assumes that the scriptures are not true. The integration of faith and science is only fundamentally impossible if the one trying to do it does not accept the legitimacy of faith (or does not accept the legitimacy of science but that is not the direction most attacks on integration are coming from).

Given that the integration of the Christian faith and a physical science (such as chemistry) is possible, what would a redeemed paradigm of science look like? We have just seen that one of the current presuppositions in the physical sciences (naturalistic science as the only source of reliable knowledge) is incompatible with a Christian worldview and therefore the task of the redeemed scientist must begin with, to borrow the terminology of Hasker¹, a reconstruction of this foundational assumption. I believe that the correct presuppositions should be that, first of all, there is an absolute truth that science is seeking and that truth originates in the God of creation. The Lord Himself created all that is and therefore is the author of all that is true about this world, whether that truth relates to how atoms bond to each other or how a man may be forgiven of his sins.

It is worth noting that this conception of truth appears to be lacking in at least some schools of secular science philosophy, notably that of Kuhn. In the final chapter of the *The Structure of Scientific Revolutions*, he states:

It is now time to notice that until the last very few pages the term “truth” has entered into this essay only in a quotation from Francis Bacon. And even in those pages it entered only as a source for the scientist’s conviction that incompatible rules for doing science cannot coexist except during revolutions when the profession’s main task is to eliminate all sets but one. The development process described in this essay has been a process of evolution *from* primitive beginnings—a process whose successive stages are characterized by an increasingly detailed and refined understanding of nature. But nothing that has been or will be said makes it a process of evolution toward anything.... We are all deeply accustomed to seeing science as the one enterprise that draws constantly nearer to some goal set by nature in advance. But need there be any such goal? Can we not account for both science’s existence and its success in terms of evolution from the community’s state of knowledge at any given time? Does it really help to imagine that there is some one full, objective, true account of

nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal?²⁶

Kuhn answers that last question in the negative and then proceeds to draw a connection to biological evolution, as another example of a process that progresses from some point with no true goal. A redeemed scientist, on the other hand, will answer Kuhn's question in the affirmative. A truly Christian philosophy of science is based on the understanding that there is "one full, objective, true account of nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal". The true account of nature is one subset of the entire spectrum of absolute truth embodied in this world because it was all created by one God with truth as a fundamental attribute. What is real does not change based on one's perspective; it is fixed by God and we are responsible for discovering that reality.

There are multiple paths by which one can get at the nature of the world as it really is. The scriptures contain some of the sum total of truth and are absolutely inerrant in their original manuscripts, while further truth can be found by the study of creation utilizing the scientific method. The latter route to truth is the proper objective of science. However, there is continuity between the knowledge uncovered by science and that uncovered by direct divine revelation from the scriptures. Any distinction between scientific knowledge and religious knowledge is based on the method by which the knowledge was gathered rather than a fundamental difference in its content and applicability.

Accepting these correct presuppositions opens up significant possibilities. Scientific research is guided by revelation; it is from the results of past experiments that one knows how to interpret current ones. The purely naturalistic scientist relies on the scientific literature for this revealed information. To that information, the redeemed scientist can add the information found in scripture, which I view as the most reliable information available because it stems from the most reliable source conceivable. Therefore, the redeemed scientist knows some basic facts the secular scientist does not; these facts can help with the interpretation of research results. As mentioned earlier, it was largely this sort of thinking that led to the development of modern science. Due to their faith in scripture, these early scientists knew they should expect nature to be orderly and comprehensible with study. Their understanding of the God of the Bible led them to develop a way to study His creation.

A common argument against this sort of integration is that it leads to a "God in the gaps" type of science; that the supernatural will be invoked to explain anything for which there is not a readily apparent naturalistic explanation. However, the very methodology being suggested here is opposed to that sort of thinking. God is not to be used as an explanation for everything or anything not yet discovered. Rather, we accept His record of what He has done. The idea is not to lessen the scope of study by routinely invoking the supernatural, but to combine all the reliable information we have to get at the truth. I, and I believe most other redeemed scientists, would be very hesitant to suggest that direct divine intervention was responsible for something that scripture never specified it was. Even where we know God was the ultimate cause, a redeemed scientist should be open to the possibility that He used natural forces unless the Bible directly states otherwise. For example, I believe that God destroyed nearly all life on Earth via a great flood because the scriptures clearly teach this. However, I am open to the idea that

He could have used some natural mechanism, such as an asteroid impact²⁷ or increase in nuclear decay rate²⁸, to trigger this flood if the evidence points to that. Christian geologists and geochemists would, in fact, be best positioned to study this possibility because they know that the Flood occurred and therefore know what they should be looking for. The goal of this sort of research is not to use science to “prove” the Bible, whose accuracy is a presupposition of the paradigm; the goal is to combine the information we find in scripture with the information we find in nature to get at the truth about creation.

