PERSPECTIVES on Science and Christian Faith

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In this issue . . .

"The fear of the Lord is the beginning of Wisdom."
Psalm 111:10

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Perspectives on Science and Christian Faith

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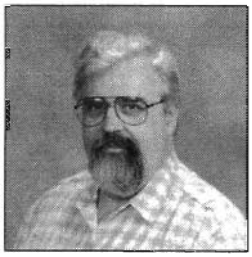

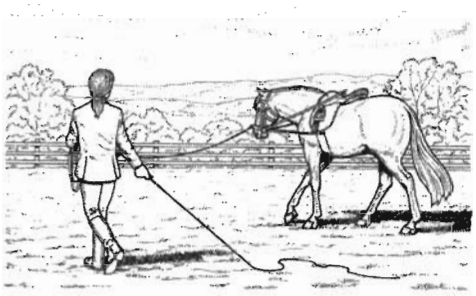

Longeing Is More than Trotting in a Circle

Recently the Shepherd purchased a young Haflinger gelding in order to provide the long-desired riding horse for his two daughters. Our newly purchased horse, Alfred, was "broken" to ride, but was only partially trained in the niceties of a horse and rider relationship. One of the first riding episodes resulted in Alfred managing to buck and unseat his rider. In response the Shepherd got on Alfred's back to "persuade him" to get the bucking nonsense out of his head. The subsequent rider was encouraged to "keep Alfred's head up" when riding to prevent another bucking episode. However, as we worked further with Alfred, it became apparent that his prior training was scanty; although he was tame, his manners left something to be desired.

Our response was to initiate a resistance free training regime for Alfred, which is popularized by the books and videos of Richard Shrake. This method includes longeing as one way to encourage the development of good horse manners (obedience), good attitude, and good body movements. In longeing the horse is typically connected to the trainer via a long longe line. Then as the trainer provides verbal commands, changing whip positions, and distinctive body movements, the horse learns to appropriately respond by stopping, walking, trotting, or cantering in a circle around the trainer. As in most training enterprises, success comes only by spending time with the horse, maintaining consistency in handling, and sharing an attitude that promotes harmony. When onlookers watch a trainer longe a horse, it often appears like a meaningless repetitive exercise where the horse simply trots in a circle around the trainer. However, longeing is a methodological tool that enables training and promotes harmonious responsiveness of the horse to signals of the trainer.

Harmonious relationships emerge when individuals experience mutual respect, communicate clearly, and work toward a common goal. This principle is true in horse training, in an academic institution, in the Christian church, and in one's relationship to God. Relationships are fostered when we "longe with each other" (work together). Sometimes profitable longeing is hindered by stress or tension. Yet persistence, mutual respect, and love by the parties involved restore a harmonious relationship.

As I work with Alfred, I am reminded how Jesus Christ my Lord works with me and lovingly draws me back to him when I stray from his plan. The key to a harmonious relationship with Christ is to love and submit to his directions, his words, and his examples. Although we may not understand the discipline of the Lord, yet our submission to his will makes our way more clear and enhances our life. The writer of the book of Hebrews says, "Moreover, we have all had human fathers who disciplined us and we respected them for it. How much more should we submit to the Father of our spirits and live!" (Heb. 12:9 NIV). When I am given a longeing lesson by God, I want to understand that it is more than a trotting episode. It is an opportunity to learn to know my Trainer and develop a more harmonious relationship with him.

Shalom,
Roman J. Miller, Editor

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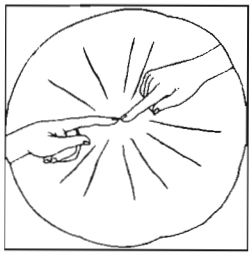

Article
The Real Adam

The Real Adam

John A. McIntyre

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This investigation considers three versions of Adam: the Adam of Scripture, the Adam of the creeds, and the Adam of science. I find that the Adam of the creeds contradicts the Adam of Scripture while the Adam of science is complementary to the Adam of Scripture. By combining the Adam of science with the Adam of Scripture, we obtain the Real Adam. The tension between the prehistoric men found by science and the Adam of Scripture has been eliminated.

By combining the Adam of science with the Adam of Scripture, we obtain the Real Adam.

One of the primary assertions of the Christian faith is the fall of Adam.[1] From Augustine and the Reformers to the church Confessions of the present day, Christians have believed in the "fall."

The scriptural evidence for the fall rests on the sinful state of the human race throughout history as compared to the righteous state of the created Adam. No one would attempt to assert that the human race has not always been sinful. But where is the evidence for the original righteous state of Adam?

In this paper, I will show from Scripture that Adam was created as a mortal human being without the knowledge of good and evil. Until he ate of the forbidden tree, he could not distinguish right from wrong. There is no scriptural evidence that Adam was created "with an immortal soul and endued with knowledge, righteousness, and true holiness" as the *Westminster Confession* asserts. From this and other evidence, I conclude that the Adam of Scripture and the Adam of the creeds are contradictory.

In 1950, **John McIntyre** *received a Ph.D. in physics from Princeton University under the supervision of Robert Hofstadter. Subsequently he accompanied Professor Hofstadter to Stanford University where they carried out the electron scattering experiments for which Professor Hofstadter received the Nobel Prize in 1962. After spending six years on the faculty at Yale University, McIntyre went to Texas A & M University in 1963 to direct the nuclear physics research program at the new Cyclotron Institute. In 1995, McIntyre was made Professor Emeritus at Texas A & M University. McIntyre has served on the Executive Council of the American Scientific Affiliation. As an active fellow in the ASA, he currently is serving on the Editorial Board of our journal. John and his wife Madeleine are charter members of a new congregation of the Presbyterian Church in America in Bryan, Texas. He may be contacted at: jmcintyre@physics.tamu.edu.*

But, there is another Adam as well, the Adam of science. Science, of course, does not know the Adam of Scripture but it does know about the *Homo sapiens sapiens* of archeology who populated Mesopotamia, the scriptural home of Adam. These humans are found to have the same nature as Adam even to the extent that they intermarried with his family. Adam, presumably then, was one of these Mesopotamians just as 2,000 years later Abraham was a Mesopotamian.

The scientific knowledge of these Mesopotamian humans can then be added to the scriptural knowledge about Adam to provide a description of the real Adam. A seamless connection has thus been established between the Adam of Scripture and the prehistoric *Homo sapiens sapiens* of science.

The Adam of Scripture

Adam's Family

The scriptural account of Adam and Eve is straightforward enough. Beginning with the second chapter of Genesis, Scripture presents Adam as a historical figure connected by genealogies to Abraham, the head of the chosen people. According to this account, God completed the formation of Adam from the dust of the ground in Mesopotamia about 4000 BC.[2] God then created Eve from Adam's rib after which Adam and Eve disobeyed God by eating of the tree of the knowledge of good and evil. After expulsion from the Garden of Eden by God, Adam and Eve had children and Genesis records the history of Adam's family.

Adam's son Cain was a farmer while Abel, his brother, was a shepherd. Cain killed his brother Abel and, fearing for his life, emigrated to the east where he built a city.

The Creation of the World

Scripture also connects Adam to the creation of the world:

> 4When the LORD God made the earth and the heavens ...7the LORD God formed the man from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being (Gen. 2:4, 7 NIV).

Verses 5 and 6 have been deleted since they contain an interpolation unrelated to the formation of Adam. Verse 4 states that Adam was formed by God "when the LORD God made the earth and the heavens." However, the first chapter of Genesis says that man was made on the sixth day of creation. Because of this discrepancy and other problems,[3] Augustine was led to write: "I own I do not know what ages passed before the human race was created."[4] Augustine concluded that the time interval between the creation of the world and the creation of Adam could not be determined from Scripture.

Adam's Nature

As for Adam himself, John Calvin derived his nature from Gen. 2:7:

> Whatever the greater part of the ancients might think, I do not hesitate to subscribe to the opinion of those who explain this passage of the animal life of man; and thus I expound what they call the vital spirit, by the word, *breath*. Should anyone object, that if so, no distinction would be made between man and other living creatures, since here Moses relates only what is common alike to all: I answer, though here mention is made only of the lower faculty of the soul, which imparts breath to the body, and gives it vigour and motion: this does not prevent the human soul from having its proper rank, and therefore it ought to be distinguished from others.[5]

Calvin concludes here that the "breath of life" received by Adam is concerned with "the animal life of man." He notes, however, that the human soul should retain its proper rank and therefore be distinguished from others. Indeed, as the story of Adam unfolds in Genesis, it is clear that Adam is far more than an animal. Adam's control of language is evident when God commands him not to eat of the forbidden tree and his language ability appears again when he names the animals.

Calvin then goes on to explain why Gen. 2:7 does not refer to Adam as having been "created in the image of God":

> Now we know that the powers of the human mind are many and various. Wherefore, there is nothing absurd in supposing that Moses here (in Gen. 2:7) alludes only to one of them; but omits the intellectual part, of which mention has been made in the first chapter.[6]

Calvin notes that the "image of God" in the first chapter of Genesis is not being discussed in Gen. 2:7. The restriction in Gen. 2:7 to the bodily part of Adam can be understood when, later, God condemns Adam with the words "for dust you are and to dust you will return" (Gen. 3:28). Adam, as the image of God, will appear in another context.

After recognizing the absence of the "image of God" in the description of the formation of Adam, Calvin continues his discussion of Gen. 2:7 with a consideration of the "living being" (soul):

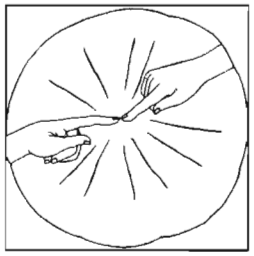
> Paul makes an antithesis between this living soul and the quickening spirit which Christ confers upon the faithful (1 Cor. 15:45) for no other purpose than to teach us that the state of man was not perfected in the person of Adam; but it is a peculiar benefit conferred by Christ, that we may be renewed to a life which is *celestial*, whereas before the fall of Adam, man's life was only *earthly*, seeing it had no firm and settled constancy.[6]

Calvin emphasizes that, in 1 Corinthians, the Apostle Paul distinguished the *earthly* nature of Adam before the fall from the *celestial* nature of a person renewed through his life in Christ. Also, Calvin is careful to note that Adam's *earthly* nature had "no firm and settled constancy" in anticipation of Adam's later disobedience of God's command in the Garden of Eden.

While Adam's body was the same as that of a modern human, Adam was like an animal in that he had no conscience.

Charles Hodge, the eminent Princeton theologian, in his 1857 commentary on 1 Corinthians, also concludes that Adam had an animal nature (1 Cor. 15:45):

> (The Scriptures) represent Adam as having been created with an animal nature, and therefore as having an animal body. Whereas, the second Adam is a person of a far higher order. The proof with regard to the nature of Adam does not rest exclusively on the words quoted, but on the whole account of his creation, of which those words form a part. It is evident from the entire history, that Adam was formed for



Article

The Real Adam

> an existence on this earth and therefore with a body adapted to the present state of being; in its essential attributes not differing from those we have inherited from him.[7]

Concerning his body, Adam was the same as a modern human.

Also, Adam shared the mortality of modern humans. After Adam ate from the tree of the knowledge of good and evil, God banished Adam from the Garden of Eden saying: "(Adam) must not be allowed to reach out his hand and take also from the tree of life and eat, and live forever" (Gen. 3:22). Clearly, Adam was mortal until he ate of the tree of life. And, since Adam did not eat of the tree of life, he eventually died (Gen. 5:5).

While Adam's body was the same as that of a modern human, Adam was like an animal in that he had no conscience. Genesis 3:22 reveals this absence of conscience when, after Adam has eaten the forbidden fruit, God says: "Behold, the man has become like one of us, knowing good and evil." Before eating the forbidden fruit, Adam had no knowledge of good and evil. And, lacking the knowledge of good and evil, Adam could be neither righteous nor sinful. "But sin is not taken into account when there is no law" (Rom. 5:13).[8] Until he acquired the knowledge of good and evil, Adam was aware of no law and so could not sin (aside from his disobedience of a direct command of God).

Nevertheless, despite his animal nature, Adam far excelled the animals in his technical knowledge and his command of language. Adam was a farmer and had command of the not insignificant technology of that craft. Furthermore, Adam named the animals, demonstrating his ability to assign abstract symbols to objects in the real world.

Adam's New Nature

However, after disobeying God and eating of the tree of the knowledge of good and evil, Adam's nature was changed. "His eyes were opened" (Gen. 3:7). Let's now investigate the scriptural record to learn about the nature of this enlightened Adam.

The temptation. In his temptation of Eve, Satan said: "You will not surely die ... For God knows that when you eat of (the tree) your eyes will be opened, and you will be like God, knowing good and evil" (Gen. 3:4,5).

The first thought that arises is: "Why should we pay attention to what Satan says? Did not Jesus Christ say of Satan, 'He was a murderer from the beginning, not holding to the truth, for there is no truth in him' (John 8:44)?" But, as an accomplished liar, Satan often speaks the truth to maintain his credibility. When Satan tempted Jesus, he quoted Scripture (Matt. 4:6). Thus, in his temptation of Eve, Satan spoke the truth when he said that her eyes would be opened, that she would be like God knowing good and evil, and even that she would not die. Scripture confirms the extent of his veracity when it says that their eyes were opened (Gen. 3:7), that they would be like (in the image of) God (Gen. 1:27), and that they would not die (although Adam did die some 900 years later [Gen. 5:5]).

And their eyes were opened. As evidence that their eyes were opened Scripture says: "they realized they were naked." (Gen. 3:7). Before they ate the forbidden fruit, when their eyes were closed, Adam and Eve saw the world as animals. "They were naked and felt no shame" (Gen. 2:25). The world was "just there" to be accepted. Nakedness was part of the world. As I write this, my cat is sitting on my desk swishing his tail across the keyboard. He is naked and unashamed.

Of course, human beings wore clothes long before Adam and Eve if only to protect themselves from the burning Mesopotamian sun. But in the heat of the day, under the trees of the Garden, Adam and Eve would be naked to take advantage of the cooling of any moving air.

Now, their eyes are opened. They are no longer anonymous features within the world. Knowing good and evil, they can now evaluate the world. They stand naked, as individuals, outside the world, exposed to the Creator who also dwells outside his creation. To avoid this exposure, they cover themselves with fig leaves. They also hide among the trees showing that sexual exposure is not the issue. And God understands that their recognition of their nakedness followed the acquisition of the knowledge of good and evil (Gen. 3:11).

Before they ate the forbidden fruit, ... Adam and Eve saw the world as animals. ... The world was "just there" to be accepted. Now, their eyes are opened. They are no longer anonymous features within the world. Knowing good and evil, they can now evaluate the world.

Atheists, such as Bertrand Russell and H. G. Wells, have admitted that their rejection of God is based on their dislike of being constantly exposed to the view of an almighty God. They desire to hide from God just as did Adam and Eve. Their solution has been to say that there is no God.

I still remember an experience in school when I was six years old. The teacher had the class stand in a circle. Each student was then asked to count the number of students in the circle. Half of the students counted eleven, the other half counted twelve. Half of the students were counting themselves. We had just reached the age when we first began to recognize ourselves as individuals in the world.

This historical account of Adam and Eve records how the human race made the transition from the naturalistic world of "is" to the human world of "ought."

In their acquisition of the knowledge of good and evil, Adam and Eve were the first humans to view the world from the outside. They had entered a new world from which they could criticize the naturalistic world of their past. A familiar saying is that one cannot proceed from an "is" to an "ought." Adam and Eve had lived in a world of "is." Now, with the knowledge of good and evil, they had entered into the world of "ought." This historical account of Adam and Eve records how the human race made the transition from the naturalistic world of "is" to the human world of "ought."

The image of God. Satan was also correct when he said: "You will be like God" (Gen. 3:5). For the eyes of Adam and Eve could now view from the outside the old world of their animal natures. Just as God the Creator is outside his created world, so were Adam and Eve, as God's images, released from bondage to the world of nature. As Calvin recognized, the story of Adam's creation in Gen. 2:7 did not include the image of God. Adam and Eve became images of God only after their enlightenment in Gen. 3:7 when they ate of the tree of the knowledge of good and evil and their eyes were opened.

This understanding of the "image of God" is confirmed in Gen. 1:26 where the "image of God" is first introduced. In the first twenty-five verses of Genesis, God has been doing only one thing, creating the world. Thus the audience for whom Genesis was written, would know God only as a person outside his created world. To them, an "image of God" would be a person outside the world. This understanding of "the image" is further confirmed by the command immediately given to "man" in Gen. 1:26, "to rule" over all of the creatures in the world. It is difficult for people to rule over all of the creatures in the world if they are creatures within the world themselves.

Of course, it was not necessary for Adam and Eve to disobey God to acquire his image. If they had obeyed God and not eaten of the tree, they would have remained in the Garden in communion with God and have acquired the knowledge of good and evil from God himself. They would have been images of God but not in rebellion from God.

Adam the sinner. Before eating of the tree, Adam was innocent even though he followed the desires of his animal nature. But when he received the knowledge of good and evil, God's law was written on his heart and he acquired a conscience. Now his formerly innocent animal desires (the "flesh" in Rom. 7) led Adam to become a sinner. For "sin is not taken into account when there is no law" (Rom. 5:13).[8] An inevitable feature of being a human being, with a conscience and an animal inheritance, is to be a sinner.

Summary of "The Adam of Scripture"

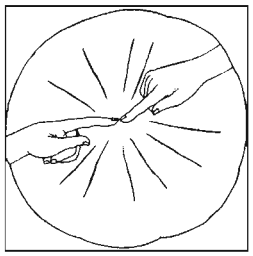
Adam was formed by God at about 4000 BC as a mortal man without a conscience. Adam was innocent; he could not sin because he knew no law to disobey.

