

## **The Integration of Faith and Science**

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Faith and science—can they live in the same house? There are many who say that scholars, especially scientists, must leave all religious influences out of their scholarly pursuits because to do otherwise would compromise the search for truth. Even many Christians are nervous about attempts to find a harmony between Scripture and science. Is this concern justified? This depends partly on how we understand the nature of inspiration and partly on our understanding of the scientific data.

I am well aware of the diversity of views on the nature of inspiration and of the variation in degree of confidence in the history of life given in Genesis. Even in some seemingly conservative Christian circles there seems to be the conviction that we can only be worthy scholars if we move away from acceptance of Bible history as describing literal events, such as the six-day creation and perhaps even a literal second coming. However, the approach I will take in this paper is based on an understanding of inspiration well summarized by E. G. White: “The language of the Bible should be explained according to its obvious meaning, unless a symbol or figure is employed” (GC 599). “It [the Bible] was designed for the common people, and the interpretation given by the common people, when aided by the Holy Spirit, accords best with the truth as it is in Jesus (5T 331). “A sense of the power and wisdom of God, and of our inability to comprehend His greatness, should inspire us with humility, and we should open His word, as we would enter His presence, with holy awe. When we come to the Bible, reason must acknowledge an authority superior to itself, and heart and intellect must bow before the great I AM” (SC 110).

This approach accepts the events described in the Bible as actual historical happenings, including creation in seven literal days, a global flood, Jesus’ miracles, and God’s literal communication of ideas and facts to at least some Bible writers, such as Moses, Daniel, Paul, and John (not through verbal inspiration, but communication of thoughts). This approach must be used with wisdom, prayer, and careful thought, or it can lead to such simplistic ideas as the common

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fundamentalist belief in verbal inspiration of Scripture (which some SDAs have also tried to apply to E. G. White).

I have both spiritual reasons (which I will not discuss here) and scholarly reasons for taking this position, arguing that biblical insights can open our eyes to new insights in science (Brand 1997). The God of the Bible is the greatest scholar of all time, and Scripture deals in the highest levels of scholarship, not just in comforting inspirational themes. (When God arranged to have Genesis written, He knew vastly more about radiometric dating than we will ever know.)

The application of this concept can be valuable not only in biology but even in what may seem like the most unlikely disciplines—paleontology and geology. My own area of training and research is in evolutionary biology and paleontology, and I will discuss the integration of faith and science mainly in these fields. I will not attempt in this paper to defend my conservative view of biblical interpretation, but will only discuss the application of that concept in integrating faith and scholarship. Scholarly thinking based on confidence in a high view of scripture does not need to be inferior to more liberal scholarship, and in fact can give us advantages. We benefit from insights from the Creator of the universe—insights that others ignore.

#### **Challenges to Be Overcome**

The attempt to integrate faith and scholarship introduces a tension. Can religion interject a bias into our scholarly search for truth? The answer, clearly, is yes: it can introduce a bias. Some conservative Christians believe dinosaurs never existed, even though numerous dinosaur skeletons have been found, and they think this opinion is based on the Bible. One suggested solution is to leave the Bible out of our scholarly pursuits, so religious biases will not trouble us and we can be more objective. An episode in the history of geology illustrates the shallowness of that solution.

The pioneering geologist Charles Lyell wrote a book (Lyell 1830-1833) that defined the field of geology for over a hundred years. Lyell rejected all the catastrophist geological interpretations common in his day and replaced them with the theory that all geological processes occurred very slowly and gradually over eons of time (gradualism). Historical analysis of Lyell's work has concluded that the catastrophists were the more unbiased scientists, while Lyell imposed a culturally derived theory upon the data (Gould 1984). Gould and others are not agreeing with the biblical views of some of the early geologists, but they have concluded that Lyell's colleagues were more careful observers than Lyell, and their catastrophist views were realistic interpretations of the data.

Lyell's strictly gradualistic theory was very bad for geology, because it closed geologists' minds to any interpretations that suggested rapid, catastrophic geologic processes (Gould 1965; Valentine 1966). The authors just cited still prefer to explain geology in a "millions of years" scenario, but they recognize the evidence that many sedimentary deposits are catastrophic in nature. Now

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that Lyell's serious bias has been recognized and at least partially abandoned, the minds of geologists have been opened to recognize more evidence for catastrophic processes. That evidence was there in the rocks before, but was not recognized because of Lyell's bias. If the prevailing paradigm says it isn't true, it will probably not be noticed.

