

## **Beliefs, Values and Science: Paradigmatic Filters and Perceptions of Evolution**

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Individuals' personal beliefs and values systems constitute a cognitive and affective filter that mediate their understanding and epistemological paradigms of what is true – even in a domain such as science that places a high regard on testability and empirical evidence to inform and ascertain that which is valid and reliably true. Societal values and science interact but their interplay is ultimately actuated at the individual level and motivated by personal beliefs. A better understanding of how individuals perceive science may benefit the reciprocity between science and the values of society. The interaction of personal values and perceptions of scientific verisimilitude is especially at work in dealing with matters of scientific origins, including biological evolution. This paper explores how individuals' personal values, particularly when religiously motivated, moderate their understandings of evolution and perceptions of its scientific veracity. A study of Christian biology-related majors at a Christian university and their perceptions of evolution serves as the platform which to study the interaction of students' understanding of evolution and their personal religious beliefs and values.

### *Evolution and Creationism*

Evolution is described as a biological theory that “all organisms have a common ancestor and that differences between species are due to divergent modifications in successive generations due largely to genetic variation and natural selection” (Baker, 2006, p. 196). Biological evolution has been characterized as one of the cornerstones of modern science learning (Jackson, Doster, Meadows, & Wood, 1995). The National Academy of Sciences (1998) asserts that evolution is “the most important concept in modern biology, a concept essential to understanding key aspects of living things” (p. viii).

The theory of evolution provides a naturalistic mechanism to explain the diversity of life on Earth without reference to supernatural intervention. In contrast, “creationism,” as used in this paper, is the Christian view that God directly created the universe (Scott, 2004). A broad spectrum of beliefs exists within creationism. At one end of the creationism spectrum, “Young Earth Creationists” with a literal interpretation of Genesis assert that the universe is 6,000-10,000 years old and that God created a multiplicity of living beings in a matter of days (Dalrymple, 2000). Another distinct group on the creationism spectrum is the Progressive Creationists, or “Old Earth Creationists,” who agree with currently accepted cosmological and geological theories, but reject basic tenets of biological evolution such as the dynamic view of speciation (Scott, 2004). The days of Biblical creation, instead of 24-hour periods, are long epochs of millions or billions of years and are generally compatible with the Big Bang, radiometric dating, and old-earth geological evidence. Progressive creationists believe that God, in a supernatural act, created plant and animal life at important junctures in history (B. J. Alters, 1996). All creationists categorically reject evolution as descent with modification from a single common ancestor.

Intelligent Design (ID) is a relatively recent form of creationism. Intelligent Design advocates posit that certain biological structures have the appearance of being intelligently designed (Behe, 1996) and could not have come about by evolution. Leaders within the movement avoid revealing an identity, but most assume the “designer” is the Judeo-Christian God (Scott, 2004). Intelligent Design literature aims to undermine what its proponents call “Darwinism,” a term loosely associated with anything related to Darwin's idea of natural selection (Scott, 2004).

Religious belief does not have to preclude acceptance of evolution. Theistic evolutionists believe that God works through the laws of nature in harmony with currently accepted theories of science.

Colburn and Henriques (2006) broadly define theistic evolution as a “marriage of theism and evolution” (p. 435). As a central tenet of Christianity maintains God is actively involved in creation, theistic evolution should not be confused with deism (Murphy, 2002).

Theistic evolution introduces a variety of complex theological issues that must be addressed if one ascribes to a God who works through evolution (Peters & Hewlett, 2003). These include teleology (the purpose or ultimate goal of a random universe), divine action (how God works in the universe), theodicy (the problem of evil) and the nature of the human soul. These theological implications are pertinent for Christian university students struggling to find balance in reconciling their personal religious beliefs with science (Colburn & Henriques, 2006; Brem, Ranney, & Schindel, 2003).

### *Values, Beliefs, and the Understanding and Acceptance of Evolution*

A critical aspect of this study was to investigate the relationship between Christian university biology-related majors’ acceptance of evolution and their faith as a personal worldview that incorporates beliefs and values in judging that which is true. An *acceptance* of evolution should be distinguished from an *understanding* of evolution. A study of an undergraduate non-majors biology class showed that there is no relation between students’ knowledge of evolution and their reported acceptance of it (Sinatra, Southerland, McConaughy, & Demastes, 2003). Bishop and Anderson (1990) found that an improvement in college students’ understanding of evolution “did not generally change their convictions about the truthfulness of the theory” (p. 426). Dagher and BouJaoude (1997) cite evidence that a good understanding does not necessarily lead to an acceptance of evolution when religious beliefs interfere. In a study by Lord and Marino (1993), three-quarters of the college students who said they thought evolution was true did not have an understanding of the mechanism behind it. Summarizing these studies, understanding does not necessarily lead to an acceptance of evolution, nor is understanding a prerequisite to accepting evolution. However, as an ethical consideration, instruction should enable students to understand evolution prior to their acceptance or rejection of evolution.

While an acceptance of evolution is distinct from an understanding of the theory, the differentiation between an acceptance of and a *belief* in evolution is less apparent. Cobern (1994) argues that the primary goal of evolution education is an understanding rather than a belief in evolution. Still, Cobern associates belief with knowing, defined as the process by which one comes to accept a concept as true or valid. Indeed, Cobern writes, “What one teaches about photosynthesis is what one *believes* [italics in original] to be true about photosynthesis” (1991, p. 82). However, Cobern immediately qualifies his statement by adding: “Photosynthesis is a specific topic and a benign one at that.”

M. U. Smith (1994) contends that Cobern’s view of knowing is misguided in equating the acceptance of a concept with believing that it is so. Smith agrees that students’ beliefs can significantly impact their learning of evolution, but writes, “The genuine scientist is bound by the rules of evidence and judges the validity of various claims on the basis of empirical evidence, not on the basis of his personal convictions, opinions, and beliefs” (p. 594). The National Academy of Science recently released *Science, Evolution, and Creationism*, the third edition of a publication that addresses science and religion (NAS, 2008). The book contains a section entitled, “Isn’t belief in evolution also a matter of faith?” Within that section, the NAS states, “*Acceptance* of evolution is not the same as a religious *belief* [italics in original]. . . . Evolution is accepted within the scientific community because the concept has withstood extensive testing by many thousands of scientists for more than a century” (p. 49). As such, scientists do

not believe in evolution – they accept it as a theory, the best explanation available in accordance with a systematic evaluation of the evidence.

In spite of the distinction between belief and acceptance, Cobern (1994) contends that belief should be “allowed a legitimate role in the science classroom” (p. 588) as personal beliefs can impede an understanding of evolution. Meadows, Doster, and Jackson (2000) similarly contend that persons whose religious beliefs are in apparent conflict with evolution may actively resist learning about evolution. Meadows et al. state, “These students do not fail to learn about evolution as teachers often think; instead, they actively choose not to learn about evolution” (p. 106) in order to minimize the troubling and emotionally trying aspects of their perceived conflicts between evolution and personal beliefs.

A poignant example of religious beliefs co-opting an acceptance of science is found in Ebenezer’s (1996) study of Christian preservice teachers’ responses to constructivism in a curriculum and instruction course at a public university. The following quotation is from a study participant:

When it comes to religious beliefs, there are things [truths] that are not negotiable. . . . And understanding those truths and accepting them have eternal consequences and eternal value, whereas in scientific circles when you are talking about understanding the properties of matter we come to some social negotiation about it. It doesn’t really matter if you negotiate it wrong. It doesn’t have eternal consequences (p. 444).

Clearly, the preservice teacher’s personal composition of the ultimate importance of religious truths superseded notions of scientific legitimacy.

This study, in contrast to Ebenezer’s investigation (1996) at a public university, occurred in the context of a Christian university that emphasizes positive interaction in religious and scientific ways of knowing the world. In contrast to the preservice teacher’s approach to religious and scientific truth, Holmes (1987) stresses that the challenge for Christian higher education is to help students develop a faith responsive not only to spiritual belief but also to evidence and arguments from other ways of knowing, including science. Poe (2004) writes that Christian liberal arts colleges consider “the religious and academic programs as parts of a whole that should not be separated” (p. 39). Hasker (1992) posits that there is a “single reality, all of which is created by God” (p. 236). Therefore, “one is not confronted with the task of ‘integrating’ two or more or less separate and disjoint bodies of knowledge and belief; rather, there is a unitary vision of truth” (pp. 236-237). Still, Hasker acknowledges diversity in ways of knowing: science as an empirically driven discipline; and theology as a response to God’s revelation. Holmes (1987) claims that all truth is God’s truth and “in the final analysis there will be no conflict between the truth taught in Scripture and truth available from other sources [e.g., science]” (p. 18). Holmes argues for a constructive dialog, an interaction between religious beliefs and other ways of knowing, that seeks to find resolution in perceived areas of dissonance.

This interplay of religious beliefs and other ways of knowing occur in the nexus of a person’s worldview. Cobern (1994) highlights the importance of the worldview that appropriates meaning according to “culturally dependent presuppositions or assumptions about what the world is ultimately like and what constitutes first causes” (p. 587). The interpretive worldview “predisposes one to feel, think, and act in predictable patterns” (Cobern, 1991, p. 19). Recognition of the importance of affect and a structured worldview by which predictable patterns emerge are critical aspects of Fowler’s stages of faith (Fowler, 1981) and Parks’ model of young adult faith (Parks, 1986). This study utilized faith

development theory as a useful means to investigate Christian university biology-related majors' reconciliation of their perceived conflicts between evolution and personal religious beliefs.