After eating of the tree of the knowledge of good and evil, Adam was no longer simply a portion of the natural world, accepting the world as it was. Adam was freed from his bondage to the world and had become an "image of God," viewing the world from the outside. He had left the world of "is" and entered the world of "ought." But, an unavoidable part of becoming a human being with both an animal inheritance and the knowledge of good and evil was to become a sinner.

The Adam of the Creeds

Perhaps the most compelling expression of the traditional Adam is that found in Milton's *Paradise Lost.* Milton, a Puritan sympathetic to the Westminster Assembly, wrote his classic within walking distance of the deliberations of the Assembly twenty years before. We, therefore, have selected the product of the Assembly, the *Westminster Confession of Faith* to represent the Adam of the creeds. The *Westminster Confession* also represents several other Protestant confessions.[9] The pertinent portions of the *Confession* with the supporting scriptural references are presented in the Appendix.

Let us now discuss the parts of the *Confession* that contradict Scripture.



Article

The Real Adam

In contradiction [to the Westminster Confession], Scripture describes a mortal Adam who had not yet eaten of the tree of life ... [and who] only knew good and evil after he had eaten of the forbidden tree.

Adam's Mortality

In Chapter IV.2 of the *Confession*, Adam is created with an "immortal soul." The scriptural references for this statement are Luke 23:42 and Matt. 10:28. Luke quotes Jesus' words to the thief on the cross: "Today you will be with me in paradise" while Matthew quotes Jesus' words: "Fear not them that kill the body, but are unable to kill the soul." Neither Luke nor Matthew is referring to the state of Adam at his creation but to people contemporary with Christ who can inherit eternal life. In contrast, as Calvin emphasized, "Adam's life was only *earthly*" while a Christian "may be renewed to a life which is *celestial*." Furthermore, Scripture explicitly states that Adam was mortal. After Adam had eaten of the forbidden tree, God says: "(The man) must not be allowed to reach out his hand and take also from the tree of life and eat, and live forever" (Gen. 3:22). It is clear that Adam did not have the "eternal life" of the believer in John 3:16, who has an immortal soul.

Adam's Righteousness

In Chapter IV.2 of the *Confession*, Adam is "endued with knowledge, righteousness, and true holiness." The scriptural reference for the "knowledge" is Col. 3:10 while the reference for "the righteousness and true holiness" is Eph. 4:24. Both of these references are describing the "new self" of the New Testament. The *Confession* again has ignored Calvin's distinction between Adam, with his *earthly* nature, and the "new self," with its *celestial* nature. The description of Adam in the *Confession* is not that of the Adam described in Genesis but rather the description of the Christian in the New Testament whose nature has been regenerated by Christ. Adam's righteousness also is referred to in Chapter VI.2.

Adam's Conscience

In Chapter IV.2, the *Confession* states that Adam and Eve were created with "the law of God written in their hearts." The reference for this statement is Rom. 2:14,15. Here the Apostle Paul is speaking of people living after Adam's disobedience and not of the created Adam before he disobeyed God. But after Adam had eaten the forbidden fruit, God says: "The man has now become like one of us knowing good and evil" (Gen. 3:22). Obviously, Adam did not know good and evil before he ate the fruit. Thus, at the time of his creation, Adam did not have "the law of God written in his heart."

Summary of "The Adam of the Creeds"

The Adam of the creeds, as expressed in the *Westminster Confession*, "was created with an immortal soul and endued with knowledge, righteousness, and true holiness." In contradiction, Scripture describes a mortal Adam who had not yet eaten of the tree of life. Furthermore, the scriptural references for knowledge, righteousness, and true holiness are from the New Testament where the new self of the Christian, and not the earthly nature of the created Adam, is being described.

Finally, the *Confession* states that Adam and Eve were created with "the law of God written in their hearts." Again, this statement is contradicted by Scripture which says that Adam only knew good and evil after he had eaten of the forbidden tree.

The Adam of Science

Having examined Scripture and the creeds, we now turn to science for further information about Adam. Of course, science knows nothing of Adam, the individual, any more than science knows anything about Abraham, the patriarch. John Bright writes of the limitations of science concerning its contributions to history:

> Nor are we to overbid archeological evidence. It cannot be stressed too strongly that in spite of all the light that it has cast on the patriarchal age, in spite of all that it has done to vindicate the antiquity and authenticity of the tradition, archeology has not proved that the stories of the patriarchs happened just as the Bible tells them. In the nature of the case it cannot do so. At the same time—and this must be said with equal emphasis—no evidence has come to light contradicting the tradition. The witness of archeology is indirect. It has lent to the picture of Israel's origins as drawn in Genesis a flavor of probability, and has provided the background for understanding it, but it has not proved the stories true in detail, and cannot do so. We know nothing of the lives of Abraham, Isaac and Jacob save

> what the Bible tells us, the details of which lie beyond the control of archeological data.[10]

Similarly, archeology cannot tell us about Adam himself, although it can "cast light" on Adam's world.

Adam's World

Using archeological data, the location of the Garden of Eden is now fairly well established to be in southern Mesopotamia.[11] Also, the scriptural description of Adam's sons, farming, and herding in Mesopotamia in 4000 BC fits in well with archeological knowledge.[12] In addition, Cain's building a city in the east agrees with the archeological evidence that the first cities were built about 4000 BC in Mesopotamia and shortly thereafter in the Susiana plain some 250 km to the east.[13]

Of more immediate interest for our investigation of Adam is the archeological evidence that thousands of *Homo sapiens sapiens* lived in the Mesopotamian valley at the time of Adam.[14] Wenke defines the *Homo sapiens sapiens* in the following terms:

> We reserve the ultimate accolade of "people like us," *Homo sapiens sapiens*, for only some of the humans who lived after about 150,000 years ago, and it was not until about 30,000 years ago that we alone came to constitute humanity.[15]

It should be noted here that the archeological knowledge of the *Homo sapiens sapiens* is completely independent of the theory of evolution. The evidence for their existence depends entirely on the inspection and dating of fossils and the remains of the artifacts that they produced. The evidence for the existence of the *Homo sapiens sapiens* would be unchanged if Darwin had never lived.

During the many millennia of their history, the *Homo sapiens sapiens* developed languages, learned to count and build shelters, and intuitively had learned Archimedes' Law of the Lever when they pried up rocks with sticks. In general, they had learned to use reason in the pursuit of "practical" matters.

In contrast to their sophistication about the natural world, *Homo sapiens sapiens* were retarded in their social relationships. They exhibited the selfishness and cruelty of their animal natures that had developed for their survival over the millennia. Jerry D. Korsmeyer, expresses the situation in these terms:

> Our hominid ancestors were emotion-laden individuals long before they were self-conscious. Anger, fear, maternal love, sexual arousal, awe at nature and intimations of the creator—all these were present before sin. There was suffering and evil for millions of years, but no guilt, and no sin.[16]

There were "intimations of the creator" as burial sites indicate.[17] But there was no sin because there was no law. For, "sin is not taken into account when there is no law" (Rom. 5:13).[18]

The discovery by archeology that *Homo sapiens sapiens* were neighbors of Adam has provided unanticipated illumination of the scriptural account of Adam's family. The origin of Cain's wife, Cain's fear of other people, and Cain building a city are now understandable if other people were living near Eden. Furthermore, this cryptic passage is clarified:

> When men began to increase in number on the earth and daughters were born to them, the sons of God saw that the daughters of men were beautiful, and they married any of them they chose (Gen. 6:1).

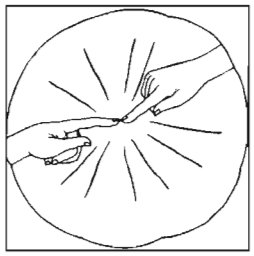
The commentators have explained the sons of God as angels[19] or as pagan myths.[20] On the other hand, with an historical Adam, "the sons of God" would be Adam's family (Adam is called the son of God in Luke 3) while "the daughters of men" would belong to other families living at the same time. Furthermore, this intermarriage between Adam's family and the humans outside his family is significant. It shows that Adam's family was biologically compatible with the *Homo sapiens sapiens* living in Mesopotamia.

The discovery by archeology that Homo sapiens sapiens *were neighbors of Adam has provided unanticipated illumination of the scriptural account of Adam's family.*

The scientific discovery of prehistoric humans therefore supports the biblical milieu found for Adam in Genesis. In fact, it almost appears that the Holy Spirit, in supervising the writing of Genesis, was aware of the other humans living contemporaneously with Adam. Cain's wife, Cain's fear of other people, Cain building a city, and the marriages outside the family of God are referred to in Genesis as matters requiring no explanation.

Adam's Date

Using the accumulation of scientific knowledge, the dating of Adam can now be based solely on scientific evidence and becomes independent of the uncertain genealogies in Genesis. The scientific data for farming and animal husbandry in Mesopotamia determine Adam's



As a farmer Adam lived after 9000 BC. As a user of speech-alone talk, he lived before 4000 BC. Cain's building a city would occur after 4000 BC providing his city is given the archeological definition of city. Recognizing this provision about Cain's city, Adam lived about 4000 BC.

date to be some time after 9000 BC.[21] The building of a city by Cain indicates a considerably later date.[22]

However, another scientific factor can be used for dating Adam. The appearance of the first cities in 4000 BC may have depended on a "way of talking" different than the "way of talking" used previously.[23] Until *Homo sapiens sapiens* used purely symbolic speech-alone talk, they could not linguistically construct the symbol-laden administrative tools required to build cities. Thus, while Adam demonstrated the creative use of speech-alone talk when he named the animals (Gen. 2:20), his *Homo sapiens sapiens* neighbors demonstrated the identical use of symbolic-laden speech-alone talk when they built the first cities in Mesopotamia about 4000 BC. However, instead of naming the animals, the early Ubaid named the people—as potters, traders, makers of musical instruments. The use of symbolic words to label people established grounds for social differentiation and laid the groundwork for the social construction of cities.

It is therefore possible that the *Homo sapiens sapiens* in Mesopotamia obtained their fluency with speech-alone talk from their intermarriage with Adam's family (Gen. 6:1). For it appears that Adam controlled speech-alone talk before his neighbors. Scripture says that God created Eve because "for Adam no suitable helper was found" (Gen. 2:20); perhaps no one could be found to communicate with Adam using speech-alone talk. As Steven Pinker has remarked: "If a language involves, for its true expression, another individual, who did the first grammar mutant talk to?"[24]

Thus, the scriptural reference to Adam naming the animals (with speech-alone talk), and the indication that no other person could communicate with him with this talk, implies that Adam lived before anyone else used speech-alone talk. Adding the requirement that speech-alone talk was used after 4000 BC for the building of cities, indicates that Adam lived before 4000 BC.

In summary, as a farmer Adam lived after 9000 BC. As a user of speech-alone talk, he lived before 4000 BC. Cain's building a city would occur after 4000 BC providing his city is given the archeological definition of city. Recognizing this provision about Cain's city, Adam lived about 4000 BC.

Science also can determine Augustine's unknown time interval between the creation of the earth and the heavens (Gen. 2:4) and the formation of Adam (Gen. 2:7). Recent measurements have shown that the universe has been expanding from a Big Bang for the past 13.7 billion years.[25] Assuming that God "made the earth and the heavens" at the time of the Big Bang, and that Adam appeared a few thousand years ago, the duration of Augustine's unknown time interval now is known to be an enormous 13.7 billion years.

Summary of "The Adam of Science"

While Adam the individual cannot be identified by archeology, the community in which Adam lived has been found. From the archeological evidence, the members of this community appear to be modern humans. Their burial remains show a belief in an afterlife. However, archeology has not shown whether these humans had consciences. On the other hand, the building of cities about 4000 BC indicates that these people had a control of the symbolic speech-alone talk that Adam possessed. The intermarriage of Adam and his neighbors is further evidence of the similarity between the nature of Adam and that of his neighbors.

The Real Adam

The Two Men

We have reviewed the evidence for the nature of the Adam of Scripture and the evidence for the nature of the Adam of science (a *Homo sapiens sapiens* in Adam's community). Comparing the natures of these two men, we find them to be identical in their biological nature, their technological achievement, their intelligence, their mortality, and their control of language. The only reason to treat them as different human beings is the record of their ancestry.

According to Scripture, Adam, formed from the dust of the ground produced at the creation, appears in Mesopotamia about 4000 BC. According to science, the members of Adam's community in 4000 BC are *Homo sapiens sapiens* whose histories recede back to the Big Bang in 13.7 billion BC. But these two historical records are, in reality, the same:

one is general and from Scripture; the other is detailed and from science.

Let us now digress to recall an insight obtained during the development of particle physics.

An Insight from Particle Physics

In the early fifties, the new particle accelerators were producing a range of unexpected particles. At almost every physics meeting, reports were being made of unknown particles of bizarre masses. Two of these "strange" particles, the theta and the tau, soon captured attention. At first their masses differed by 50%, at the next meeting by 20%, at the next meeting by only 5%. Why not say that they were the same particle?

The reason that the two particles had been given different names is that the theta particle decayed into a system of even parity while the tau decayed into a system of odd parity. (Parity is a rather subtle concept which need not concern us here.) Because parity was not supposed to change during particle decay, the theta particle was assigned an even parity and the tau an odd parity. Yet, in every other respect, the particles were identical.

Lee and Yang solved the puzzle by decreeing that "strange" particles do not have a parity. There was only one "strange" particle, the theta/tau particle. By a similar argument, the different historical records for the two men are describing only one history so that the Adam of Scripture and the Adam of science are the same person.

The Adam of Scripture and of Science

If then, the Adam of Scripture and the Adam of science are the same man, God presumably selected one of the men in the Mesopotamian community to be the Adam of Scripture. Perhaps Adam was selected because of his control of speech-alone talk. In like manner, two thousand years later, God would also select a man, Abraham, from among the Mesopotamians to be the father of his chosen people.

This selected Adam, then, carried all of the emotional and intellectual baggage of the *Homos sapiens sapiens*. Yet, despite his unrestrained animal nature, he could not sin because he had no knowledge of good and evil; there was no law for him to disobey. Consequently, with his inexperience in obedience, when God commanded him not to eat of the tree of the knowledge of good and evil, he easily capitulated. But after eating of the forbidden tree, he now had the knowledge of good and evil written on his heart. This knowledge, at enmity with the old animal nature (the flesh of Romans 7), made Adam a sinner.

By showing that the Adam of Scripture could have been one of the *Homo sapiens sapiens* revealed by science, one of the longstanding tensions between science and Scripture has been removed. The recognition that, by eating of the tree of the knowledge of good and evil, this Adam became a morally responsible person provides the transition from the animal history of the human race to the moral nature of people today.

Summary of "The Real Adam"

The Adam in Scripture and the Adam of science are the same Adam. This Adam was selected by God to make the transition from the *Homo sapiens sapiens* world of "is" to the human world of "ought." In making this transition, Adam acquired the image of God but he also became a sinner.

Of course, there are many questions still to be answered. For example, how was the guilt of Adam's sin imputed to the human race? This is too large a question to be answered here. However, the fact that all humans everywhere already have an animal nature means that the propagation of Adam's sin to other humans requires only the propagation of the knowledge of good and evil. Thus, the American Indians needed only to acquire the knowledge of good and evil to become sinners.

Conclusions

The Adam of Scripture and the Adam of science are the same Adam with different historical records. On the other hand, the Adam of the creeds contradicts the Adam of Scripture in numerous respects. ◆

Acknowledgment

The author thanks J. Raymond Zimmer for his contribution to the discussion of "speech-alone talk."

Appendix
The Westminster Confession

Chapter IV
Of Creation

2. After God had made all other creatures, he created man, male and female,[2] with reasonable and immortal souls,[3] endued with knowledge, righteousness, and true holiness after his own image,[4] having the law of God written in their hearts,[5] and power to fulfill it and yet under a possibility of transgressing, being left to the liberty of their own will, which was subject unto change.[6]

[2]Gen. 1:27
[3]Ps. 8:5, 6; Gen. 2:19, 20; Luke 23:43; Matt. 10:28.
[4]Gen. 1:26; Col. 3:10; Eph. 4:24
[5]Rom. 2:14,15;
[6]Gen. 2:16, 17; Gen. 3:6, 17

Notes

[1]See e.g., *The (Westminster) Confession of Faith* (Richmond, VA: Presbyterian Church in the United States, 1969), Standard Book Number: 8042-3936-3, chap. VI.

[2]The location of the Garden of Eden is given in Gen. 2:14 which states that the Tigris and Euphrates Rivers flow through the Garden. The date for the creation of Adam has been calculated from the genealogies in the Bible. The best known date calculated in this fashion is the 4004 BC date of Archbishop Ussher. The great Isaac Newton calculated a date of 3988 BC (see Edward Harrison, *Cosmology, the Science of the Universe* [Cambridge: Cambridge University Press, 2000], 518).

[3]St. Augustine, *The Literal Meaning of Genesis* (New York: Newman, 1982), Book 5, Chapter 5.

[4]St. Augustine, Ibid., Book 7, Chapter 28 and St. Augustine, "The City of God" in *Great Books of the Western World* 18 (Chicago: Encyclopedia Britannica, 1952), Book XII, Chapter 16.

[5]John Calvin, *Commentaries on the Book of Genesis* trans. John King (Latin original, 1554; Grand Rapids, MI: Eerdmans).

[6]Ibid.

[7]Charles Hodge, *An Exposition of the First Epistle to the Corinthians* (first published 1857; Grand Rapids, MI: Baker, 1980).

[8]John Calvin, *Commentary on Romans*, trans. Ross Mackenzie (Latin original 1540; Grand Rapids, MI: Eerdmans, 1960). Here, Calvin traces the association of the law with sin back to Adam's son, Cain. As Adam's son, Cain was aware of the law of the knowledge of good and evil and so was a sinner. Adam himself disobeyed a direct command of God and was also a sinner. Before Adam there was no knowledge of good and evil and, hence, no sinners.

