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A Pranalological Approach to Faith-Integration with Students

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*This article is written in response to Russell Howell's "The Matter of Mathematics," an essay intended to describe some of the latest challenges for scholars investigating the relationship between mathematics and the Christian faith.¹ In his essay, Howell asks, "Does faith matter in mathematics?" His answer is "yes" (at least at the metalevel), and he uses the four categories of faith-integration suggested by Arthur Holmes in his book, *The Idea of a Christian College*, as the framework for his thoughts.² Howell supplements these four categories (foundational, worldview, ethical, and attitudinal) with a fifth, the pranalological, a term which he defines. In my response, I suggest a strategy for involving undergraduate students in the conversation about faith and mathematics. After highlighting some of the pitfalls of trying to achieve this goal within the four categories of faith-integration suggested by Holmes, I will argue that the fifth category, the pranalological, has potential to draw students into the conversation.*

My first experience in Christian higher education followed twenty-five years of secular education. After twenty-plus years of training followed by several years of teaching at secular institutions, I was confronted with a concept that was entirely new to me, and the confrontation could not have taken place at a less opportune time. I was being interviewed by a former dean of the college where I am currently employed, and he asked me a question that caught me completely off guard. His question: "What connections do you see between your faith and mathematics?" Today, I do not remember how I answered that question, but I do remember the anxiety I felt as I fumbled my way through an answer. Why was I anxious? Although I had been raised in a Christian family, and had made a personal commitment to Jesus Christ as a young boy, and even though I had spent eleven-plus years being trained as a mathematician and had already taught for two years at two different institutions, I had not put a lot of thought into the relationship between my faith and mathematics.

In regard to my discipline, I thought, as Harry Blamires defined it, "secularly." He said, "To think secularly is to think within a frame of reference bounded by the limits of our life on earth; it is to keep one's calculations rooted in this-worldly criteria."³ This is not to say that when I was confronted with ideas that directly opposed my Christian upbringing that I simply abandoned my biblical convictions and accepted what passed as scientific theory, or even fact, in the secular community. It is to say, however, that when it came to mathematics, recognizing God as the all-knowing, omnipotent Creator of all that exists, and other ideas essential to the Christian—eternity, heaven and hell, sin and forgiveness, and the fallen state of humanity and its need for a savior—did not enter into my thought process. In short, my faith did

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not matter when it came to my understanding of mathematics.

My inability to articulate a mature answer to the dean's question was a direct result of my education. Unfortunately, this applies to many, if not all, Christians who have obtained an education from secular institutions. In contrast to my training, the college at which I currently teach is a Christian college that makes the claim "Christ is preeminent." The mission statement of this college includes the following proclamation:

Our mission is to educate men and women toward maturity of intellect, character and Christian faith in preparation for lives of service, leadership and reconciliation in church and society.⁴

In addition, the department in which I teach, the Information and Mathematical Sciences Department, has its own mission statement which includes the following objective: "to challenge students to live out their faith in their vocation as they become servant-leaders in society, church, and the world."⁵ These statements suggest that both the college and the department for which I teach take seriously the importance of pursuing a career in light of the Christian faith and its teachings. A natural question to ask then concerns how the goals and objectives that are alluded to in these mission statements make their way into the classroom. That is, how are the students in my classroom challenged to "live out their faith in their vocation," or to "become servant-leaders in the world" by the instruction I give them?

It should be noted that we cannot assume that just because the setting is a Christian college with fine-sounding mission statements that this type of learning is actually taking place. In particular, we cannot assume that this type of instruction naturally takes place just because there is a Christian professor at the front of the classroom. In fact, I would suggest that for a professor like me, who has had no formal instruction in this type of thought, the task of challenging students to think about their education and future career in light of the Christian faith is not an easy thing to do. The discipline of mathematics makes this especially hard, because as Howell suggests, if one plays the game of mathematics, one agrees to play by its rules, resulting in a practice that is "world-viewishly" neutral.⁶ The reality is that a teacher who has studied the discipline of mathemat-

ics from a secular perspective for many years is not likely to have thought much about what it means to teach mathematics from a Christian perspective.

In his book, *Faith and Learning on the Edge*, David Claerbaut recounts his experience at a Christian college, an undergraduate institution that claimed to teach its courses from a "Christian perspective." According to Claerbaut, "apparently, that teaching occurred in classes I cut or slept through, because I recall scarcely a single class devoted entirely to providing an overtly Christian perspective from which to view the material studied."⁷ Instead of professors who taught from a Christian perspective, he encountered "rebellious, agnostic students—many of whom had been forced by their parents to attend a Christian college—boldly proclaiming their unbelieving views in dormitory bull sessions."⁸ Claerbaut suggests that his education left him unprepared to answer some of the questions that were raised by these agnostic students. In the end, he says his college education left him "intellectually unarmed, devoid of any ammunition" to confront the examples of unbelief that he encountered even on his Christian college campus.⁹

Before my department had developed a mission statement, the only place in its curriculum that formally attempted to address the idea of faith and learning as it relates to pursuing a career in mathematics was the capstone course for our majors. This meant that our mathematics majors had to wait until their last semester of college before they were required to deal with these issues and the questions they might raise. This is not to say that there were no other opportunities to address faith-related issues, but such issues as discussed in the classroom were usually devotional in nature, and rather intermittently dispersed throughout the curriculum. In many ways then, mathematics majors at my college had a similar experience (at least in terms of their major courses) to the experience Claerbaut had at his college.

