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# A Survey of Science/Theology Paradigms among Students at a College in the Young-Earth or Old-Earth Creationist Tradition

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*I report and analyze the administration of a survey investigating students' beliefs about the relationship between science and theology at a college in the young-earth or old-earth creationist tradition. Using a previously established survey, science-theology paradigms were identified. With 221 responses, there was enough statistical power to identify some links between the science-theology paradigms and other beliefs in areas of epistemology of science, theology, and preferred model of creation or evolution. Results showed that these paradigms are often interconnected, not allowing for tidy classifications of students' beliefs about faith and science. Results suggest that students who are more religious and know more science are more likely to match with at least one science-theology paradigm. And, those with more constructivist epistemological views on the nature of science are more likely to view science and Christian faith in harmony.*

**Keywords:** science-theology paradigms, Christian college students, epistemology, theology, creation, evolution, miracles

The relationship between Christian beliefs and science has been an area of interest to a broad range of scholars. Since Charles Darwin, focus has often been on conflict. John William Draper and Andrew Dickson White are often cited as the archetype of the conflict thesis. Some research undermines this idea though, finding that large numbers of scientists, students, and the general population do not operate under the conflict thesis.<sup>1</sup> In one interesting paper, Timothy O'Brien and Shiri Noy found that a "Post-Secular" population of Americans were more religious while also more knowledgeable about and positive toward science than the "Traditional" population.<sup>2</sup> For another good summary of the shortcomings of a simplistic conflict thesis, see Pablo de Felipe and Malcolm Jeeves and references therein.<sup>3</sup>

However, much of current research tends to focus on Americans' acceptance or rejection of biological evolution. Some results have shown that more knowledge of evolutionary theory specifically and science in general leads to higher acceptance of evolution.<sup>4</sup> Leslie Rissler et al. also found that while science knowledge (and being a science major) was predictive of evolution acceptance, religiosity was a more significant factor predicting acceptance or rejection of evolution than educational background.<sup>5</sup> Higher religiosity was correlated to greater rejection of evolution. In that study, religiosity was measured by frequency of religious service attendance and by items from the

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Pew Religious Landscape Study.<sup>6</sup> This result might suggest that rumors of the death of the conflict thesis could be exaggerated.

Among those with insights into the relationship between Christian faith and science, Ian Barbour is probably among the most recognized. He has famously described four views on the relationship between religion and science.<sup>7</sup> While one view is that of conflict, the other views of independence, dialogue, and integration offer alternatives. One of Barbour's types of conflict is "Biblical Literalism," which includes young-earth creationism (YEC) and at least some forms of old-earth creationism (OEC) and intelligent design. The problem is that many young- and old-earth creationists and intelligent design advocates would reject the label of conflict, choosing dialogue or integration instead. Perhaps John Hedley Brooke is correct to say, "There is no such thing as *the* relationship between science and religion. It is what different individuals and communities have made of it in a plethora of different contexts."<sup>8</sup>

The current study is based on the work of Michael Tenneson, David Bundrick, and Matthew Stanford.<sup>9</sup> From Christian literature, including Barbour, Bundrick developed a survey instrument that identified five paradigms labeled (1) Conflict: Science over Theology, (2) Conflict: Theology over Science, (3) Compartmentalism, (4) Complementarism, and (5) Concordism.<sup>10</sup> That work was further developed into the form used by Tenneson, Bundrick, and Stanford<sup>11</sup> and by the current study.

In the first paradigm, Conflict: Science over Theology, both science and theology make claims about the same reality, and science should take precedence whenever those claims conflict. Paradigm 2, Conflict: Theology over Science, is similar in that it sees science and theology making claims about the same reality, but it views the theological claims as preferable. Paradigm 3 is called Compartmentalism. Similar to the non-overlapping magisteria or independence viewpoints described by Barbour,<sup>12</sup> this paradigm views science and theology as separate ways of knowing without overlap. Paradigm 4, Complementarism, recognizes that science and theology describe the same reality. However, they focus on different aspects of reality and can work together to progress. Finally, paradigm 5 sees science and theology through a lens of Concordism. This view

sees theology and science as "describing the same kind of things about the same realm of reality."<sup>13</sup>

Tenneson, Bundrick, and Stanford administered the survey to several different populations including scientists at public and private institutions of higher education and students at Christian universities. However, a significant portion of the samples included individuals who did not match any of the science-theology paradigms. This was hypothesized by Tenneson, Bundrick, and Stanford as representing levels of religious commitment.<sup>14</sup> Perhaps those with less religious commitment had a less thought-out or consistent perspective on the relationship between science and theology. Also, many responses showed agreement with multiple paradigms. This indicates that the paradigms are not necessarily mutually exclusive. Perhaps this supports the conclusion that these views can be fluid or at least context specific.

For this study, the following research questions (RQ) were considered:

- RQ1. What science-theology paradigms are present in this Christian college's student population?
- RQ2. What are some factors that influence the science-theology paradigm choices?

## DATA

Data were collected through an online survey sent to residential and commuting undergraduate students at a midwestern Christian college during the fall semester of 2021. Although students are not required to endorse any statement of faith to attend, the statement signed by employees means most faculty are either young-earth or old-earth creationists. The survey did not ask denominational affiliation. But 34% of the student population that semester identified with a Protestant Christian denomination, 26% did not report a religious affiliation, 20% identified as "Christian," 18% as independent or nondenominational, and 3% as Roman Catholic. (The sum adds to more than 100% due to rounding.) Participation was incentivized by offering entry into a gift-card drawing. While 313 began the survey, only 221 provided usable data. 72 respondents failed to complete the survey (23%), and an additional 18 (6%) responses were lost due to technical error from the survey administration. Those who failed to finish stopped at various points in the survey, likely due to survey fatigue. The administration of the survey

was handled by a third party; thus, there is no way for the author to know why the 18 responses were lost. The rest of the study assumes that the lost data were random and therefore do not affect the results except through the loss of statistical power. Also, two respondents were removed from the analysis who did not mark that they believed in the existence of God. Removing these respondents focused the analysis on theists.

Of the 221 responses, 159 were from female students and 62 from male students. This means that the data are skewed toward females in comparison to the campus's gender ratio of 1.45/1 female to male. The sample is also skewed toward first-year students as the instructor of the first-year seminar took time in the class to encourage students to take the survey. In this dataset, 99 were first-year students, 49 were in their second year, 45 in their third, 25 in their fourth, and 3 were past the fourth year. Responses were divided by major into four groups. The groups were divided into science & math ( $N=37$ ), engineering ( $N=4$ ), Bible & ministry ( $N=16$ ), and all others ( $N=164$ ). Science & math was defined as having a major in the Department of Science & Mathematics. Therefore, students with majors in the social sciences and fields related to psychology were included in "other."