### *Stages of Faith: A Framework to Understanding Values and Beliefs*

In his 1981 seminal book entitled *Stages of Faith: The Psychology of Human Development and the Quest for Meaning*, James Fowler formulated a structural-developmental theory of faith to describe the cognitive rationale and affective response in shaping one's world. In *Stages of Faith* and subsequent writings, Fowler broadly defines faith:

Faith has to do with the making, maintenance, and transformation of human meaning. It is the mode of knowing and being. In faith, we shape our lives in relation to more or less comprehensive convictions or assumptions about reality. Faith composes a felt sense of the world as having character, pattern and unity. In the midst of the many powers and demands pressing upon us, enlarging and diminishing us, it orients us toward centers of power and value which promise to sustain our lives (Fowler, 1986, p. 15).

Fowler asserts that faith is a universal phenomenon, regardless of any religious affiliation, that all humans possess whether or not they are aware of it. Parks (1986) writes, "To be human is to dwell in faith, to dwell in one's meaning – one's conviction of the ultimate character of truth, of self, of world . . . whether that meaning be strong or fragile, expressed in religious terms or secular" (p. xv). From this perspective, W. C. Smith (1979) argues that only a faith-less person would love no one, care for nothing, see no beauty, and have no joy or hope.

Fowler was inspired by the structural-developmental theories of Piaget and Kohlberg and psychosocial theories of Erickson to operationalize six stages of faith. He recognized in their work the power to formally describe "predictable changes in human thought and adaptation" (Fowler, 1981, p. 89). Fowler also observed crisis and dissonance as critical experiences that accompany stage transitions. Fowler's faith stages are therefore strongly linked to Piaget's cognitive development stages, Kohlberg's moral development framework, and Erickson's eras that focus on the search for identity. However, Fowler infused a broader understanding beyond cognitive structures in claiming that faith involved "passionality" in addition to rationality. The faith stages integrate the "structures of affective, valuational and imaginal modes of knowing . . . that Piagetian and Kohlbergian stage theories have intended to avoid" (1981, p. 99).

Fowler's six stages of faith are fully described in *Stages of Faith* (Fowler, 1981) and other sources (Parks, 1986). Stages 2 through 4 are most pertinent to university students (Holcomb & Nonneman, 2004). Stage 2 is a mythic-literal faith characteristic of children who rely on intuition and lack critical thinking skills. A Stage 2 person's notions of fairness and morality are based on reciprocity. Towards the end of this stage, the rise of formal operational reasoning enables children to reflect on the emerging contradictions of simplistic morality and literal thinking.

Stage 3, synthetic-conventional, is typical of adolescents with their "conformist" identity and heavy reliance on interpersonal relationships. As one's world enlarges to encompass new demands from school or work, the Stage 3 person's sense of identity is tuned to the expectations and judgments of significant others. Authority is external, lying in the consensus of those significant others and in the authority figures and symbols that represent the traditions by which the person has found value and meaning. To summarize, Stage 3 persons accept the conventions of group and societal norms without

critical analysis. Although beliefs and life-guiding values are deeply felt, their structure is tacitly held without conscious analysis. Many adults remain fixed in the synthetic-conventional stage for life.

Stage 4, individuative-reflective, occurs as a person critically reflects on his or her personal identity and beliefs. Through a personal crisis or a clash of authority figures and symbols, the tacit assumptive values system gives way to the explicit through reflection. Authority relocates from the external to within the self in what Fowler calls the emergence of an executive ego. Stage 4 persons recognize the relativity of their perspectives and those of others. Transition to Stage 4 can occur at any time in adult life and the process may take many years.

### *Young Adult Faith*

While Fowler's theory of faith stages serves as an important backdrop for this study, Parks' (1986) focus on the faith development of college students is particularly relevant. As the shift from Stage 3 to Stage 4 can be an extended process, Parks proposes an intermediate "young adult" stage to span the transition from adolescence to adulthood. Parks claims this intermediate stage holds a kind of "equilibrated integrity that itself constitutes a distinct form of faith – a developmental balance worthy of attention" (Parks, 2000, p. 61). Based on their work in conducting qualitative interviews with 240 Christian university students, Holcomb and Nonneman (2004) support Park's designation of an intermediate stage.

Parks (1986) identifies three concepts that describe college students' transitions in faith: form of cognition; form of dependence; and form of community. Building upon the work of William Perry's (1970) investigation of university students' cognitive growth, Parks describes forms of cognition that begin at Fowler's Stage 3: authority-bound/dualistic; unqualified relativism; commitment in relativism; and convictional commitment. Authority-bound persons uncritically assume a trust in an authority outside themselves and tend to compose their perceptions of self and the world in dualistic terms (i.e., right and wrong, true and untrue). When persons recognize that their established patterns of thinking clash with lived experiences, they may shift to a position of unqualified relativism, realizing that all knowledge is relative in being conditioned to the knower. When persons make a self-conscious commitment to critically reflect and make judgments based on principles rather than intuition and assumptions, they have moved from a tacit set of assumptions to an explicit system, a so-called commitment in relativism associated with young adult faith. Persons may eventually reach a position of convictional commitment when they develop a mature wisdom that fully engages with "complexity and mystery" (p. 51).

Like Fowler, Parks (1986) values the role of affect in faith development, stating, "Cognition and affect are intimately woven together in the fabric of knowing" (p. 52). Parks describes three forms of dependence: dependent/counter dependent; inner-dependent; and interdependent. Dependence is a tacitly held trust in which an assumed authority determines "feelings of assurance, rightness, hope, fear, loyalty, disdain or alarm" (p. 55). When persons begin to test truth for themselves, counter-dependence occurs in opposition to that dependence, yet the authority still remains in control. Inner-dependence, indicative of young adult faith, appears when persons "include the self within the arena of authority" (p. 57) while still responsible to external authority figures. The adult faith, in becoming less dependent upon others for a sense of value and meaning, shifts to a confident inner-dependence. Eventually, individuals' primary trust may lie neither in outside authority nor the inner self, but in interdependence where trust is centered "in the meeting of self and other, recognizing the strength and finitude of each and the promise of the truth that emerges in relation" (p. 59).

The form of community describes the social dynamics that influence how persons compose meaning (Parks, 1986) and include: conventional; diffuse; self-selected group; and open to others. In conventional community, worldviews are greatly influenced by the social norms and interests of the group to which persons feel a sense of belonging, similar to Fowler's Stage 3. As individuals begin to desire independence in thinking, they may look to a multiplicity of relationships with which to connect in an ideologically compatible diffuse form of community that demarcates a young-adult faith. Thereafter, persons may self-select and reconstitute the group to which they belong, enabling a diversity of political, religious, and philosophical perspectives to emerge. The open-to-others form of community occurs when individuals yearn to be more inclusive in their associations, based on a sense of love and social justice.

While Fowler (1981) provides a global perspective, Parks' (1986) description of young adult faith in the transition from adolescence to adulthood presents a more nuanced view of the context and factors inherent in a university student's journey of faith development. Therefore, Fowler's theory was used in this study to help distinguish Christian university biology-related majors' stages of faith, while Parks' model added rich insights into the forces that shape Christian university students' reconciliation of their perceived conflicts between evolution and personal religious beliefs.

### *Research Framework and Methodology*

This study utilized a socially constructed knowledge framework which maintains that individuals develop subjective interpretations of their experiences (Creswell, 2003). Human beings' knowledge construction of the world they experience arises from their social interactions and their individual thinking. The socially constructed knowledge claim was well suited to this study because of the research focus on participants' constructions of meaning making and ultimate value, and how those constructions influenced reconciliation of perceived conflicts between evolution and personal religious beliefs.

Naturalistic research was chosen as the primary approach for this study. The instrumental case study design (Stake, 2000) was applied, in which the single case was a bounded system of biology-related majors at a Christian university in the Midwest. Data collection, analysis and interpretation centered on participants' perceptions. The study's findings revealed patterns of internal conflict and disequilibrium experienced by the participants. Redundancy and variety existed in the data, which allowed the researcher to provide a panoramic description of common and distinctive perspectives across all of the case study participants.

The typical site sampling strategy was used for this study, meaning, "the site is specifically selected because it is not in any major way atypical, extreme, deviant, or intensely unusual" (Patton, 1990, p. 173). While a diversity of approaches exists for addressing evolution issues at Christian universities (B. J. Alters & S. M. Alters, 2001), no aspect of the study site suggested that it was atypical of higher education institutions committed to the teaching of evolution in non-opposition to religious belief. The site for this study was a Midwestern Christian university with an undergraduate enrollment of 1,200 students. The institution offers the usual variety of small university science programs including biology, chemistry and physics degrees. Other than a high regard for its preparatory programs for graduate study and medical school, the science department is typical.

The purposeful sampling method (Patton, 1990) was employed to select "information-rich" cases (participants) with significant relevance to the central question of the study. Participants were senior Christian university biology-related majors and recent graduates within the last two years who

majored in biology-related science (biology, biology-chemistry, or biological science education), and had completed an upper-level biology course on evolution entitled Origins, as described in the 2005-2007 university catalog:

A multi-disciplinary search for the origins of the universe, galaxies, our solar system, earth, life, diversity of living organisms, and the human body. The fields of nuclear physics, astronomy, geology, embryology, comparative anatomy, genetics, cell and molecular biology, and biochemistry inform the search for physical origins. Metaphysical questions about origins are informed by scholars in Biblical analysis, theology, philosophy, and literature. Each student will develop an annotated bibliography and a scholarly paper integrating course content with his/her own worldview.