If a Christian college does not prepare its students to confront unbelief and also to recognize erroneous beliefs within the academic disciplines, then what is the advantage of a Christian education? Can a Christian college or university expect its graduates to challenge secular thought that contradicts a Christian worldview if it fails to include faith-related topics in its curriculum? The answers to these

questions seem obvious to me and motivate self-examination. How do the stated faith-related goals and objectives implied by the mission statements of my college, school, and department make their way into my classroom? Does the instruction that I offer my students arm them with ammunition not only to confront examples of unbelief that they may encounter, but also to prompt them to ask and seek answers to questions regarding the discipline of mathematics as it relates to their Christian faith?

At this point, I would like to begin to argue why I think that the pranalogical category introduced by Howell is a welcome addition to the categories suggested by Arthur Holmes. In particular, I want to suggest that this category allows mentors to develop a contextual framework that is appropriate to drawing undergraduate students into the conversation regarding faith and mathematics. To do so, I will use the language of *faith-integration* that Howell also uses in his essay. After defining what I mean by faith-integration, I hope to describe an appropriate strategy for faith-integration within the discipline of mathematics and then argue why I think that the pranalogical category is better suited to undergraduate participation than the other categories mentioned by Holmes (and Howell). I will conclude this article with a brief discussion of some of my own work in this area.

William Hasker describes faith-learning integration as “a scholarly project whose goal is to ascertain and to develop integral relationships which exist between the Christian faith and human knowledge, particularly as expressed in the various academic disciplines.”¹⁰ In general, when I use the language of faith-integration, I mean any attempt by both educators and students alike to relate the academic disciplines (not just an individual’s major or specialty) to a biblical worldview. This attempt could be as simple as a devotional that uses a concept or fact within a discipline to illustrate a spiritual truth, or it could be much more complex with the very nature of the discipline itself depending on the faith assumptions that are either held or not held. For the purposes of this article, I am interested in making connections that are deeper than just devotional in nature. However, I need to express a word of caution here. Since the focus of this article is on undergraduate participation in faith-integration, a greater emphasis must be placed on the process of faith-integration rather than any final product that may result.

I agree with Claerbaut who says that initial attempts at faith-integration need not be particularly good.¹¹ This approach is valid because, when attempts at faith-integration are made in the company of fellow scholars, not only will there be the opportunity for constructive criticism, but these very attempts may also stimulate further attempts which are actually better than the original.

A Strategy for Faith-Integration within the Discipline of Mathematics

I grew up learning about God from my parents, pastors, and Sunday school teachers. Among other things, I was taught that God is beyond anything I could imagine. I learned that he is eternal, existing outside of time. I learned that he is omniscient, knowing not only the number of hairs on my head, but also the number of hairs on every head of every human being that ever lived. I also learned that he is omnipresent, present wherever two or three are gathered together in his name. In short, I learned about the infinite nature of God, a concept that is difficult for my finite mind to grasp. Moreover, as I learned about these attributes of God, I was challenged with concepts such as the triune nature of God and paradoxes of the faith such as the “first will be last and the last will be first.”¹² All of these ideas are foundational to my faith, and yet because they are rooted in the infinite nature of God, they are difficult for me to understand.

The concept of infinity is also foundational to my study of mathematics and its inclusion in my studies has proven to have its own difficulties. It was not until I studied calculus as a high school senior that I really began to deal with the concept of infinity in a mathematics classroom. Prior to that, infinity was just an idea, but in my calculus class, I was actually expected to use that idea in my calculations. Limits brought me infinitely close to a point without ever actually getting me there. My study of infinite series taught me how to add up an infinite number of terms, most of the time not finding a sum but only knowing whether the sum was in fact finite. Moreover, as I studied calculus, I learned that certain mathematical properties that I thought to be universally true, such as the commutative property of addition, did

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not necessarily hold true in the realm of the infinite.¹³ All of these ideas were hard to grasp as a high school senior, and even today, after twenty-plus years of teaching the subject, I am still mystified by some of the outcomes that are a result of using the infinite in my calculations.

Because both mathematics and theology seek to describe the infinite, one might ask if there is any relationship between the insights gained from these two different perspectives in the search for truth. Unfortunately, in my case, this question never entered my mind. For me, theology and mathematics were disjoint. I learned about the infinite God in church and through reading my Bible, while I learned about the mathematical concept of infinity in my calculus classes. In my mind, these two manifestations of the infinite were unrelated. I had what Richard Bube would call a “compartmentalized” view of these disciplines.¹⁴ This view holds that mathematics and theology tell us “different kinds of things about different things.”¹⁵ One who holds this view believes that mathematics and theology deal with two totally unrelated aspects of reality and therefore have no common ground. I believe that, practically speaking, most Christian mathematics majors enter college with this compartmentalized view of their faith and the discipline they intend to pursue.