This episode reveals that bias is not a religious problem. It's a problem that we all have to contend with, no matter what philosophy we adopt. Biases such as these can persist because of the inadequacy of our information on complex topics, and a continued search for new evidence can help to reveal them, *if we have the right state of mind to notice them*. The idea that religion introduces biases, but scholarship that leaves religion aside is objective, is naive (Plantinga 1997). It is true that we often read our pet ideas into the Bible, between the lines, and misunderstand how to relate Scripture to nature. But those who do not take Scripture seriously have their own problems with other biases, and these are no less significant than the biases that can result from religion.

Testing a theory is easier in some fields than in others. Questions about whether faith and science can productively interact may seem almost irrelevant to those in biochemistry or physiology or engineering, because there is no conflict between their faith and their science. Another consideration is that those disciplines work with currently active biological, chemical, and physical processes, while paleontology, geology, and parts of evolutionary biology study historical events which we cannot observe, but must try to reconstruct from the meager evidence they have left behind. These disciplines, as practiced by most professionals, are heavily dependent on certain assumptions—especially the worldview of millions of years of evolutionary history without any Divine intervention. This naturalistic worldview can introduce extremely pervasive biases into scientific inquiry.

Nevertheless, the nervousness of Christian thought leaders about the idea of seeking a relationship between science and religion cannot be lightly brushed aside. It could arise for several reasons, and any method for integrating faith and science must have an answer for these (Brand 2000a & b). In addition to the possibility of bias addressed above, the issues most relevant here are 1) the possibility that if we try to integrate our science and our faith, science may disprove our belief system, and 2) religious explanations (“God did it”) may seem to answer all questions and thus discourage scientific investigation.

**An Approach to Relating Faith and Science that Doesn't Work**

One response to this challenge that some find attractive is to simply keep science and faith separate (e.g., Gould 1999). This method can work fine in many disciplines that do not deal with the history of life or of the earth, because Scripture may not speak to the issues those disciplines address. As I have observed the results of this approach as used by people I know (and by Stephen Gould), it is evident to me that when they begin to study earth history, where the

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Bible and science sometimes say opposite things, they in reality switch to a different approach. They then either take Scripture as more reliable than historical science, or they go the other direction and decide that science gives us facts, and Scripture only provides the spiritual meaning of those facts. This latter approach leaves me with one nagging question. If God can't keep His facts straight, or at least doesn't know how or doesn't bother to communicate them to us, why should I care what He has to say about spiritual meanings? Why should I trust what He has to say? This can be expressed as a strictly scholarly question: if a book claims to speak for some individual, and much of what the book says is mythical or just not true, is there reason to believe the rest of the book or to trust the person behind the book? There must be a better answer to the problem of relating faith and science.

Perhaps then we should just solve the problem by being sure to keep an open mind as we pursue our scholarly study. That is a worthy goal, but as our discussion of Lyell's theory suggests, we often don't have nearly enough facts to know what a truly open mind would be thinking. This is truer in geology, paleontology, and evolutionary science than is commonly recognized.

**A Productive Approach to Relating Faith and Science**

Another solution is to know God as a personal friend, learn to trust His Word, and use it to assist us in our scholarly thinking. Meanwhile, if we interact with other scholars with various views, that interaction can help us avoid simplistic attempts to relate Scripture to the natural world. There are many creationists who write books or pamphlets on evolution or geology that are clearly an embarrassment even to a conservative Christian who is informed on these subjects. It may be that the problem isn't their use of biblical concepts, but a lack of scientific knowledge, combined with a lack of peer review of their ideas.

This, I believe, leads us to an approach that is tried and proven (Brand 1997, ch. 5-6), using the following steps: 1) Allow new scientific findings to challenge our interpretation of Scripture, and vice versa (Fig. 1); 2) actively search for and utilize insights from Scripture pertinent to our discipline, allowing these to help us devise hypotheses that can be tested with the methods of science, especially in areas of seeming conflict between science and Scripture (Moreland 1994, ch. 1); 3) be aware of the work and thinking of those who have a different world view; 4) whenever feasible, submit our work for publication and peer review; and 5) become friends with those in a different world view, and perhaps even do collaborative work with them. This requires the confidence and independence of thought to not accept whatever our collaborators think, while maintaining a constructive dialogue that can reduce the likelihood of superficial thinking.