[9]For example, the Presbyterian Church in the United States recommended in 1976 that, in addition to the Westminster Confession and its catechisms, several other confessions and catechisms be added to its *Book of Confessions*.

[10]John Bright, *A History of Israel* (Philadelphia: Westminster, 1981), 75.

[11]Carol A. Hill, *Perspectives on Science and Christian Faith* 52 (2000): 31–46.

[12]Robert J. Wenke, *Patterns in Prehistory* (New York: Oxford, 1999), 283–304.

[13]Ibid., 404–10. This reference states that the first cities were built about 4000 BC. A settlement is defined to be a city only if a certain complexity and hierarchical relationship is attained within the settlement. Thus, the Scriptural reference to "Cain building a city" may be referring to a large settlement preceding 4000 BC. Likewise, earlier settlements such as Jericho would not be defined as cities by Wenke.

[14]See e.g., Ibid., chap. 8.

[15]See e.g., Ibid., 160.

[16]Jerry D. Korsmeyer, *Evolution and Eden* (New York: Paulist, 1998), 122.

[17]See e.g., Wenke, *Patterns in Prehistory* , 398–9.

[18]Calvin, *Commentary on Romans*.

[19]Gerhard von Rad, *Genesis* (Philadelphia: Westminster, 1961), 113.

[20]Claus Westermann, *Genesis* (Grand Rapids, MI: Eerdmans, 1967), 43; and Bruce Vawter, *On Genesis* (Garden City: Doubleday, 1977), 110.

[21]See e.g., Wenke, *Patterns in Prehistory*, 296.

[22]Ibid., 283–304.

[23]J. Raymond Zimmer, "The evolution of talk and the emergence of complex society," *Semiotica* 138 (2002): 205–6.

[24]Steven Pinker, "The Language Instinct" (New York: Harper Collins, 2000) 376.

[25]*Physics Today* (April 2003): 21.

Books Received and Available for Review

Contact the book review editor if you would like to review one of these books. Choose alternate selections. Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761. ruble@tcainternet.com

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M. A. Cremo, *Human Devolution: A Vedic Alternative to Darwin's Theory*, Torchlight Publishing, 554 pages, 2003

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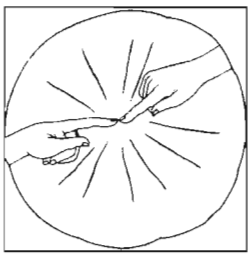
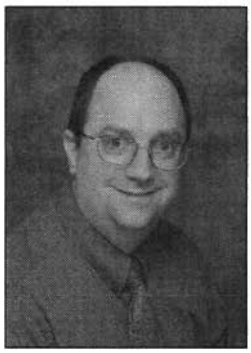


Genesis 1 as a Sign of the Evolutionary Record: Art and Implications

J. Raymond Zimmer



J. Raymond Zimmer

Artistic concordism steps out of the world of science-inspired representation and into the world of semiotics.

The semiotics of C. S. Peirce permits a new way of constructing relations between the sign systems of theology and the evolutionary sciences. Signs are constructed using phrases in the Genesis 1 text as sign-vehicles and aspects of corresponding evolutionary epochs as objects. The artist connects the pair on the basis of natural sign interpretants, thus constructing a sign where a passage in the biblical text stands for an aspect of a corresponding evolutionary era. The accumulation of signs yields a global sign that operates according to the logic of Steven Meyer's "God hypothesis." Both Genesis 1 and the evolutionary record belong to a single reality.

Concordism attempts to find harmony between the biblical and evolutionary "origins stories" without favoring one story at the expense of the other.[1] In this article, I will follow the intuition expressed in Robert C. Newman and Herman J. Eckelmann Jr.'s *Genesis One and the Origin of the Earth*[2] by comparing, through a day-epoch correspondence, the creation story and the evolutionary record.

Newman and Eckelmann Jr. were among the first to construct a detailed match between passages in each Genesis 1 "day" and phenomena in the modern evolutionary record. They assumed that words were representations. Phrases in the Genesis 1 text represented evolutionary phenomena.

In our scientific age, the term "representation" has been defined as an index; a sign based on pointing or contiguity.[3] For example, the symbol-word "copper" indicates a particular metal with particular properties. The indexality of "representation" gives science its greatest strength. Every symbol-word in science stands for "something that can be pointed to" and examined. However, the indexality also gives science its greatest weakness. How much of the human imagination can be reduced to indexes? Human thoughts are not like thermometers indicating temperatures. Nor are all of the phrases of Genesis 1 indicators of the epic of evolutionary history.

The index is one of the three types of natural signs. According to Charles Sanders Peirce, the founder of (post)modern triadic semiotics, the icon, index, and symbol reflect the three categories of existence: possibility, actuality, and mediation.[4] These are listed in Table 1. Each sign in Table 1 is defined by the same formula. That formula constitutes the definition of "sign." In semiotics, as well as in this article, the word "sign" denotes Peirce's relational formula.

Peirce's sign contains three elements: a sign-vehicle, an object, and an interpretant. Scientific representation contains two: the word and the thing indicated. The sign allows choice. Choice is inherent in the selection of the interpretant. Representation allows no choice. The possibility of choice is not an option when words are index-based repre-

J. Raymond Zimmer *(M.S. Medical Physics; Ph.D. Physical Chemistry) is currently employed as a clinical medical physicist in the Illinois Advocate Health System. As part of his project in artistic concordism, he is studying evolutionary anthroposemiosis (the human use of signs) and attending conferences, ranging from regional meetings of the AAR to Symbolic Interactionism. A member of the ASA, Ray enjoys reading and walking. Correspondence can be sent to him at: 5020 S. Lakeshore Dr. #3315N, Chicago, IL, or John.Zimmer@advocatehealth.com.*

sentations. When we step into the hybrid world of modern Christian concordism, we must ponder: How do phrases in the Genesis 1 text signify aspects of the modern evolutionary record? Do they signify them as icons, indexes, symbols, or all three? Or do they signify them as representations?

Artistic concordism steps out of the world of science-inspired representation and into the world of semiotics. We take one foot out of modernism and set it in postmodernism. In the modern scientific world of representation, we tended to think of the interaction between God and nature in terms of indexes. Indexes belong to the category of actuality. Christians aspired to demonstrate the actuality of God's action in evolutionary history.[5] The lively debate about God's action in nature continues in the pages of this journal,[6] as well as in others.[7]

Science	
Term	**Definition**
Representation	Word or symbol indicates "something that can be pointed to"
Semiotics	
Term	**Definition**
Icon (sign in category of possibility)	A sign-vehicle stands for an object to an interpreter on the basis ... of similarity or imagery
Index (sign in category of actuality)	... of contiguity or pointing
Symbol (sign in category of mediation)	... of definition or convention

Table 1. Terms and Definitions for Science and Semiotics

In the postmodern milieu of signs, we have blasted ourselves out of the cannon of representation and are now flying, with great uncertainty, toward what we hope is a net. We realize that we made the cannon. We are making the net. We are doing so through our choices. More than ever, we are inspired to think of the interaction among ourselves, God, and nature in terms of choices. We construct our world and that requires choice: a mediation that turns a possibility into an actuality. Now, if we step back and squint our eyes, we might see that this is also what art accomplishes: Art turns possibilities into actualities through choices.

The Nature of Artistic Concordism

Christian concordism in this scientific age addresses the question: If the biblical origin stories and the evolutionary record pertain to a single reality, then how do they match? Modern scientific concordisms viewed the match through the lens of representation. Postmodern artistic concordism (of which there is only one at the moment) constructs the match through the medium of signs.

The biblical and evolutionary origin stories belong to two distinct sign systems: theology and science. The sign operations of both systems are shown in figure 1, using the three-spoke figure favored by semiotician Floyd Merrell.[8]

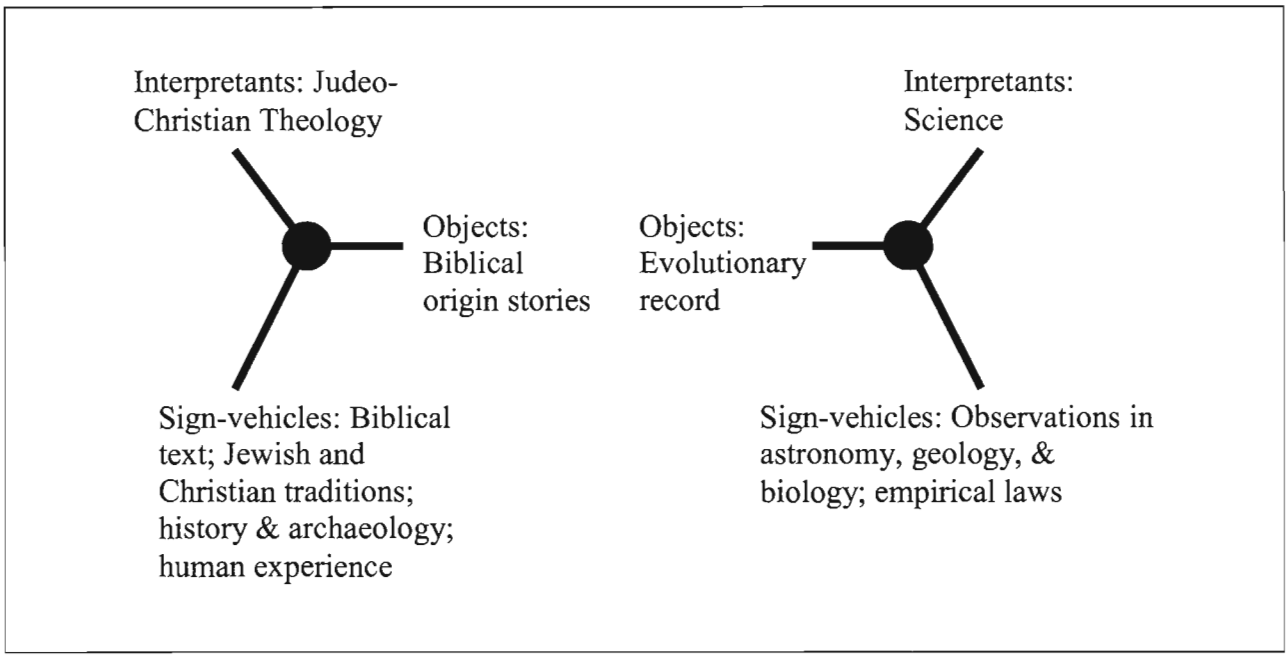
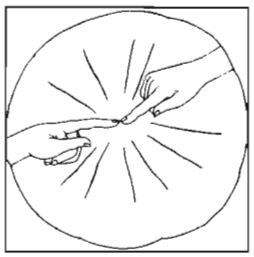


Figure 1. Two Sign Systems of Theology and Science



Article

Genesis 1 as a Sign of the Evolutionary Record: Art and Implications

If the biblical origin stories and the evolutionary record pertain to a single reality, then how do they match?

Figure 1 juxtaposes the objects of each sign system, so the concordist question becomes obvious. Concordism matches the objects of each sign system.

How these objects are conceived will influence the character of a match. For theology, the sign-vehicles include the Genesis text, the entire biblical text, the history of the Jews, Jewish and Christian traditions, the archaeology of southwest Asia, our human experiences, and so forth. To the theologian, these sign-vehicles stand for the biblical origin stories in regard to theological interpretation. When theologies differ, the "biblical origin stories" differ. For some, the Genesis stories are ancient myth. For others, they are revelations to Moses. In the first case, the creation story matches an old, intuitive, now discredited view of nature that should not be compared to our current scientific knowledge.[9] In the latter case, the words of Genesis 1 represent nature, irrespective of current scientific consensus.[10]

For the evolutionary sciences, the sign-vehicles are observations in astronomy, geology, and biology; laws from the empirical sciences; and other scientific works. To the scientist, these sign-vehicles stand for the evolutionary record in regard to evolutionary theories. If theories differ, the evolutionary record differs. For example, divergent interpretations of the prehistoric Indo-European expansion predict different evolutionary records. However, investigations (the gathering and interpreting of sign-vehicles) have not been able to distinguish among the predictions.[11]

In the modern world of representation, there is no sign system beyond these two sign systems. The only way to establish harmony between the two sign systems is to favor one interpretant at the expense of the other. Two permutations are possible, science-favored or theology-favored concordism. As shown in figure 2, traditional biblical theology is replaced by some form of "evolutionary theology" in science-favored concordism. The "biblical origin stories" are correspondingly objectified as myths, explanations of the unknown, contrasts to the Babylonian god-filled mythos, and the like. While these objects may be valid, they are often peripheral to traditional biblical theologies that regard the creation story as somehow real.[12]

In theology-favored concordism, shown in figure 3, a "creation-inspired science" attempts to displace the traditional evolutionary sciences. The resulting "creation-inspired evolutionary record" matches, in

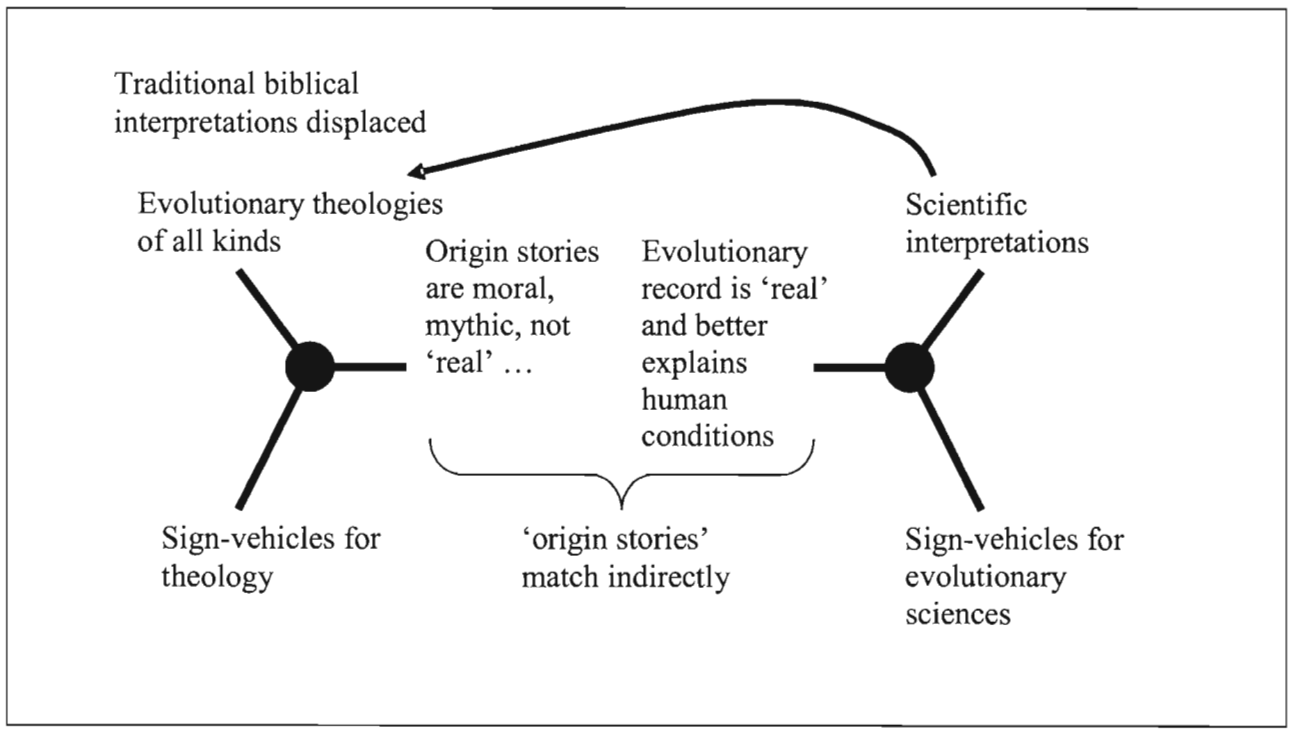


Figure 2. Science-favored Concordism

one way or another, the biblical origin stories. The "creation-inspired evolutionary record" has been problematic for centuries. For example, during the founding of the field of geology, many investigators unwittingly assumed some form of theology-favored concordism as they (mis)took the sign-vehicles of theology as belonging to geology. The result was a mix of valid and invalid theories, which were sorted out with painful consequence by the elimination of sign-vehicles belonging to theology.[13] Today, theology-favored concordisms, which may include Intelligent Design,[14] are no longer the accidental inclusions of Christian traditions in scientific inquiry.[15] Rather, they appear to be attempts to dislodge atheistic-evolutionary world views that seem intent on dislodging traditional biblical theologies.[16]

The two types of concordism depicted in figures 2 and 3 appear to be in conflict, even though, according to Ian Barbour's scheme, individual efforts may be classified in terms of independence, dialogue, or integration.[17] For example, Howard Van Till's thoughtful Robust Formational Economy Principle[18] (RFEP) gives us a fruitful way to reflect upon the single reality implied by Genesis 1, and therefore should be classified as integration. However, it does not give us a way to picture God's creation story as an expression of that single reality. Therefore, it appears as science-favored concordism.[19]

Similarly, the Intelligent Design (ID) project provides a valuable critique of the presumption by the sciences that there is no need to postulate divine action for the emergence of evolutionary phenomena. [20] As such, ID may be classified as dialogue. But, the project explicitly distances itself from the sacred text (which inspires its efforts) in order to avoid the theology-favored concordist position.[21]

Despite the labels of "integration" and "dialogue," charges that the RFEP is science-favored concordism and that ID is theology-favored concordism are effective. Why? No one has figured a way beyond figures 1, 2 and 3.