What is the actual relationship between these two representations of the infinite? More importantly, if a compartmentalized view of faith and mathematics produces a limited understanding of truth, how does one move away from it toward a view that more accurately reflects reality? In an attempt to answer these questions, I will use some of the language that is found in the literature to describe the relationship that exists between faith and various disciplines. Richard Bube mentions seven patterns for relating science to the Christian faith,¹⁶ one of which is the aforementioned “compartmentalized.” Of the seven patterns that he mentions, none seems to fit mathematics (and in particular our discussion of the infinite) perfectly. However, certain aspects of the “complementary” and “new synthesis” patterns seem to form a basis for a strategy of integration that is appropriate for our current discussion of the infinite.

The complementary pattern suggests that mathematics and theology *can* tell us “different kinds of things

about the same things.”¹⁷ That is, both mathematics and theology can provide valid insights into the nature of the infinite, but they do so from different perspectives and therefore tell us different things. Similarly, the “new synthesis” pattern suggests that mathematics and theology *should* tell us the “same kind of things about the same things,” but the present status of both disciplines makes this impossible. Both of these strategies are flawed when it comes to relating mathematics and faith. The problem with the complementary view is that it stresses the differences in knowledge obtained from the two contributing perspectives. Although mathematics and theology may tell “different kinds of things about the same things,” I believe that it is also possible that they tell “the *same* kind of things about the same things.” This is more in line with the “new synthesis” pattern.¹⁸ Unfortunately, this pattern holds that the current states of theology and mathematics do not allow for integration to take place and therefore calls for a radical transformation of theology, mathematics, or both. I do not believe that the current states of mathematics and theology disallow integration, and therefore I reject the need for radical transformation.

Instead, I believe that when it comes to mathematics and faith, secular thinking has contributed to the tendency to compartmentalize knowledge. Therefore, it is the Christian scholar’s task in integration to “decompartmentalize” this knowledge and to link it in some integral way. Attempts at connecting the mathematical and theological concepts of infinity should thus not require major reconstructions of either of these ideas, but rather should focus on how one of these concepts can shed light on the other. Such a strategy is the compatibilist strategy suggested by Ronald Nelson in *The Reality of Christian Learning*. This approach assumes that the integrity of both the faith and the discipline are intact, and that the scholar’s task is to show how the shared assumptions and concerns of the discipline and faith can be profitably linked.¹⁹

In regard to my discussion of the infinite at the beginning of this section, there is no reason to believe that an infinite God and the idea of a mathematical infinity are in conflict. The compatibilist strategy recognizes this as fact and seeks to link the two in some way. Howell’s essay clearly takes a compatibilist approach to faith-integration within the discipline of mathematics. He hints at this when he suggests that

he seeks to analyze mathematics at the metalevel. In his essay, he notes that the axiomatic paradigm that defines mathematical practice has been in place for several centuries.²⁰ The purpose of his article is not to question this paradigm, but as is stated by Howell in his introduction to *Foundational Issues*, to delineate “a sampling of perspectives that lead to important interactions with the Christian faith.”²¹ In the next section, I will consider some of these perspectives in light of the initiative to include undergraduate students in the conversation.

The Difficult Task of Integrating Faith and Mathematics

I believe that the task of integrating faith and a discipline should be a two-way process. That is, I believe that my faith should affect the way I approach my discipline, and the study of my discipline should enhance my understanding of truth and therefore benefit my understanding of faith. In his discussion of faith-integration, Hasker refers *both* to the insights of a Christian worldview that are relevant to the discipline, and to the contributions of the discipline to the Christian view of reality.²² Likewise, in describing integration, Holmes states,

Integration is concerned ... with the positive contributions of human learning to an understanding of the faith and to the development of the Christian worldview, and with the positive contribution of the Christian faith to all the arts and sciences.²³

It is clear from this statement that Holmes recognizes that faith-integration allows for contributions both from learning to faith and from faith to learning, making it a two-way process.

Nevertheless, much of the literature seems to emphasize faith’s impact on learning. For example, after stating that “learning has contributed from all fields to the church’s understanding and propagation of its faith,” Holmes adds that the Christian college must recognize that “faith affects learning far more deeply than learning affects faith.”²⁴ In making this statement, Holmes makes a distinction between the two directions of integration. He identifies one direction of integration as being “deeper” than the other.