The survey asked a variety of questions focused on the students' beliefs about science and theology, science knowledge, and religious practices. Demographic and other information including gender, age, class year, race, and major were collected automatically through the campus database to avoid any priming of survey answers. Most survey items were statements, and students were asked to mark agreement on an anchored, Likert-style scale. The anchors were *strongly disagree* and *strongly agree*. The middle three choices were unlabeled so that data could be reasonably treated as a linear scale. All the questions were presented in the same order to all participants. However, that order was randomized. Therefore, questions that were grouped together in the analysis were not necessarily encountered together in the survey.

### Science and Theology Paradigms

The primary focus of this study was the Science-Theology Paradigm framework used by Tenneson, Bundrick, and Stanford.<sup>15</sup> Five paradigms were mea-

sured by five questions each. The 25 questions and the corresponding paradigms are shown in table 1.

The Science-Theology Paradigm data were analyzed in two ways. Method 1 followed that of Tenneson, Bundrick, and Stanford. For each statement, responses of 4 or 5 (5 being strongly agree) were rated as "agreement" with the statement. If at least four out of five responses that matched a given paradigm were "agree," that student was marked as agreeing with the paradigm. Method 2 was a simple average of the responses to each of the paradigm's five statements. Therefore, a student was given a score on a scale of 1 to 5. A score of 1 corresponds to maximum disagreement with the paradigm and a score of 5 corresponds to maximum agreement.

### Theological Beliefs and Religious Practices

Theology and religious questions asked about beliefs regarding miracles, the Bible, and religious practices. Religious practice questions were adapted from the Pew Religious Landscape Study.<sup>16</sup> These asked about regularity of prayer and worship service attendance. Another set of questions asked students which statement about the nature of God they agreed with the most. Options were, "God is a person," "God is an impersonal force," "I don't know," and "I don't believe in God." Three items about miracles were included which asked for students' agreement with the following statements: "Miraculous events described in the Old Testament actually happened just as described in the Bible," "Biblical accounts of Jesus's miracles in the New Testament happened just as described," and "The physical (bodily) resurrection of Jesus actually happened as described in the Bible." Additional questions about God's engagement with the world were taken from *Baylor Religion Survey, Wave II*.<sup>17</sup> Finally, students were asked which account of origins best matched their views. The choices are shown on table 2.

### Science Knowledge

A measure of basic science knowledge included items from Dan Kahan (and references therein).<sup>18</sup> The questions are shown in table 3. If a student answered the question correctly, a score of 1 was recorded. An incorrect answer was awarded a score of 0. Scores were summed resulting in an overall score that could range from 0 to 8 with the maximum score denoting all correct answers.

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**Table 1: Science-Theology Paradigm Survey Items**

Paradigm	Survey Question
<b>Conflict: Science over Theology</b>	Reliable information comes only as the result of investigation by the scientific method.
	All phenomena find their only true and complete description in the physical and chemical description of the behavior of matter.
	True knowledge about anything can come only from the scientific method, not from theology.
	A scientific description is the only meaningful description of reality that can be given.
	Science is the only valid source of insights into the nature of reality.
<b>Conflict: Theology over Science</b>	The Bible is literally and completely true even when it appears to contradict a scientific matter.
	Because the Genesis account of creation is true, evolution is necessarily false.
	Every part of biblical revelation that seems to present a scientific mechanism must surely do so with absolute authority and finality.
	We must reject any input from science that conflicts with a theological interpretation of the Bible.
	When theology and science conflict, theological conclusions must always take precedence over the claims of science.
<b>Compartmentalism</b>	Science and theology deal with entirely different realms of knowledge, and so they must be kept separate.
	Science can contribute nothing of significance to our understanding of theology, and theology can contribute nothing of significance to our understanding of science.
	Science has little or nothing to say about theology, and theology has little or nothing to say about science.
	Science and theology have little significance for each other.
	It is highly unlikely for science and theology to have any valid interaction.
<b>Complementarism</b>	Differing insights derived from both theology and science should be taken into account equally in the attempt to develop a more adequate and coherent view of the natural world.
	When using languages and methods appropriate to their own realms of discourse, both science and theology may provide different but meaningful descriptions of the same natural phenomena.
	Science and theology, when true to their respective principles and methodologies, provide differing, yet valid and relevant, insights that must be taken into account when describing the nature of reality.
	In order to obtain the fullest insight into the nature of reality, the different (but complementary) insights of science and theology should be integrated.
	Valid scientific descriptions and valid theological descriptions of the world will not contradict each other.
<b>Concordism</b>	Accurate scientific investigations of the natural world affirm the valid conclusions of theology.
	A scientifically constructed mathematical model for the existence of the universe would be logically consistent with a theologically derived explanation for why the universe exists.
	Descriptions of the natural world provided by science should be consistent with descriptions of the natural world provided by theology.
	Complete consistency between scripture and science regarding the ending of the universe should be attainable.
	Valid scientific descriptions and valid theological descriptions of the world will not contradict each other.

**Table 2: Perspectives on Origins Included in the Survey**

Answer Choice	Classification
"God created the Earth and all life on it within the last 10,000 years or so."	<b>Young-Earth Creation (YEC)</b>
"God created the universe almost 14 billion years ago, and at some point later created two humans who are the ancestors of all humans and who were not descended from any animal ancestors."	<b>Old-Earth Creation (OEC)</b>
"God created the universe almost 14 billion years ago and guided evolutionary processes in order to create all animals and humans from a single common ancestor."	<b>Evolutionary Creation (EC)</b>
"God created the universe almost 14 billion years ago and allowed natural evolutionary processes to run their courses without any guidance resulting in all animal and human life."	<b>Deistic Evolution (DE)</b>
"God had nothing to do with the origin of the universe or life on Earth."	<b>Atheism (omitted from analysis)</b>

### Epistemological Views about Science

The survey included several questions to measure students' beliefs about science. These were measured using five possible student epistemological views (SEV) as reported by Chin-Chung Tsai and Shiang-Yao Liu.<sup>19</sup> The first view, Social Negotiation, views science in a constructivist way through negotiations between scientists. Second, the Invented and Created view sees science as "invented rather than discovered."<sup>20</sup> A third epistemological view is that of Theory-Laden Exploration. This view recognizes biases and presuppositions in the work of scientists.