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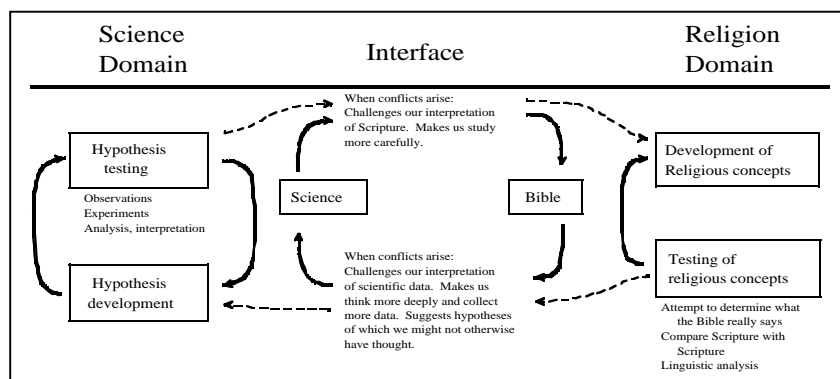


Figure 1. A working relationship between science and religion. The methods of science are used in science, but not to test religious ideas, and vice versa. The interface is a thought process where each domain is allowed to challenge the other and cause us to think more carefully about both science and religion. This process will encourage, not discourage, continuing research. (from Brand 1997)

**Scientific Challenges to Scripture and Scriptural Challenges to Science**

Progress in the integration of faith and science often begins with a new scientific finding that challenges our understanding of Scripture. At that point we may be tempted to bar the doors against all new ideas and defend our personal beliefs against all challenges. A more constructive answer to the challenge (Fig. 1) is to use the methods of science to pursue the challenging area (science domain), while using the methods in the religion domain to dig deeper in Scripture to determine if it actually says what we thought it says. As we do this, it may become evident that Scripture surely does disagree with accepted scientific interpretations, thus challenging us to think of new hypotheses that can explain the scientific data. This method differs from Gould’s method (Gould 1999), because it maintains a continuous mental interaction between the religion and science domains, as they each challenge the other to more careful thought. Another difference from Gould is that in my approach Scripture contributes not just pleasant pastoral counsel, but also truths about events of earth history.

This approach does not discourage research, but can stimulate more careful research in both science and religion. In this process Scripture can suggest hypotheses to be tested by the methods of science. For example, the biblical framework predicts that the fossil-rich portion of the geological record formed in a much shorter time frame than most geologists think. This can be translated into specific testable scientific hypotheses about individual rock formations.

This may sound good on paper, but do we have evidence that it can truly work? In the examples below, I will show that the process does work, has stimulated productive scientific research, and has also resulted in responsible reevaluation of some interpretations of Scripture. One common belief held by

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many conservative Christians about geological history is now revealed as a strictly human assumption that is not present in Scripture. We will return to this point later.

**Biblical Anchor Points**

Application of the above described integration process leads me to the following list of earth history concepts (biblical anchor points) that I believe are supported by Scripture:

1. In a literal week of six consecutive, twenty-four hour days, God prepared the earth's surface and created living things (Genesis 1, 2).

2. At the end of that creation week, a complete ecosystem was in place, including invertebrates (creeping things), birds, aquatic animals, mammals (cattle), and plants (Genesis 1). Not much detail is given as to exactly what animals and plants were present, but the list includes some that do not appear until fairly late in the fossil record, like fruit trees (angiosperms) and humans. Thus the list of organisms present at creation week includes both invertebrates and also "higher forms" of life. This indicates that the major life forms were created and did not result from evolution.

3. At some time since the creation there was a catastrophic flood of global proportions.

4. The creation week occurred only a few thousand years ago. There are uncertainties about the completeness of genealogical lists and differences between ancient biblical manuscripts, but although we don't know the exact time span, I conclude that Scripture clearly portrays a short history of life on this earth, measured in thousands, not millions of years. It is evident that many Bible writers accepted the creation, the flood, and the early biblical record of human history as accurate. Many biblical passages make no sense whatever if the fossil record represents millions of years of time.