Of Hasker’s four major dimensions of integration within the theoretical disciplines, only one, the worldview contribution, clearly emphasizes a disci-

pline’s contribution to the Christian view of reality. Of this view Hasker says, “[the] worldview contribution is the one which has been least emphasized in the literature ... so it may be worthwhile saying a few things in defense of its inclusion.”²⁵ In making this statement, Hasker recognizes that academia has had little to say about the contributions a theoretical discipline makes to the Christian view of reality. Howell also seems to imply this in his essay suggesting that when analyzing mathematics at the metalevel, “faith perspectives will surely influence the conclusions one comes to on important questions about mathematics.”²⁶

If integration is restricted to the influences of faith on learning, the mathematician loses a dimension of integration that is full of many rich possibilities. This is unfortunate because before any restrictions are made, the integration process is already not easy or natural for the mathematician. In speaking of disciplines within higher education which superficially seem to have no integral relationship with Christianity, Holmes includes mathematics.²⁷ Of the three approaches to integration mentioned by Gene Chase (applicational, incarnational, and philosophical), he states that with respect to mathematics, two “seem inadequate” and one seems “difficult.”²⁸

The mathematician who restricts faith-integration to a scholarly project that examines faith’s impact on his discipline is, in reality, asking if there is a *Christian mathematics*, that is, a type of mathematics that is different from the rest of mathematics because of the influence of Christianity. Many mathematicians, even Christian mathematicians, would argue that the answer to this question is no. Hasker notes that

the mathematician can deny, with some plausibility, that his Christian faith makes or ought to make a substantive difference to the way he conducts the study of his field: there is no “Christian Mathematics”; the problems and methodologies of mathematics are the same for the believer and the nonbeliever.²⁹

Howell agrees with this conclusion in his essay, but suggests that not all is lost; that one can still participate in faith-integration at the metalevel, where analysis and criticism of the discipline can take place.³⁰ He then goes on to propose several faith-related questions in each of the four categories suggested by Holmes, as well as in his own “prana-logical” category.

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Howell's discussion of the relationship that exists between mathematics and faith in these five areas is excellent. However, in the following paragraphs, I would like to make a distinction between the first four categories defined by Holmes (foundational, worldview, ethical, and attitudinal)³¹ and the fifth category added by Howell, the pranalological. The problem that I see with faith-integration in Holmes's four areas is that it tends to rely on faith's impact on the discipline and therefore gravitates toward a discussion that either is not directly dependent on the discipline of mathematics, or relies heavily on philosophical and historical arguments. The pranalological, on the other hand, seems to consider the impact that mathematics can have on faith and as such provides a different perspective from which to do faith-integration. Howell himself seems to use a different language when he talks about the pranalological. In his essay he states, "pranalological applications of mathematics can relate to and even enhance one's Christian faith."³² Note the direction of impact, namely, mathematics on faith.

What does the attitudinal approach to integration entail? Speaking of this view of integration, Chase says that there is a strong version of this view which claims that "there is a Christian mathematics only insofar as there are Christians who are mathematicians."³³ Holmes describes this approach by saying that "the attitude of the teacher or student is the initial and perhaps most salient point of contact with the Christian faith."³⁴ Holmes then implies that the attitudinal approach would be extremely significant if he were to teach a mathematics course. He states,

... my Christianity would come through in my attitude and my intellectual integrity more than in the actual content of the course. A positive, inquiring attitude and a persistent discipline of time and availability express the value I find in learning because of my theology and my Christian commitment.³⁵

This is an example of faith-integration that seems "inadequate" to Chase.³⁶ Hasker goes further and says "cultivation of personal living on the part of the faculty member" is not faith-learning integration.³⁷

I agree to some extent with Chase and Hasker that a deeper type of faith-integration exists, one that is more directly connected to the discipline of interest. Attitudinal issues exist across disciplines and are not

unique to the study of mathematics. Still, even if one takes this further and suggests, as Howell does, that attitude should influence the types of assignments that mathematics instructors make, one could argue that this is more of a faith-integration exercise for the instructor than the student. Nevertheless, I would argue that the attitudinal approach is a necessary component of faith-learning integration; from a practical viewpoint, it is probably the most important approach to faith-learning integration an individual can take. In fact, I believe that unless an individual takes this approach to faith-integration, all other attempts at doing it will be merely academic. For this reason, all mathematicians should seek to work at faith-integration at the attitudinal level.

With regard to ethics, Howell lists three possibilities for integration in mathematics: disciplinary worth, apology, and pedagogy.³⁸ These are topics that undergraduate students certainly can write about. In fact, I have my first-year students write an apology of their own after attending my first-year seminar for mathematics majors. Their assignment is to write a letter to a friend who is considering a major in mathematics expressing why a Christian should indeed pursue a career in mathematics. My only problem with this as an example of faith-integration within the discipline of mathematics is that the resulting discussion is not unique to the discipline of mathematics. Howell's own apology which appears in *Mathematics through the Eyes of Faith* ends with these words:

Thus, whether you choose to use your gift in mathematics—or *any field* (emphasis mine)—as a vehicle for your Christian vocation depends on several factors. Do you like it? Are you good at it? Does the world need it? Do others encourage you in it?³⁹

As such, the integral relationship that is being developed here is more between vocation and Christianity and not so much between mathematics and Christianity. With the exception of the question, "Does the world need it?" the answer is not so much dependent on the discipline, but more on the individual who is asking the questions. This is not to say that this is an inappropriate exercise; I believe that it is an appropriate exercise, and I believe that it is faith-integration. However, I do not think that it is the best example of faith-integration that emphasizes mathematics.