The criteria optimally filtered for participants with relatively advanced biology knowledge and reasoning skills. Completion of the Origins course guaranteed exposure to contemporary debates on evolution and religious beliefs. Enlarging the participant pool to recent graduates allowed for compelling reflection on college experiences in shaping beliefs systems and how those belief systems play out in the post-graduate world. Twenty-one potential participants fit the study criteria. Three potential participants who were recent graduates were inaccessible and three declined participation in the study. Fifteen study participants included six female undergraduates, one male undergraduate, six female graduates and two male graduates.

During the time of the study, the researcher was a faculty member at the study site. All participants who completed this study had previously taken a science or science education course from the researcher. No participant was enrolled in any of the researcher's courses during the period that this research was conducted. Of the 18 biology-related majors who were accessible and were contacted for this research, 83% elected to participate in and complete the study. Despite the busy schedules of participants, several of whom were in professional or graduate studies, participants appeared eager to help the researcher. The high participant rate indicated that the research topic was relevant to participants and the existing rapport between the researcher and participants was a positive aspect of the study.

#### *Data Sources*

The broad sources of data in this study included semi-structured interviews, an Evolution Attitudes survey, and scholarly papers, and were collected from December 2006 to August 2007. A dual interview design was utilized. The first interview investigated the participants' faith development using an interview protocol as outlined in the *Manual for Faith Development Research* (Fowler, Streib & Keller, 2004; see also Fowler, 1981). The data from the faith development interviews were analyzed and coded similarly to all the data sources in this study. Additionally, the faith development interview data were further analyzed using Fowler's protocol.

The creationism-evolution interview was conducted approximately a week following the faith development interview. The second interview explored participants' perceived conflicts between evolutionary theory and personal religious beliefs. The interview protocol for the first and second interviews is found in Appendix A. At the beginning of the second interview, participants completed the Evolution Attitudes Survey (Ingram & Nelson, 2006) that served as another source of evidence to round out a comprehensive understanding of participants' perspectives.

As an Origins course assignment, participants wrote a “scholarly paper” that integrated course content with their own worldview. As data in this study, the scholarly paper was a rich source of information that represented the participants’ views on evolution. The carefully prepared contents of the scholarly paper were an effective complement to the informal, spontaneous interview responses.

Participants were given opportunity to review their interview transcripts to check for accuracy and provide clarification. In addition, participants were provided personal portraits that described their views of creationism and evolution. Participants returned a member check form with feedback. The purpose of the member checks was to ensure accuracy in description and fidelity to participants’ perspectives, and thus increase trustworthiness in the study.

The researcher observed the Origins course in the spring of 2007. Descriptive fieldnotes of the Origins course, including the professor’s presentations and professor-student interactions, offered insights into the milieu in which students processed their understanding of evolution and their personal religious beliefs. All fifteen participants in this study had completed Origins in the previous two years before the spring of 2007; therefore, none of this study’s participants were formally observed in Origins.

### *Methods of Analysis*

Data analysis was a multi-step process that included multiple readings and coding of the interview transcripts, documents, and fieldnotes. Scrutinizing data for regularities of words, phrases, behaviors, events, and participants’ ways of thinking enabled the identification of codes assigned to units of data. The development of codes in the first reading of both the faith development and evolution-creationism transcripts centered on participants’ views of creationism and evolution as well as the influences and events that fostered those perspectives. The preliminary list contained codes such as “parental influence,” “Bible,” “fear or anxiety,” and “domains of science and religion.”

At the end of the second reading in which all transcripts, member check forms and scholarly papers were coded line-by-line, some codes were subsumed by other codes or adapted to fit the emergent categories and themes. As the researcher became increasingly familiar with the data through multiple readings and refinement of codes, themes began to emerge from the patterns evident within the data. The patterns were written into themes which are the key outcomes of this study. As this study is a naturalistic inquiry, the themes are not quantitative. Instead, descriptive words such as “most,” “many,” and “some” convey the extent of a pattern to which the theme applies. “Most,” in the context of this study with 15 participants, indicates ten and greater, or at least two-thirds of the participants, but not all participants. “Many” is five or more but less than most. “Some” indicates less than five but still represents a meaningful extent.

### *Summary of Participants’ Views on Creationism and Evolution*

The following summary provides the variety and scope of participants’ views of creationism and evolution in this study. The dominant Christian perspectives on the creationism-evolution continuum, as described earlier, are Young Earth Creationism, Progressive Creationism, and theistic evolution. In this study, participants’ views fell into these three same categories. Table 1 summarizes participants’ childhood beliefs, including the sources for those beliefs, and their present views on creationism and evolution.

Most participants, as seen in Table 1, believed in Young Earth Creationism during childhood. Many participants reported that their strong creationist and anti-evolution beliefs were due to their

parents' influence. Other participants remarked that they simply assimilated creationist beliefs from what they heard in church. Two notable exceptions in Table 1 are Diana, Participant 4, and Tiffany, Participant 6. Diana's father was a geologist and she remarked how her father encouraged her to read evolution and old earth geology books as a child. Tiffany was also unique in that she accepted evolution while in high school. When Tiffany first studied evolution in ninth grade biology, she said, "It struck me during class when we were talking about evolution that evolution didn't necessarily mean that God didn't create everything. It just maybe meant that things evolved and that was kind of how stuff happened." Both Diana and Tiffany were surprised at how many of their fellow classmates struggled with evolution at the university. Tiffany remarked, "I didn't even realize that [my other classmates didn't accept evolution] until I actually took that Origins course and there were kids in there who, . . . the light bulbs were just coming on and I was like [? - quizzical expression]."

Diana and Tiffany's relative ease with evolution contrasts with most other participants who struggled to overcome their distrust of evolution. Many participants did not realize that a Christian could accept evolution until they arrived at the study site university. Most participants from a creationism background who eventually accepted theistic evolution did not reach that position until late in their university tenure, and only through a process of conflict resolution and apprehension.

In contrast to their childhood beliefs in creationism, most participants held a theistic evolution view at the time of the study. Thirteen participants affirmed that God created through evolution. Two noticeable exceptions are Ashley, Participant 5, and David, Participant 15. David espoused a traditional, Young Earth Creationist view. Ashley's position deserves further explanation since her views are a unique mix of Progressive Creationism and theistic evolution perspectives. Ashley came from a strong creationist background and reported that throughout her childhood, she always believed that the first chapter of Genesis was literal because, as she articulated, "That's just how I was raised." As a senior in the Origins course, Ashley struggled to make her theology and science fit. She sought to find a common ground between science and her personal religious beliefs in order to reach a sense of integrity in both. Ashley commented in her interview, "Sometimes, it's not possible." Ashley stated that "the whole Adam and Eve passage" can be seen as "poetry to explain the ten thousand different species He put on earth to evolve later." In other words, Ashley asserted that God specially created the first line of organisms, and evolution took over from there. As a result of her theological perspectives and ideas regarding the intricacies of nature, Ashley's view integrates evolution to a point at which God specially intervened to create an initial line of ten thousand species.

To summarize, most of the participants in this study were raised during childhood to believe in Young Earth Creationism. Many participants had no concept of theistic evolution and instead held anti-evolution perspectives when they entered the study site university as freshmen. However, most participants, after a process of conflict resolution, came to accept evolution as God's mechanism for creation.

Table 1 also presents results of participants' faith stages. The Fowlerian faith stage scores of the participants fell along a continuum from 3.0 to 4.0. Participants' faith stages, as described by Parks' model, ranged from conventional faith to adult faith, in accordance with Parks' analysis of college students' faith. Parks' qualitative faith description and Fowler's quantitative faith stage score demonstrate complementary, parallel outcomes from the analysis. The import of participants' faith stages to their acceptance of evolution is discussed in detail further below.

Table 1  
*Participants' Childhood Beliefs, Present Views on Creationism and Evolution and Faith Stages*

| Participant    | Childhood Beliefs  | Influenced by              | Present Views   | Parks' Faith Stage Description     | Fowler's Faith Stage Score |
|----------------|--|----------------------------|---|------------------------------------|----------------------------|
| 1 - Gail       | Young Earth Creationism                                    | Parents                    | Theistic evolution  | Transitioning to adult faith       | 3.7                        |
| 2 - Stephanie  | Young Earth Creationism                                    | Church                     | Theistic evolution  | Transitioning to young adult faith | 3.3                        |
| 3 - Megan      | Young Earth Creationism                                    | Father, who is a pastor    | Theistic evolution  | Young adult faith                  | 3.5                        |
| 4 - Diana      | Theistic evolution   | Father, who is a geologist | Theistic evolution  | Conventional faith                 | 3.2                        |
| 5 - Ashley     | Young Earth Creationism                                    | Mother                     | Progressive creationism with elements of theistic evolution | Transitioning to adult faith       | 3.8                        |
| 6 - Tiffany    | Young Earth Creationism, accepted evolution in high school | Church                     | Theistic evolution  | Transitioning to young adult faith | 3.3                        |
| 7 - Jennifer   | Young Earth Creationism                                    | Parents                    | Theistic evolution  | Adult faith                        | 4.0                        |
| 8 - Rachel     | Young Earth Creationism                                    | Father, who is a pastor    | Theistic evolution  | Adult faith                        | 3.9                        |
| 9 - Heather    | Young Earth Creationism                                    | Parents                    | Theistic evolution  | Transitioning to young adult faith | 3.2                        |
| 10 - Brittany  | Young Earth Creationism                                    | Church, grandparents       | Theistic evolution  | Transitioning to young adult faith | 3.4                        |
| 11 - Nicole    | Young Earth Creationism                                    | Parents                    | Theistic evolution  | Young adult faith                  | 3.7                        |
| 12 - John      | Young Earth Creationism                                    | Parents                    | Theistic evolution  | Young adult faith                  | 3.5                        |
| 13 - Elizabeth | Young Earth Creationism                                    | Church                     | Theistic evolution  | Young adult faith                  | 3.5                        |
| 14 - Michael   | Young Earth Creationism                                    | Mother                     | Theistic evolution  | Adult faith                        | 4.0                        |
| 15 - David     | Young Earth Creationism                                    | Mother                     | Young Earth Creationism                                     | Conventional                       | 3.0                        |

### *Study Findings: Categories and Themes*

Several categories of themes emerged from the data and include the following: 1) the primary factors that influenced participants' views on evolution and creationism; 2) the meaning participants gave to science and religion in their lives; 3) the nuances of participants' views on evolution and creationism; 4) the process of participants' reconciliation of evolution and personal religious beliefs; and 5) the relationship of participants' faith stages to their acceptance or rejection of evolution. This paper focuses on the fifth category but includes pertinent information from the other categories to provide context. Further information on the first four categories can be found in Winslow (2008).