Artistic concordism appears at first to belong to a broad group of concordist works that Karl Giberson and Donald Yerxa, in *Species of Origins*, label the "via media" or the "middle way."[22] However, it differs from "middle way" concordisms by mediating between the objects of the two sign systems, rather than the intepretants. This is shown in figure 4. For the most part, "middle way" concordisms are interested in the relationship between the interpretants of the two sign systems; that is, the relationship between theology and science.[23] Artistic concordism, in contrast, creates interpretants that hybridize the objects of the two distinct sign systems.

The "art" of artistic concordism consists in choosing which natural sign interpretant links a sign-vehicle (a descriptive phrase in the Genesis 1 text) to an object (an aspect of a corresponding evolutionary epoch). The interpretant may be based on imagery and similarity (icon), pointing and indication (index), or definition and naming (symbol). As soon as an interpretant is identified, that phrase in Genesis 1 becomes a sign of the evolutionary record.

The act of creating interpretants (in figure 4) differs from the act of substituting interpretants (in figures 2 and 3).

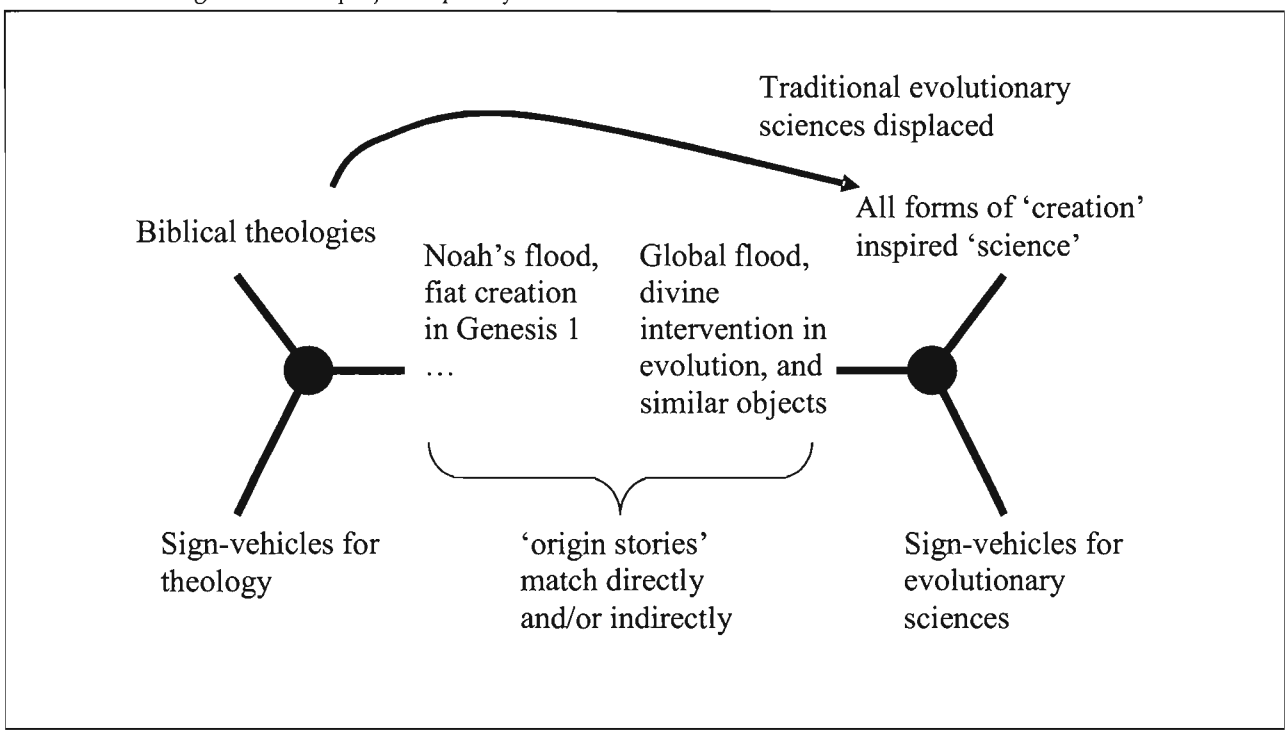
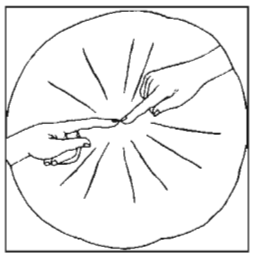


Figure 3. Theology-favored Concordism



Article

Genesis 1 as a Sign of the Evolutionary Record: Art and Implications

My construction of a match begins by dividing the evolutionary record in a manner conducive to a day-age correspondence.

The generation of an interpretant requires an interpreter. Substitution does not. Artistic concordism needs the participation, involvement, and work of an artist; that is, "someone who chooses." Theology- or science-favored concordisms need effective advocates. Artistic concordism manifests itself as play and choice. The other two concordisms partition the world into competing alternatives, complete with conflicts between vested interests, power plays, and rhetorical excess.

The Evolutionary Record as Epochs

My construction of a match begins by dividing the evolutionary record in a manner conducive to a day-age correspondence. The evolution of the solar system, of the Earth, of life, and of humanity consists in a sequence of emergent phenomena.[24] These emergences are classified as different evolutionary epochs, eras, or periods. Different fields of study are relevant to each epoch. For example, astronomy studies the formation of solar systems, and biology examines the evolution of life systems.

To some extent, the division of evolutionary history is both "arbitrary" (in that we are dividing a continuum that could be divided in many ways) and "not arbitrary" (in that certain processes dominate during particular portions of the continuum). However, what science has divided on the basis of its own interests, the text of Genesis 1 images as "days." This remarkable coincidence was becoming apparent by 1977, the year that Robert Newman and Herman Eckelmann Jr. first published *Genesis One and the Origin of the Earth*. Table 2 is adapted from figure 6 and Table 4 of the *Genesis One* text.[25] Against each "day of creation" are listed the corresponding epoch from Newman and Eckelmann Jr. and from my more recent work.[26] The amazing progress in the evolutionary sciences during the intervening two decades did not alter the basic pattern. The works of Hugh Ross[27] as well as Held and Rust[28] also key into similar "Genesis day" to "scientific age" correspondences.

Constructing a Match

In order to show the richness of the correspondence within Table 2, the details of the day-one match are shown in Table 3.

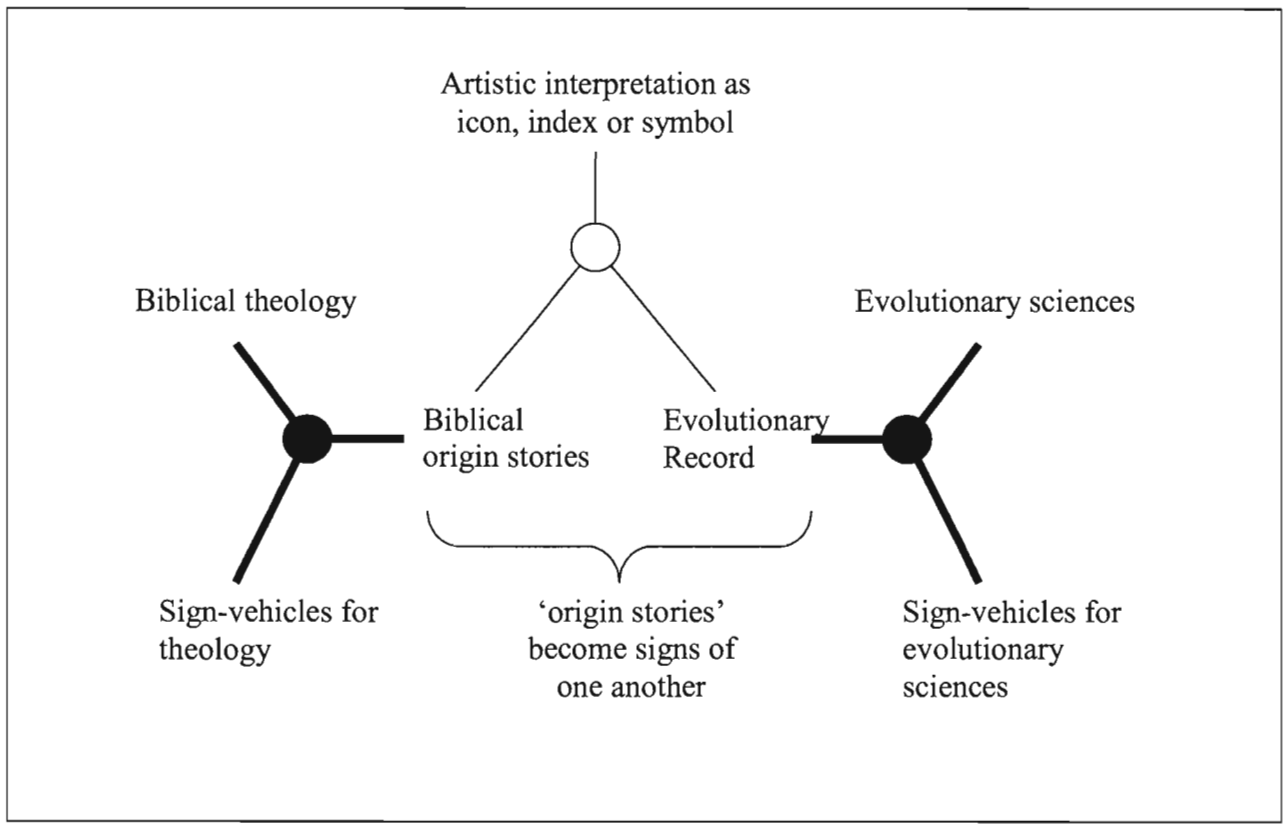


Figure 4. Artistic Concordism "Matching" Objects of Theology and Science

Newman and Eckelmann Jr. wrote *Genesis One* as the revolution in the evolutionary sciences was just beginning. Ninety percent of their day-one references were published after 1960. By 2002, the match was even more apparent. Astronomical discoveries since the 1970s provide images for phrases that were previously interpreted as divine acts. Also, the "naming of the day and night" now appears more symbolic, since the Earth was probably not formed during this epoch.

The construction of a match is best seen using the two most problematic days in Genesis. Days 3 and 4 have been interpreted as depicting the formation of plant life before the making of the sun. Some theologians have advised against all concordist interpretations on the basis of this obvious inconsistency with scientific knowledge.[29]

For the artistic match pictured here, these days correspond to the Archean and Proterozoic eras, as seen in general in Table 2 and in detail in Table 4. In day three, God commands the earth to bring forth vegetative life, plants bearing seed and fruit trees bearing fruit, and the earth does so. While the image of vegetative life is easily an icon of Archean bacterial formations, the passages about "plants bearing seed" obviously do not belong to the Archean on the basis of similarity. However, the passages do point to the early Archean as the start of photosynthetic, hence vegetative, life. Furthermore, the passages describe why the appearance of photosynthetic life is important to us now. The passages depict the ways we experience this evolutionary development. "Plants bearing seed" may be regarded as a symbol of the emergence of life during the early Archean.

Phrases that were once problematic in a day to epoch match resemble the importance of the corresponding era. In other words, they are symbols of the corresponding epoch. Every apparently descriptive phrase in Genesis 1 matches an aspect of a corresponding age when classified as icon, index, symbol, or a combination thereof. The association is open-ended. If future scientific discoveries render now-accepted portions of the evolutionary record invalid, a match to the new evolutionary information may still be attempted. Thus, this art-work, like science itself, will always be a work in progress. Such open-endedness reflects the nature of signs, which are not things, but relations.

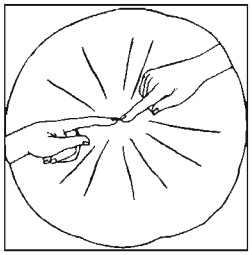
From Construction to Performance

If Genesis 1 is a sign of the evolutionary record, then what does that imply? The match implies that the two distinct sign systems of theology and science somehow belong to a single reality. That "somehow" is similar to Steven Meyer's "God hypothesis" in that an abduction constructs a sign that is then performed.[30]

Meyer wrote: "Scientific evidence ... provide(s) epistemological support (but not proof) for the theistic world view affirmed by Christianity."[31] What was meant by "support (but not proof)"? Meyer turned to the aforementioned Peirce to explain that the "support" follows the logic of abduction, that is, of hypothesis. A hypothesis is a possible or plausible explanation for an observed state of affairs. Meyer gave the following abduction as an example: If it rains, then we would expect the streets to get wet.

Biblical Material	Scientific Theory (1977: Newman & Eckelmann Jr.)	Scientific Theory (2000: Zimmer)
Day One	Formation of Solar System	Formation of Solar System
Day Two	Formation of atmosphere and ocean	Accretion of the planets, especially Earth
Day Three	Formation of dry land & land vegetation	Formation of earliest continents & appearance of bacterial photosynthetic life
Day Four	Long-term change in composition of atmosphere due to continental weathering and photosynthesis	Long-term change in composition of atmosphere due to continental weathering and photosynthesis
Day Five	Age of multicellular life to age of mammals	Age of multicellular life to end of dinosaurs
Day Six	Age of mammals	Age of mammals
Verse 26		Evolution of *Homo* genus
Verse 27		Appearance of *Homo sapiens*
Verse 28		Paleolithic era
Verse 29		Early Neolithic (invention of agriculture)
Verse 30		Developed Neolithic (fodder for animals: agriculture combined with stockbreeding)

Table 2.



Article

Genesis 1 as a Sign of the Evolutionary Record: Art and Implications

Artistic concordism generates the impression that the many individually-constructed signs add up ... We begin to sense ... [that] Genesis 1 is a sign of the evolutionary record.

The streets are wet. Therefore, perhaps it rained.[32]

From the semiotic point of view, the hypothesis also constructs a sign: Wet streets stand for rain to an interpreter concerning this abduction. This sign is then performed whenever one says: "Observe! The streets are wet!" So we grab the umbrella, even when the streets are just washed.

We may apply this concept of hypothesis, sign construction, and performance explicitly to Meyer's line of argument. First, the abduction: If God created, then we should see evidence of that creation. The anthropic principle and biological irreducible complexity are evidence. Therefore, perhaps God created.[33] Second, the sign: The anthropic principle and biological irreducible complexity stand for divine creation to the interpreter concerning the "God hypothesis." Finally, the performance: Observe! The anthropic principle and biological irreducible complexity are interpretations of scientific discoveries.

The founding question of artistic concordism tracks the same line. First, the abduction: If the creation story and the evolutionary record pertain to a single reality, then we would expect them to match. We may choose natural-sign interpretants that render a match. Therefore, perhaps both pertain to a single reality. Second, the sign: The artistic match between Genesis 1 and the evolutionary record stands for a single reality to the artist concerning the abduction in artistic concordism. Finally, we can observe the match being performed.

Tables 2, 3 and 4 are performances. They support (but do not prove) the traditional Christian theological view that there is one "reality" and that "truth cannot contradict truth." The correspondences along the rows in Tables 2, 3 and 4 involve aesthetic choices. Some of the choices are obvious and some are not. Each choice constructs a relationship that is more or less recognizable as a sign. Rather than the intellectual assent procured by Meyer's "God hypothesis," artistic concordism generates the impression that the many individually-constructed signs add up. They intertwine, like threads in a rope. The stronger signs give strength to the weaker. As the signs accumulate, we begin to sense a more global sign, a sign that can carry weight. Genesis 1 is a sign of the evolutionary record. Both belong to a single reality.

Biblical Material	Scientific Theory (1977)	Scientific Theory (2000)
Day One	Formation of Solar System	Formation of Solar System
Gen. 1:1	A beginning—the "big bang" perhaps	Interstellar medium, nebula where dense cores form, see Hubble views of "stellar nurseries"
Gen. 1:2 (darkness)	Earth an amorphous, tenuous nebula	Dense core, prior to collapse, outside light occluded in center of core
Gen. 1:2 (wind)	(Providential oversight and occasional intervention)	Swirling nebula appears in center of core as gravitational collapse begins
Gen. 1:3 (let there be light)	Further contraction causes cloud to glow	Core collapses from inside out, light emitted as falling debris hits nebula, heat radiated
Gen. 1:4 (separation of light from darkness)	Planetary material thrust outside glowing cloud	Magnetically driven bipolar winds allow protostar to lose angular momentum and/or solar wind after fusion starts
Gen. 1:3 (there was light)	...	Solar fusion begins
Gen. 1:5 (call light, day; darkness, night)	Planet condenses from planetesimals, sun and rotation give day-night sequence	Symbols of the epoch of solar formation: How we experience this age

Table 3.

From Performance to Sensibility

The sense of a single reality is common to both ancient and postmodern views of the creation story. We may (perhaps controversially) assume that the story in Genesis 1 was originally performed in a family or tribal context as an oral proclamation that signified both nature and God. In ancient Mesopotamia, the story would have matched a static world view where nature, like society, was a hierarchy of powers. At this time, modern distinctions between nature and society (as well as between faith and reason) had not been articulated. The "single reality" was sensed in a cultural world that divided "reality" differently from our own.

Various proposals for how Genesis 1 was interpreted reflect this. Stanley Jaki suggested that the creation story depicted the making of the "tent of the heavens and earth."[34] That is, the divine making of nature was confounded with humans building a tent. Meredith Kline argued that the story in Genesis 1 was understood as creations in the heavens echoing creations on the earth.[35] That is, the heavens and the earth were mutual reflections. The diverse features of nature, described as gods in contemporaneous cultures, were demystified and put into order through the words of the one true God.[36]

In writing the oral tradition down as Genesis 1, Moses changed the context of the original performance. Instead of a speech, it became a text that could be examined and parsed as well as proclaimed. Moses' writing made modern concordism possible. Modern concordism necessarily takes Genesis 1 out of its ancient context.[37] With the birth of science, Christians have been forced to ask the questions: Do God and nature belong to a single reality? And if so, how?