Faith can also influence mathematics at the foundational level. What does this type of integration require? Interpreting the use of the words “Christian mathematics” by the Dutch philosopher Herman Dooyeweerd, Holmes says “yet he is thinking not of proofs and procedures but rather of the foundations of mathematics and the fact that God and the law-governed nature of his creation make mathematics possible at all.”⁴⁰ That is, there is a Christian mathematics when one recognizes that the foundations of the subject are dependent upon the structure that God built into the universe. Thus, this type of integration is typically done from a philosophical point of view and requires an examination of the assumptions that underlie the discipline in view of an individual’s faith. Much of what is done in terms of scholarly integration projects within the field of mathematics is done at this level. Howell’s essay certainly validates this claim. He begins his discussion with Foundational Issues, noting that “mathematics has a particularly rich tradition” regarding “the historical and philosophical components that have shaped its practices, procedures, and paradigms,” and almost half of his essay is devoted to these issues.⁴¹

Integration at this level can pose problems though. Hasker notes that the “foundation of mathematics is a primary concern for only a rather small percentage of mathematicians and for virtually no undergraduate students.”⁴² Because of this, he suggests that it would seem to have, at best, limited relevance, a statement with which I agree. To compound the issue, many mathematicians do not have a very strong knowledge base in philosophy or theology. Holmes notes that a scientist can come out of the best graduate school with little more than an eighth-grade knowledge of theology, and perhaps less of philosophy.⁴³

Howell’s discussion of worldview issues is also, at least to some degree, related to philosophy. He begins by noting that some of the topics discussed in the foundational issues category could just as well qualify as worldview issues.⁴⁴ In each of the topics that he introduces in this category, with the exception of aesthetics, there is some connection to philosophy or philosophical argument. Regarding unreasonable effectiveness, a topic that, in my opinion, is by nature very philosophical, he notes that attention was paid to how “different philosophical schools might view

the status of theories.”⁴⁵ In his discussion of chance, he refers to “two very different approaches to a philosophy of chance that Christian thinkers might take.” Regarding culture, he refers to several works that describe how mathematics has shaped modern philosophy and thought.⁴⁶ Certainly, discussion of the topics that Howell presents in the worldview section is not limited to the philosophical arena, but much of the discussion initiated by Howell seems to have a philosophical taste to it.

How can Christians participate in the faith-integration process with integrity if they are forced to go outside of their own interests and knowledge? One approach would have students strengthen their philosophical and theological understanding. The very nature of scholarly work suggests that this should be the case, but for an undergraduate student or even an established applied mathematician who is more interested in procedures and methodologies than the assumptions that underlie them, it would seem that the integration process would be better suited at the procedural level than at the foundational level. Connections involving faith more naturally occur in an area of interest to an individual. This is true for the teacher of mathematics as well. Teachers typically interact with students whose primary interest in mathematics is not at the foundational level. If teachers are to model the integration process to their students, it would best occur at the level where the teaching occurs. For both the teacher and the working mathematician, integration at the practitioner’s level of mathematics does not pose the problems of interest and knowledge that occur at the foundational level.

A Praxiological Approach to Integration

Integration can and should be done at the functional level of mathematics, that is, where it is practiced, taught, and learned by most individuals. This type of integration depends on the functionality of mathematics and therefore usually considers the discipline’s impact on faith. The dimension of “worldview contribution” suggested by Hasker seems to fit well here.⁴⁷ This facet of faith-integration seeks to identify how the study of mathematics contributes to an understanding of the world God has created. In particular, it asks how

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the Christian who has been trained in mathematics views reality differently than the Christian who has had no mathematical training. Mathematicians who answer this question will have a better understanding of their discipline's relevance to their faith, and teachers of mathematics who answer this question will have a tool to motivate their students in their study of mathematics.

How does the study of mathematics contribute to an understanding of the world God has created? I would submit that one of the primary means through which contributions are made is the modeling process. Mathematical models attempt to describe reality abstractly. For this reason, the modeling process seems to fit the worldview dimension of integration mentioned by Hasker well. Giordano and Weir define a mathematical model as a "mathematical construct designed to study a particular real-world system or phenomenon."⁴⁸ This definition implies that the goal of mathematical modeling is to study and gain insight into some aspect of reality. By modeling some real-world system, I can gain insight into how that system actually works, and thus have a better understanding of the world God has created.

Caution needs to be used here. Just because a model contributes to a better understanding of God's creation does not make it an example of faith-integration. This understanding can be sought after for a variety of purposes and ultimately used in a variety of ways. It can be used for destructive purposes, or it can be used to improve the quality of life on this earth. Even in the case in which the quality of life is improved, if no attempt is made to relate the model to a biblical worldview, it is not an example of faith-integration. For example, manufacturers of a wide variety of commodities, from shoes to airplanes, use mathematical models to improve existing products and develop new ones.⁴⁹ In doing so, these manufacturers improve the safety and performance of their products. However, if such improvements are motivated only by profit or other self-serving outcomes, and there is no discernible connection to a biblical worldview, these models are not examples of faith-integration. So once again this type of faith-integration is closely tied to the motives and attitudes of the model maker. For that reason, this kind of faith-integration also faces the criticism that it is not uniquely related to the discipline of mathematics.