Here then, to summarize, is the redeemed paradigm of science. There is an objective reality apart from man. This reality is the creation of the God of the Bible and His scriptures are absolutely correct in all they say about it. God has also granted man the powers of observation (to gain primary knowledge) and reasoning (to convert it to secondary knowledge). The redeemed scientist will use these capabilities within the framework of the scientific method to study nature and discover the truth of what God has created. The redeemed scientist recognizes the validity of the scriptures and of science and seeks to use both to discover truth rather than pitting one against the other.

A proper understanding of this paradigm forms the basis for a correct Christian view on the controversial topic of origins. A straight-forward reading of the Bible makes it clear that all created things originated in six days in the relatively recent past. This is the starting point for the redeemed scientist in studying Earth history, because on this topic God has spoken and we accept His word. No further external evidence is required to validate God! However, because there is only one truth, proper scientific study will not lead to a different conclusion. Therefore we need not fear performing the study. In fact, I believe the redeemed scientist is compelled to do so, because of the incorrect interpretations (secondary knowledge) of the basic data (primary knowledge) that have become the standard view of the evidence under the naturalistic evolution paradigm. These untruths are offensive for two reasons: because they are untrue and science seeks truth as well as because they distract people from the greater truth of God’s existence and plan for their lives. Therefore, it is perfectly legitimate for a redeemed scientist to both perform basic research of his or her own on origins issues and to provide reinterpretations of the already published data. It will be, of course, very difficult indeed to convince someone operating under the naturalistic evolution paradigm of truths that are evident to us under the redeemed paradigm; Kuhn corrects points out the difficulties in communication between followers of opposing paradigms²⁹. However, unlike Kuhn, we recognize that there is an objective reality and our paradigm, not theirs, best fits it. While presuppositions undeniably color our worldview and therefore we must be aware of them, ultimately the presuppositions must bend to reality, not reality to the presuppositions.

There is a fine line to tread here and I wish to be very explicit in treading it. I do not believe that on the basis of evidence alone the redeemed scientist will prove our paradigm, at least not until the Lord returns (at which point faith shall be sight and the evidence will be truly overwhelming). The origin of life is a specific historical event and, in matters of history, the scientific method is far better at demonstrating what could have happened than at proving what did. Furthermore, the redeemed paradigm involves an acceptance of God’s Word that will only fully come about in the lives of fallen humans through the work of the Holy Spirit. However, basic research by redeemed scientists can demonstrate inconsistencies in the naturalistic evolution paradigm and point to the fit

between the raw data and the redeemed paradigm. If science is to have any purpose, research must point to the truth rather than just inevitably confirm one's presuppositions. Therefore a proper approach to origins incorporates both a recognition of the importance of presuppositions with an emphasis on the value of evidence. While we will never convert the world to Christ by reason or evidence, it is not inconceivable that we might, by solid arguments from evidence, one day so undermine the naturalistic evolution paradigm as to force a new scientific revolution and the acceptance of a less hostile view.

The discussion above is somewhat general and theoretical in tone. A skeptic might well respond that it is all well and good to speak of using the evidence to support the redeemed paradigm. However, the majority of scientists the world over would argue that the evidence does not in fact support it. How then should a redeemed scientist respond when the scientific data appears to contradict that which is revealed in scripture? I do not think we should blithely disregard scripture simply because it seems to be at odds with our observations nor do I believe that we should simply ignore scientific data if we consider it contradictory to the Bible. The key point, as stated repeatedly above, is that there is no separate "religious truth" and "scientific truth"; there is one truth and that truth comes from God. If these two ways of gathering knowledge are giving us contradictory information, then we must be misunderstanding something. In this situation, the correct response is to carefully study both areas to find our mistake. We must certainly recheck our experiment to ensure that the scientific results are not merely in error. However, it is also appropriate to take another look at the text of scripture in question and perform a careful study of the exact wording used in the original language and the context of the passage. While God's word is infallible, our interpretation of it is not and it is possible for scientific results to point us to areas where we are wrong. This is not an example of science "triumphing" over Christianity; God is the author of nature as well as scripture and He can use both to impart knowledge to us.