5. Jesus demonstrated in His miracles that God is very capable of instantaneously creating animal or plant tissue, or in restarting the biochemical processes in tissue that is no longer living. This is demonstrated in the turning of water to wine (John 2:1-10), creating food to feed several thousand people from a handful of fish and bread (Mark 6:30-44, 8:1-10), raising someone who had been dead for several days (John 11:38-44), restoring sight to blind eyes (John 9:1-11), restoring tissue destroyed by leprosy (Luke 17:11-17), and restoring a withered hand (Mark 3:1-6). This shows that God is very capable of creating life as described in Genesis.

6. After sin the biological world began to change (Genesis 3:14-19). Thorns and thistles began to appear, and apparently some large mammals became carnivorous that were not carnivorous before (Isaiah 11:6-9).

From study of E. G. White's writings on this topic (1864, 1890), I add the following items to the list:

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7. A strong reaffirmation of the literal creation week, a few thousand years ago.

8. In connection with the flood, mountains disappeared, new mountains appeared, coal and oil were formed, and in fact the entire crust of the earth was changed.

**Examples of Research Resulting from Biblical Insights**

The following are a few examples—and more could be given—of successful scientific research that used insights from Scripture to suggest new questions to be asked or hypotheses to be tested.

**1. Grand Canyon Geology.** Dr. Arthur Chadwick of Southwestern Adventist University has been studying the Tapeats Sandstone near the bottom of the Grand Canyon. I will not attempt to explain the details of his research in this brief paper, but he and his collaborators found a geological deposit that clearly changes the interpretation of the Tapeats Sandstone in the Grand Canyon area (Kennedy et al. 1997). Others have interpreted the Tapeats Sandstone as an accumulation of sand in shallow water along an ocean shore, with the water level and sand deposit gradually rising along an existing cliff face over eons of time. The findings of Chadwick and Kennedy require accumulation of the sand in deep water, by very different processes from those that would occur in shallow water (these deep water processes possibly were also much more rapid, but that is another issue). They presented their data and conclusions to a professional meeting of geologists, including some who had done much of the previous research on that formation, and these geologists concluded that Chadwick and Kennedy's conclusions were correct. One geologist asked Dr. Chadwick afterwards why he had seen these things that other geologists have missed? The answer is that our worldview prompts us to ask questions that others are not asking, to question conclusions that others take for granted, and it opens our eyes to see things that are likely to be overlooked by a geologist working within a conventional naturalistic scientific theory. The questions a scholar asks have a strong controlling influence on what features of rocks or fossils will catch their attention, for example, and what data they will collect.

Careful scientists who allow Bible history to inform their science will not use a different scientific method from the method used by other scientists. When we are at a rock outcrop we all use the same scientific method, the types of data potentially available to us are the same, and we use the same scientific instruments and logical processes to analyze data. The differences are in 1) the questions we tend to ask, 2) the range of hypotheses we are willing to consider, and 3) which of the potential types of data are likely to catch our attention.

If we start from what we believe to be a more correct beginning point (like starting with divinely revealed history), that starting point does not guarantee that the hypotheses we develop will be correct, since God has not given us that much detail. It just initiates a search in a particular direction, and we may need

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to make a number of course corrections (based on scientific data) before we find the right answer. The advantage in beginning from a more correct starting point is that it can greatly speed up the process by eliminating gross errors in our interpretations. A God who has witnessed all of earth history can give us insights about history that would be difficult or impossible for us to discover by science alone, at least in a time frame consistent with the human life span. My point is that if we trust Divine insights, they can help us improve our progress in some areas of science by opening our eyes to things we would otherwise be much less likely to see.

**2. Fossil Whales of the Miocene/Pliocene Pisco Formation of Peru.** A few years ago I first visited the Pisco Formation in Peru, a diatomite deposit containing numerous well preserved fossilized whales. Microscopic diatoms are organisms that float near the surface of lakes and oceans. Upon death their silica skeletons sink, and in modern oceans they form accumulations of diatomite a few centimeters thick in a thousand years. It is assumed that ancient (fossil) diatomite deposits formed at the same slow rate—a few centimeters per thousand years.