#### *1) Primary factors that influenced participants' views on evolution and creationism*

Participants viewed parents as a strong influence in their lives. In most cases, participants were led to believe in creationism during childhood, either directly from their parents or within the church. Many parents aggressively pressured participants as university students to reject evolution. In spite of past or ongoing struggles over evolution, many participants maintained a close relationship with their parents. However, many participants also claimed a worldview unique from their parents.

Participants viewed their professors as influential role models. Many participants appreciated the authenticity and transparency of their Bible professors and the Origins professor. These professors were straightforward in communicating their views on evolution and their religious beliefs. Many participants also expressed that their professors served as examples in developing a positive relationship between science and religious beliefs. Compared to the influence of parents and professors, other factors, including church, friends, siblings, grandparents, and spouses, were only moderate influences in most participants' lives during their process of reconciling evolution and personal religious beliefs.

#### *2) Meaning participants gave to science and religion in their lives*

Participants trusted and valued science as a way of knowing. Many participants expressed the notion that science brought meaning to their lives. The following statements reveal that most participants viewed science as integral rather than peripheral to their way of thinking:

As far as a worldview goes, I would say it [science] influences a lot because I take the theories and the evidence that science has and I incorporate that. (Michael, Participant 14)

Science . . . helps me to ask questions about the way things are and helps me to look at things closer and to me that brings joy to my life, to be able to notice something and to maybe wonder about it and then to be able to answer that question and figure it out. (Tiffany, Participant 6)

All 15 participants indicated that they thought science was trustworthy. Twelve participants articulated one or more reasons for their trust in science including: the scrutiny of the peer review process in scientific publishing; the verification process that comes through replication of scientific experiments; the notion that science is based on observation and evidence; and scientists' openness to change in light of new evidence. While all participants expressed a trust in science, their trust was not absolute. Ten participants qualified their statements of trust. For example, Gail, Participant 1, said,

Everything is always changing in science so we might find things later that explain something further or maybe changes little things here and there. So I guess I think it is trustworthy, but I'm not going to put all of my trust in it.

Five participants noted that scientists are human and thus have biases or occasionally ulterior motives in securing grant awards. The following interview excerpts illustrate the contention of some participants:

I think you have to be careful about who was doing the research, who was funding the research, . . . how big was the sample size, was it only wealthy white males or did they take a big slice of humanity and look at everything. . . . You have to be smart about believing certain research. You have to look into it more because you can . . . manipulate science a lot. . . . If it is a good study, [then] science in its purest form is trustworthy. (Tiffany, Participant 6)

I would call true science . . . fairly trustworthy. But it's a human endeavor and . . . there could be errors in things we don't see. But I would say in general . . . that it would be reasonably trustworthy. (John, Participant 12)

Most participants trusted and were committed to their religious beliefs. The researcher asked, "How do you feel about the trustworthiness of your religious beliefs?" None of the participants asked what was meant by "religious belief" and no definition was provided in the interview protocol. However, participants answered the question without pause. From the context of their answers, participants appeared to interpret personal religious beliefs as double-pronged: core convictions about reality and the fundamental nature of God; and a moral code to decipher a right course of action and what is true. For example, Gail, Participant 1, described her religious belief system as "my communication with God and what I read in the Bible and what I hold to be true."

Fourteen participants clearly expressed that they were confident in their personal religious beliefs. Brittany, Participant 10, was the exception. When asked about the trustworthiness of her personal religious beliefs, Brittany replied, "We [my husband and I] are still trying to figure that one out." At the time of her interviews, Brittany was in a period of unqualified relativism, described by Parks (1986) as a transition towards young adult faith. Similar to Parks, Perry (1970) termed this position "multiplicity," in which without reasoned analysis, every opinion and judgment is as valid as another. Still, Brittany continued to express a personal belief in God. Brittany hadn't given up on her beliefs. Instead, she was trying to determine what it was that she actually believed.

John, Participant 12, said his beliefs were "very trustworthy." This statement in the second interview came one week after he confessed a sense of guilt in the first interview for pondering the question, "Where is the evidence that God is real, that He is a real person when you die?" Although John qualified his rhetorical question with, "I know it's a natural thing to wonder those kinds of things," his renewed confidence one week later demonstrated the resilience of some participants' personal religious beliefs. John wondered about the reality of God and yet he trusted his beliefs. Brittany wondered about the contents of her beliefs yet she trusted in the reality of God. John and Brittany illustrate that while some participants experience doubts about certain aspects of their religious beliefs, they remained committed to those beliefs.

Six participants articulated that belief and trust were inseparable as an integral part of their religious faith. When asked about the trustworthiness of her beliefs, Stephanie, Participant 2, immediately said, "It's faith. . . . Trustworthiness in religion, it just has to be faith." Although Ashley, Participant 5, confessed beliefs about the supernatural are religious claims that cannot be scientifically proven, she was confident in her beliefs and characterized them as religious faith:

I just feel like the answer, “I believe because I believe” should be sufficient enough. . . . I have this feeling that God is not going to let you know everything. I think it is sufficient enough for me to, on certain things, just come to the realization I just believe it because I believe it and that’s where the whole faith, I can’t see it, I can’t touch it, I don’t really know a 100% sure that it’s there, but I just believe it.

Participants spoke about how their religious beliefs were particularly trustworthy because their beliefs were based on life experiences. Tiffany, Participant 6, said,

I think that your religious views are – well they should be anyway, they should be personal convictions. I mean things that you have, like *my* [italics added] beliefs I feel are things that are tried and true and through my life that they’ve proved. I believe that there is a God. My life, things that I have experienced in my life show evidence of the existence of God. That’s personal to me.

Tiffany’s comment highlights an obvious pattern in participants’ responses: their beliefs are personal and deeply felt. As participants conversed about their beliefs, they conveyed a sense of ownership. Michael, Participant 14, even joked about this. When asked how he felt about the trustworthiness of his religious beliefs, Michael responded, “Well I trust those because they’re *mine* [italics added].” The comments of Gail, Participant 1, are especially germane:

If I had to distinguish between science and religion – religion would be *my* [italics added] foundation, what I stand on and science would be something that I hang on to. . . . I would say that religion is *my* [italics added] core and science is just, it’s affecting everything, but it’s not what I go to all the time.

To paraphrase Gail’s comments and those of several other participants, “Science is something I do or is one way I think, but my religious beliefs go to the core of who I am.” Not surprisingly, many participants expressed that religious beliefs were integral to their worldviews. “As a religious person when you have faith, it influences everything you see so you have this looking glass,” Michael, Participant 14, said, “that’s totally different from anyone who doesn’t because that’s just . . . one of your first thoughts always.” Elizabeth, Participant 13, noted, “I think that the whole purpose of life is wrapped up in religion and I think that it would be hard for that not to affect your decisions in life.”

Although participants were very committed to their beliefs, they also displayed a willingness to change certain aspects. Thirteen participants said their beliefs about the Bible and creationism had changed significantly since coming to the university. Two patterns emerged from the data in which 13 participants spontaneously discussed Genesis and the Bible: nine participants stated the Bible is not a book of science; and four participants stated that the first chapter of Genesis is literary rather than literal. The data showed that participants considered the Bible as important in their life, regardless of their altered view of the Genesis account of creation. Of the 13 participants that had negotiated a literal interpretation of Genesis, ten explicitly stated the Bible was very important to them. Each of the other three participants articulated general statements that indicated the Bible was important to them in their life. Elizabeth, Participant 13, illustrates many participants’ views about the continuing importance of the Bible in their lives:

[I] used to . . . [think] of the Bible as being literal, that’s how everything happened exactly, but I guess I don’t think that that’s necessarily true now. I think . . . maybe that’s God’s way of putting what He wants us to know into kind of this story format and to help to be able to wrap our

minds around what we need to believe. . . . I look at it [the Bible] differently but it still is as important as it always was.

Participants who accepted evolution maintained their commitment to a Christian life, defined in this study as active expressions of personal religious beliefs, including church attendance, prayer, etc. Evidence of a Christian life was provided by participants' responses to the faith development interview question, "Do you pray, meditate, or perform any other spiritual discipline?" Additionally, participants spontaneously disclosed their commitment to practicing the Christian life during their discourse.