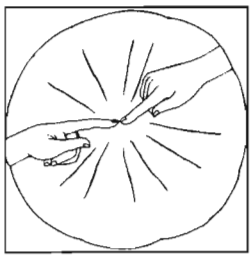
The many proposals that fall under the categories of science- or theology-favored concordism do not return us to the original sensibility inherent in the proclamation that "this story is a sign of nature and a sign of God" because they are concerned with advocating the priority of one sign-system interpretant over the other. They are trapped in figures 1, 2 and 3.

Conclusion

The art-work performance of artistic concordism lets us re-enact the original sensibility of the creation story. The point-by-point construction of signs that span the systems as icons, indexes, and symbols culminates in a sign that signifies by way of abduction. "Genesis 1 as a sign of the evolutionary record" makes vivid the single reality that

Genesis 1	Class of sign	Evolutionary Record
[9] Let waters gather and dry land appear	icon	Formation of earliest continents in early Archean
[10] call dry land "earth," waters "seas"	symbol	How we experience the results of this age
[11] let the earth put forth vegetation	index, icon	Appearance of earliest photosynthetic bacterial life
[11] plants yielding seed, trees bearing fruit	symbol	How we experience the results of this emergence
[11] bearing according to its kind	index	DNA mediated reproduction
[12] earth brought forth vegetation	icon	Spread and evolution of bacterial life
[12] plants yielding seed, trees bearing fruit ...	symbol	As in verse 11 ...
[14] Let there be lights in the firmament of the heavens, to separate day and night, to be signs for seasons and years, [15] to give light upon the earth	index, symbol	Stated purposes point to "looking up" from surface of planet and describe how we experience the results of this epoch
[16] And it was so. God made the two great lights and the stars	icon, index	Progressive loss of cloud cover (and atmospheric opacity) due to long-term global cooling following the reduction of atmospheric greenhouse-gas carbon dioxide as well as removal of atmospheric reduced-organic and nitrogen compounds by increasing levels of oxygen due to photosynthesis and carbon burial
[17] And God set them in the firmament ...	index, symbol	As in verses 14 and 15

Table 4.



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encompasses both theological and scientific sign systems.

Since the performance alters neither the biblical text nor the scientific literature, a wide variety of artistic media may be employed, from stodgy tables to flashy multimedia imagery. Each performance is a proclamation that inspires us to feel the "single reality" studied by both theology and science. Each performance fills the air with a sense of unity that seems so long forgotten. Such is art. Just as Giotto's perceptive frescoes heralded the arrival of a new cultural perspective,[38] so the matches of artistic concordism ignite our awareness of the coming "fourth age of understanding," the age when we come to terms with signs.[39] ◆

Notes

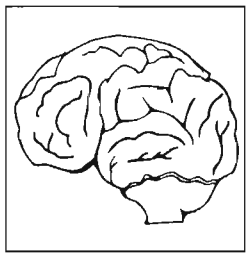
[1]J. Raymond Zimmer, "Artistic Concordism and the Generation of Scientific Hypotheses," (paper presented at the annual meeting of the ASA, Pepperdine University, Malibu, CA, August 2002).
[2]Robert C. Newman and Herman J. Eckelmann Jr., *Genesis One and the Origin of the Earth* (Hatfield, PA: Interdisciplinary Biblical Research Institute, 1977).
[3]For a more nuanced discussion, see John Deely, *The Human Use of Signs or: Elements of Anthroposemiosis* (Lanham, MD: Rowman and Littlefield, 1994), 51–63.
[4]Floyd Merrill, *Peirce, Signs, and Meaning* (Toronto: University of Toronto Press, 1997), 298.
[5]Ronald L. Numbers, "The Creationists," in *God and Nature: Historical Essays on the Encounter between Christianity and Science*, ed. David C. Lindberg and Ronald L. Numbers (Berkeley, CA: University of California Press, 1986), 391–423.
[6]For example, March 1997, March 2002, and December 2002 issues of *PSCF*.
[7]For example, December 2003 issue of *Zygon*.
[8]Merrill, *Peirce, Signs, and Meaning*, 3–16.
[9]Jean Pond, "Independence: Mutual Humility in the Relationship Between Science and Christianity," in *Science and Christianity: Four Views*, ed. Richard F. Carlson (Downers Grove, IL: Intervarsity Press, 2000), 85–90.
[10]Karl W. Giberson and Donald A. Yerxa, *Species of Origins* (Lanham, MD: Rowman and Littlefield, 2002), 67–104.
[11]James P. Mallory, "The Homelands of the Indo-Europeans" in *Archaeology and Language 1: Theoretical and Methodological Orientations*, ed. Roger Blench and Matthew Spriggs (New York: Routledge, 1997), 93–121; and Colin Renfrew, "World Linguistic Diversity and Farming Dispersals," in *Archaeology and Language 1: Theoretical and Methodological Orientations*, 82–90.
[12]Giberson and Yerxa, *Species of Origins*, 17–45.
[13]Norman Cohn, *Noah's Flood: The Genesis Story in Western Thought* (New Haven, CT: Yale University Press, 1996), 47–129.
[14]J. P. Moreland, "Complementarity, Agency Theory and the God-of-the-Gaps," *PSCF* 49, no. 1 (1997): 2–14.
[15]Giberson and Yerxa, *Species of Origins*, 105–49.
[16]Donald A. Yerxa, "Phillip Johnson and the Origins of the Intelligent Design Movement 1977–1991," *PSCF* 54, no. 1 (2002): 47–52; Giberson and Yerxa, *Species of Origins*, 217–34.
[17]Ian Barbour, *When Science Meets Religion* (New York: HarperCollins, 2000), 7–38.
[18]Howard J. Van Till, "The Fully Gifted Creation ('Theistic Evolution')," in *Three Views on Creation and Evolution*, ed. J. P. Moreland and John Mark Reynolds (Grand Rapids MI: Zondervan, 1999), 159–218. and "Partnership: Science and Christian Theology as Partners in Theorizing," in *Science and Christianity: Four Views*, 195–234.
[19]Van Till, "Partnership," 203–5.
[20]Giberson and Yerxa, *Species of Origins*, 193–215.
[21]Ibid., 217–34.
[22]Ibid., 151–92.
[23]Ibid., 172–9.
[24]Ibid., 17–42.
[25]Newman and Eckelmann Jr., *Genesis One and the Origin of the Earth*, 83–8.
[26]J. Raymond Zimmer, "The Creation Story and Evolution," *Journal of Interdisciplinary Studies* 5 (1993): 77–92 and "The Creation of Man and the Evolutionary Record," *PSCF* 48 (1996):16–27.
[27]Hugh Ross, *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 2d ed. (Colorado Springs, CO: Navpress, 2001), 17–58.
[28]Armin Held and Peter Rust, "Genesis Reconsidered," *PSCF* 51, no. 4 (1999): 231–43.
[29]Stanley L. Jaki, *Genesis 1 through the Ages* (London: Thomas More Press, 1992), 196–7, 270.
[30]Stephen C. Meyer, "The God Hypothesis," *Journal of Interdisciplinary Studies* 11, no. 1/2 (1999): 1–38.
[31]Stephen C. Meyer, "Qualified Agreement: Modern Science and the Return of the 'God Hypothesis,'" in *Science and Christianity: Four Views*, 130.
[32]Ibid., 162–8.
[33]Ibid., 141–62, 167–74.
[34]Jaki, *Genesis 1 through the Ages*, 259–301.
[35]Meredith G. Kline, "Space and Time in the Genesis Cosmogony," *PSCF* 48, no. 1 (1996): 2–15.
[36]Karen Armstrong, *In the Beginning: A New Interpretation of Genesis* (New York: Alfred A. Knopf, 1996), 7–17.
[37]Paul H. Seely, "The First Four Days of Genesis in Concordist Theory and in Biblical Context," *PSCF* 49, no. 2 (1997): 85–95.
[38]E. H. Gombrich, *The Story of Art*, 3rd ed. (New York: Oxford University Press, 1950),144–8.
[39]John Deely, *Four Ages of Understanding: The First Postmodern Survey from Ancient Times to the Turn of the Twenty-first Century* (Toronto: University of Toronto Press, 2001), 609–63.

Upcoming ASA Conferences

Aug. 5–8, 2005:
Location: Messiah College, Grantham, PA
Program Chair: Kenell Touryan
Local Arrangements Co-Chairs: Ted Davis and Jerry Hess

July 28–31, 2006:
Location: Calvin College, Grand Rapids, MI
Local Arrangements Chair: Hessel Bouma III

August 5–8, 2007:
Location: Edinburgh, Scotland



An Individualized Approach to Religious Coping in Alzheimer's Disease

Lauren S. Seifert and Melinda K. Baker

Previous research has indicated the importance of religious coping among caregivers of individuals with dementia. However, there is almost no empirical research about religious coping among individuals with dementia. It is difficult to measure religious coping directly since many obstacles to improve coping strategies, particularly in diseases like probable Alzheimer's, prevent the uses of conventional measures of coping and of traditional therapies for improving one's positive coping strategies. Additional problems may be co-morbidity with serious physical ailments and adapting psychotherapeutic interventions to include religious coping and to suit individuals with progressive cognitive decline. We propose a practical approach to the topic and recount case evidence.

Lauren S. Seifert

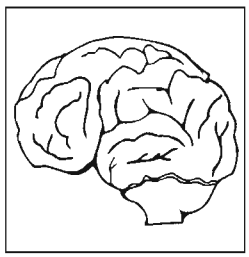
Alzheimer's disease (AD) is a neurodegenerative disorder of the central nervous system found most often among older individuals. Two broadly defined variants of AD are the early-onset type (possessing a strong genetic component on chromosome 14 and being most often evident in memory and behavior changes before age 65) and the late-onset type (occurring after age 60 with increasing prevalence in those over 85 and appearing diverse in its apparent chromosomal links).[1] Brain changes in AD include profound deterioration of the hippocampus and additional global deterioration that often involves widespread cerebral atrophy. At the cellular level, neurons may develop neurofibrillary tangles inside and neuritic (beta-amyloid) plaques outside.[2]

Early in the course of the disease, individuals have difficulty finding words (such as names of objects, in otherwise fluent speech), forget recent events and conversations, and exhibit changes in personality with episodes of confusion and disorientation (e.g., to time or place). As AD progresses, individuals exhibit perseveration of familiar behaviors (like preparing to make a meal or asking when the bus will arrive); lose the ability to track time, activities, and conversations; and eventually lose the abilities to perform even well-learned tasks like grooming, feeding, and toileting.

AD is the most common cause of dementia among elderly individuals, and there is no known cure. The best current treatments tend to work early in the course of the disease with effectiveness of key medications declining in the later stages (Stages 5, 6, 7: when AD patients' memories, problem solving, attention, and overall health decline).[3] Barry Reisberg and his colleagues have described decline from AD as seven stages of "global deterioration" from Stage 1 (no cognitive deficit) to Stage 7 (profound cognitive deficit).[4] AD becomes noticeable and is usually diagnosed as a person experiences growing forgetfulness and anomia (difficulty with word finding, usually in Stages 2 and 3). Eventually, functioning deteriorates through phases of increasing confusion, lost orientation to time and place, and lost verbal skills—and then to end-stage dementia in

Alzheimer's disease (AD) is a neurodegenerative disorder of the central nervous system found most often among older individuals.

Lauren S. Seifert *received her Ph.D. in cognitive-experimental psychology from The Ohio State University, with a doctoral minor in psychobiology and additional coursework in psycholinguistics and visual aesthetics. She has written and published over twenty scholarly articles related to memory, memory change in Alzheimer's disease, and cognitive processing related to visual arts. She is currently an associate professor of psychology at Malone College. The calls to research and teaching have been a tremendous blessing for her, and she is ever thankful for her family, spouse Toby, and dear friends Mindy and Jon. Correspondence regarding this paper may be sent to her at lseifert@malone.edu.*



Article

An Individualized Approach to Religious Coping in Alzheimer's Disease

Melinda K. Baker

Without discussions of religious coping ..., debates about dementia care and coping with AD are incomplete.

which the person does not speak, locomote, toilet, groom, or feed.[5]

Since the industrial revolution in Westernized nations, dementia care has followed a path similar to that of general "aging care": to institutionalize the very ill in order to maintain stability in the larger, industry-focused society and to create a "total institution" in long-term/nursing-home care settings that focuses on routine and regulation. Many are the families who have been dismayed at the regimentation and inflexibility of long-term care. Dismay among baby boomers, who are also the adult children of aging parents, is catalyzing slow reform. These adults are rediscovering the advantage of individualized care, because it focuses on the value of one's aging parent rather than diminishing him or her to "livestock status" with mere requirements for feeding, bathing, and toileting.

Titles of recently written guides on caregiving in dementia reflect sentiments of reform. In dementia care that is "person-centered," care planning no longer accentuates differences across "sectors" of care (e.g., medical versus mental health versus pastoral versus rehabilitative). Instead, dementia care is refocused on the "whole person" and on meeting the individual's needs by integrating care across many professions. Teams comprised of many different types of professionals can work together to provide integrated, whole-person care.[6]

In his article on dementia and faith, Malcolm Goldsmith observed: "To provide imaginative care of the highest quality is a daunting task. It is often lonely and it often seems as if we go two steps backward for every one step forward."[7] In our views, person-centered care[8] uplifts the person from "livestock" to "lovestock" with an emphasis on the value of each individual (e.g., as can be witnessed in many of the techniques for dementia care that have originated in Sweden during the past two decades).[9] Several passages of Scripture direct that type of uplifting behavior, including Matt. 19:19b (NIV) "... love your neighbor as yourself" and—as Goldsmith also has noted—the mandate in 1 Cor. 12:22-23 (NIV): "On the contrary, those parts of the body that seem to be weaker are indispensable, and the parts that we think are less honorable we treat with special honor."

In his chapter arguing that dualism is unneeded as a crutch to justify human worth, Stephen Post contended that the equal worth of each human is wholly justified by Christ's example of agape. He stated:

> ... the image of Christ's love properly appreciated will hopefully permeate any anthropology with the power of its insistence on radical inclusivity ... It is the story of Christianity that strongly demands solicitude for all, including those with retardation and dementia.[10]

Goldsmith argued that there are ways in which the petulant and transient worlds of faith and dementia can interact. However, he also stated that those interactions must be person-centered and that faith-based approaches to life must be made accessible to the individual with dementia, e.g., through uplifting love from a community of faith.[11]

A further caution from Elizabeth MacKinlay is that spiritual or faith hunger should not be mistaken as mere psychosocial need.[12] She stated that techniques for satisfying the latter will leave the former desires unmet. In her study to evaluate outcomes of a workshop for improving nurses' awareness of their patients' spiritual needs, MacKinlay stressed the importance of evaluating and attending to both the broadly-based yearnings that evolve from shared humanness and the specific spiritual needs that derive from an individual's understanding of life's meaning and his or her place therein.[13] Thus she has indicated the critical nature—in considerations of dementia and dementia care—of the search for that which is sacred, of the search for life's meaning in ways associated with the sacred, and of ideas about coping that are primarily religious in nature.[14] Without discussions of religious coping, i.e., ways of coping that relate beliefs and behaviors to the sacred, debates about dementia care and coping with AD are incomplete.[15]

Melinda K. Baker *received her B.A. in Psychology from Malone College where she began conducting research with Dr. Lauren Seifert. She completed a Gerontology Certificate and a M.A. in Applied Cognitive Aging Psychology from the University of Akron where she is currently a Ph.D. candidate. She works at Ohio Wesleyan University as a project administrator for a National Institutes of Health grant awarded to Dr. Harry Bahrick. Her research interests include developing interventions for older adults and persons with dementia, and her time outside work is spent with family, friends, and husband Jon.*

There exists an extensive literature in psychology about coping such as how individuals assess their environment, relationships, and selves; and how individuals respond to perceived threats and perceived supports.[16] In this article, our goal is not to recapitulate the vast literature on personality, stress, and coping. Neither is it our goal to review the literature on religious coping in adulthood and aging.[17] Instead, our goal is to speak directly to the need for further consideration of religious coping in dementia and dementia care.

Assessing Spiritual Needs in Dementia

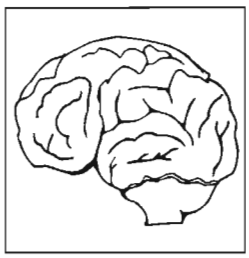
Harold Koenig has described a critical need in gerontology (an interdisciplinary field that includes medical practitioners, mental health care professionals, rehabilitation specialists, research scientists, clergy and many more) for research on religious coping by individuals with Alzheimer-type dementia (DAT; i.e., the type of dementia that occurs in AD) and associated types of dementia.[18] Surprisingly, there is very little empirical work on the topic, and most pertinent articles are either about larger projects in which the study of religious coping in dementia was tangential to the main purpose or in which conclusions were based on non-empirical observations.[19] General research on aging suggests that a person's religiousness and spirituality remain stable during adulthood.[20] Attitudes about the sacred and about religion do not seem to change, even when there are impediments to church attendance.[21] However, researchers have not studied dementia's effects on an individual's attitudes about religion and his or her religious behaviors. How do those attitudes and behaviors change when a person experiences cognitive decline due to AD?