This is an idea that could with good reason make some Christians nervous. Many schools of biblical interpretation have shown a disturbing willingness to essentially disregard the accuracy of God's word to accommodate the theories of mainstream science. The assumption that the early chapters of Genesis must be interpreted metaphorically so as to not conflict with evolution or that the days of Genesis must actually represent ages so as to not contradict the geologic time scale come to mind. However, I am not suggesting that scripture be made to fit whatever scientific theory is currently favored. As Paul would write, God forbid! However, there are passages in scripture that have been clarified by the study of nature. For example, it seems to me that the discovery of various species of dinosaurs has given us a great clue as to the identity of the Behemoth and Leviathan mentioned in Job. As another example, D. Russell Humphreys, a creationist scholar at Sandia National Laboratories, suggests that several passages in scripture refer to nuclear decay, with what I found to be a particularly good argument being made for II Peter 3:7 & 12.²⁵ While it would not be necessary to know anything of nuclear decay to understand such passages, the knowledge that we may have observed the process being described makes it easier, at least for me, to picture what Peter is describing.

In *Faith, Reason, and Earth History*, Leonard Brand speaks to this issue at some length, laying out the same basic approach to integration as I have just advocated (my thinking has been significantly impacted by Brand's). He sums up his position this way:

If we follow this process, the Bible is maintained as the standard for religious doctrines and for areas for which the Bible makes claims in natural history; yet science and the Bible continue to shed light on each other. Science suggests ideas that may help us to recognize that we have been reading some preconceived ideas into the Bible. In other cases, the Bible can help us to recognize incorrect scientific theories so we can turn our efforts toward developing more accurate interpretations of the data. This can be an on-going feedback process in the interface between science and religion that challenges us to dig deeper in both areas.³⁰

The controversy surrounding radiometric dating provides an example of this occurring. At first glance, the evidence here appears to be in conflict with our understanding of scripture; the ratio of radioactive parent to daughter isotopes found in many rocks suggest that they are very old. Scripture speaks of a recent creation. Painstaking study of the early chapters of Genesis have shown that these passages are a straightforward narrative³¹, validating their historicity and supporting a recent creation. Therefore, redeemed scientists have looked closely at the various techniques for radiometric dating and found significant problems, both in the fundamental assumptions underlying the techniques and in the consistency of the results.³² However, scientists holding to an old-earth have responded by developing superior methodologies for radiometric dating, such as the mineral-isochron method.³³ This has improved the science involved (although it is worth noting that these improved methods still fail to give consistent ages even when applied to that same rock formation³³), but leaves the apparent conflict with scripture intact. As a result, some redeemed scientists are beginning to focus on a new possibility: accelerated nuclear decay.^{25,34} If at some time in the Earth's past the rate of nuclear decay was much more rapid than it is now, then the ratio of parent to daughter would give the appearance of an older age than the rock actually has. As mentioned earlier, Dr. Humphreys believes that some passages of scripture describe this occurring, so his scientific research is also helping him interpret the Bible.²⁵ If accelerated nuclear decay has occurred, it would constitute a major scientific discovery and may shed new light on some passages of scripture. If this discovery is made it will be because redeemed scientists refused to accept that there could be a real conflict between science and scripture.

My own research plans provide an example of this sort of fusion. Most of my research has focused on environmental mercury pollution and how to deal with it. Due to that work, I have some knowledge of mercury's behavior in the environment. Several years ago, I was present during a discussion in which Dr. John Whitmore presented some findings from his own research at the Grand Canyon. During the conversation following his presentation, it was mentioned that our current understanding of the events of the Flood suggests that there was a great deal of volcanic activity that occurred concurrent with it. Now from my own research, I know that volcanic activity releases significant amounts of mercury into the atmosphere, to the point that spikes in the mercury content of glacial core samples can be detected in layers corresponding to the years of major volcanic eruptions.³⁵ The mercury in these glacial cores came from atmospheric deposition of mercury. If there was a great deal of volcanic activity during the flood, it stands to reason that a great deal of mercury was released into the atmosphere and then