Fourth, the Cultural Impacts view sees science as culturally dependent. Finally, a fifth is the Changing and Tentative perspective that science is an evolving enterprise that makes tentative claims subject to further revision. The details of these survey items are shown in table 4.

After recoding for negatively coded items, each of the five views was averaged to obtain a score of 1 to 5. A lower score aligns with an empiricist or positivist epistemology of science, and a higher score aligns with a constructivist epistemology.

**Table 3: Science Knowledge Battery Items**

Question	Answer Choices
1. All radioactivity is manmade.	True/False
2. Lasers work by focusing sound waves.	True/False
3. Which gas makes up most of the Earth's atmosphere?	H <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub> , O <sub>2</sub>
4. Antibiotics kill viruses as well as bacteria.	True/False
5. The center of the Earth is much hotter than the surface of the Earth.	True/False
6. It is the father's genes that determine whether a baby is a boy or a girl.	True/False
7. Electrons are smaller than atoms.	True/False
8. The Earth goes around the sun.	True/False

**Table 4: Survey Items Comprising the Students' Epistemological Views (SEV)**

SEV Category	Survey Item
<b>Social Negotiation</b>	New scientific knowledge acquires its credibility through the recognition by many scientists in the field.
	Scientists share some agreed perspectives and ways of conducting research.
	The discussion, debates, and result sharing in the science community is one major factor facilitating the growth of scientific knowledge.
	Valid scientific knowledge requires the acknowledgement of scientists in relevant fields.
	Contemporary scientists have agreed upon an acceptable set of standards with which to evaluate scientific findings.
	Through the discussion and debates among scientists, the scientific theories become better.
<b>Invented &amp; Created</b>	Scientists' intuition plays an important role in the development of science.
	Some accepted scientific knowledge comes from human's dreams and hunches.
	The development of scientific theories requires scientists' imagination and creativity.
	Creativity is important for the growth of scientific knowledge.
<b>Theory-Laden Exploration</b>	Scientists can make totally objective observations, which are not influenced by other factors.*
	Scientists' research activities will be affected by their existing theories.
	The theories scientists hold do not have effects on the process of their exploration in science.*
<b>Cultural Impacts</b>	People from different cultural groups have the same method of interpreting natural phenomena.*
	Scientific knowledge is the same in various cultures.*
	Different cultural groups have different ways of gaining knowledge about nature.
<b>Changing &amp; Tentative</b>	The development of scientific knowledge often involves the change of concepts.
	Contemporary scientific knowledge provides tentative explanations for natural phenomena.
	Currently accepted science knowledge may be changed or totally discarded in the future.

\* Items are reverse coded.

## ANALYTIC PLAN

The data analysis can be grouped in two sections that roughly correspond to the two research questions, RQ1 and RQ2. First, the more general question, “What science-theology paradigms (found in table 1) are present in a Christian college’s student population?” (RQ1) is answered through comparisons of paradigm results found in the current dataset. Along the way, I compare the results from this dataset to the previously published findings of Tenneson, Bundrick, and Stanford.<sup>22</sup> I also, like them, report on the relationship between paradigm choice and preferred account of origins. This also begins to answer RQ2.

The primary way in which I address RQ2, “What are some factors that influence the science-theology paradigm choices?” is by the construction of linear regression models. These models will be explained later with reference to tables 10 to 14.

## RESULTS

### Science-Theology Paradigms

Table 5 presents the numbers and percentages for each paradigm, as chosen by students (using method 1) and, for comparison, includes data from Tenneson, Bundrick, and Stanford.<sup>22</sup> Complementarism was chosen by 43.4% ( $N=96$ ) of the students followed by Conflict: Theology over Science (39.8%,  $N=88$ ), and Concordism (27.6%,  $N=61$ ). Only two students chose Conflict: Science over Theology (0.9%), and one chose Compartmentalism (0.4%). Because of respondents who matched multiple paradigms, the totals add to more than 100%.

Table 6 shows that a total of 59 (26.7%) of the sample matched no paradigm. In fact, only 42.1% of students matched only one science-theology paradigm. A breakdown of the number of paradigms matched is shown.

Of those who matched only one paradigm, the popularity order was the same. As shown on table 7, Complementarism was chosen by 46 students (49.5%), Conflict: Theology over Science by 34 (36.6%), and Concordism by 13 (14.0%). No student chose Conflict: Science over Theology or Compartmentalism.

Table 8 describes the combinations of multiple paradigms chosen by 69 students (31.2% of the 221 responses). Of the 88 who chose Conflict: Theology over Science (paradigm 2), 54 chose at least one other. Paradigm 2 was found in combination with Complementarism 20 times, with Concordism 17 times, and with both Complementarism and Concordism 15 times. One student chose the combination of Conflict: Theology over Science and Compartmentalism and one other student chose the combination of Theology over Science, Science

**Table 5: Science-Theology Paradigms of Undergraduate Students at Christian College**

*Note:* percentages add to more than 100% due to those who chose multiple paradigms.

Science-Theology Paradigm	This study % ( $N=221$ )	Tenneson, Bundrick, and Stanford % ( $N=402$ )
Complementarism	43.4% (96)	58.0% (223)
Conflict: Theology over Science	39.8% (88)	31.3% (126)
Concordism	27.6% (61)	33.1% (133)
None	26.7% (59)	19.9% (80)
Conflict: Science over Theology	0.9% (2)	1.0% (4)
Compartmentalism	0.4% (1)	1.2% (5)

**Table 6: Responses That Used None, One, or Multiple Simultaneous Science-Theology Paradigms**

Science-Theology Paradigm Used	This Study % ( $N=221$ )	Tenneson, Bundrick, and Stanford % ( $N=402$ )
None	26.7% (59)	19.9% (80)
One Only	42.1% (93)	42.5% (171)
Two Simultaneous	23.5% (52)	29.1% (117)
Three Simultaneous	7.7% (17)	8.0% (32)
Four Simultaneous	0.0% (0)	0.5% (2)
<b>Total</b>	<b>100% (221)</b>	<b>100% (402)</b>

**Table 7: Science-Theology Paradigms of Students Who Chose Only One Paradigm ( $N=93$ )**

Science-Theology Paradigm	% ( $N=93$ )
Complementarism	49.5% (46)
Conflict: Theology over Science	36.6% (34)
Concordism	14.0% (13)
Conflict: Science over Theology	0.0% (0)
Compartmentalism	0.0% (0)

over Theology, and Concordism. Concordism was chosen along with Complementarism by 14 students. Finally, one student chose a combination of Conflict: Science over Theology with Concordism and Complementarism.