One great difficulty in dementia research (i.e., in psychology and sociology) has been the measurement of religious coping, because most measures are self-report and involve sensitive questions about one's coping strategies, e.g., the Religious Coping Index.[22] For individuals with dementia who may feel anguish associated with knowledge about their diagnosis, questions about coping with the disease can be disconcerting. Indeed, it is not uncommon for them to verbalize a sense of hopelessness.[23] Moreover, for mid- and late-stage patients, items on a religious coping questionnaire may be difficult to comprehend or difficult to answer with self-report. Consistent with that notion, Koenig and his colleagues reported data on religious coping only for those research participants with initial scores on the Mini-Mental State Exam (MMSE) above 14, presumably because religious coping was difficult to measure in lower-functioning patients (as is true of many measures that utilize self-report and which heavily rely upon verbal skills).[24]

Ethical guidelines in medicine, psychology, and social work (and in similar health care professions which have ethics codes for licensed practitioners) caution a practitioner against causing harm, e.g., the Hippocratic Oath in medicine and the APA "Ethical Principles of Psychologists and Code of Conduct."[25] When one considers the additional issue of disorientation or confusion, asking for self-report about coping may seem inappropriate when the patient has moderate-to-severe AD. Although it is unlikely that a simple query about one's coping strategies might cause lasting harm, questions that require more reflection about the nature of his or her mortality and disease must be weighed against a person's ability to process the meanings of such issues. A practitioner must evaluate whether a client is capable of responding to such questions, and whether the progression of the disease might interfere with attempts to teach him or her new, more positive coping strategies.

A practitioner must evaluate whether a client is capable of responding to [questions of mortality and AD], and whether the progression of the disease might interfere with attempts to teach him or her new, more positive coping strategies.

For medical practitioners and mental health care professionals who wish to assist patients and their families to cope with AD, some of the best approaches to assessment and assistance may be through family and friends.[26] A clinician or researcher with savvy will utilize converging techniques for gathering evidence, including collecting a detailed medical history, administering tests that measure cognitive skills (like the MMSE, Clock Drawing, BCRS),[27] assessing functional independence and skills (the ability to perform the activities of daily living [ADL's] and to perform physical tasks),[28] and interviewing primary caregivers to obtain key information about a client's level of functioning (using measures like the NPI and GAFS).[29] Additional measures for assessment of substance abuse, mood, and social support may be useful.[30] Finally, while there do exist measures for assessing spiritual support and religious coping, not all of them have been adapted for use with those who have AD.[31] Assessing spiritual support and support for religious coping also should include: (1) the



client's history and pre-morbid strategies for coping; (2) the accessibility of and types of social support; and (3) the availability of external memory support (e.g., in the physical environment and in the client's social network) for sustaining positive coping strategies.

Insights about Religious Coping in AD

Perhaps the most informative exposition on religious coping in AD is *My Journey into Alzheimer's Disease* by Reverend Doctor Robert Davis.[32] He described the fear and anxiety that seemed to replace his feeling of closeness to God. With his wife's help, he wrote about his awareness of this loss of closeness. Davis recounted the emotional pain of his deteriorating memories of favorite prayers and Scripture passages. Given Davis's report of his own experience, one can conjecture about the loss of ability to use religious coping among individuals with Alzheimer-type dementia. It seems clear that Davis utilized religious coping effectively in the years prior to his diagnosis with AD. His own account of post-morbid struggles to utilize religious coping indicates how very difficult the challenge can be—even for someone who had automatized many religious coping strategies pre-morbidly.[33]

Effective religious coping in AD most likely will depend upon a behavioral framework that was learned before significant cognitive decline occurred.

As mentioned previously, a critical ethical issue for mental health professionals is determining whether it is appropriate to attempt to facilitate religious coping among individuals with AD. From a professional perspective (e.g., in psychology), such attempts might be *contraindicated* when: (1) assessment (as recommended above) yields no evidence of a pre-morbid preference for religious coping; (2) an individual with AD shows no interest in religious coping; and (3) there is no consent from an individual's legal guardian (as is required when one studies and/or treats an individual who cannot give his or her own consent; e.g., local, state, and federal laws governing research and practice; see also the APA Ethics Code).[34]

William Clements argued that "spiritual development comes from identity and identity requires memory."[35] If so, then one should not prevail upon a person with AD to "develop" spiritually. Instead, effective religious coping in AD most likely will depend upon a behavioral framework that was learned before significant cognitive decline occurred.

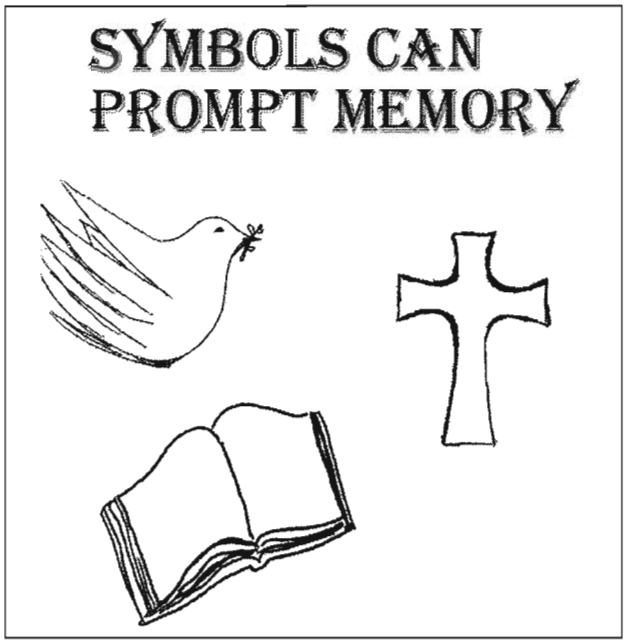
The foregoing conceptualization is consistent with Davis's opinion.[36] Davis rebuked himself for begging individuals with dementia to repent and hear God when he was a young minister. Later in his life, as he sensed his own cognitive decline due to AD, he realized that imploring someone to listen and repent is more likely to confuse and cause anguish than to effect a new connection with God. Davis suggested gentle touch and softly spoken words as spiritual support for individuals with dementia. He contended that those behaviors might communicate the love of God to such a person better than appeals to repent.[37] A patient's level of dysfunction related to AD (mild, moderate, or severe[38]) would be just one of many considerations in determining whether interventions related to religious coping are at all appropriate in a specific case. (See the aforementioned suggestions for determining the appropriateness of supports for religious coping, which should include proper assessment across several sources of evidence.)

"Making the Case" for Religious Coping in AD

It has been observed that caregivers of individuals with a chronic illness experience better adaptations when they (self-)report stronger internal religiosity.[39] This also might be true for individuals with AD for whom higher internal religiosity could be associated with more positive coping outcomes. [Note our assumption that religious coping and internal religiosity should be positively correlated, despite a few situations in which they might not be.] Unfortunately, the vast literature on AD addresses many aspects of cognitive and perceptual-motor decline without specifically assessing spiritual changes.[40] If religiousness and religious coping strategies could lead to positive coping outcomes in AD, then how might family, friends, mental healthcare providers, and medical professionals foster its occurrence? And why might one even believe that religious coping is possible when a person has AD?

Positive religious coping might best suit those who have employed it pre-morbidly, because procedural skills for maintaining

well-practiced behaviors (like an individual's specific behavior patterns or approaches to coping) often remain intact for some period of time after disease onset.[41] In a landmark study, David Knopman and Mary Jo Nissen observed that a patient might be able to carry out a procedure, like getting dressed, well into the course of AD, without also being able to explain or explicitly recall that procedure.[42] One could argue that strategies for coping in adulthood are procedures that an individual automatizes over time through experience and practice. If those procedures do become automatized, then an individual with AD should be able to continue to utilize them during the early and middle stages of the disease when many implicit and procedural memories remain intact. Symbolic rituals and sacred objects of faith may serve to cue intact procedural memories, and Goldsmith has compiled a partial list of specific stimuli for cuing those types of memories such as lighting candles, singing or playing particular types of music, and wearing specific attire (e.g., clerical collar).[43] We suggest that following a specific liturgy or a planned order of events within worship might provide powerful memory cues for individuals with AD. Also, detailed histories about a person's religiosity, careful observations of post-morbid behaviors, and simple changes in his or her post-morbid environment may be the keys to facilitate religious coping among individuals with AD. They may provide powerful external cues that help one remember his or her coping strategies and "procedures."



Original drawings by Toby and Lauren Seifert

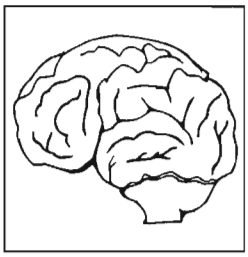
Illustrative Cases

In our research that pertains primarily to memory change and procedural skills over the course of AD,[44] we have observed patients' behavior patterns over long intervals.[45] In some cases, there has been a conspicuous absence of religious objects that had been important to individuals before the apparent onset of probable AD. Often individuals with AD are moved out of their own homes and into long-term care for the purposes of helping them (and their family/caregivers) with the burdens of physical care and behavior management. In such moves, many important possessions are left behind, and those may include religious symbols (e.g., a cross, a crucifix, a family book of Scripture) that are important reminders of faith and of one's approach(es) to coping through faith and religion.

We have heard many caregivers of AD patients report anecdotes related to pre-morbidly learned methods of religious coping. In some cases, caregivers failed to understand the significance of religious coping in the life of the individual with AD and in so doing apparently catalyzed combativeness (e.g., taking a family Bible to give to a grandchild, and in so doing, removing an important memory cue for religious coping from the family member with AD—thus creating confusion and frustration that could not be adequately explained by the individual with AD). In other cases, caregivers recognized a need for a specific approach to religious coping and apparently were able to help the individual with dementia. The cases described below are examples of success in facilitating religious coping.

We suggest that following a specific liturgy or a planned order of events within worship might provide powerful memory cues for individuals with AD.

During early Autumn, a female resident (MMSE = 16; aged 81 years; with dementia of the Alzheimer's type diagnosed five years previously via clinical neuropsychological assessment) of a long-term care facility in Ohio presented with depression and general confusion when moved from her home of many years to the facility. Several breakable items were brought from her home and placed in a locked cabinet with a clear, shatter-resistant panel so that she could observe them without breaking them. The cabinet also reduced the risk that the items would be stolen. At least twice each week for three weeks, the resident would insist that her valuables be removed from the cabinet so that she could pack them and move back to her home. Frequencies of wandering and aggressive vocalizations were high, with incidents reported almost daily. At that time, little was known about her religious background.



Article

An Individualized Approach to Religious Coping in Alzheimer's Disease

In our research on memory change over the course of dementia, we have documented many situations in which a specific religious item or object holds significance for the individual with AD.

Shortly before the Advent season (i.e., during November), it was learned that the resident identifies herself as "Catholic," and a caregiver observed that one of her "valuables" in the locked cabinet was a gold cross. On one occasion, when the resident asked to receive her belongings from the cabinet, she took special interest in the cross, specifically mentioned it, held it up, and then placed it in her purse. It was decided that she would keep it in her handbag, and the other items were returned to the cabinet. After that, she no longer asked about the items in the cabinet. She has kept the cross in her purse (as we observed over the course of three months) and has taken on the appearance of praying—with the cross held tightly against her chest. When one of us asked the resident about the cross, she smiled and took it out of her purse. Afterward, she was observed polishing it and holding it firmly. The frequency of incidents of combativeness associated with spontaneous verbalizations about the cabinet and its contents dropped to zero following the removal of the cross from the cabinet (and continued to be zero for three months following its removal from said cabinet—after which time we ceased to take measures on the behavior).

In the foregoing illustrative case, religious coping seems to have been impaired by the physical removal of a religious object from the individual with AD. With the item remaining in view (i.e., in the cabinet), the resident's memory of her own approach to religious coping was most likely cued. However, since she could not touch or handle the object, this may have been a source of frustration, because she seems to have relied on handling it as part of her approach to praying and coping with anxiety-producing situations. After the cross was returned to her possession, her frustration appeared to diminish (as indicated by the cessation of her attempts to remove the remaining items from the cabinet with the goal of packing to go home), and she was able to resume a previously learned approach to religious coping: handling the object as part of a regimen to reduce anxiety. Her family reports that prayer, with the cross in-hand, was a pre-morbid behavior.

Admittedly, there may have been additional factors that contributed to the decline in her combativeness—including the mere passage of time, which may have facilitated her adjustment to the new residence. However, the relationship between her possession of the cross and her resumption of a behavior that appears to be prayer or spiritual reflection does seem to be strong. In the absence of the caregivers' comprehension of that relationship, the resident might have continued indefinitely to be combative and frustrated about the locked cabinet. Therein resides the value of the professional assessment: through an analysis of information about the history of the individual, this situation was brought to a useful and happy resolution.

In our research on memory change over the course of dementia, we have documented many situations in which a specific religious item or object holds significance for the individual with AD. The following cases are additional examples across several Christian denominations.

An article of clothing that was worn to church pre-morbidly (and only on the Sabbath) was used to orient a resident in long-term care (MMSE = 15; aged 92 years with diagnosis of Alzheimer-type dementia two years previously) to the day of the week. She was gently reminded to put it on in preparation for an afternoon visit from her minister. Thus, the clothing served dual purposes: orientation to day and orientation to upcoming fellowship with clergy.

Another individual in long-term, residential care (MMSE = 25; aged 70 years with diagnosis of Alzheimer-type dementia one year previously) who loves to sing hymns was able to derive spiritual support from clergy visits with an emphasis on music. In fact, she remembered his visits from week-to-week and often described the music they sang together.

A third individual also in residential, long-term care (MMSE = 16; aged 81 with diagnosis of Alzheimer-type dementia five years previously) enjoyed the Twenty-Third Psalm and recited it with assistance. She appeared to enjoy that help, and often thanked the assistant (the first author) for her help in recitation.

In all of these illustrative cases, the outcomes were favorable as they related to the utilization of religious symbols and/or activi-

ties to enhance the quality of daily life and positive coping among individuals with AD. It is key that caregivers in each case focused on the needs and behaviors of the individual and on the behavior tendencies of that person, with careful analysis of the history of the individual and his or her current abilities and circumstances.

Conceptualizing Religious Symbols as Memory Cues

The aforementioned examples (and the many similar cases one encounters when working with individuals with AD) illustrate the need for a model of behavioral intervention that would facilitate religious coping among individuals with dementia. This model of "spiritual support intervention," as described above, would (1) reside within the ethical guidelines in one's discipline for care of individuals with dementia; (2) regard a person's tendency toward religious coping, his or her expressed interest in religious coping, and his or her legal guardian's wishes concerning this matter; (3) take into account several aspects of pre-morbid life (including personal history, church history, history of coping and social support); and (4) include a careful analysis of the client's current cognitive, social, emotional, and physical circumstances. Overall, these factors will help determine whether active spiritual support is feasible.[46]

The foregoing cases provide preliminary evidence for roles of religious coping among individuals with AD and limited, but successful, spiritual support for those individuals. Critical ethical issues about when supports are feasible and appropriate must be left to the assessment of a specific case within one's discipline (e.g., pastoral care, social work, psychology, nursing). The implications of initial success and effectiveness in the specific, foregoing cases are far-reaching. A larger, more comprehensive assessment might yield very specific information about the efficacy of interventions to enhance positive, religious coping in AD. ◆

Acknowledgment

This article was completed during the first author's sabbatical leave from Malone College. Many thanks are due.

Notes

[1]See M. P. Janicki and A. J. Dalton, *Dementia, Aging, and Intellectual Abilities* (Philadelphia, PA: Brunner/Mazel, member of Taylor & Francis, 1999).

[2]National Institute on Aging/National Institutes of Health, "Alzheimer's Disease: Unraveling the Mystery," NIH Publication #96-3782 (1996).

[3]Janicki and Dalton, *Dementia, Aging, and Intellectual Abilities.*

[4]B. Reisberg, J. H. de Leon, and T. Crook, "The Global Deterioration Scale for Assessment of Primary Degenerative Dementia," *American Journal of Psychiatry* 139 (1982): 1136–9.

[5]Ibid.; and National Institute on Aging/National Institutes of Health, "Alzheimer's Disease."

[6]G. W. Hartz and D. M. Splain, *Psychosocial Intervention in Long-Term Care: An Advanced Guide* (New York: The Haworth Press, 1997); V. Bell and D. Troxel, *The Best Friends Approach to Alzheimer's Care* (Baltimore, MD: The Health Professions Press, 1997); and M. Castleman, D. Gallagher-Thompson, and M. Naythons, *There's Still a Person in There* (New York: A Perigree Book, 1999).

[7]M. Goldsmith, "Through a Glass Darkly: A Dialogue Between Dementia and Faith," *The Journal of Religious Gerontology* 12 (2001): 125.

[8]For example, Bell and Troxel, *The Best Friends Approach to Alzheimer's Care.*

[9]B. Beck-Friis, *At Home at Baltzargarden* (Orebro: Bokforlaget Libris, 1988).

[10]S. G. Post, "A Moral Case for Nonreductive Physicalism" in *Whatever Happened to the Soul?* ed. W. S. Brown, N. Murphy, and H. N. Malony (Minneapolis, MN: Augsburg Fortress, 1998), 211.

[11]Goldsmith, "Through a Glass Darkly."

[12]E. MacKinlay, "Understanding the Ageing Process: A Developmental Perspective of the Psychosocial and Spiritual Dimensions," *The Journal of Religious Gerontology* 12 (2001): 116.

[13]Ibid., 119.

[14]L. S. Seifert, "Toward a Psychology of Religion, Spirituality, Meaning-Search, and Aging: Past Research and a Practical Application" *Journal of Adult Development* 9 (2002): 61–70; K. I. Pargament, "The Psychology of Religion and Spirituality? Yes and No" *International Journal for the Psychology of Religion* 9 (1999): 3–16; and R. G. Paloutzian, *Invitation to the Psychology of Religion* 2d ed. (Boston, MA: Allyn & Bacon, 1996).

[15]For a brief review of literature about religion and aging and a practical approach to the study of religious coping, see Seifert, "Toward a Psychology of Religion, Spirituality, Meaning-Search, and Aging."