If, however, one seeks to use a mathematical model to better understand some theological concept such as the consistency of God or his infinite nature, the relationship between mathematics and faith is much deeper than the attitude-dependent relationship described above. Here the relationship does not focus so much on the attitude of the modeler (that is not to say that attitude is irrelevant), but on the mathematics and its relationship to faith. This type of integration is what Howell refers to as the "pranalological," that is, "the practical application of an analogy gleaned from one's discipline or life experience."⁵⁰ Consider our earlier discussion of the infinite. Regarding Georg Cantor's discussion on different sizes of infinity, Howell says,

If the teacher of this theory draws the proper connections it seems inevitable that, once students see and understand the proof of this result, their notion of God being infinitely wise, infinitely powerful, or infinitely good, takes on a new and richer meaning, a meaning that would not be possible without seeing that proof.⁵¹

In other words, students who have studied mathematical infinities will have a better understanding of the infinite nature of God than if they had not.

The pranalological approach to integrating faith and a discipline is not without its own potential problems. Too often attempts at this type of integration are only devotional or illustrative in nature. In describing pseudo-integration, David Wolfe cites an example from an article that was written to illustrate the difference between teaching in public day schools and Christian day schools: "Two and two is always four ... and God is always the same; you can depend on him."⁵² Both Hasker and Wolfe argue that this is not faith-learning integration.

Although my definition of faith-integration would allow for such an example, it is not the type of faith-integration that is the subject of this article. The above example uses a mathematical "fact" to illustrate a spiritual truth. It considers two unrelated concepts—addition and the immutability of God—and leaves them as separate. Nothing is done to bring the two concepts together. One concept simply illustrates the other. While addition and the immutability of God may not be internally shared by both mathematics and the Christian faith, the concept of consistency that is the main point in the above illus-

tration is internal to both. The worldview dimension of integration asks how the study of mathematics contributes to the Christian's understanding of consistency. It is only when this question has been asked, and the relationship between faith and discipline in the context of consistency has been considered, that genuine integration has taken place.

In summary, modeling gives the mathematician several avenues from which to practice faith-integration. Guided by Christian principles, the mathematician can construct models of reality with the hope of better understanding God's creation in order to improve the quality of life here on this earth. When this happens, mathematics becomes a tool through which mathematicians can love their neighbors as themselves, yet another example of faith influencing the practice of mathematics. But modeling can also be used to gain insight into things that are more directly related to the Christian faith, such as the infinite nature of God. When this happens, mathematics serves as a pranalological tool that can actually help to shape a proper biblical worldview. Moreover, the insight gained into the biblical worldview is at least directly related if not unique to the study of mathematics.

A Faith-Integration Project for Students

I conclude this article by describing my attempt at including undergraduate students in the faith-integration conversation. I am currently writing a text, now in its third draft, that includes a collection of what I have called "faith-integration projects." These projects provide opportunities for the reader to practice faith-integration by encouraging dialogue. To accomplish this, I begin the conversation with some of my own thoughts on a particular topic. These thoughts are intended only to initiate the dialogue, not to provide the reader with an expert's final analysis of the topic. In particular, each project consists of a short essay that is an attempt on my part to relate faith and mathematics in some way. These essays discuss a variety of mathematical topics appropriate for undergraduate students; many of them are pranalological in nature.

Because the essays are designed to promote discussion, my hope is that they will provide a basis for

further work in the area of faith-integration. In other words, the essay is only part of the project. Each project has the potential for reader participation. Each project begins with a question and includes some of my thoughts as to how that question might be answered. As such, my discussion provides an opinion and not "the answer" to the question. The key to these projects really is the reader's response. My role is only to begin the conversation. The reader's response may be a critique of my essay, or it may be the reader's own answer to the question posed by the project, or it may be both. It may even be the reader's initial thoughts to some other question that the essay prompted her to consider. In any case, the goal of each essay is to engage the reader in connecting faith and mathematics.

While the primary goal of the essay portion of each project is to begin a conversation with the reader regarding faith and mathematics, my writing serves an additional purpose. In particular, my essay serves as a pattern of the type of work that is expected to enter into the dialogue. At a minimum, the dialogue should be a response to some of my comments. At a more serious level, the dialogue might be original work, not a follow-up to discussion in the essay. Ultimately, the purpose of these projects is to help the reader think deeply about mathematics and faith, whether by responding to the author's thoughts or by producing original work. In either case, the discussion should include appropriate worked-out mathematical examples as well as an overview of the topic being considered, including pertinent definitions and theorems. Discussion should include references to scripture and appropriate faith-related definitions. It also might include what others have written and said about the topic. A student project need not include all of the above elements, but it should contain some of them.