There are publications in scientific research journals on the geology of the Pisco Formation and on the systematics and evolution of the whales. But apparently no one has previously asked how it can be that sediment accumulating at the slow rate of a few centimeters per thousand years can contain complete, well-preserved whales, which would seem to require rapid burial for their preservation. This was another case in which our worldview opened our eyes to see things that others have not noticed. This was an opportunity to test whether my working hypothesis (derived initially from Scripture) of a shortened geological time scale could be applied to the Pisco Formation. Such slow diatom accumulation does not seem compatible with well-preserved whales, and further research could evaluate this. Our research there during three summers, with graduate student Raul Esperante and other geologists and paleontologists, has indicated that the whale carcasses were not in any type of special situation that could favor preservation of animals over extended time periods before burial. Our evidence points to rapid burial, probably within a few weeks or months for any given whale, or a few years at an extreme maximum, and suggests some processes that can help to explain how ancient diatomites may have accumulated much more rapidly than is usually assumed. Other scientists are studying decay and disarticulation of modern whale carcasses on the ocean floor, and their data provide information on the timing of decay and disarticulation of modern whales.

In this research we presented papers at the annual meetings of the Geological Society of America (Esperante-Caamano et al. 1999, 2000), interacting with other scientists who deal with these phenomena, and have published one article (Esperante-Caamano et al. 2002), and more manuscripts are in preparation. The best scientists in the field have opportunity to evaluate our work and will be



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eager to point out our mistakes. That is a powerful incentive to keep us from being careless. Of course we do not discuss biblical insights at the geology meetings or in our publications, as that would not be appropriate. We discuss scientific work only, and if the data support our conclusions, our work will stand up to the criticisms of scientific reviewers.

In this research and other similar research projects, I have spent time in the field with, and even collaborated with, other paleontologists and geologists who have a non-creationist worldview. I find there is value in working with someone from a different point of view. I discover things they would probably never even consider, and they notice things I would likely overlook. This can help each of us to not be misled by our inherent biases. The LLU researchers found data that raise serious questions about applying the radiometric time scale to these geologic formations, and these questions exist in other formations as well—there are geological reasons to think there is something wrong with the radiometric time scale. But on the other hand, our findings indicate that the sediment in these formations apparently could not have accumulated in a few weeks or months, and thus it could not have formed in a one-year global flood—it was deposited rapidly, but the sedimentary data are consistent with a time frame of perhaps tens to hundreds of years, not a few weeks or months. We will come back to this point later.

**3. Fossil Vertebrate Trackways in the Permian Coconino Sandstone, Northern Arizona.** The Coconino Sandstone is generally interpreted as a deposit of wind-blown desert sand, and its only fossils, vertebrate trackways, have been considered supporting evidence of this interpretation. Because I wondered how this desert interpretation could fit into a biblical earth history model, and because of superficialities in previous research on the fossil trackways, I have been doing research on these tracks for some years (Brand 1979, 1983, 1992, 1996; Brand and Tang 1991). At present it is not clear what the ultimate conclusion from this research will be. The trackways have features that seem virtually impossible to explain unless they were made with the animals completely underwater, while the sedimentary evidence, as interpreted by sedimentologists, seems to point to wind-blown sand. This seeming contradiction indicates there are some unknown pieces of the puzzle that remain to be discovered. When these pieces are found they may provide new insights into processes of sand deposition or new insights into how trackways are made under unique conditions. Whatever the outcome will be, our understanding of the Coconino Sandstone and its fossil tracks will be on a stronger footing (no pun intended) because of my questioning of the accepted interpretation of these tracks. We will then know what course corrections are needed in sedimentological interpretations of cross-bedded sand deposits or in our understanding of some extra-biblical details of earth history.

**4. Biological Origins and Intelligent Design.** The application of naturalism to the origin of life and of the diversity of organisms is being challenged by

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scholars in the Intelligent Design movement, led by Phillip Johnson and others (Behe 1996; Dembski 1998, 1999, 2002; Moreland 1989, 1994; Johnson 1991, 1995, 1997). There is much opportunity for significant scholarly work in this area. Darwinian theory is very successful in explaining biological change in species or subspecies of organisms, but quite unsuccessful in accounting for the origin of larger novelties like the origin of life or new classes or phyla of plants or animals. It is time for a different approach to have a hearing. If science is going to be an openminded search for truth, it cannot arbitrarily exclude some hypotheses. Advances in molecular biology make it increasingly difficult to justify excluding the hypothesis that life requires an intelligent inventor—that idea at least must be open for candid discussion. Phillip Johnson is probably right in his conviction that our primary task is to get the philosophy of naturalism onto the table for open discussion. If naturalism can be openly discussed and challenged, its weaknesses and arbitrariness will become evident.