[16]R. S. Lazarus and S. Folkman, *Stress, Appraisal, and Coping* (New York: Springer, 1984); R. R. McCrae and P. T. Costa, Jr., "Personality, Coping and Coping Effectiveness in an Adult Sample," *Journal of Personality* 54 (1986): 385–405; C. M. Aldwin and T. A. Revenson, "Does Coping Help? A Reexamination of the Relationship Between Coping and Mental Health," *Journal of Personality and Social Psychology* 53 (1987) 337–48; N. S. Endler and J. D. A. Parker, "Multidimensional Assessment of Coping: A Critical Evaluation of Coping," *Journal of Personality and Social Psychology* 58 (1990): 844–54; B. Egloff and M. Hock, "A Comparison of Two Approaches to the Assessment of Coping Styles," *Personality and Individual Differences* 23 (1997): 913–6; and M. Vollrath, S. Torgersen, and R. Anaes, "Personality as Long-Term Predictor of Coping," *Personality and Individual Differences* 18 (1995): 117–25.

[17]Paloutzian, *Invitation to the Psychology of Religion;* K. I. Pargament, *The Psychology of Religion and Coping* (New York: Guilford Press, 1997); and Seifert, "Toward a Psychology of Religion, Spirituality, Meaning-Search, and Aging."

[18]H. G. Koenig, *Aging and God* (New York: The Haworth Press, 1994).

[19]As in Koenig, Blazer, and Ford's work from 1993: an unpublished manuscript cited by Koenig in *Aging and God;* and as in Fisher's article from 1990 as cited by Koenig in *Aging and God.*

[20]Seifert, "Toward a Psychology of Religion, Spirituality, Meaning-Search, and Aging."

[21]S. C. Ainlay, R. Singleton, Jr., and V. L. Swigert, "Aging and Religious Participation: Reconsidering the Effects of Health," *Journal for the Scientific Study of Religion* 31 (1992): 175–88.

[22]Koenig, *Aging and God,* 164.

[23]Janicki and Dalton, *Dementia, Aging, and Intellectual Abilities.*

[24]M. F. Folstein, S. E. Folstein, and P. R. McHugh, "'Mini-Mental State': A Practical Method for Grading the Cognitive States of Patients for the Clinician," *Journal of Psychiatric Research* 12 (1975): 196–8; and Koenig, *Aging and God,* 146.

[25]For example, American Psychological Association, "Ethical Principles of Psychologists and Code of Conduct," *American Psychologist* 47 (1992): 1597–611.

[26]D. Field, "Special Not Different: General Practitioners' Accounts of Their Care of Dying People," *Social Science and Medicine* 9 (1998): 1111–20. See, specifically, Table 1.

[27]For the MMSE, see Folstein, Folstein, and McHugh, "'Mini-Mental State'"; for "clock drawing," see, e.g., Y. I. Watson, C. L. Arfken, and S. J. Birge, "Clock Completion: An Objective Screening Test for Dementia," *Journal of the American Geriatric Society*, 41 (1993): 1235–40; and for BCRS, see B. Reisberg, M. K. Schneck, S. H. Ferris, G. E. Schwartz, and M. J. deLeon, "The Brief Cognitive Rating Scale (BCRS): Findings in Primary Degenerative Dementia (PDD)," *Psychopharmacology Bulletin* 19 (1983): 47–50.

[28]For Katz assessment of ADL's and for general assessment reference , see J. J. Gallo, et al., ed., *Handbook of Geriatric Assessment*, 3rd ed. (Gaithersburg, MD: Aspen Publishers, 2000); for physical performance, see D. B. Reuben and A. L. Siu, "An Objective Measure of Physical Function of Elderly Outpatients: The Physical Performance Test," *Journal of the American Geriatric Society* 38 (1990): 1105–12.

[29]For NPI, see J. L. Cummings, "The Neuropsychiatric Inventory: Assessing Psychopathology in Dementia Patients," *Neurology* 48, Suppl. 6 (May 1997): S10–S16; and for GAFS, see American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders* 4th ed. (Washington, DC: APA, 1994).

[30]J. J. Gallo et al., *Handbook of Geriatric Assessment*.

[31]See M. Maas, K. C. Buckwalter, and M. A. Hardy, eds. *Nursing Diagnoses and Interventions for the Elderly* (Redwood City, CA: Addison-Wesley Publishers, 1991).

[32]R. Davis, *My Journey into Alzheimer's Disease* (Wheaton, IL: Tyndale House, 1989).

[33]Ibid.

[34]U.S. Title 45 CFR 46 which stipulates protections for human research participants; See also, American Psychological Association, "Ethical Principles of Psychologists and Code of Conduct."

[35]W. M. Clements, "Aging and the Dimensions of Spiritual Development" in *The Role of the Church in Aging*, ed. M. C. Hendrickson (New York: The Haworth Press, 1986). For descriptions of faith development and normal aging, see also, C. Bruning and K.Stokes, "The Hypotheses Paper" and J. W. Fowler, "Stages of Faith and Adults' Life Cycles" in *Faith Development in the Adult Life Cycle*, ed. K. Stokes (New York: W. H. Sadlier, 1983).

[36]Davis, *My Journey into Alzheimer's Disease*.

[37]Ibid., 110–1. Note that prevailing upon a person to examine issues associated with positive coping and religious development is not necessarily the same as sharing faith for the purposes of catalyzing conversion. Indeed, the issue of whether religious conversion is possible when someone is experiencing Alzheimer-type dementia (especially in the middle and late stages) is quite different than the issue set forth here. One might very well believe that religious conversions are still possible for individuals with AD, without also believing that those individuals are cognitively equipped to learn new strategies for religious coping. Davis's writing would suggest a critical role for communicating support through nonverbal comfort. He seemed to eschew the notion that cognitive arguments for repentance could effect change in either the faith-state or coping strategies of a person with AD.

[38]See Janicki and Daulton, *Dementia, Aging, and Intellectual Abilities*, 12 and Appendix 2.

[39]P. V. Rabins, M. D. Fitting, J. Eastham, and J. Zabora, "Emotional Adaptation Over Time in Care-givers for Chronically Ill Elderly People," *Age and Ageing* 19 (1990): 623–7.

[40]Reisberg, et al., "The Brief Cognitive Rating Scale (BCRS)."

[41]D. S. Knopman and M. J. Nissen, "Implicit Learning in Patient's with Probable Alzheimer's Disease," *Neurology* 37 (1987): 784–8.

[42]Ibid.

[43]M. Goldsmith, "When Words Are No Longer Necessary," *Journal of Religious Gerontology* 12 (2001): 139–50.

[44]The first case described herein was presented as part of an invited talk entitled, "On Faith Issues and Dementia," at Geneva College, Beaver Falls, PA (March 1998).

[45]M. K. Baker and L. S. Seifert, "Syntagmatic-Paradigmatic Reversal in Alzheimer-type Dementia," *Clinical Gerontologist* 23 (2001): 65–79; L. S. Seifert and M. K. Baker, "Art and Alzheimer-type Dementia: A Longitudinal Study," *Clinical Gerontologist* 26 (2002): 3–15; and L. S. Seifert, B. M. Drennan, and M. K. Baker, "Compositional Elements in the Art of Individuals with Alzheimer-type Dementia," *Activities, Adaptation, and Aging* 25 (2001): 95–106.

[46]American Psychological Association, "Ethical Principles of Psychologists and Code of Conduct"; and for a general model of a person's physical, psychological, and spiritual aspects in relation to God, see Koenig, *Aging and God*, 107.

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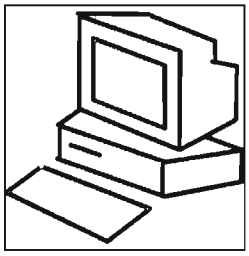


Computer Origins and the Defense of the Faith

John Warwick Montgomery

In virtually all discussions of the prehistory of computing, the following names are mentioned: Ramon Lull (thirteenth century), Wilhelm Schickard (1592–1635), Blaise Pascal (1623–1662), and Charles Babbage (1791–1871). Their religious orientations, however, are rarely, if ever, discussed. This essay, based on the primary as well as authoritative secondary sources, demonstrates that all four were serious, orthodox Christian believers with strong apologetic concerns. The argument is presented that scientific genius – particularly in the computing realm – correlates positively with a sound theology and a concern to discover and present evidence for the faith. Andrew Dickson White's "warfare of science with theology" turns out to be the least satisfying category for understanding computer prehistory.

John W. Montgomery

At least four of the major figures in the prehistory of modern computing were not only serious Christian believers but also directly concerned with the defense of Christian truth.

The first president of my Alma Mater, Cornell University, set an ideological trend which has been generally followed in modern times. Andrew Dickson White's *A History of the Warfare of Science with Theology in Christendom* (1896) endeavored to show that theology was the implacable foe of true science and that, in that fight to the death, science always wins in the end. In the computer sciences, a late twentieth-century monograph follows in White's wake: Geoff Simons attempts to de-theologize computing in his *Is God a Programmer? Religion in the Computer Age.*[1]

It therefore will come as a surprise to many that at least four of the major figures in the prehistory of modern computing were not only serious Christian believers but also directly concerned with the defense of Christian truth. The purpose of this paper is briefly to introduce readers to these individuals and to attempt to determine why computing and apologetics have been—and continue to be—natural bedfellows.

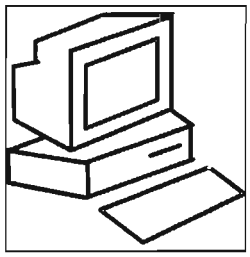
Ramon Lull

L(l)ull—or Lullius (the Latin form of his name)—was a thirteenth-century contemporary of Thomas Aquinas. Like Aquinas, he was a theologian in what one of the Roman Church's eulogists has termed the "greatest of centuries," since it was then that the Church's enduring systematic theological formulations were developed.[2]

But Lull was very different from Aquinas. The latter devoted his life to the systematizing of the Church's teaching, based on the philosophical principles of the Aristotelian revival in his time.[3] He wrote for those within the framework of western Christendom. One interpreter has observed, not unjustly, that when Thomas wrote his *Summa contra gentiles* ("Summation Against the Pagans"), he had probably never met a pagan!

Lull, on the other hand, was a polymath[4] who believed that theology could only be properly pursued in the context of missionary endeavor—and that new methods had to be developed to achieve results in contexts where western approaches would not carry the weight they did at home. Lull was ultimately to die a martyr for his beliefs whilst preaching the gospel to that most difficult audience, the followers of Islam. The great nineteenth-century missionary statesman Samuel M. Zwemer characterized Lull as, quite simply, the "first missionary to the Moslems."[5] And, like C. S. Lewis in the twentieth century, Lull's apologetic was not just a tough-minded one; he produced (in

John Warwick Montgomery *(Ph.D., Chicago, D.Théol., Strasbourg, LL.D., Cardiff); barrister-at-law, England; inscrit au Barreau de Paris; member of the bar of the Supreme Court of the United States) is emeritus professor of law and humanities, University of Luton, England, and distinguished professor of apologetics, Trinity College and Theological Seminary, Indiana. He is a US and UK citizen, author of some fifty books in five languages, and is included in* Who's Who in America, Who's Who in France, Who's Who in the World, *and* Contemporary Authors. *Website: www.jwm.christendom.co.uk*



Article

Computer Origins and the Defense of the Faith

Lull is frequently mentioned by students of the prehistory of computing. ... [He resolved] theological problems by exhaustively interrelating combinations of divine qualities.

his own Catalan tongue) a remarkable missionary novel, *Blanquerna,* which has been compared to Bunyan's *Pilgrim's Progress.*[6]

Lull's theological "Art" or method was scholastic but not Aristotelian—and its unique character has given it a place in the history of logic.[7] Lull is frequently mentioned by students of the prehistory of computing. Martin Gardner, in his well-received work on *Logic Machines and Diagrams,* begins with Lull and devotes to him an entire chapter of the nine comprising his book.[8] Gardner offers the following illustration of the Lullian method for resolving theological problems by exhaustively interrelating combinations of divine qualities:

> For example, we realize that predestination and free will must be combined in some mysterious way beyond our ken; for God is both infinitely wise and infinitely just; therefore He must know every detail of the future, yet at the same time be incapable of withholding from any sinner the privilege of choosing the way of salvation. Lull considered this a demonstration *"per aequiparantium,"* or by means of equivalent relations. Instead of connecting ideas in a cause-and-effect chain, we trace them back to a common origin. Free will and predestination sprout from equally necessary attributes of God, like two twigs growing on branches attached to the trunk of a single tree.[9]

Lull's approach literally became "a method for 'finding' all the possible propositions and syllogisms on any given subject and for verifying their truth or falsehood."[10]

> Lull saw that everything could be systematically related back to God by examining how Creation was structured by the active manifestation of the divine attributes—which he called Dignities and used as the absolute principles of his Art. Examining their manifestations involved using a set of relative principles; and both sets could be visualized in combinatory diagrams ...
>
> The most distinctive characteristic of Lull's Art is clearly its combinatory nature, which led to both the use of complex semimechanical techniques that sometimes required figures with separately revolving concentric wheels—"volvelles," in bibliographical parlance ...—and to the symbolic notation of its alphabet. These features justify its classification among the forerunners of both modern symbolic logic and computer science.

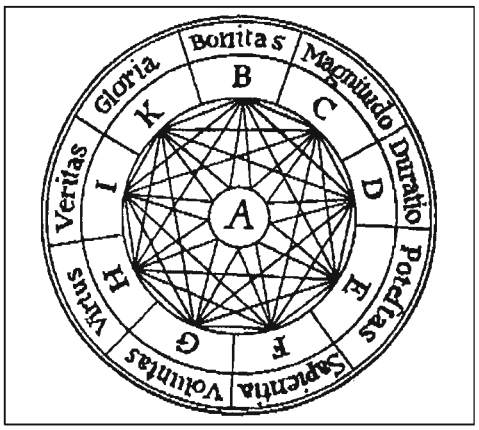


Fig. 1. The Lullian "Dignities"

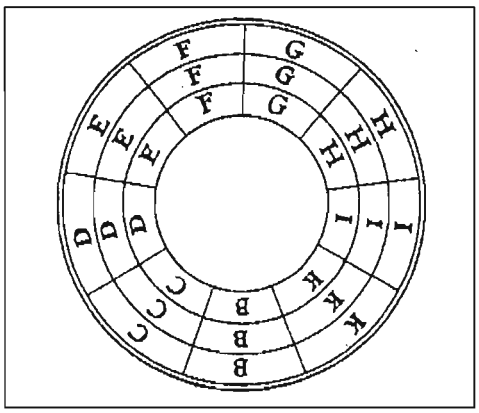


Fig. 2. Lull's Combinatory Art. The fourth figure of the later Art: the inner wheels rotate independently, allowing all possible ternary combinations of the letters *BCDEFGHIK* to be read off.

> Yet the Art can be understood correctly only when viewed in the light of Lull's primary aim: to place Christian apologetics on a rational basis for use in disputations with Muslims, for whom arguments *de auctoritate* grounded on the Old Testament—widely used by Dominicans in disputations with the Jews—carried no weight ... Lull advanced what he called necessary reasons for accepting dogmas like the Trinity and the Incarnation.[11]

We illustrate with but a single example of Lull's apologetic reasoning: his overarching concern to justify Trinitarian doctrine over

against the Muslim refusal to accept it.[12] Lull poses the key question "whether there is plurality in God." To answer this he appeals to a subspecies of one of what he has earlier set forth as the "ten general questions, to which all other possible questions can be reduced," namely Question C (*Quid?* – "What Is It?"). That subspecies deals with the question:

> What does the intellect have coessentially [essentially, naturally] in itself? To which one must reply that it has its correlatives, that is to say, intellectivity, intelligibility, and understanding, without which it could not exist, and would, moreover, be idle and lack nature, purpose, and repose.

Now Lull draws the inevitable logical conclusion on the original issue of plurality within the Godhead:

> One should answer yes, with respect to His correlatives as exemplified in the Second Species of rule C, without which He could not have in Himself an infinite and eternal operation bonifying, magnifying, eternalizing, etc., as a result of which His dignities would be constrained and idle, which is impossible.[13]

What Lull is arguing here is that if God did not consist of more than one Person He could not have manifested from eternity the characteristics such as "understanding" which are essential to an intelligent being. This argument is the logical underpinning of such modern justifications of Trinitarian theology as that which we have presented in our *Tractatus Logico-Theologicus*, 3.747:

> The philosophical importance of Trinitarian doctrine (three Persons in one Godhead) is often overlooked: if God is indeed love, and has always been so (even before he created other persons), he would have to be more than monopersonal.[14]

Wilhelm Schickard

For Protestantism, the seventeenth century corresponded to Roman Catholicism's thirteenth: it was the great period of the Protestant dogmaticians and savants who systematized the results of the Reformation and applied those consequences to cultural life in general. The center of much of that Lutheran activity was the province of Württemberg and its university city of Tübingen. In that region, the learned theologian and littérateur Johann Valentin Andreae (1586-1654) created a "*Societas Christiana*" – a fellowship of likeminded believers in the sciences and the arts for the purpose of transforming society on the basis of sound, confessional Lutheran theology. Though the Thirty Years' War prevented the practical realization of Andreae's utopian dream of a "Christianopolis," that little band accomplished remarkable feats of learning and social amelioration under exceedingly difficult conditions.[15]

Among the leading members of the *Societas Christiana* was Wilhelm Schickard or Schickhardt (1592–1635).[16] Like

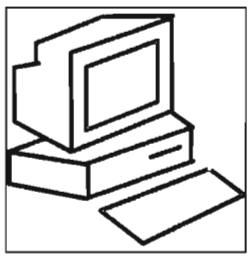
Fig. 3. Wilhelm Schickard (1592–1635)

Lull, Schickard was a polymath. He was an ordained Lutheran pastor with a scientific background and a knowledge of several oriental languages. He was a long-term friend of Johannes Kepler (also a member of the Andreae's *Societas*) and an early supporter of his astronomical theories. At Tübingen he held professorships in the oriental languages, astronomy, mathematics, and geodesy.