The testimony of Rachel, Participant 8, offers perhaps the most striking example of how Christians who accept evolution can remain committed to their Christian way of life, in stark contrast to the opinions of fundamentalist naysayers who would cast doubt on that possibility. In her interviews, Rachel shared about heated arguments with her father, who is a pastor in the same denomination as the study site university. Asked why her father was so concerned about her views on evolution, Rachel reflected,

I think he's really concerned about my spiritual life and he wants me to stay on track with God and so I kinda tried to tell him you know, "I'm there and I'm walking and I'm praying and reading the Bible so it hasn't affected me," but it's still, I think it's hard for him to get out of that mindset. I think he's afraid that it will kinda push me away from God instead of getting closer to Him.

While Rachel was home for the summer, her father placed some literature in their church foyer, which Rachel described as "little pamphlets on why evolution is stupid." She continued the story,

I was like, "Dad, don't put that in the church" and he was like, "Why not? I think it's good that people know about it, know that evolution is wrong," and I said, "No Dad, because people have different viewpoints and I don't think just because a person is a[n] evolutionist doesn't mean they aren't a Christian."

Rachel smiled as she recounted, "He took them down after a few Sundays. I was pleased." She never asked him why. During her interview, Rachel indicated she was ready to stop arguing with her father and explained,

I'm just . . . taking a step back and letting him see how I'm walking through my *Christian life* and then maybe later on, he will be like, "Hey, are you still an *evolutionist*? Do you still believe that?" And I'm like, "Yeah, I still do *both* [*italics added*]."

### 3) Nuances of participants' views on evolution and creationism

Most participants discontinued their belief in creationism while at the study site university and viewed evolution as a valid explanation for the diversity of life on Earth. However, their endorsement of evolution was qualified. Item 1 in the Evolution Attitudes Survey (Ingram & Nelson, 2006) stated, "Over billions of years all plants and animals on Earth descended from a common ancestor." Nine participants agreed and four participants were undecided. Participants who were undecided expressed uncertainty of the evidence supporting evolution or expressed some misgivings about whether evolution could account for the present biological diversity on Earth. However, the totality of their statements in the interviews and Origins scholarly papers demonstrated an acceptance of evolution as a valid theory.

David strongly disagreed with Item 1 in the Evolution Attitudes Survey and Ashley disagreed with this statement. Ashley, Participant 5, posited that evolution occurred from an initial line of ten thousand supernaturally created species, a quasi-Progressive Creationism view. David, Participant 15, was the only participant who grew up with a belief in creationism and maintained a commitment to that belief in spite of his experiences at the study site university. Indeed, David appeared to become further fixed in his Young Earth Creationism and Intelligent Design beliefs during his university studies. The reasons for David's entrenchment are further explored below.

Fourteen participants, including Ashley, Participant 15, demonstrated an acceptance of human evolution as evidenced by their responses to the Evolution Attitudes Survey. Participants saw ample evidence for human evolution in the Origins course. Understanding and accepting human evolution may require less scientific inference in the minds of the participants than the linking of all living things to a single ancestor billions of years ago. Many participants referred to hominid fossil evidence in their interview statements. For instance, Megan, Participant 3, said, "There's definitely a lot of fossil evidence . . . so yeah I think that we evolved. . . . I don't think that God supernaturally created humans. I think that we evolved along with everything else on earth." Many participants expressed that human evolution was part of the larger story of evolution. When asked if humans evolved, Gail, Participant 1, said, "For evolution to make sense in my head, we have to have had a common ancestor. If I understand evolution correctly, there has to be some ultimate beginning, which would be a link for all of us."

Ashley, Participant 5, articulated a position that fit with her overall conception that evolution occurred from an original line of species: "I definitely believe in organisms evolving. . . . I believe even back to like Neanderthals to whatever to us. I believe in that, but before that, I'm not sure." The researcher asked for clarification, "So it sounds like human evolution has occurred at some point in the past but the connection with the rest of the tree, you are not so sure of?" Ashley immediately said, "Right." When a guest lecturer in the Origins class used skulls to demonstrate the connection between humans and primates, Ashley's instinctual reaction was to reject that proposition. Asked why she felt the need to keep the hominin lineage separate, Ashley replied,

For no particular reason. I don't know why I can't really grasp, I don't know. Maybe it's because of the way that we relate to God is that we are made in His image and I don't see Him having that same spiritual relationship with a monkey.

Ashley's personal religious beliefs were influencing her scientific perspectives. Her response paralleled a common occurrence in participants' dialog – the interaction of their personal religious beliefs with their conceptions of evolution. This process, akin to a journey in which participants struggled to come to an acceptance of evolution, is discussed below.

#### *4) Process of participants' reconciliation of evolution and personal religious beliefs*

The data show that religious beliefs played an important role in shaping participants' experiences during their study of evolution. This section focuses on participants' personal religious beliefs and the reconciliatory process that most participants experienced in accepting evolution. Since David, Participant 15, was the only participant who rejected evolution, his case is less pertinent here.

Four factors facilitated many participants' acceptance of evolution. First, the evidence for evolution was an important consideration for most participants who accepted evolution. Second, negotiating Genesis as non-literal was important for most participants. Third, many participants came to recognize that an acceptance of evolution and salvation are unlinked. Fourth, observing a Christian

professor model a commitment to evolution was important in many participants' acceptance of evolution. These factors are mirrored in the comments of participants below.

Most participants' acceptance of evolution was a process of conflict resolution and apprehension. Eleven of the 14 participants who accepted evolution discussed an affective response to learning about evolution in the context of their studies at the university. One of the three exceptions was Diana, Participant 4, who accepted evolution during her childhood. The other two exceptions, Tiffany and Michael, Participants 6 and 14 respectively, appeared to be relatively unaffected emotionally in their encounters with evolution. Tiffany's encounter with evolution in high school biology class was described earlier. Michael said that once he became more open-minded about the Bible near the beginning of his university experience, there was no reason for conflict. He explained, "It [evolution] didn't worry me. . . . If it matches the rest of your faith, then there's not much to be scared of."

For other participants, coming to an acceptance of evolution was a journey-like process. No participant who came to accept evolution reported that the process was abrupt. Instead, most participants indicated the process took several years. Some who learned about evolution in their freshman Zoology class didn't resolve the issue in their minds until their junior or senior year. In many cases, the process was a slow accumulation of scientific evidence from various science courses. Many participants reported that Origins was a semester-long process of working through perceived conflicts. Ashley, Participant 5, described her experience in the course: "There you were, a whole semester, just basically ripping your hair out about where you stand."

Some participants mentioned they had "a-ha" moments along the journey. A few participants encountered a new perspective in a lecture or in a book, and their understanding of evolution and their personal religious beliefs suddenly found greater clarity. However, these advances were steps along an extended journey. Megan, Participant 3, exemplified the journey-like process of accepting evolution. She reflected on learning about evolution in Zoology: "It was kinda like an epiphany almost, just something like, 'Wow,' I can believe this and I don't have to believe in something that I had learned since I was a little kid that I'm not totally sure about."

Many other participants also indicated that the process was a tug-of-war experience. They were pulled back and forth in deciding what scientific aspects to accept and how their religious beliefs would mesh with that new scientific acceptance. The comments of Ashley, Participant 5, illustrate the struggle:

I wanted to please both sides of myself. I wanted to please the science part of me but I also wanted to be true to the faith part of me and I wanted to get right in the middle and make sure both were all right and sometimes it's not possible.

Later in her interview, Ashley also remarked,

I felt like you'd get three steps ahead and you'd be "All right" and then five back! Because you'd hear something else and you're just like, "Oh, no!" And it was just a constant thought process . . . about where do I stand on this new issue.

Rachel, Participant 8, felt pulled in different directions as a freshman in Zoology. She was seeing through her professor that a Christian could accept evolution, but she was also hearing, "No!" from her parents. Rachael felt so conflicted at the time, she exclaimed, "Oh my gosh, I don't know what to do!" Jennifer, Participant 7, joked about trying to come to closure on human evolution. She said, "When it [the Bible] says man was created instantaneously, one [evolution] says man was created over time, that

was hard, but we eventually worked that one out.” Asked what she meant by “we,” Jennifer laughed and offered as an explanation, “Well me, myself, and I.” Her joke implies the internal, contentious, decision-making process to which many participants similarly alluded.

Jennifer, Rachel and Ashley’s statements indicate that emotional turmoil accompanied the process of reconciliation. Another example was Stephanie, Participant 2, who described her evolution encounter in freshman Zoology as the “most upsetting time” in college and her “defining moment of . . . being challenged.” She recounted, “I was sitting there and she [the Zoology professor] started talking about it and I was just floored that she could believe in evolution. I was like, ‘You call yourself a Christian and you believe in evolution?!’ [her voice elevated and sounding incredulous]” Stephanie continued, “I remember walking out of that class so angry. I can still remember how angry I was.” Stephanie’s angry reaction is a curious response to learning about evolution. Asked if she would have responded similarly at a secular university, Stephanie said, “I probably wouldn’t take it as anger or whatever because I would just be like, ‘Oh well, maybe they’re not a Christian.’” Stephanie’s answer reveals what was so troubling in her mind: her Christian professor’s openness to evolution. She wrote in her scholarly paper,

I know the idea of evolution infuriates many Christians today because I was one who was completely against evolution before I came to college. . . . I remember being in a fury when I heard that a Christian college believed in evolution.

Stephanie’s visceral anger was apparently provoked by a sudden, unacknowledged fear that a belief she had held so strongly for most of her life was suddenly overturned. As was true with many participants, Stephanie realized for the first time that a Christian could accept evolution. Her professor was a testimony of that possibility.