Behe (1996) has been applying the hypothesis of intelligent design in his study of molecular biology. He finds biomolecular structures (biomolecular machines) that seem to require construction and assembly of several complex parts before they can work at all (irreducible complexity), just like a mousetrap must have all its parts before it will work. He presents this as evidence requiring a designer, since natural selection will only work in evolving complex structures if it can gradually “invent” one part at a time. Others attempt to challenge Behe’s conclusions, but his work is like other scientific research programs—his initial attempt is unlikely to once and for all disprove the opposing view. We can now all watch the interaction between different viewpoints as they pursue research attempting to support or disprove the implications of biomolecular complexity for intelligent design.

#### **Implications for Science and for Faith**

These are just a few examples of what must certainly be a wide field of opportunities for constructive integration of religious insights and scholarly work. Wolfe (2000) concluded an article on intellectual contributions by Christians by stating, “There are not, and in all likelihood there never will be, similar developments (a serious intellectual contribution by conservative Christians) in the natural sciences.” If that prediction can be proved wrong, science as well as religion will benefit.

How scientists get their ideas cannot be analyzed objectively and is irrelevant to the scientific process (Cromer 1993, 148; Popper 1959, 31, 32). No matter where their ideas come from (even from the Bible), those ideas and hypotheses are valid science if they can be tested against data. Science, of course, has nothing to contribute to evaluating much of the content of Scripture. Whether Jesus actually changed water to wine or bodily raised Lazarus from the dead is beyond scientific scrutiny. Many scholars will claim it is very unscientific to believe such things, but that conclusion is based solely on untested and

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untestable philosophical assumptions (biases), and in reality has nothing to do with science. What experiment would you do to test those biblical miracles? Unless science can conduct such a test, science cannot properly claim to have anything to say about such matters.

When a biblical worldview can suggest testable hypotheses, those are valid contributions to science. This claim is supported by the examples from geology and paleontology given above and from personal experience or the work of close friends. Other examples could be given. It is also interesting to see certain general trends in the geological sciences and in biology that are going in the direction predicted by a conservative reading of Scripture. Examples would be the trend of increasing recognition of catastrophic processes in geology and the growing number of voices who doubt that Darwinian processes can produce life from non-living material or can produce major new life forms. The latter example still involves a minority of individuals (a well-entrenched theory like abiogenesis or Darwinian macroevolution dies hard), but growing knowledge of the intricacies of molecular mechanisms in living cells makes belief in a naturalistic origin of life forms increasingly difficult, and the usual lack of fossil intermediates between phyla and classes of organisms compounds the difficulty.

A point made earlier needs to be emphasized: the research cited above does not use a different scientific process from that used by other scientists. We have access to the same types of data, we use the same observation techniques and laboratory instruments for analyzing rock or fossil samples. Everyone uses X-ray diffraction (XRD) to identify minerals and scanning electron microscopy or polarized light microscopy for close examination of rocks and small fossils. We use the same type of logic in deriving conclusions from data.

So what is different? The differences are in 1) the questions that we tend to ask, 2) the types of hypotheses we are willing to consider, and 3) which of the potential types of data are likely to catch our attention. Biblical insights indicate there are important scientific discoveries to be made if we ask questions about, for example, how much time it really took to form various rock formations with their fossil deposits, instead of assuming the standard geological time scale is correct.

The research examples described above all resulted in new scientific insights because we allowed biblical insights to open our minds to see things that had previously not been noticed. This gives us reason to believe there are many more such discoveries awaiting the biology or earth science researcher who uses this approach. This also gives us reason to be skeptical about judging the book of Genesis on the basis of current scientific interpretations.

#### **The Other Side of the Coin**

Earlier I stated that being aware of the thinking of those who disagree with us and collaborating with such persons can help us notice things that we would otherwise be likely to overlook in religion as well as in science. Geological

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study, as in the examples cited above, has made some of us aware of conflicts on both ends of the spectrum of geological interpretations. There are many situations in which it is difficult to reconcile the actual data in the rocks and fossils with millions of years of geological time. That theory fits well in a general way, but problems arise when we give careful attention to detail. The devil is in the details!