One of the hypotheses put forward by Tenneson, Bundrick, and Stanford was that respondents who matched no science-theology paradigm were those with less religious commitment.<sup>23</sup> I compared the religiosity (using the definition of the Pew Religious Landscape Study<sup>24</sup>) of those who matched no science-

the maximum value of 4. Therefore, a Wilcoxon test was used to compare the religiosity of those without a paradigm match ( $M=2.97$ ,  $Mdn=3$ ,  $N=59$ ) to those with a paradigm match ( $M=3.44$ ,  $Mdn=3$ ,  $N=162$ ). The difference between the two populations was statistically significant ( $w=3833.5$ ,  $p<0.05$ ). This result suggests that Tenneson, Bundrick, and Stanford were correct in suggesting a relationship between a science-theology paradigm and religious commitment.

### Paradigms Related to Origins Beliefs

Relationships between paradigm agreement and origins perspective are outlined on table 9. The left column shows the number and percentage of the population who chose each perspective on origins. The paradigms chosen by those claiming each origins perspective are shown in each row. While Tenneson, Bundrick, and Stanford ignored those with multiple paradigms, table 9 includes them. Therefore, the percentages across a row do not add to 100%. Young-earth creation was the preferred choice of 153 students (69.2%) followed by old-earth creation ( $N=45$ , 20.3%), evolutionary creation ( $N=16$ , 7.2%), and deistic evolution ( $N=7$ , 3.2%). While those selecting young-earth creation were more likely to choose Conflict: Theology over Science, they were also less likely to select no science-theology paradigm and more likely to choose the Concordism paradigm compared to those who selected one of the other origins perspectives.

### Linear Regression Models

Using the paradigm scores (the 1–5 scale of method 2 rather than the binary agree or disagree), five linear regression models were calculated. For each model, the dependent variable (outcome) was dependent on multiple independent variables (predictors). If the

**Table 8: Science-Theology Paradigms of Students Who Chose Multiple Paradigms (N=69)**

Science-Theology Paradigms	% (N=69)
Conflict: Theology over Science with Complementarism	29.0% (20)
Conflict: Theology over Science with Concordism	24.6% (17)
Conflict: Theology over Science, Concordism, and Complementarism	21.7% (15)
Concordism with Complementarism	20.3% (14)
Conflict: Theology over Science with Compartmentalism	1.4% (1)
Conflict: Science over Theology, Concordism, and Complementarism	1.4% (1)
Conflict: Science over Theology, Conflict: Theology over Science, and Concordism	1.4% (1)

theology paradigm with those who did. Religiosity was defined by a combination of church membership (Yes=1, No=0), a self-reported level of importance of religion (important or very important=1, else=0), regularity of service attendance (once or twice a month or more often=1, else=0), and regularity of prayer (a few times a week or more often=1, else=0). The sum of these four items resulted in a scale ranging from 0 to 4. The religiosity scores for both populations were nonparametric, skewing toward

**Table 9: Science-Theology Paradigms by Origins Perspective (N=221)**

Origins Perspective (N, % of total)	None % (N)	Conflict: Science over Theology % (N)	Conflict: Theology over Science % (N)	Compartmentalism % (N)	Complementarism % (N)	Concordism % (N)
YEC (153, 69.2%)	20.3% (31)	0.6% (1)	49.7% (76)	0.0% (0)	42.5% (65)	34.6% (53)
OEC (45, 20.3%)	37.8% (17)	0.0% (0)	22.2% (10)	2.2% (1)	44.4% (20)	6.7% (3)
EC (16, 7.2%)	43.8% (7)	0.0% (0)	12.5% (2)	0.0% (0)	50.0% (8)	18.8% (3)
DE (7, 3.2%)	57.1% (4)	14.3% (1)	0.0% (0)	0.0% (0)	42.8% (3)	28.6% (2)

YEC=young-earth creation; OEC=old-earth creation; EC=evolutionary creation; DE=deistic evolution

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model found that a predictor was statistically significant at the  $p \leq 0.05$  level or better, it was included in the final model. (Control variables are included no matter the significance level.) The effect of each predictor on the outcome is described by the “estimate.” Tables 10–14 show each predictor’s estimate (the slope of the linear relationship), estimate error, and statistical significance level.

The five linear regression models were calculated using demographic controls, plus other predictors were hypothesized to affect views on science and theology. Demographic controls were gender, academic area, and year in school. Academic area was categorized by majors. Majors were divided into four areas: science and math, engineering, Bible/ministry, and all others. All three controls were analyzed as categorical rather than linear variables. Academic area was analyzed with the reference level as “other,” and the year in college with reference level of year 1.

All models began with a number of hypothesized predictors which were removed using backward elimination to produce a model that included only the controls and those predictors that were significant at the  $p < 0.05$  level. The predictors that were included from the beginning were those asking about religious practices (prayer and church attendance), theological beliefs, science knowledge, student’s epistemological view, and the other paradigm scales.

Of these predictors, beliefs about origins and the question about God’s nature as a person were treated categorically. Because young-earth creation was the most common response, it was the reference level for the belief about origins variable. The other categorical variable asked, “Which comes closest to your view of God?” Here the most common response, “God is a person,” was used as the reference level.

### *Paradigm 1 – Conflict: Science over Theology*

Table 10 shows the result for the paradigm 1 model. The control of year in school shows only year 3 with a statistically significant effect. Because of the categorical nature of the variable, a significant result means that the predictor (year 3 in this case) is statistically significant in comparison to the baseline of year 1. The control variable of major showed a statistically significant relationship between being a science or math major and higher score on paradigm 1.

Belief in biblical accounts of miracles is significantly and negatively related to score on paradigm 1. There is a significant and positive relation between believing that God is “an impersonal force” and score on paradigm 1.

Among the other paradigms, paradigm 2 (Conflict: Theology over Science) is negatively related to score on paradigm 1. On the other hand, higher scores on paradigm 3 (Compartmentalism) are very significantly and strongly predictive of higher scores on paradigm 1. Higher paradigm 5 (Concordism) scores are also related to higher paradigm 1 scores.