Though less intense than Stephanie’s response, many participants reacted with anxiety to learning about evolution. The data indicate two primary sources of anxiety: participants’ awareness that the beliefs they once thought so sacrosanct were beginning to change; and participants’ apprehension about how they would defend an emerging acceptance of evolution to their parents. Ashley, Participant 5, said that learning about evolution “was a culmination of your thoughts for so many years being shattered and then you’re picking pieces here and there and adding your own.” She expressed a personal sense of shock in first learning that a Christian could actually accept evolution. A look of exasperation came over Ashley’s face when she reflected on that new realization her sophomore year when a guest lecturer spoke on campus about theistic evolution. With a laugh of incredulity, she said,

Now do you see what I mean about being blindsided or bombarded with things that for 18 or 19 years you’ve held true? I mean, to me, it’s almost like for 23 years believing that my mom and my dad are my parents and then one day, them saying, ‘No, you’re adopted.’ That’s kinda like what it was to me. Just this truth for so long and then you’re just like, ‘What?!’ *That’s how out of the blue it was to me* [italics added].

Participants who accepted evolution also worried about how they would be viewed by their parents. Eight participants indicated that they either had experienced conflict with their parents over evolution or were too worried to broach the issue of evolution with their parents. Gail, Participant 1, wrote her scholarly paper as a personal letter to her father to relieve the “burden” of a strained relationship she faced with her father over evolution. “He and I definitely have had lots of different confrontations,” Gail said, “but they’ve gotten a lot better and we’ve both . . . come to an understanding and acceptance of each other’s opinions.” Gail especially wanted to communicate to her father through

her paper that an acceptance of evolution was not a salvation issue, a recurring pattern in several participants' comments. Ashley, Participant 5, remarked,

I think they [my family] were just worried that I was gonna just not be a Christian. . . . And so when I was expressing these different views, it was just like an automatic, "No and I hope that you realize what you're getting [into]."

Rachel, Participant 8, wrote in her scholarly paper,

One of the toughest challenges for me regarding evolution is my family. It is extremely difficult to talk to them about this because they are still in the mindset that science is out to destroy Christianity. That is how they were raised and evolution is just nonsense to them.

These comments indicate that most participants' acceptance of evolution was a process of conflict resolution and apprehension. Most participants were anxious about the changes in their own religious beliefs and what their parents would think about their acceptance of evolution. Participants' faith, as a cognitive rationale and affective response in shaping their response to the perceived tensions between personal religious beliefs and evolution, mediated the process of accepting or rejecting evolution and is discussed below.

##### *5) Faith and reconciliation of evolution and religious beliefs*

Table 1 summarizes participants' faith utilizing Parks' descriptions of college students' faith (Parks, 1986) and Fowler's faith stages (Fowler et al., 2004). The purpose of this section is not to rank participants' faith or to discuss the relative merits of participants' faith scores. Instead, the purpose is to demonstrate the emergent patterns in which faith played a role in participants' reconciliation of evolution and personal religious beliefs. Two major themes emerged from the data: 1) participants operating in adult faith were deferential to scientific evidence, while some participants operating in conventional faith disregarded scientific evidence; and 2) participants operating in adult faith stage displayed a nuanced approach to perceived tensions between evolution and their personal religious beliefs, while participants operating in conventional faith avoided confronting their perceived tensions.

In cross-referencing faith stages with participants' acceptance of evolution in this study, it became clear that a participant's acceptance of evolution cannot be correlated with a minimum faith stage for three reasons. First, only one participant was a young earth creationist. More data about the faith dynamics of several participants with Young Earth Creationism perspectives would be needed. Second, the very nature of participants' perspectives on evolution defies categorization. For instance, Ashley, Participant 5, espoused elements of a quasi-Progressive Creationist model. However, she accepted evolution, albeit from an initial line of specially created species. The complex perspectives that emerged in this naturalistic study resist quantification and numerical correlation.

The third reason that an acceptance of evolution cannot be correlated with a minimum faith stage score is that factors other than faith affected participants' acceptance of evolution. For example, Diana, Participant 4, accepted evolution as a child because her father espoused evolution in the home. At the time of her interviews, Diana operated in conventional faith with a Fowlerian faith score of 3.2. Her acceptance of evolution did not derive from a conventional or prior faith stage. Still, Diana's conventional faith affected how she reconciled perceived tensions between her conceptions of evolution and her religious beliefs. Consequently, the effect of participants' faith on their reconciliation of evolution and personal religious beliefs is explored in this section.

Since participants' faith stages fell along a continuum, drawing clear distinctions between adjacent participants on the continuum is unreasonable. Instead, contrasting the perspectives of participants in a conventional faith stage to the perspectives of participants in an adult faith stage accomplishes the purpose of exploring how faith development affects participants' reconciliation of evolution and personal religious beliefs. Additionally, the perspectives of participants in young adult faith, the intermediate stage between conventional and adult faith, elucidates matters. This method will serve as the framework in exploring participants' faith and their acceptance of evolution.

One major theme that emerged from the data was that participants who operated in adult faith were deferential to the scientific evidence for evolution while some participants who operated in conventional faith disregarded the scientific evidence. David, Participant 15, operated in a conventional faith stage and rejected evolution based on his perception that evolution lacked scientific merit. Asked if he had a good understanding of evolution, David replied,

I feel I understand it very well. . . . and the evidence behind it, that's disagreeing with it. And so I've been reading this stuff for a long time with all my science classes too. I believe I really know the information very well.

Throughout the second interview, David provided a litany of reasons where evolution falls short: lack of fossil intermediates; the "biochemical challenge" to the origins of life; and the sudden, "unexplained" emergence of species in the "Cambrian explosion." David was familiar with Intelligent Design arguments regarding the irreducible complexity of biological systems such as blood-clotting mechanisms and the bacterial flagellum (Behe, 1996), which he posited could not be explained by evolution. Asked how he would react if science found a naturalistic explanation to these systems, David referred to a historical example to state his response:

If they prove it right, I mean everyone from Galileo's time, they didn't want to believe the Earth wasn't the center of the universe and he proved that false. . . . So I mean, if I go to not take those, then I cannot call myself a scientist. If they provide the facts and give them—show they are true, then—and I don't take them, I can't consider myself a scientist.

A careful inspection of David's statements reveals that he never said he would accept the evidence, even if shown to be "true." Ironically, David's reference to Galileo is fitting. Several of Galileo's most vocal critics in the early seventeenth century refused to look through Galileo's telescope (Sobel, 2000). However, several prominent Jesuit astronomers looked through the telescope and "did not deny the evidence of their senses" (Sobel, p. 40) and affirmed Galileo's heliocentric ideas. It appeared as if David was unwilling to look through the telescope.

A recurrent theme throughout David's response to questions about evolution was his concern over atheism. David feared what he perceived were the dire consequences of Darwinism, including the moral breakdown of society. He expressed some form of the word "atheism" 18 times in the second interview. In David's mind, atheism was inseparable from evolution. He explained, "That's the big thing atheism is founded on, you know, is Darwinism. They have to have that for atheism to be true. Without evolution, atheism has nothing to stand on because . . . they're at a dead end." David also connected evolution and atheism to a host of social problems including how "secular progressives have really pushed morals out of the school by taking Christianity out of the school."

David took science classes similar to the rest of the participants who accepted evolution. However, some aspect was different in the manner David approached evidence and the credence he

allowed the evidence. In order to maintain a safe zone, David created a mental filter to trap only evidence that supported his assumptions. His presumptions drove what evidence for evolution he would consider rather than permitting evidence to inform his assumptions. Therefore, instead of considering the preponderance of evidence for evolution, his focus was fixed on information that he found against evolution. In fulfilling the Origins course requirements, David processed information about evolution, but it didn't stick to his filter – the evolution evidence passed on through. David practically admitted as much in his scholarly paper, stating, "I follow . . . [the] Bruce Lee Philosophy. 'Keep what is useful, discard what is useless.'"

Other participants noted this filtration mode was possible. Megan, Participant 3, said she wrote an evolution paper in high school for the grade and didn't "let it impact" her "in any way." Gail, Participant 1, remarked she could have completed freshman Zoology without paying any attention to evolution had she perceived an "attack" against creationism from her professor. Gail said, "I would totally close up and like, 'I'm done.'" Gail's comment demonstrates that the mental filter applies not only to evidence, but also to whom a person trusts. Rather than dismiss her Zoology professor, Gail was open-minded to the professor's instruction. In contrast, David's mental filter obviated the very same professor Gail had as a freshman. Nevertheless, David's filter accepted information from perceived authorities such as creationist and Intelligent Design scientists whose ideas have been discredited in the scientific community.

David's mental filter is in marked contrast to the mental operations of Jennifer, Participant 7, who functioned in an adult faith stage. Jennifer wrote in her scholarly paper,

I doubt that everything I want to believe will make perfect sense and will fit in the exact boundaries of a place I have carved out for it. *But I can't force something to fit that doesn't* [italics added]. I could change my view to allow for it to fit, but sometimes that's a lot harder than it seems.