deposited back on earth, right at a time in which it is believed that a significant portion of our current geologic features were forming. Therefore, it is possible that much of our current geologic mercury deposits formed during or immediately after the flood. At the time, I was particularly interested the mercury content of coal, because it is believed to be formed from dead plant matter accumulating in a somewhat aquatic environment (either peat bogs over long periods of time or rapid carbonization during the Flood).³⁶ Modern swamps such as the Everglades retain mercury due to their high sulfate reducing bacteria content and their accumulated humic matter, which can bind to environmental mercury.³⁷ Some coal does contain significant amounts of mercury; in fact coal-fired power plants are a significant source of mercury pollution.³⁸ The initial question Dr. Whitmore and I discussed was whether any correlation could be found between a coal's apparent age and position in the geologic column and its mercury content. A survey of the literature did not show any obvious correlation, however, the search did point to the unusually high mercury content of black shales^{39, 40}, which are also believed to have been formed under conditions which are ideal for accumulating mercury²⁸ and may also be a candidate for the repository of Flood mercury. These discussions and study also led to an opportunity to write a paper on mercury toxicity and the Genesis Flood, which has been accepted for publication in an upcoming book on Flood geology. One of my research plans for the future is to acquire coal and black shale samples to analyze for mercury concentration, with the goal of eventually developing a profile of mercury content in the geologic column. Hopefully, patterns would emerge that could be tied to the Flood, although it may be that no correlation will be found at all. Whatever the answer, the fact remains that I would not have thought to look if I had not accepted the revelation of a worldwide flood found in the Bible.

My faith as a redeemed scientist does not only lead me to research those areas where scripture suggests a line of enquiry or where there is an apparent conflict to be resolved, it also directs me to do research to physically benefit others. As believers we are all called of God to serve not only him, but others as well. This is true of a Christian in any profession, including the academic disciplines. As Arthur Holmes wrote "...if you can find no other connection between faith and learning in your particular field, do it for the Glory of God! Use it for the betterment of the human condition!"² The exact mode that this service will take will vary from person to person based upon those gifts which the Lord has bestowed upon them. I have felt led to direct some of my scientific efforts towards the aid of others by attempting to develop new technology for the removal of toxic metals from our environment.

Among believers, protection of the environment has appropriately been viewed as a stewardship issue. God placed Adam in the Garden to care for it, not to destroy it. In the same way, believers today have a mandate to use the creation responsibly, rather than in a blithely destructive manner. However, I think there is a deeper issue that this. Toxic materials do not affect the environment in a vacuum and humans do not exist completely apart from the ecosystem. When toxins are permitted to persist in the environment, it is often humans as well as plant and animal life that suffers.⁴¹ Therefore an argument can be made that environmental pollution is a human life issue as much as a stewardship issue. My attitude towards environmental issues is well expressed by Dr. John Silvius's comments in "Bald Eagles and Babies":

Thus they [compassionate conservationists] would care about the environment of the bald eagle chick, especially when the egg crushes under the weight of the mother because the eggshell has been weakened by pesticides in the food chain. But they would also seek protection of the unborn baby from all threats, whether they be humanly introduced toxins and abortifacients or environmental pollutants that the baby might encounter through the mother.⁴²

This thinking has led me to have an interest in research that can aid in the removal of toxic substances from the environment. My particle focus has been heavy metals such as mercury. Mercury, particularly organomercurials, is highly toxic to humans. However, it also has had a variety of industrial applications including use as a catalyst⁴³, aid in gold mining^{44,45}, thermometric material⁴⁶, and pesticide/slimicide/preservative.⁴⁷ These uses have led to widespread mercury pollution. Mercury is readily methylated in the environment and this highly toxic methyl mercury can then accumulate up a food chain, resulting in serious and sometimes fatal poisoning of humans. As a redeemed scientist, I don't see the fact that mercury is in the environment as some great travesty against "mother nature", as some non-believing (and often pantheistic) modern environmentalists would.⁴⁸ I recognize that God has given man dominion over the earth and that responsible industrial activity is part of that dominion. However, that does not change the fact that its presence there now poses a threat to human life, which is highly valued by God. Therefore, it seems appropriate to me that redeemed scientists should be in the forefront of trying to deal with the problem. It was this reasoning that led me in graduate school to choose to be part of a project to design new compounds to precipitate mercury from water. As a professor engaged in research at Cedarville University, I plan to continue working on the removal of heavy metals from water for the same reason that I originally chose that project; I see it as an opportunity to use what God has given me to perhaps help some of those threatened by these toxic elements in their food or water supply.