**Table 10: Linear Regression Model with Outcome of Conflict: Science over Theology Score** (df= 196); ns: not significant; \*:  $p < 0.05$ ; \*\*:  $p < 0.01$ ; \*\*\*:  $p < 0.001$

Parameter	Estimate	Standard Error	Significance
Intercept	1.97	0.46	***
<b>Controls</b>			
Gender (Male)	0.02	0.08	ns
Year at College			
Year 2+	0.07	0.09	ns
Year 3+	0.20	0.09	*
Year 4+	-0.02	0.12	ns
Year 5+	0.41	0.31	ns
Academic Area			
Science & Math	0.23	0.10	*
Engineering	0.04	0.27	ns
Bible/Ministry	-0.09	0.14	ns
<b>Other Predictors</b>			
Belief in Biblical Miracles	-0.17	0.06	**
Nature of God:			
“God is an impersonal force.” †	0.19	0.08	*
“I don’t know.” ‡	0.01	0.13	ns
SEV – Social Negotiation	0.22	0.06	***
SEV – Theory-Laden Exploration	-0.23	0.06	***
Paradigm 2 Scale (Conflict: Theology over Science)	-0.16	0.05	**
Paradigm 3 Scale (Compartmentalism)	0.39	0.06	***
Paradigm 5 Scale (Concordism)	0.20	0.06	***
Adjusted R <sup>2</sup> = 0.45			

† Reference Level is Year 1

‡ Reference level is “God is a person.”

SEV = student’s epistemological view



Some of the students' epistemological views (SEV) also are significantly related to paradigm 1 scores. While Social Negotiation is positively related to scores on paradigm 1, Theory-Laden Exploration views are negatively related. So, while students who see science as the result of discussion and negotiation between scientists score higher on paradigm 1, those who think that biases and existing theories can influence scientific pursuits score lower.

**Paradigm 2 – Conflict: Theology over Science**

A linear regression model with paradigm 2 as an outcome is shown in table 11. Here also the year in college is significant as year three and year four are both negatively related to score on paradigm 2 (again with respect to year 1). All other control variables were statistically insignificant.

Old-earth creation, evolutionary creation, and deistic evolution are all negatively related to paradigm 2 with respect to young-earth creation. Belief in biblical miracles is also a significant positive predictor.

**Table 11: Linear Regression Model with Outcome of Conflict: Theology over Science Score** (df=202); ns: not significant; \*: p<0.05; \*\*: p<0.01; \*\*\*: p<0.001

Parameter	Estimate	Standard Error	Significance
Intercept	2.50	0.36	***
<b>Controls</b>			
Gender (Male)	-0.03	0.10	ns
Year at College			
Year 2+	-0.17	0.11	ns
Year 3+	-0.24	0.11	*
Year 4+	-0.39	0.14	**
Year 5+	-0.37	0.38	ns
Academic Area			ns
<b>Other Predictors</b>			
Belief in Biblical Miracles	0.43	0.07	***
Origins Perspective:			
Old-Earth Creation‡	-0.44	0.12	***
Evolutionary Creation‡	-0.66	0.18	***
Deistic Evolution‡	-0.83	0.25	**
Paradigm 4 Scale (Complementarism)	-0.28	0.07	***
Paradigm 5 Scale (Concordism)	0.16	0.06	*
Adjusted R <sup>2</sup> = 0.42			

† Reference Level is Year 1

‡ Reference is Young-Earth Creation Perspective

Scores on paradigm 4 were negatively related to paradigm 2 while scores on paradigm 5 were positively related to paradigm 2. None of the students' epistemological views was related to paradigm 2 at a statistically significant level.

**Paradigm 3 – Compartmentalism**

Table 12 shows the paradigm 3 model. Having a science or math major was negatively related to Compartmentalism score. All other control variables were insignificant.

The Social Negotiation SEV was negatively related to scores on paradigm 3. Finally, as we have seen before, there is a positive relationship between paradigm 1 and paradigm 3 scores. But both paradigms 4 and 5 are negatively related to paradigm 3.

**Table 12. Linear Regression Model with Outcome of Compartmentalism** (df=202); ns: not significant; \*: p<0.05; \*\*: p<0.01; \*\*\*: p<0.001

Parameter	Estimate	Standard Error	Significance
Intercept	3.29	0.30	***
<b>Controls</b>			
Gender (Male)	0.09	0.08	ns
Year at College			ns
Academic Area			
Science & Math	-0.21	0.10	*
Engineering	0.26	0.32	ns
Bible/Ministry	0.09	0.14	ns
<b>Other Predictors</b>			
SEV – Social Negotiation	-0.23	0.07	**
Paradigm 1 Scale (Conflict: Science over Theology)	0.48	0.06	***
Paradigm 4 Scale (Complementarism)	-0.20	0.07	**
Paradigm 5 Scale (Concordism)	-0.28	0.05	***
Adjusted R <sup>2</sup> = 0.48			

SEV = student's epistemological view

**Paradigm 4 – Complementarism**

No control variable was statistically significant in the paradigm 4 model, shown in table 13. Belief in biblical miracles was positively related to paradigm 4. Among the SEV, both Social Negotiation and Changing and Tentative were significantly and positively related to paradigm 4. This was the only model for which the Changing and Tentative dimension

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**Table 13: Linear Regression Model with Outcome of Complementarism**  
(*df*=203); ns: not significant; \*: *p*<0.05;  
\*\*: *p*<0.01; \*\*\*: *p*<0.001

Parameter	Estimate	Standard Error	Significance
Intercept	1.08	0.32	***
Controls			
Gender (Male)	-0.04	0.08	ns
Year at College			ns
Academic Area			ns
Other Predictors			
Belief in Biblical Miracles	0.23	0.06	***
SEV – Changing and Tentative	0.24	0.07	***
SEV – Social Negotiation	0.36	0.07	***
Paradigm 2 Scale (Conflict: Theology over Science)	-0.17	0.05	**
Adjusted R <sup>2</sup> = 0.35			

SEV = student's epistemological view

**Table 14: Linear Regression Model with Outcome of Concordism**  
(*df*=197); ns: not significant; \*: *p*<0.05;  
\*\*: *p*<0.01; \*\*\*: *p*<0.001

Parameter	Estimate	Standard Error	Significance
Intercept	1.95	0.58	***
Controls			
Gender (Male)	0.19	0.09	*
Year at College			ns
Academic Area			ns
Other Predictors			
Nature of God: "God is an impersonal force."†	-0.37	0.10	***
"I don't know."†	-0.07	0.16	ns
SEV – Cultural Impacts	0.14	0.06	*
SEV – Theory-Laden Exploration	0.20	0.08	**
Paradigm 1 Scale (Conflict: Science over Theology)	0.27	0.08	***
Paradigm 2 Scale (Conflict: Theology over Science)	0.27	0.06	***
Paradigm 3 Scale (Compartmentalism)	-0.41	0.08	***
Paradigm 4 Scale (Complementarism)	0.16	0.07	*
Adjusted R <sup>2</sup> = 0.34			

† Reference level is "God is a person."  
SEV = student's epistemological view

of SEV was a significant predictor. Finally, the paradigm 2 score had a negative relationship with paradigm 4.