On the other hand it is equally difficult to see how the details of many deposits can be reconciled with the theory that most of the geological record was produced in a one-year flood (the devil is still in the details). This has led to our recognition that most theories of “flood geology” over the last hundred years, attempting to explain how the flood formed the rocks and fossils, have made one big assumption that is not found in the Bible (or in E. G. White). That is the assumption that most of the geological record was produced in the one-year Genesis flood (perhaps with some forming after the flood, as catastrophic conditions gradually settled down to the more stable conditions of today), with no geological processes forming rocks and fossils between creation and the flood. Genesis tells us that there was a creation week and a flood that heavily impacted life on earth, but it does not tell us what parts of the geological record formed during that event (and I am speaking only of the fossil-rich part of the geological record—the origin of the earth and of the universe is a different question altogether). All of our explanations of such things are extra-biblical theories.

Perhaps the Phanerozoic portion of the geological record began forming in ocean basins or lowland areas after sin, and continued before, during, and after the flood. If the geological record, from Cambrian to the present, took several thousand years to form instead of much of it forming in one year, that is a very different type of geological challenge—orders of magnitude different, from trying to put it all in one year. The rocks and fossils seem to indicate a genuine series of consecutive events that took some time, but there is also evidence of much catastrophe and rapid sedimentary processes. The choice is not only between 1) the geological record forming in one year, or 2) 540 million years for the geological column with its fossil record of complex organisms. There are other options that need to be considered, and I predict that allowing Scripture as well as science to open our eyes to things that others overlook will continue to lead to productive science as we search for answers to the big questions about origins. This type of interaction between science and Scripture can yield insights in other fields as well.

### **Living with Unanswered Questions**

As we pursue research aimed at answering the give and take of challenges between science and religion we will continue to live with many unanswered questions (and so do those who do not accept Scripture, if they honestly face the conflicts between data and theory). It is not realistic to think science will prove or disprove either creation or the flood. Christians have trusted too much in sci-

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ence to prove these events from the distant past; we did not observe them, and science can investigate hypotheses about such ancient historical events, but not provide proof. God has also given us evidence on which to base faith, but not proof. If we had proof we would probably be much too arrogant anyway!

Our faith cannot be based on science, but must be based on knowing Jesus and learning to trust Him, even when we have questions without answers. He knows much more than we do about earth history, and if we know Him and trust His Word we can benefit from the insights in Scripture. All will at some point decide (consciously or unconsciously) which worldview they will accept and live by. We can't be continuously evaluating all beliefs, but if we maintain a constructive interaction between science and faith (Fig. 1), we can test whether our faith is based on Scripture or on our personal biases.

While we depend on our faith, it will not be helpful to ignore science. Even though we experience conflict between our interpretations of Scripture and our interpretations of science, the two sources will not ultimately contradict each other. Willingness to learn from science, understanding science's limits (Ratzsch 2000), and a commitment to the highest quality of science are important complements to our faith. Elton Trueblood (1958, 170) set an inspiring objective before us when he stated that "the religious scientist has more reason to be careful of his evidence than has the nonreligious scientist, because he is handling what is intrinsically sacred. Shoddiness, for him, is something to spurn because it is a form of blasphemy."

One who accepts the Bible as a reliable record of events is not hampered by that worldview, as many would claim, but actually has an advantage. Most scientists are only familiar with one basic understanding of earth history and do not actively ask critical questions of their paradigm. That is not true of a scientist who accepts Bible history and is also active in the biological or earth sciences. He/she cannot escape becoming knowledgeable about the prevailing theories of earth history, as well as his/her own, and thus is constantly evaluating the options. What we want to know is truth. We don't need to be afraid of data, but there is also no virtue in naively accepting whatever interpretations of the data conventional science gives us, including a liberal interpretation of Scripture that is ultimately dependent on the prevailing scientific theory of the history of life in contrast to the Genesis account.

#### **Answers to Challenges**

Earlier I introduced three concerns about the effort to integrate faith and science that must be answered by any valid integration method. First is the concern that if we try to integrate faith and science, we expose our belief system to possibly being disproven by science. But are we really afraid of that? If we believe something that is false, wouldn't we want to know that? And are we so unsure of our Christian beliefs that we are afraid they will be disproved? We may believe some things that are not truly biblical—such as the assumption that

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all geological formations must be explained by the one-year flood. If we hold such non-biblical beliefs, it is better to find out. On the other hand, truly God-given truths will not be disproved.