My desire to obey Christ's command to serve others also drives my commitment to teaching. I am greatly honored that the Lord has seen fit to place me in this position, where I can have some impact on the lives of young people. I am very conscious that I will answer to Him for how I discharge that responsibility. Therefore, I endeavor to serve my students by carefully preparing lectures that aim to not only be informative, but also interesting; by attempting to write tests and quizzes that are challenging enough to both evaluate the student's knowledge and spur them to correct the areas where that knowledge is deficient, yet are not so difficult as to discourage them; and perhaps most of all, to be available as a source of both academic and personal support for them. To provide academic support, I devote a significant amount of my time to personally helping students study and answering their questions. During the latter part of a semester, I often spend the bulk of the normal working day helping students who come to my office, then do my other work in the evening. Before giving a test to my lower level students, I usually hold an evening study session lasting two or three hours (although when I have sensed that anxiety was especially high among students, I have on some occasions extended the length of the study sessions considerably beyond that).

While all of the things described above stem from my faith and desire to serve my Lord, they are not, strictly speaking, examples of the integration of my faith and

discipline. As I mentioned earlier, all believers are called to model Christ-like attitudes and behavior in their professions. So the question remains, how do I integrate my faith into the teaching of science? I do this primarily by attempting to instill in my students (most of whom will be going into a science or health-care related career) a biblically based view of God's creation and the use of science to study it. Essentially, I try to get them to think about science and their faith in the same way that I have outlined in the earlier portion of the paper.

A significant impetuous for this effort occurred during my first semester teaching at Cedarville. I had given my students a test, in which one of the questions asked the students to evaluate a particular scientific law in light of scripture. To my surprise, a number of students gave answers indistinguishable from those I would have expected to receive from non-believers. When I commented on this in class, a student responded that since this was a science class and I had not specified otherwise, he had given the "science" answer to the question. If this had been a Bible course, he assured me, he would have given the "Christian" answer. I, needless to say, found this response very disturbing. Clearly this student had to some extent bought into Gould's "Nonoverlapping Magisteria" idea.¹⁶ In retrospect, I should not have been as surprised as I was by this. As described earlier in this paper, that is a fundamental concept to many modern scientists and (as demonstrated by the textbook quoted earlier¹³) is passed on to student, even those who have grown up in Christian families and may have attended Christian schools. Therefore, I decided to emphasize in my teaching a proper view of faith and science.

How this is practically done can vary from class to class. In all my classes I make a conscious effort to emphasize to the students that they are not studying some abstract and secular thing called science, but God's creation. I attempt to stress that we should praise the Lord for the wonder of what He has made as we study it. For example, the textbook I use for the Principles of Physical Science course made the point that, if not for air-resistance, raindrops would gather enough velocity to be dangerous when falling. I suggested in class that it was therefore appropriate that we should thank God for air-resistance. I also devoted the first two lectures in that class to a detailed discussion of the scientific method, the mistaken belief that Christianity and science were in conflict, and how a Christian should properly practice science (the content of the second of those lectures was very similar to the material covered in the central portion of this paper). On one occasion in General Chemistry, I arranged the schedule such that after having a noted creationist speaker in chapel, we could spend the following class period in a discussion of the things he had talked about and how they related to what we were studying in the class. In my Analytical Chemistry course, I have developed a section on radioanalytical chemistry (not covered in most textbooks) in which I discuss the supposed conflict between radiometric dating and Genesis in detail.

I feel that it is important that my students be ready to intelligently engage those theories currently held by the mainstream scientific community that appear to conflict with the word of God. I recognize that many of those conflicts fall outside the purview of a course in chemistry and therefore are not things I should touch on in detail. A few of the conflicts are rooted in chemistry and I make a special effort to cover those. An example of this is the issue of radiometric dating. Nuclear reactions are covered in Principles of Chemistry and chemical analysis (I would argue that radiochemistry in both its medical and geological uses is a form of chemical analysis) is the topic of Analytical

Chemistry. I teach both of these courses and make a point of describing the various methods of dating to my students, emphasizing the chemistry involved and the assumptions behind each method, with this leading into a discussion of the reliability, or lack thereof, for each method. In Analytical Chemistry, I discuss in greater detail the instrumentation involved in this analysis and how the data would be treated. By exposing my students to the science involved in radiometric dating in some depth, I hope to prepare them to tackle the issue as a real scientific question where further research is needed, not just as another area where “science” and the Bible disagree.