## Paradigm 5 – Concordism

Table 14 shows the model for paradigm 5. None of the controls was statistically significant. The predictor of belief in "God is an impersonal force" had a negative relationship to paradigm 5. Both the Theory-Laden Exploration SEV and Cultural Impacts SEV had statistically significant positive relationships to paradigm 5.

All other paradigm scores had a statistically significant relationship to Concordism. Paradigms 1, 2, and 4 had positive relationships while paradigm 3 was negative.

## DISCUSSION

Comparing the science-theology paradigms between this study and the prior work, we see several similarities. Table 5 and table 6 compare results from this study directly with those of Tenneson, Bundrick, and Stanford. A higher percentage of respondents in this study chose no paradigm. Also, slightly higher numbers chose paradigm 2 and fewer chose paradigms 4 and 5. Both studies showed low percentages of paradigms 1 and 3. While the populations are different—the current study did not include faculty—the results are qualitatively similar. The especially low percentages of paradigms 1 and 3 responses in comparison to the others lend credence to the reliability of the survey instrument.

But what are we to make of the significant number of responses which matched no science-theology paradigm or those that matched multiple paradigms? The finding that students who matched at least one science-theology paradigm had higher religiosity scores suggests that Tenneson, Bundrick, and Stanford were correct, that there may be a relationship between greater religious commitment and matching at least one science-theology paradigm. Kyle Longest and Christian Smith found that religiousness (defined by importance of faith, reading scriptures, and committing to live for God) among young adults was positively related to viewing science and faith as compatible and rejecting a conflict view.<sup>25</sup> A similar finding was that young adults who attended Protestant high schools viewed science and faith

as compatible, agreed that their faith was strengthened by science, and rejected conflict between faith and science. Perhaps the process of thinking deeply about and knowing one's faith causes better integration with other aspects of life. Further research should investigate this relationship.

This result raised the question of whether the relationship also worked in the other direction. Does increased science expertise relate to science-theology paradigms? Elaine Ecklund and Jerry Park found that elite scientists were less likely to endorse conflict between science and faith than the general population and even the well-educated population.<sup>26</sup> Is there a difference in science fluency between those who did not match a science-theology paradigm and those who did? A comparison by means of a t-test showed that the science knowledge (see table 3) of those who did not match a paradigm ( $M=5.0$ ,  $SD=1.6$ ) was significantly ( $t(90.8)=-4.8$ ,  $p<0.001$ ) lower than those who did match a paradigm ( $M=6.1$ ,  $SD=1.4$ ). Perhaps the process of knowing science better also causes better integration with faith.

A few things should be mentioned here. First, this work did not find religiosity nor science knowledge to be significantly correlated to any one paradigm (see tables 10-14). This is only a connection between religiosity or science knowledge and matching a paradigm. Also, the results of Longest and Smith and Ecklund and Park mentioned above were specifically those of people embracing a compatible view of faith and science and rejecting a conflict view.<sup>27</sup> In the current dataset and that of Tenneson, Bundrick, and Stanford, matching a paradigm also includes the possibility of embracing a conflict view.<sup>28</sup>

Unfortunately, it is not as simple as dividing those in the dataset who chose Conflict or Compartmentalism paradigms from those with Complementarism or Concordism paradigms. As we have seen (table 8), many students match multiple paradigms, including 52 students (24% of all responses) who chose paradigm 2, Conflict: Theology over Science *and* one or both of Complementarism and Concordism. This is more than the number of students (table 7,  $N=34$ ) who chose paradigm 2 alone. This raises an important question of whether the questions identifying paradigm 2 are valid. That is, are those items accurately identifying those who genuinely view science and theology in conflict?

As noted earlier, one's perspective on the relationship between faith and science is context dependent.<sup>29</sup> If researchers are interested in a broad perspective on this relationship, it is probably best to not use questions that are context specific such as those asking about acceptance of evolution.<sup>30</sup> Pratchayapong Yasri et al. also point out that many of the taxonomies focus on different aspects of the faith-science relationship. Some emphasize the explanations while others focus on epistemology. Still others focus on metaphysics. In the current survey instrument, we see a mixture of these, especially in the questions for paradigm 2. One statement explicitly addresses the evolution question: "Because the Genesis account of creation is true, evolution is necessarily false." But the more general questions for paradigm 2 can be seen to be compatible with the paradigms of Complementarism and Concordism. One says, "The Bible is literally and completely true even when it appears to contradict a scientific matter." One can easily view science and Christian faith in harmony (thinking metaphysically) while acknowledging that epistemologically there might be an *appearance* of conflict. In addition, the statement, "When theology and science conflict, theological conclusions must always take precedence over the claims of science," can be agreed to by someone who denies that there are any real conflicts, but believes that there is only the *appearance* of conflicts. Or one could reject a conflict view of science and faith while still agreeing with these statements if one were employing the theological conservatism principle that Theodore Cabal and Peter Rasor argue is the typical response of Christians to perceived conflict between their faith and science.<sup>31</sup>

According to Margaret Evans et al., such a person would likely be employing a coexistence model of cultural beliefs.<sup>32</sup> This student is accepting both scientific and supernatural epistemologies simultaneously. When explicitly asked about the priority of biblical or theological epistemic claims, the student may agree. However, on the whole, this student harmonizes both epistemologies to assemble a metaphysical or explanatory model.

While the large number of overlapping paradigms raises questions about the interpretation of the paradigms, there are still reasons to think that they identify important characteristics of the students' beliefs. These are seen in the linear models in tables 10-14. These are described below by looking at

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the various predictors that were statistically significant in the linear models.

## Origins Perspective

Origins perspectives were significant for only the Conflict: Theology over Science paradigm. Since young-earth creationism (YEC) was the reference level of the variable (table 11), every other perspective scores significantly lower on the paradigm 2 score. So, even if using method 1 (identifying binary agreement) to analyze paradigm 2 might not adequately capture a conflict viewpoint, method 2 (calculating a score of agreement) does show what we expect. In fact, the estimate for each origins perspective increases as we approach deistic evolution. That is, deistic evolution beliefs predict a score of 0.83 less on the paradigm 2 score than young-earth creation, evolutionary creation predicts 0.66 less on the paradigm 2 score, and old-earth creation only 0.44 less. The relationships show that the more evolutionary and cosmological theory the students accept, the lower their agreement with paradigm 2 will be. This result matches what would be expected if the paradigm 2 score does measure the amount of agreement with a Conflict: Theology over Science viewpoint.