It is important to understand that science is a human activity, all scientific interpretations are subject to correction and change, and a willingness to readily abandon basic religious beliefs because of science will not be constructive. We may at times need to hold on to our spiritual commitments in spite of unresolved conflicts and wait for more evidence. Non-religious scientists must do that frequently—trust that data yet to be discovered will provide better answers. A balanced approach will be willing to learn from science, but not be over-awed by it.

The second concern is that religious answers (God did it) will discourage research. The discussion above illustrates that the method for integrating faith and science outlined in Fig. 1 and in the research examples does not discourage research, but in fact stimulates more careful research in both science and in religion, yielding insights and hypotheses that can benefit research in both domains.

The third concern is the possible introduction of bias into science by the effort to integrate faith and science. The answer is that any philosophical approach can introduce biases. Avoiding integration is not an answer and just introduces its own serious biases. The integration method described here encourages both science and religion to constantly challenge each other, raising our awareness of possible biases. The other important antidote to superficial thinking and biases is awareness of the thinking of others and working with those who disagree with us. We will each see things that the other is likely to miss, and this acts as an important quality control process.

#### **Summary**

Religion can introduce biases into our science, but so can any other philosophical approach. The answer is to be aware of the problem, consciously analyze our thinking to try to see if we are not being objective, and communicate with others regarding our ideas and take seriously their criticisms. That doesn't mean we will always agree with our critics, but we can evaluate whether their criticisms are based on good evidence or just on their personal opinions. Awareness of different points of view on an issue generally improves our ability to reach a defensible conclusion. The reverse of this is also true—if we *do not* seek to integrate science and faith it is unlikely that we will adequately understand the areas where science and religion seem to be in conflict. If we do not put forth serious effort, including original field and laboratory research, to challenge conventional thinking and develop a positive synthesis of science and faith, we are likely to accept conventional thinking without knowing whether or not it is based on a solid foundation.

The effort to integrate our faith and science will work best if we: 1) Allow new scientific findings to challenge our interpretation of Scripture, and vice

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versa; 2) develop and carefully evaluate our biblical anchor points; 3) utilize insights from Scripture to open our minds to ask new questions, open our eyes to see things that others don't see, and devise hypotheses that can be scientifically tested, especially in areas of seeming conflict between science and Scripture; 4) be aware of the work and thinking of those who have a different worldview; 5) use the scholarly methods of quality control whenever feasible—publication in scholarly journals and working with friends whose worldview differs from ours; and 6) above all, remember that none of this is important unless we maintain our personal friendship and trust in the greatest and most knowledgeable biologist and geologist of all time—Jesus Christ.

In every case where the approach I have described has been diligently pursued, with biblically motivated questions, we have made progress in our attempts to reconcile Genesis and geology.

The church in the Middle Ages accepted Greek science and made aspects of it, like the geocentric universe, part of its belief system. Then Copernicus and Galileo changed what science understood about nature, and the church was left behind, with some beliefs based on out-of-date science. If we adjust our theology to fit today's science, I predict that in time new scientific discoveries will change the picture, and we will be left wondering what happened.

This prediction doesn't result from naivety on my part about the scientific data. I am well aware of the data and am aware that my view of earth history requires the prediction of major new discoveries that would change such things as our understanding of dating methods, including radiometric dates.

Some may predict that my approach will fail. Or, they may predict that this type of feedback between faith and science will lead me gradually down the slippery slope to belief in the evolution of life over 540 million years. The reason why that won't happen is because of my confidence in the biblical anchor points and my belief that the God of Genesis knows much more about earth science than any of us will ever know.

We will continue to live with many unanswered questions. Faith cannot be based on science, but on knowing and trusting Jesus. It will also not be wise to ignore science or do sloppy science.

Just reading the geological literature and taking field trips to look at the rocks will not give us reliable answers. We will not discover geological truth unless we are immersed in original geological research and publishing and actively using biblical insights to challenge accepted wisdom with the highest quality of research.

Why do we put our time and energy into this work? If a friend gives us some clues to the location of a buried treasure, will we search for the treasure? The answer will depend on how much confidence we have in that friend. If a Friend gives us clues to the nature of geological history, will we use those clues to help us make discoveries that will improve our understanding of geological history? It depends on how well we know this Friend, and how much we trust

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Him. In this research we are following up leads from a dear Friend who personally loves each of us—loves each of us enough to die to save us, and consequently the search is irresistible!

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