My efforts to help my students begin to integrate their knowledge of scripture and the Christian life with their knowledge of science extend beyond just the lectures. Every class I have taught so far at Cedarville has involved some assignment with that goal as well. I have currently settled on using one type of assignment for my Analytical Chemistry course and a slightly different one for my Principles of Chemistry and Principles of Physical Science courses. In Analytical chemistry I assign the students a six to eight page research paper. The paper can cover any area of current controversy on which the discipline of chemistry has some bearing. The student’s assignment is to fairly report the position of both sides in the debate they choose, accurately describe what information science has provided that affects the debate, and then give a Christian perspective on the debate. For my lower level courses, I am requiring that the students take part in online discussions forums. In the forums, I lay out several issues involving science or research in general and then let the students discuss them. Each student must post comments several times during the semester and at least half of their comments must be backed up by facts from outside sources (which must be properly referenced). Some topics I have given them to discuss are: the debate over the origin of life on earth by special creation or evolution, the propriety of using information gained by unethical means (I usually start this by discussing medical data originating from experiments in concentration camps, then ask the students to apply the principles they elucidate from that debate to the issue of fetal stem cell research), and whether there are some areas that a Christian’s faith would prevent them from researching. I believe that this assignment forces the students to begin thinking about issues related to science with the conscious employment of a biblical worldview.

To summarize my position, I think it is very possible to integrate the Christian faith into all areas of our lives, including the practice of a physical science such as chemistry. The key to this integration is to recognize that all truth originates with God and therefore there is no separate “scientific truth” and “Christian truth”. This attitude will permit the redeemed scientist to let his faith strengthen his research and his research strengthen his faith. As a scientist I seek to apply this attitude to my own life and as an educator I desire to instill it in my students.

Works Cited

1. Hasker, W. *Christian Scholar's Review*, **1992**, XXI (3), 231
2. Holmes, A. *Perspectives*, 1993
3. Keynes, J. M. *Essays in Biography*, pp.311, 313-314 Cited in Percy, N. R.; Thaxton, C. B. *The Soul of Science: Christian Faith and Natural Philosophy*; Crossway Books: Wheaton, IL, 1994, pp 72
4. Kaiser, C. *Creation and the History of Science*; Eerdmans: Grand Rapids, MI, 1991, pp. 127 Cited in Percy, pp. 23
5. Percy, pp. 21-37
6. Ratzsch, D. *Science and its Limits: The Natural Sciences in Christian Perspective*; InterVarsity Press: Downers Grove, IL, 2000, pp 136-137
7. Cobb, C.; Goldwhite, H. *Creations of Fire: Chemistry's Lively History from Alchemy to the Atomic Age*; Plenum Press: New York, N. Y, 1995, pp.24-25
8. Percy, pp. 37-40
9. Percy, pp. 22-24
10. Calvin, M. *Chemical Evolution*; Clarendon Press: Oxford, UK, 1969, pp. 258 cited in Percy, pp.25
11. Anderson, C. B. *Science*, **1999**, 286, 907
12. Raman, V. V., *Zygon*, **2001**, 36 (3), 541
13. Krauskopf, K. B.; Beiser, A.; *The Physical Universe 5th ed.*, McGraw Hill: New York, NY, 2002, pp. 6
14. Beardsley, T., *Scientific American*, **1998**, 278 (2), 28
15. Larson, E. J.; Witham, L., *Scientific American*, **1999**, 281 (3), 88
16. Gould, S. J., *Natural History*, **1997** , 106, 16
17. Colson, C.; Percy, N.; *How Now Shall We Live*; Tyndale House Publishers , Inc.: Wheaton, IL, 1999, pp. 420
18. Dawkins, R., *Free Enquiry Magazine*, **1998**, 18 (2)