## The Nature of God

In the models for paradigms 1 and 5, the question about the nature of God was significant. Here a positive relationship with paradigm 1 (table 10) and a negative relationship with paradigm 5 (table 14) was found with the response that "God is an impersonal force." The comparison level is to those who responded that "God is a person." It appears that those who do not have an orthodox view of the nature of God are less likely to see science and Christian faith in harmony through the Concordism paradigm and more likely to see science as superior to theology. This supports the view stated earlier that those who have thought through and know their faith are more likely to see harmony between their faith and science.

## Miracles

Not surprisingly, a belief that the biblical descriptions of miracles (both Old and New Testament) literally happened was negatively correlated to paradigm 1 and positively to paradigm 2 (tables 10 and

11). But it is interesting to note that it was also a statistically significant positive predictor of paradigm 4 (table 13), but not of paradigm 5 (table 14). Perhaps, like religiosity, believing in the accounts of miracles represents a well-developed faith leading to a harmonious viewpoint like that of Complementarism. But, in the minds of some students, miracles may be the ultimate example of an irreconcilable difference between the natures of faith and science that prevent full endorsement of a Concordism paradigm. This would be an interesting area for further study.

## Students' Epistemological Views (SEV) of Science

What might be the most intriguing results from these models are those relating to the SEV measurements. Of the five SEV dimensions used, only one, created and invented, did not appear as a significant predictor in any model.

The Social Negotiation dimension was significant for three models. It was a positive relationship to paradigms 1 and 4 and negative with paradigm 3. Since the Social Negotiation dimension emphasized the collaborative nature of science, I hypothesize that the positive relationship to paradigm 1 could arise from those students' faith in peer review and scientific consensus, leading to their placing extra credibility to science over theology. However, direct causal links to paradigms 3 and 4 are less clear.

It is interesting to note that the integration leaning paradigms (Complementarism and Concordism) both had positive relationships with two SEV each. Since a positive score on an SEV represents a "sophisticated" view of the nature of science, we again see a possible link between a knowledgeable and developed view of science and a positive view of the faith-science relationship. On the other hand, the only two negative SEV relationships were to Conflict: Science over Theology and Compartmentalism.

The Theory-Laden Exploration of science appeared in two models. It was a positive predictor for Concordism and a negative predictor for Conflict: Science over Theology. Since Theory-Laden Exploration recognizes biases and presuppositional influences on the work of scientists, perhaps those who recognize it are therefore less likely to place extra credibility on science over theology (paradigm 1).

Perhaps an acknowledgment of biases, prejudices, and presuppositions in science is required to see science and theology in unified harmony (paradigm 5).

Two SEV dimensions, Changing and Tentative along with Cultural Impacts, were found in one model each. The relationship between Changing and Tentative and Complementarism was significant and positive along with Cultural Impacts with Concordism.

Specific causal links between these SEV dimensions and the paradigms could be a fruitful area for future research. Such work could also further test the hypothesis that a sophisticated view of science lends itself to choosing harmonious perspectives on faith and science.

### Other Paradigms

Each model also included the other paradigm scores. The negative or positive effect varied across the models. See tables 10-14 for the details. Some of the connections seem obvious. Paradigm 2 was negatively predictive of paradigm 1. Paradigms 1 and 3 had significant, positive relationships with each other. Conflict and separation might go hand-in-hand. However, the story cannot be that simple since the Conflict: Theology over Science paradigm does not see a similar positive relationship to Compartmentalism. Perhaps issues with respect to the validity of paradigm 2 discussed above are at play here.

A positive relationship of paradigm 4 to paradigm 5 is also expected given the prior work.<sup>33</sup> But it is interesting to note that the effect size from paradigm 4 to 5 is smaller than some of the other relationships such as 1 to 3, 2 to 5, and even 1 to 5! Another strange result is that paradigm 4 is negatively related to paradigm 2 while paradigm 5 is positively related to paradigm 2. While some of these relationships seem straightforward, others are not.

In addition, while some paradigms appear to be opposed, most are not mutually exclusive. This is even apparent from the wording of the questions. As argued before, beliefs about the relationship between science and theology are likely very context specific. Results such as these show that the students cannot always be pigeonholed into neat, separate paradigms by this survey.

Future research here should focus on several predictors. First, can the survey instrument be improved to better identify science-theology paradigms? Work in this area should focus on making the items less context specific. Perhaps also, insight from Yasri et al. and Evans et al. could help in identifying epistemological paradigms separately from explanatory or metaphysical paradigms.<sup>34</sup> These may operate in different combinations. For example, a young-earth or old-earth creationist might have a metaphysical worldview that sees no conflict between scientific pursuit and Christian faith while at the same time being skeptical of specific epistemological claims made by scientists and elevating the epistemological claims of the Bible. Such an individual would likely score high on both the Concordism and Conflict: Theology over Science paradigms in the survey's current format.

## CONCLUSIONS

The survey instrument for science-theology paradigms was employed to identify the paradigms used by Christian college students at this institution. Results showed that there are often complex relationships between the various science-theology paradigms. Many students used multiple paradigms, often including a conflict paradigm. The results suggest the context-dependent nature of these paradigms.

The specific breakdown of origins beliefs and science-theology paradigms varies slightly from the previous work,<sup>35</sup> although it shows some similar patterns. However, they represent the beliefs of only a small sample at one institution. The results are likely to change from one institution to another based on student background and theological commitments of the school. Future work could expand to include multiple institutions of varying denominations or theological perspectives in order to identify variations in paradigm choice that might arise from such differences.

When connected with religious practices, beliefs, science knowledge, and beliefs about the nature of science, an interesting story emerges. Students who are more engaged with their faith and more knowledgeable about basic science are more likely to be identified with one of the science-theology paradigms. Even more specifically, those who have

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an orthodox view of God (a person rather than a force), those who believe the biblical accounts of miracles, and those with sophisticated views on the nature of science are more likely to score higher on Complementarism or Concordism paradigms. Future work should investigate these relationships using qualitative or mixed-methods research. For example, interviews with students who display intriguing combinations of science-theology paradigms and epistemological beliefs could reveal relationships undetected by the quantitative data.