Jennifer recognized that reconciling an acceptance of evolution and her religious beliefs was a difficult task. In Origins, her mental schema with its "carved" boundaries was confronted with evidence for evolution. Jennifer was in the crucible of cognitive and affective dissonance. She could "force something," perhaps by changing her perception of the evidence in order to leave her existing mental structures unchanged. This act of assimilation would leave her existing schema preserved (Renner & Stafford, 1979). However, Jennifer, acting in adult faith, chose the more difficult task and did what she recognized she must do: change her view of evolution to fit the evidence. The act of accommodation represented a change in her existing schema (Renner & Stafford, 1979). Boeree (2003) writes, "Even one's grip has to accommodate to a stone, while clay is assimilated into our grip" (¶ 5). The evidence for evolution, in Jennifer's hand, was a stone. The evidence for evolution, in David's hand, was clay.

Participants who operated with adult faith were not the only ones to accommodate evolution in their worldview. For example, John, Participant 12, operated with young adult faith. John related that he felt like his thought life was analogous to the history of science when scientific revolutions such as the Copernican model effected great change in a relatively short time. When asked to clarify how that analogy applied to his life, John responded,

I just have these times where there's no effort on my [part], . . . where there's no new understanding . . . for me. And then I have these times where I gain this new knowledge, and I have to come to grips with, "Well, how does that change my faith or not? Does that kind of

mesh together with what I already believe, or does it turn it all upside down?” And . . . [then] I have to weave something completely different.

John’s willingness to “weave something completely different” is his accommodation of the scientific evidence. John continued talking about how the last three years had “definitely changed things” for him. He credited his change to:

Really understanding the true nature of science and how . . . you discover things, and interpret evidence and all those kinds of things that go along with that. And how science is always changing, that it’s not just, “Okay this is what we believe,” that there aren’t beliefs in science and that there’s just *evidence* [italics added] and you either accept it or you don’t.

Operating in a conventional faith, David avoided change by filtering evidence and authority sources to leave his worldview intact. Operating in young adult and adult faith respectively, John and Jennifer operated in deference to the scientific evidence, even when it required them to examine their religious beliefs in order to accommodate an acceptance of evolution. Similarly, other participants had to perform the same functions in overturning their creationist beliefs to arrive at an acceptance of evolution.

A second major theme that emerged from the data was that participants operating in adult faith displayed a nuanced approach to perceived tensions between evolution and their personal religious beliefs, while participants operating in conventional faith avoided confronting their perceived tensions or tended to be dismissive of perceived conflict. Diana, Participant 4, operated in conventional faith. She asserted that the domains of science and religion were inseparable. Regardless of whether this view is right or wrong, the salient matter is the basis by which Diana made this claim. Diana insisted,

*It has to* [italics added]. It’s kind of like how, even just science and technology. Science drives technology. Technology drives science. Religion drives science. Science drives religion. Because they have to co-[exist], they can’t – you can’t prove something and then be like, “Well, the Bible says that’s not true.”

Collapsing the domains of science and religion into what Diana referred to as “one big science and religion ball” appeared to be how she avoided ambiguity. Combining science and religion may have initially placated her anxiety, but it required Diana to gloss over the inherent tensions that existed within such a facile position. Diana struggled, for example, to articulate her position on Genesis:

I don’t think you should just null and void chapter one through eleven. No, it’s not like that. I think that science starts at day one, Genesis one and the Bible starts at Genesis one, and there’s no just taking that part out. It’s not – I think that it all happened, and it all happened in some way shape or form, and there’s a way to explain it. *There has to be* [italics added], and I believe that. And I think that it’s something that I would have to study way more into. But, I’m just – I don’t know. I just – I don’t know. I’m just okay with it. I don’t know. It’s just okay. It’s okay for – I don’t know. I really don’t.

Defending a forced amalgamation of science and religion was apparently a difficult task for Diana. Heather, Participant 9, was transitioning from a conventional faith towards a young adult faith. She appeared to avoid ambiguity by simply dismissing contentious issues regarding evolution and personal religion belief. As part of her unqualified relativism form of cognition, Heather’s defense

mechanism was to use some form of the phrase “it didn’t matter.” During a four-minute span in her interview, she used the phrase seven times. The following is an excerpt from her statements:

It just didn’t matter, it didn’t change the fact that He was God and that He did it. It didn’t matter to me whether He used evolution or if it just magically appeared, it just didn’t matter. And I didn’t really change. Even from Origins, I was just like they don’t really matter. I mean it still really doesn’t.

Later in the interview, Heather was asked if her acceptance of evolution had affected her view of God. Heather responded, “Not really a whole lot. It just hasn’t really crossed my mind I guess. I don’t know.” Heather used the phrase “I don’t know” 35 times in her second interview. She used the phrase nine times in normal usage such as, “I don’t know very much about the end of his [Darwin’s] life historically.” She used the phrase four times in the context of innocuous statements such as, “So I don’t know, all growing up evolution was a bad thing.” But when it came to discussing contentious issues, Heather used the phrase 22 times. The following discourse demonstrates Heather’s approach to difficult issues.

Researcher: So do you believe that we have a soul then?

Heather: Well, that’s another one of those weird things.

Researcher: Because I just heard you say it [earlier].

Heather: Right, well and do other things have souls? No one knows so *I don’t know* [italics added].

Researcher: What about you? Do you believe that animals have souls?

Heather: *I don’t know* [italics added], I don’t see why not. I mean just because they can’t do all the things humans can doesn’t make us better than other creations, more valuable.

Researcher: So is it too hard to define the soul?

Heather: I don’t, that’s one of the parts of Origins where I was just like, “I have no idea.” I don’t think—if there is a soul, I don’t think God just said humans have souls and all of sudden we have a soul. I don’t think it’s a physical thing, it’s a, *I don’t know* [italics added].

Many participants used repetitive phrases such as “you know,” “like,” and even “I don’t know.” Heather’s multiple usage of “I don’t know” is unique in this case. She is stating that she indeed does not know, but there appears to be little effort to find resolution within her statements or in the tenor of her comments. Heather’s responses to questions about the soul contrast with Rachel’s, Participant 9, who operated in an adult faith stage. When asked if animals had a soul, Rachel immediately recognized the conundrum:

That’s tricky! I’m not sure. Because growing up, what I was kinda taught was that’s what sets us apart. We have a soul and nothing else has a soul and I was like, “What does that mean to have a soul? Does that mean we get to go to this wonderful place called heaven and the animals don’t?” But that doesn’t make a lot of sense to me cause they are also His creation so do they get to go [to heaven] too? Does it mean that . . . since we have a soul, we can have a special

relationship that the animals can't have? That would seem more logical to me that we can have a different kind of relationship. Because of our thought processes, . . . we are able to communicate in a different way with God and understand Him at a different level.

By the end of her statement, Rachel appeared more settled in deciding that humans have souls, rather than animals. Rachel's comments are a filmstrip of her mental processes: she recognizes the conflict; she weighs what she once believed as a child with a more recent understanding that humans and animals are directly related within God's creation; and she is able to form a decision that recognizes both views. These mental processes, both cognitive and affective, are her adult faith system in action.

Evolution and religious beliefs represented a dichotomy in many participants' minds. A noncombatant definition of dichotomy is "division into two parts, kinds, etc.; subdivision into halves or pairs" (dichotomy, n.d.). For conventional faith stage participants who encounter a conflict between evolution and their religious beliefs, their response may be paraphrased, "When perceived dichotomies exist, dismiss the issue or collapse them to remove the tension." For adult faith stage participants who encounter a conflict between evolution and their religious beliefs, their response may be paraphrased, "When dichotomies exist, operate within the tension and find ways in which both halves can contribute to your worldview."

To summarize the faith development data results, participants' faith stages fell along a continuum between conventional faith and adult faith at the time of the study. Participants who operated in a conventional faith stage tended to see the world in black-and-white terms and operated with uncritical assumptions assimilated from childhood and in acquiescence to external sources of authority, including friends, parents, and charismatic leaders. Participants who operated in an adult faith stage were willing to accept the ambiguity of life wherein complex questions seldom have clear answers. Adult faith stage participants demonstrated an internalized source of authority while simultaneously considering the perspectives of others. Participants who operated in young adult faith, as a transitory stage between conventional faith and adult faith, wrestled over what constitutes truth and what sources of truth are trustworthy.

In this study, participants who operated in an adult faith were deferential to scientific evidence for evolution. They displayed a nuanced approach to perceived tensions between evolution and their personal religious beliefs. Conversely, participants who operated in conventional faith tended to avoid confronting their perceived tensions.

### *Conclusion*

The outcomes of the study as documented in this paper have relevance and implications for anyone, religious or not, who seeks a sophisticated understanding of the "crucible" within Christian university biology-related majors' minds that mediates the disequilibrium between their personal religious beliefs and their acceptance of evolutionary theory. The findings demonstrate that Christian biology-related majors at a Christian university who accept evolution can remain committed to their religious beliefs. Contrary to the claims of creationists such as Ken Ham (1999) who claim that "evolutionary/long-age ideas totally undermine" the foundations of Christianity and lead students to seeing the Bible as "just an outdated religious book" (p. 27), an acceptance of evolution did not diminish participants' view of God or the importance they placed on the Bible in their lives.

Many participants said that their understanding and acceptance of evolution gave them a greater appreciation for God as Creator. For example, Megan, Participant 3, wrote in her *Origins*

scholarly paper as a junior, “At some point, I have to decide whether these ideas change my relationship with and/or my view of God. So far, God is still my Creator and my Savior, the One who is in charge of everything and that is all that really matters.” When she was interviewed as part of this study a year later, Megan acknowledged that God could have created according to the Genesis account, but then rhetorically asked, “Why couldn’t He also do it this way [through evolution]?” She added, “There’s a lot more evidence to back up this claim [evolution]. . . . I just kinda realized maybe God could do it this way too and that just made Him even more powerful.”