One such project in my text is entitled "The Infinite and Intuition." It investigates the following question, "Can the study of the infinite in mathematics help a Christian develop intuition with regard to understanding God and eternity?" To help answer this question, students are first asked to consider their intuition with regard to the infinite in mathematics. They are asked to guess at the percentage of whole numbers that have at least one "3" in their decimal representation; they are then guided through the calculations that show that this percentage approaches

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100% as the number of digits in the whole number approaches infinity. Most students are surprised by this result. Students also encounter an infinite set of blocks that, when stacked one upon the other, have an infinite height, and yet can fit in a 2 inch by 2 inch corner of a desk drawer. After making these observations, I state,

The exercises in this project were offered to illustrate two principles regarding human intuition as it relates to the infinite. First, because human intuition is grounded in an experience in a finite world, and because that experience is often in the context of quantities that are relatively small, human intuition with respect to the infinite is unlikely to be something that has had opportunity to develop. Second, when it comes to the infinite, some outcomes do not seem to make sense, much less be intuitive.

Students are then asked to respond to my essay with their own essay; they are asked several questions to prompt their thoughts.

1. How does the author answer the question, "Can the study of mathematics help a Christian develop intuition with regard to understanding God and eternity?" Do you agree or disagree with his thoughts?
2. Identify one belief that you hold about God which you do not fully understand. In what ways is this belief related to God's infinite nature? Has the discussion in this chapter given you any insight regarding this belief?
3. Read 1 Corinthians 2. Analyze the claims that the author makes in this chapter in light of what this passage says about understanding things related to God.
4. Identify one surprising mathematical result that you have encountered which is based in the infinite (not mentioned in this project). Does this result give you any insight into spiritual things?
5. Has your intuition ever failed you when it comes to thinking about God? In what ways is God's infinite nature related to this failure?

Involving students in the conversation about faith and mathematics sharpens that conversation and increases their understanding of truth. By making use of the pranalogical in projects like the one described above, students can be drawn into the conversation. They enter the conversation not as

individuals forced to consider philosophical arguments that are of no interest to them, or perhaps even beyond their understanding, but as a part of a community of scholars in the context of the mathematics that they are currently studying. More importantly, not only is this conversation relevant to and attainable by undergraduate students, but it also may actually strengthen the faith of all who are involved in the conversation. ♦

Notes

¹Howell defines the pranalogical as the practical application of an analogy gleaned from one's discipline or life experience. Russell Howell, "The Matter of Mathematics," *Perspectives on Science and Christian Faith* 67, no. 2 (2015): 74–88.

²Arthur F. Holmes, *The Idea of a Christian College* (Grand Rapids, MI: Wm. B. Eerdmans, 1975).

³Harry Blamires, *The Christian Mind* (Ann Arbor, MI: Servant, 1997), 3.

⁴The author of this article teaches at Messiah College. The quote is a part of the college's mission statement.

⁵A part of the mission statement of Messiah College's Information and Mathematical Sciences Department.

⁶Howell, "The Matter of Mathematics," 74.

⁷Claerbaut, *Faith and Learning on the Edge*, 14.

⁸*Ibid.*, 14.

⁹*Ibid.*

¹⁰William Hasker, "Faith-Learning Integration, An Overview," *Christian Scholar's Review* 21, no. 3 (1992): 234.

¹¹Claerbaut, *Faith and Learning on the Edge*, 139.

¹²Matthew 20:26.

¹³For example, see Ron Larson and Bruce Edwards, *Calculus* (Belmont, CA: Brooks/Cole, 2009), 637–38.

¹⁴Richard H. Bube, "Pattern 3: Science and Christian Theology are Unrelated," chap. 6 in *Putting It All Together: Seven Patterns for Relating Science and the Christian Faith* (New York: University Press of America, 1995).

¹⁵*Ibid.*, 95.

¹⁶*Ibid.*, "Pattern 1: Science Has Destroyed Christian Theology"; "Pattern 2: Christian Theology in Spite of Science"; "Pattern 3: Science and Christian Theology are Unrelated"; "Pattern 4: Science Demands Christian Theology"; "Pattern 5: Science Redefines Christian Theology"; "Pattern 6: A New Synthesis of Science and Christian Theology"; and "Pattern 7: Christian Theology and Science: Complementary Insights," chapters 4–10.

¹⁷*Ibid.*, 167.

¹⁸*Ibid.*, "Pattern 6: A New Synthesis of Science and Christian Theology," chap. 9.

¹⁹Ronald R. Nelson, "Faith-Discipline Integration: Compatibilist, Reconstructionist, and Transformationalist Strategies," in *The Reality of Christian Learning: Strategies for Faith-Discipline Integration*, ed. Harold Heie and David L. Wolfe (Grand Rapids, MI: Wm. B. Eerdmans, 1987), 320.

²⁰Howell, "The Matter of Mathematics," 75.

²¹*Ibid.*

²²Hasker, "Faith-Learning Integration, An Overview," 236.

²³Arthur F. Holmes, *The Idea of a Christian College* (Grand Rapids, MI: Wm. B. Eerdmans, 1975), 46.