The current study did not include enough responses to probe how these beliefs might change over a college career. Further work that increases sample size and/or collects longitudinal data might shed light on this interesting question. In this data, there was a statistically significant difference between freshmen and upperclassmen on the question about the nature of God. Increasing the statistical power of the data with a larger sample size might reveal more differences as a result of the college experience. The best way to answer that question would be to administer the survey on a regular basis to the same population of students in order to track changes among matched responses. ☀

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## Notes

<sup>1</sup>John H. Evans and Michael S. Evans, "Religion and Science: Beyond the Epistemological Conflict Narrative," *Annual Review of Sociology* 34 (2008): 87-105, <https://doi.org/10.1146/annurev.soc.34.040507.134702>; Elaine Howard Ecklund and Jerry Z. Park, "Conflict between Religion and Science among Academic Scientists," *Journal for the Scientific Study of Religion* 48, no. 2 (2009): 276-92, <https://www.jstor.org/stable/40405617>; Christopher P. Scheitle, "U.S. College Students' Perception of Religion and Science: Conflict, Collaboration, or Independence? A Research Note," *Journal for the Scientific Study of Religion* 50, no. 1 (2011): 175-86, <https://doi.org/10.1111/j.1468-5906.2010.01558.x>; John H. Evans, "Epistemological and Moral Conflict between Religion and Science," *Journal for the Scientific Study of Religion* 50, no. 4 (2011): 707-27, <https://doi.org/10.1111/j.1468-5906.2011.01603.x>; Kyle C. Longest and Jeremy E. Uecker, "It All Depends on What You Want to Believe: How Young Adults Navigate Religion and Science," *Review of Religious Research*

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<sup>8</sup>John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge, UK: Cambridge University Press, 1991).

<sup>9</sup>Michael Tenneson, David Bundrick, and Matthew Stanford, "A New Survey Instrument and Its Findings for Relating Science and Theology," *Perspectives on Science and Christian Faith* 67, no. 3 (2015): 200-222, <https://www.asa3.org/ASA/PSCF/2015/PSCF9-15Tenneson.pdf>.

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<sup>12</sup>Barbour, *When Science Meets Religion*.

<sup>13</sup>Tenneson, Bundrick, and Stanford, "A New Survey Instrument."

<sup>14</sup>Ibid.

<sup>15</sup>Ibid.

<sup>16</sup>Pew Research Center, "Religious Landscape Study."

<sup>17</sup>Baylor University, *Baylor Religion Survey, Wave II* (Waco, TX: Baylor Institute for Studies of Religion, 2007).

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<sup>21</sup>Tenneson, Bundrick, and Stanford, "A New Survey Instrument."

<sup>22</sup>Ibid.

<sup>23</sup>Ibid.

<sup>24</sup>Pew Research Center, "Religious Landscape Study."

<sup>25</sup>Kyle C. Longest and Christian Smith, "Conflicting or Compatible: Beliefs about Religion and Science among Emerging Adults in the United States," *Sociological Forum* 26, no. 4 (2011): 846-69, <https://doi.org/10.1111/j.1573-7861.2011.01287.x>.

<sup>26</sup>Ecklund and Park, "Conflict between Religion and Science."

<sup>27</sup>Longest and Smith, "Conflicting or Compatible"; Ecklund and Park, "Conflict between Religion and Science."

<sup>28</sup>Tenneson, Bundrick, and Stanford, "A New Survey Instrument."

<sup>29</sup>Brooke, *Science and Religion*.

<sup>30</sup>Pratchayapong Yasri et al., "Relating Science and Religion: An Ontology of Taxonomies and Development of a Research Tool for Identifying Individual Views," *Science & Education* 22, no. 10 (2013): 2679-707, <https://doi.org/10.1007/s11191-013-9623-4>.

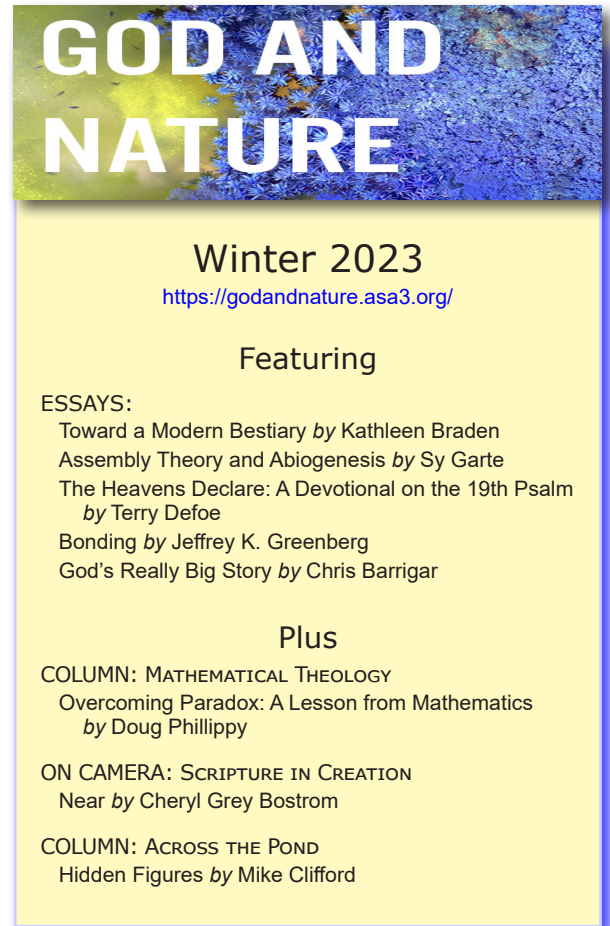
<sup>31</sup>Theodore J. Cabal and Peter J. Razor II, *Controversy of the Ages: Why Christians Should Not Divide over the Age of the Earth* (Wooster, OH: Weaver Book Company, 2017), 40-46.

<sup>32</sup>E. Margaret Evans, Cristine H. Legare, and Karl S. Rosengren, "Engaging Multiple Epistemologies: Implications for Science Education," in *Epistemology and Science Education: Understanding the Evolution vs. Intelligent Design Controversy*, ed. Roger S. Taylor and Michel Ferrari (New York: Routledge, 2010), 111-39.

<sup>33</sup>Tenneson, Bundrick, and Stanford, "A New Survey Instrument."

<sup>34</sup>Yasri et al., "Relating Science and Religion"; Evans, Legare, and Rosengren, "Engaging Multiple Epistemologies."

<sup>35</sup>Tenneson, Bundrick, and Stanford, "A New Survey Instrument."



## 2022 Peer Reviewers

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