This study’s findings contrast with other studies that explored university students’ attitudes on evolution. Brem et al. (2003) conducted a survey of 135 public university students’ perceptions of the implications of evolution. Fifty-six percent of the study participants were Christian, and at least half of these were currently active in their religious beliefs. Brem et al. report that participants’ perceptions [of evolution] were “overwhelmingly negative,” regardless of religious affiliation or non-belief. Brem et al. write, “There is a significant direction to the perceived impact [of evolution]: an increase in selfishness and racial discrimination, and a decrease in a sense of purpose, feelings of self-determination, and spiritual beliefs” (p. 193). Brem et al. also determined that “greater exposure to information about evolution,” regardless of one’s pro- or antievolution views, led to a “bleaker view [of evolutionary theory]” (p. 194).

Dagher and BouJaoude (1997) studied Lebanese Christian and Muslim biology majors and reported that several students rejected evolution solely on the basis of their religious beliefs. For some, perceptions of evolutionary theory as a purely mechanistic philosophy and of evolution as brutal survival of the fittest were antithetical to their religious worldview. Dagher and BouJaoude note, “For these students, the theory of evolution not only challenges their account for creation but violates an image of the world their beliefs and values afford them” (p. 440).

This study’s findings significantly contrast with the Brem et al. (2003) and the Dagher and BouJaoude (1997) findings. Only one of the fifteen participants in this study rejected evolution. David, Participant 15, denounced evolution for what he perceived as its moral debasement and corrupting influence on societal values. In contrast, fourteen participants did not attach negative implications to evolutionary theory. Participants who accepted evolution affirmed God’s role in the creation process while reiterating their own teleological purpose. They supported evolution as a practical mechanism for the creation of new species and rejected any association with a negative view of theodicy.

There is not enough detailed information in the studies by Dagher & BouJoude (1997) and Brem et al. (2003) to make in-depth, direct comparisons to this study in terms of the milieu in which evolution was studied. Still, a key outcome in this study was that although personal religious beliefs represented a potential to interfere with accepting evolution, most participants were able to restructure the “contents” of their faith to allow them to accept evolution, including human evolution. These faith contents included: determining that an acceptance of evolution did not jeopardize salvation; and negotiating the early chapters of Genesis as literary rather than literal while still recognizing the importance of the Bible in their lives. The essential element was that learning about evolution at the study site university was not isolated from religious beliefs and values. The Origins instructor intentionally dealt with the potential impediments of salvation issues and views about the Bible in assisting most participants to overcome a resistance to learning about evolution. Also, the learning of evolution occurred in the context of a Christian university that places importance on a positive interaction in religious and scientific ways of knowing the world. The outcomes of this study support

Cobern's (1991) recognition of the importance of students' worldviews and beliefs, their "presuppositions about the world, their *epistemological macrostructures* [italics in original]" (p. 10).

Certainly, evidence played a key role in most participants' acceptance of evolution, and most participants claimed that the evidence for evolution was incontrovertible. However, the complex interaction of perceptions of evolutionary evidence and personal religious beliefs that was mediated by participants' faith systems challenges M. U. Smith's (1994) rather blunt pronouncement that the "genuine scientist is bound by the rules of evidence and judges the validity of various claims on the basis of empirical evidence, not on the basis of his personal convictions, opinions, and beliefs" (p. 594). Like the other participants in this study, David, Participant 15, had access to the same evidence for evolution and was exposed to the same role model of a Christian professor who espoused evolution. However, operating in a Stage 3 conventional faith, David utilized a mental filter that collected only ideas and purported evidence that supported his existing notions of creationism. Conclusive evidence for evolution and influential role models apparently easily slipped through David's filter without serious consideration.

One question that remains is whether a particular faith stage is requisite for Christian university students with conflictive religious beliefs regarding evolution to eventually overcome their dissonance to accept evolution. The findings of this study show that participants operating in young adult and adult faith tended to confront their perceived tensions and worked towards a reconciliation of evolution and personal religious beliefs. However, confronting those tensions in a crisis journey may have propelled participants towards modifying their faith systems. For some, the modifications to their faith may have been largely unconscious. In contrast, others found themselves making a conscientious choice to change their views about evolution, such as Jennifer, Participant 7, who displayed meta-cognitive awareness in discussing the internal conflict she felt in coming to accept evolution: "I'd just been arguing so much with myself about it." Jennifer added,

I was almost tired of arguing evolution creation, evolution creation, and I was like, "Well maybe, . . . I'll just err on the side of religion," you know? Because I'll be a little more religious and a little less scientific and I might get a little bit discredited in the scientific community, but at least God will like me because I'm religious [laughing].

Though she admitted feeling this way at times in the past, Jennifer displayed a reconciled acceptance of evolution in her interviews. Whether she was already at an adult faith in accepting evolution or whether coming to an acceptance of evolution was one facet that stimulated her transition to adult faith, Jennifer was at a place in her faith where she could choose the difficult task of changing her view of evolution to accommodate the evidence.

Thus, participants' faith – their system of values and making meaning of the world, shaped by personal beliefs – dictated how they perceived and engaged evolution. As they struggled to accept evolution, most participants adapted their faith system to integrate dependence on empirical evidence to ascertain scientific truth, and increasingly sought consonance between their religious beliefs and scientific understanding. Thus, in the modification of their faith, the participants altered their perceptions of science to accept evolution.

## *Appendix A – Interview Protocol*

### Interview 1 – Faith Development

1. Reflecting on your life, identify its major chapters. What marker events stand out as especially important?
2. Are there past relationships that have been important to your development as a person?
3. Do you recall any changes in relationships that have had a significant impact on your life or your way of thinking about things? Please describe the changes and the impact?
4. How has your image of God and relation to God changed across your life's chapters? Who or what is God to you now?
5. Have you ever had moments of intense joy or breakthrough experiences that have affirmed or changed your sense of life's meaning? What happened to you at these times? How have these moments affected you?
6. Have you experienced times of crisis or suffering in your life, or times when you felt profound disillusionment, or that life had no meaning? What happened to you at these times? How have these experiences affected you?
7. Focusing now on the present, how would you describe your parents and your current relationship to them? Have there been any changes in your perceptions of your parents over the years? If so, what caused the change?
8. Are there any other current relationships that seem important to you? Please describe them.
9. What groups, institutions, or causes, do you identify with? Why do you think that these are important to you?
10. Do you feel that your life has meaning at present? What makes life meaningful to you?
11. If you could change one thing about yourself or your life, what would you most want to change?
12. Are there any beliefs, values or commitments that seem important to your life right now?
13. When or where do you find yourself most in communion or harmony with God or the universe?
14. What is your image or model (an idea or a person) of mature faith?
15. When you have an important decision to make, how do you generally go about making it? Can you give me an example? If you have a very difficult problem to solve, to whom or what would you look for guidance?
16. Do you think that actions can be right or wrong? If so, what makes an action right in your opinion?
17. Are there certain actions or types of actions that are always right under any circumstances? Are there certain moral opinions that you think everyone should agree on? What are the sources of these moral actions and opinions?
18. Do you think that human life has a purpose? If so, what do you think it is? Please describe how you think there is a plan for our lives, or how we are affected by a power or powers beyond our control?
19. What does death mean to you? What happens to us when we die?
20. Do you consider yourself a religious person? What does this mean to you?
21. Are there any religious ideas, symbols or rituals that are important to you, or have been important to you? If so, what are these and why are they important?
22. Do you pray, meditate, or perform any other spiritual discipline?
23. What is sin, to your understanding?
24. How do you explain the presence of evil in our world?
25. If people disagree about a religious issue, how can such religious disagreements be resolved?

## Interview 2 – Evolution and Personal Religious Belief

1. How do you feel about the trustworthiness of science?
2. How does science influence the way you see the world and make decisions?
3. How do you feel about the trustworthiness of your religious beliefs?
4. How does religious belief influence the way you see the world and make decisions?
5. You've talked about your own sense of the trustworthiness of science and the trustworthiness of your religious beliefs. Have you ever found that science and your religious beliefs agree, that they say the same thing?
6. Have you ever found that science and your religious beliefs disagree, that they say the opposite thing?
7. Think about your present views regarding evolution and creationism. If you can think about how you came to these views as a journey, tell me the story of your journey. Go as far back to the beginning as possible. Who were the people that were part of that journey? What were the key events? Take your time if you want to think about it first.
8. Tell me about how well you feel you understand the scientific view of evolution.
9. How would you define the scientific view of evolution?
10. How would you define Biblical view of creationism?
11. Is there anything in creationism and evolution that you have difficulty finding credible? Tell me about it. [As a follow-up, ask, "How do you think life first arose on Earth?"]
12. Have you ever come across anything in your learning about evolution that contradicted your religious beliefs?
  - How do you handle the conflict?
13. Have you had any disagreements with others about your views on creationism or evolution? Tell me what happened. What was it like for you – how did it make you feel?  
[If participants can't describe a relevant situation, set up the hypothetical situation of a friend with an opposing view and ask for a response. Check the completed survey to formulate an opposing view. ]
14. Has learning about evolution changed any of your views about God?
15. Has learning about evolution changed the way you think about the Bible?
16. Are there any persons you would have a difficult time telling about your views on evolution and creationism? Tell me about those persons and why it would be difficult to talk to them about evolution and creationism.
17. A famous poet once wrote, "Nature is red in tooth and claw." Some people characterize evolution as "survival of the fittest." How do you feel about these statements?
  - How does this view of nature relate to your views about God?

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