-
19. Johnson, P. E. *Darwin on Trial*; InterVarsity Press: Downers Grove, IL, 1993, pp. 116
 20. Simpson, G. G., *The Meaning of Evolution*, 1967, pp. 344-345 cited in Johnson, pp.116
 - 21 Kuhn, T. *The Structure of Scientific Revolutions*, 2nd edition; The University of Chicago Press: Chicago, IL, 1970.
 - 22 Kuhn, pp. 144-159
 23. Johnson, pp.114
 24. Dickerson, R., *Journal of Molecular Evolution*, **1992**, 34, 277 cited in Behe, M. J. *Darwin's Black Box: The Biochemical Challenge to Evolution*; Simon & Schuster, Inc.: New York, NY, 1996, pp. 238
 - 25.Ratzsch, pp.100-109
 - 26 Kuhn, pp. 170-171
 27. Brand, L. *Faith, Reason, and Earth History: A Paradigm of Earth and Biological Origins by Intelligent Design*; Andrews University Press: Berrein Springs, MI, 1997, pp. 299
 28. Humphreys, D. R., "Accelerated Nuclear Decay: A Viable Hypothesis?" in *Radioisotopes and the Age of the Earth: A Young-Earth Creationist Research Initiative*, Vardiman, L.; Snelling, A. A.; Chaffin, E. F. ed., Institute for Creation Research: El Cajon, CA, 2000, pp. 333-379
 29. Kuhn, pp. 147-150
 30. Brand, pp. 90-91
 31. Boyd, S. W., "Statistical Determination of the Genre in Biblical Hebrew: Evidence for a Historical Reading of Genesis 1:1-2:3" in *Radioisotopes and the Age of the Earth Volume II: Results*. L. Vardiman, A. A. Snelling, and E. F. Chaffin, eds. Institute for Creation Research, El Cajon, CA, 2005, p. 631-734
 32. Vardiman, L., "Introduction" in *Radioisotopes and the Age of the Earth: A Young-Earth Creationist Research Initiative*, Vardiman, L.; Snelling, A. A.; Chaffin, E. F. ed., Institute for Creation Research: El Cajon, CA, 2000, pp. 1-25
 33. Austin, S. A., "Mineral Isochron Method Applied as a Test of the Assumptins of Radioisotope Dating" in *Radioisotopes and the Age of the Earth: A Young-Earth*

Creationist Research Initiative, Vardiman, L.; Snelling, A. A.; Chaffin, E. F. ed., Institute for Creation Research: El Cajon, CA, 2000, pp. 95-121

34. Chaffin, E. F. "Theoretical Mechanisms of Accelerated Radioactive Decay" in *Radioisotopes and the Age of the Earth: A Young-Earth Creationist Research Initiative*, Vardiman, L.; Snelling, A. A.; Chaffin, E. F. ed., Institute for Creation Research: El Cajon, CA, 2000, pp. 305-331

35. Schuster, P. F.; Krabbenhoft, D. P.; Naftz, D. L.; Cecil, L. D.; Olson, M. L.; Dewild, J. F.; Susong, D. D.; Green, J. R.; Aboot, M. L. *Environ. Sci. Technol.* **2002**, 36, 2303.

36. Morris, H. *Scientific Creationsim*, 2nd ed., Master Books: Green Forest, AR, 1985, pp. 107-109

37. United States Geological Survey "Mercury Studies in the Florida Everglades" sofia.usgs.gov/publications/fs/166-96/printfood.html **2002**.

38. United States Environmental Protection Agency, "EPA to Regulate Mercury and Other Air Toxics Emmissions from Coal- and Oil-Fired Power Plants", www.epa.gov/ttn/oarpg/t3/fact_sheets/fs_util.pdf **2000**.

39. Lavergren, U. *The EES Bulletin*, **2005**, 3, 18.

40. Yudovitch, Y. E.; Ketris, M. P., *Int. J. Coal Geol.*, **2005**, 62, 107.

41. Comments by Dr. Terry Phipps have helped to shape my thinking in this area.

42. Silvius, J. *Christianity Today*, **2001**, 45 (8), 93

43. Vogt, R. R.; Nieuwland, J. A. *J. Am. Chem. Soc.* **1921**, 43, 2071.

44. Malm, O. *Environ. Res. A*, **1998**, 77, 73.

45. Pirrone, N.; Allegrini, I.; Keeler, G. J.; Nriagu, J. O.; Rossmann, R.; Robbins, J. A. *Atmosph. Env.* **1998**, 32, 929.

46. Charlton, D. S.; Harju, J. A.; Stepan, D. J.; Khunel, V.; Schmit, C. R.; Butler, R. D.; Henke, K. R.; Beaver, F. W.; Evans, J. M. In *Mercury Pollution: Integration and Synthesis*; Watras, C. J., Huckabee, J. W., Eds.; Lewis, Boca Raton, FL: Monterey, CA, 1992; pp 595-600.

47. Murphy, E. A.; Aucott, M. A. *J. Soil. Contam.* **1999**, 8, 131.

48. Colson, pp. 132