²⁴*Ibid.*

- ²⁵Hasker, "Faith-Learning Integration, An Overview," 245.
²⁶Howell, "The Matter of Mathematics," 74.
²⁷Holmes, *The Idea of a Christian College*, 47.
²⁸Gene Chase, "Complementarity as a Christian Philosophy of Mathematics," in *The Reality of Christian Learning*, ed. Heie and Wolfe, 231.
²⁹Hasker, "Faith-Learning Integration, An Overview," 246.
³⁰Howell, "The Matter of Mathematics," 75.
³¹Holmes, "Integrating Faith and Learning," in *The Idea of a Christian College*, 45–60.
³²Howell, "The Matter of Mathematics," 85.
³³Chase, "Complementarity as a Christian Philosophy of Mathematics," 231.
³⁴Holmes, *The Idea of a Christian College*, 47.
³⁵Ibid.
³⁶One could argue that this approach fits both the applicational and incarnational approaches described by Chase.
³⁷Hasker, "Faith-Learning Integration, An Overview," 235–36.
³⁸Howell, "The Matter of Mathematics," 84.
³⁹Russell Howell, "An Apology," in *Mathematics through the Eyes of Faith*, ed. James Bradley and Russell Howell (New York: HarperCollins, 2011), 245–54.
⁴⁰Cited in Holmes, *The Idea of a Christian College*, 47.
⁴¹Howell, "The Matter of Mathematics," 75–81.
⁴²Hasker, "Faith-Learning Integration, An Overview," 246.
⁴³Holmes, *The Idea of a Christian*, 56.
⁴⁴Howell, "The Matter of Mathematics," 81.
⁴⁵Ibid.
⁴⁶Russell W. Howell and W. James Bradley, eds., *Mathematics in a Postmodern Age: A Christian Perspective* (Grand Rapids, MI: Wm. B. Eerdmans, 2001); and Vladimir Tasić, *Mathematics and the Roots of Postmodern Thought* (New York: Oxford University Press, 2001).
⁴⁷Hasker, "Faith-Learning Integration, An Overview," 245, 246.
⁴⁸Frank R. Giordano, William P. Fox, and Steven B. Horton, *A First Course in Mathematical Modeling* (Pacific Grove, CA: Brooks/Cole, 2003), 54.
⁴⁹The author of this article has developed mathematical models of the foot and shoe while working for a major shoe company.
⁵⁰Howell, "The Matter of Mathematics," 85.
⁵¹Ibid.
⁵²Cited in David L. Wolfe, "The Line of Demarcation between Integration and Pseudointegration," in *The Reality of Christian Learning*, ed. Heie and Wolfe, 4.

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Christianity and Science: An Introduction to the Contemporary Conversation

A workshop preceding the 2015 ASA Annual Meeting

Oral Roberts University
Tulsa, Oklahoma

Friday, July 24, 2015, 8:30 AM–4:30 PM



Featured speakers: **Edward B. (Ted) Davis**, Distinguished Professor of the History of Science at Messiah College, Mechanicsburg, PA, and **Robert J. (Bob) Russell**, Founder and Director of the Center for Theology and the Natural Sciences and the Ian G. Barbour Professor of Theology and Science in Residence at the Graduate Theological Union, Berkeley, CA

This workshop consists of four lectures, introducing participants to some key issues in the modern dialogue of Christianity and science. After Ted Davis provides a historical perspective, Bob Russell offers thoughtful answers to some of the crucial questions.

8:30–10:00 am: Why History Matters

The myth of an ongoing, inevitable conflict between science and Christianity remains prevalent, despite the fact that historical scholarship has thoroughly discredited it. Ted traces the origins of the "conflict" view and explains why historians no longer believe it.

10:30–noon: Understanding the Modern Dialogue of Christianity and Science

Ted identifies several key issues on the Christianity-science interface, offering a brief historical overview of each one. Issues will include creation, contingency, methodological naturalism, divine action (and the god-of-the-gaps), design, and theodicy. He concludes with a picture of the spectrum of theological opinion in the modern dialogue, using John Polkinghorne as an example of an important voice that is both modern and orthodox—the same niche occupied by Robert John Russell.

1:00–2:30 pm: Five Issues on the Frontier of Theology and Science: Big Bang Cosmology, Evolution and Creation

Bob addresses three crucial issues in theology and science: (1) Does the beginning of time ($t=0$) in Big Bang Cosmology support belief in God? (2) Does the fine-tuning of physics in Big Bang cosmology support belief in God? and (3) Does "theistic evolution," especially when it is enhanced by a theology of "non-interventionist objective divine action" (NIODA), offer the best theological response to Neo-Darwinian evolution?

3:00–4:30 pm: Five Issues (cont'd): Evolution and Theodicy, the Cosmic Future, Resurrection and Eschatology

Bob addresses two additional crucial issues in theology and science generated by the issues of the previous lecture: (1) What is God's response to suffering in the evolution of life? and (2) Does the far future of the universe, one of endless expansion and "freeze," undermine a Christian eschatology based on the bodily resurrection of Jesus?

Register at <http://network.asa3.org/event/ASA2015Meeting>