> Schickard ... was a skilled mechanic, cartographer, and engraver in wood and copperplate; and he wrote treatises on Semitic studies, mathematics, astronomy, optics, meteorology, and cartography. He invented and built a working model of the first modern mechanical calculator and proposed to Kepler the development of a mechanical means of calculating ephemerides. Schickard's works on astronomy include a lunar ephemeris, observations of the comets of 1618, and descriptions of unusual solar phenomena (meteors and the transit of Mercury in 1631). He also constructed and described a teaching device consisting of a hollow sphere in three segments with the heavens represented on the inside.[17]

What I have written elsewhere of Schickard's friend Kepler could likewise be applied to him:

> Ludwig Guenther has shown in his *Kepler und die Theologie* that this Lutheran father of modern astronomy was consistently and vitally concerned about theological issues; his desire to ground his astronomical work in the biblical revelation is evident.[18]



Article

Computer Origins and the Defense of the Faith

Though it has been maintained by some that Schickard is only "the principal precursor of mechanical calculation but not the inventor of the calculating machine," the general judgment is that his device was indeed the first working arithmetical calculator, and, as such, a giant step in the future development of the computer.

Schickard's *Purim* (1634)[19] was an attempt of an eschatological and apologetical nature to unlock the numerical prophecies of the Book of Daniel and to develop a philosophy of history on the basis of them; the effort may remind one of Sir Robert Anderson's *The Coming Prince.*[20]

Though it has been maintained by some that Schickard is only "the principal precursor of mechanical calculation but not the inventor of the calculating machine,"[21] the general judgment is that his device was indeed the first working arithmetical calculator, and, as such, a giant step in the future development of the computer. Michael R. Williams, in his *History of Computing Technology,* takes that view.[22] He argues as follows: (1) Two letters from Schickard in Kepler's papers (letters of 20 September 1623 and 25 February 1624) describe the machine in very clear terms: it consisted of eleven "complete" and six "incomplete" or "mutilated" sprocket wheels and "carries by itself from one column of tens to the next or borrows from them during subtraction. [This machine] which immediately and automatically calculates with given numbers ... adds, subtracts, multiplies and divides." (2) Though the actual machines constructed by Schickard apparently have not survived, his original sketches turned up as a bookmark in a copy of Kepler's *Rudolphine Tables* in the library of the Pulkovo Observatory near Leningrad. (3) On the basis of the information provided by the letters and the sketches, Professor Baron von Freytag Löringhoff of the University of Tübingen (whose specialities included a knowledge of the techniques of seventeenth-century clockmakers) was able to build a successful working model of the original device.[23]

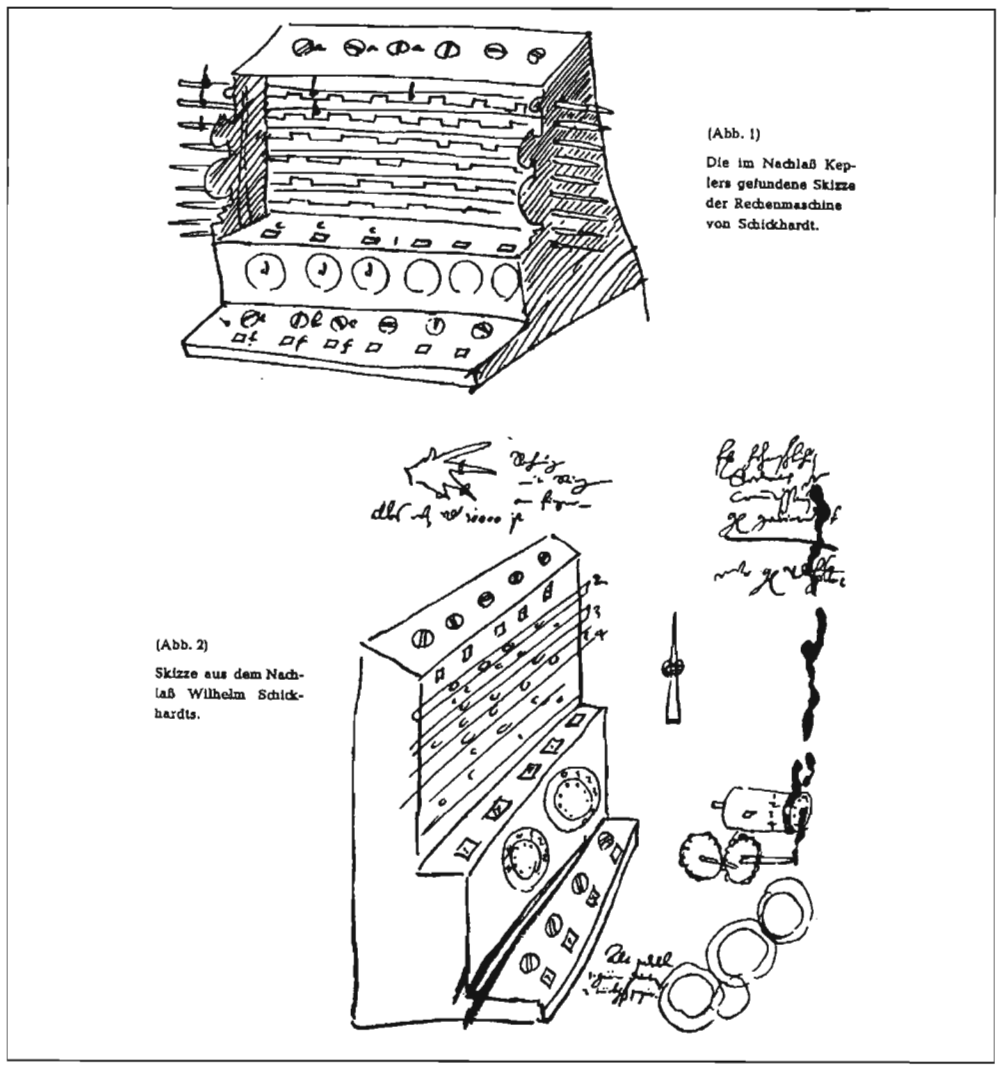


Fig. 4. The Schickardian Sketches

The mechanism used to effect a carry from one digit to the next was very simple and reliable in operation ... Every time an accumulator wheel rotated through a complete turn, a single tooth would catch in an intermediate wheel and cause the next highest digit in the accumulator to be increased by one ...

The major drawback of this type of carry mechanism is the fact that the force used to effect the carry must come from the single tooth meshing with the teeth of the intermediate wheel. If the user ever wished to do the addition 999,999 + 1, it would result in a carry being propagated right through each digit of the accumulator. This would require enough force that it might well do damage to the gears on the units digit. It appears that Schickard was aware of this particular weakness because he constructed machines with only six-digit accumulators even though he knew that Kepler undoubtedly needed more figures in his astronomical work. If the numbers became larger than six digits, he provided a set of brass rings which could be slipped over the fingers of the operator's hand in order to remember how many times a carry had been propagated off the end of the accumulator.

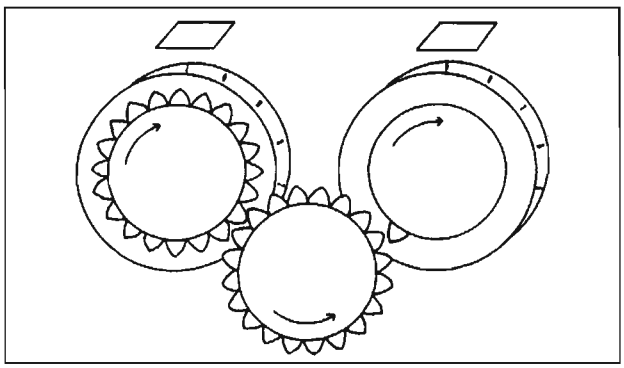


Fig. 5. Schickard's Carry Mechanism

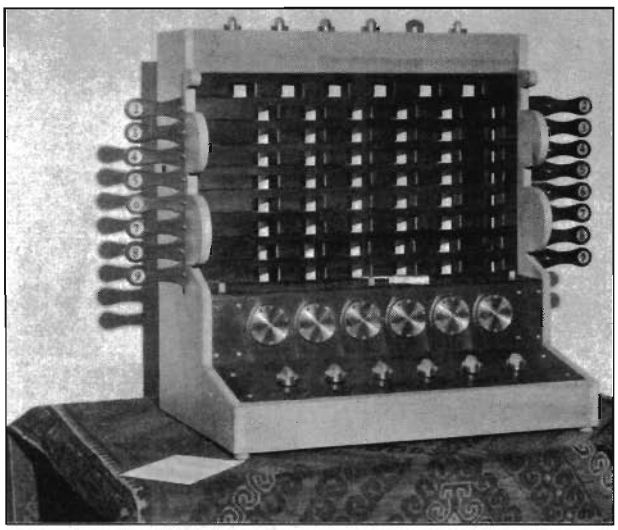


Fig. 6. The Tübingen Reconstruction of Schickard's Calculating Machine

A small bell rung each time such an *overflow* occurred to remind the operator to slip another ring on his finger.[24]

But with all its limitations, Schickard's calculating machine was a remarkable accomplishment, and one essential for the eventual development of the modern computer. At very minimum, his machine incorporated "both a set of Napier's bones and a mechanism to add up the partial products they produced in order to completely automate the multiplication process."[25]

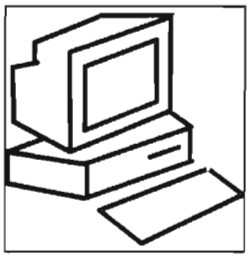
Blaise Pascal

Schickard's invention had no direct influence, since he made no effort to promote or manufacture it. A generation later, the great French mathematician, scientist, and Christian apologist Pascal (1623–1662), apparently without any knowledge of Schickard's work, developed a similar but more sophisticated calculating machine which had an immediate impact.

Before examining it, we should remind ourselves of Pascal's ideological orientation. He was a Roman Catholic of the school of Port-Royal (the so-called Jansenists). He therefore was deeply committed to an Augustinian theology, to the point of being regarded by many as virtually Protestant in his emphasis on divine grace.[26]

Pascal's apologetic activity expressed itself especially in numerous fragments collected after his death. These *Pensées* or thoughts have been ordered in a number of different ways by different editors, ancient and modern, and the arrangements can give quite diverse impressions of Pascal's apologetic method.[27] The most effective ordering is certainly that by the English scholar H. F. Stewart, who used the *entretien, discours,* or lecture on apologetics given by Pascal to friends in 1658 (or the year before or the year after) as a natural structure for arranging the "thoughts."[28] The result shows decisively that Pascal was anything but a modern subjectivist or existentialist.

Thus, the Stewart edition of the *Pensées* shows that Pascal never intended his celebrated Wager to be a device to avoid objective evidence of religious truth. That Wager (arguing that even if the evidence for and against Christianity were exactly balanced, one ought still to accept Christ, since if Christianity were false, one would still benefit from the highest moral principles and example, but if true and one rejects it, one goes to hell) was to be used at an intermediate point in witnessing to a non-Christian, not as a final proof of any kind. Its purpose was to counter indifference—to give the unbeliever the maximum motivation to engage in a serious quest for religious truth. Pascal follows the Wager with arguments showing the failure of non-Christian solutions to the human dilemma and the soundness of the case for the unique, revelatory character of Jewish history in the Old Testament and for



Article

Computer Origins and the Defense of the Faith

A generation later, the great French mathematician, scientist, and Christian apologist Pascal (1623–1662), apparently without any knowledge of Schickard's work, developed a similar but more sophisticated calculating machine which had an immediate impact.

the prophetically anticipated, miraculous, saving activity of Jesus Christ in the New Testament—as attested by solid eyewitness testimony.[29]

And now to the calculating machine, called the "La Pascaline." Pascal's father Etienne was an investor, tax collector, and no mean mathematician in his own right. The tedium of assisting his father in the taxation area led Blaise, at the age of only nineteen, to design his first calculating machine.[30] Eventually he would produce—and in a number of instances market—some fifty different machines, but they all were refinements of the fundamental design of the original machine.[31]

> Pascal seems to have realized right from the start that the single-tooth gear like that used by Schickard, would not do for a general carry mechanism. The single-tooth gear works fine if the carry is only going to be propagated a few places but, if the carry has to be propagated several places along the accumu-

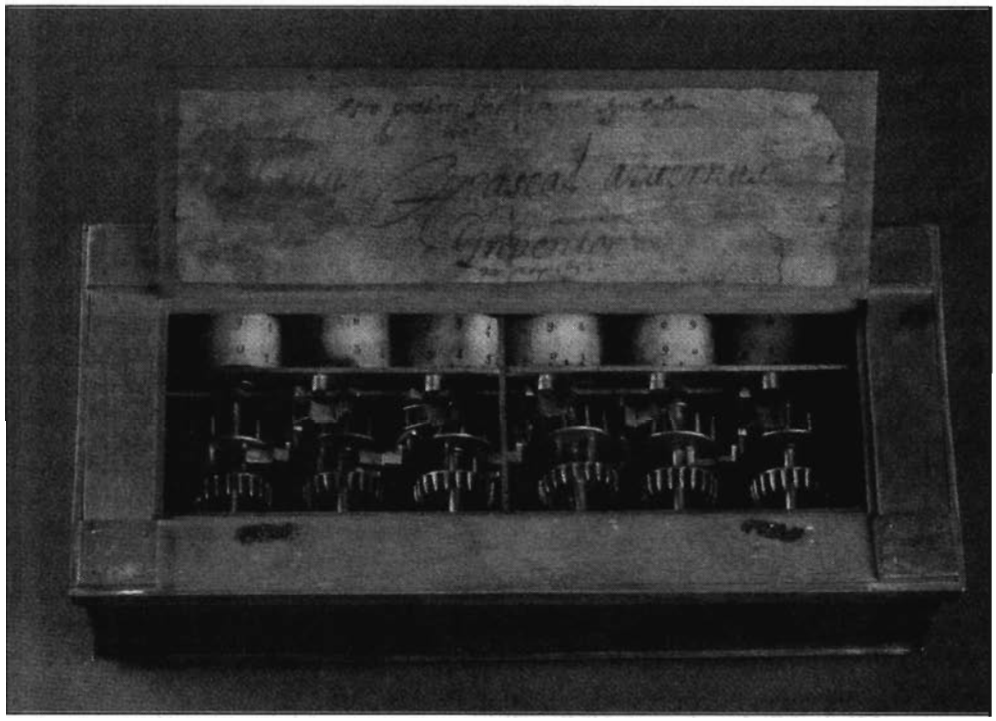


Fig. 7. One of the Surviving Examples of Pascal's Calculating Machine.

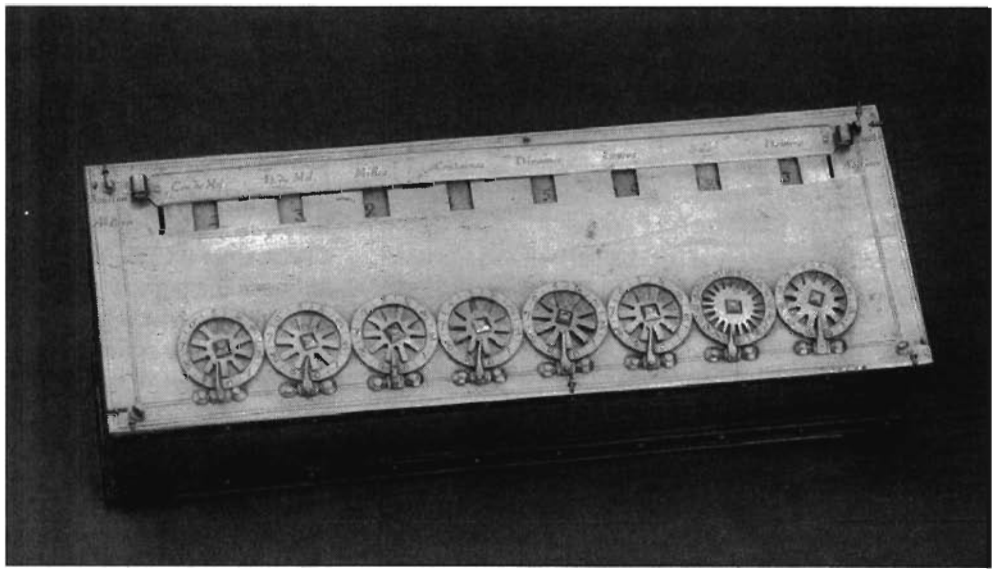


Fig. 8. Pascal's Calculating Machine, 1642. Length: 36 cm.

lator, the force needed to operate the machine would be of such a magnitude that it would do damage to the delicate gear works. Pascal managed to devise a completely new mechanism that was based upon falling weights rather than a long chain of gears ...

This carry mechanism, which would have been the pride of many mechanical engineers 100 years after Pascal, eliminated any strain on the gears. However, it did have the drawback that the wheels turned in only one direction, and this meant that it was only possible to add and not to subtract with the machine ... The subtraction problem was solved by simply adding the nines complement of the required number, a process which limited the use of the machine to those with a better than average education.[32]

Of the Pascaline, his sister Gilberte wrote:

My brother has invented this arithmetical machine by which you can not only do calculations without the aid of counters of any kind, but even without knowing anything about the rules of arithmetic.[33]

Comments Georges Ifrah in his *The Universal History of Computing*:

Pascal's sister's letter perceptively foresaw the nature of the era which her brother had just inaugurated ... an era soon to be marked by the rapid development of a great variety of machines which not only eased the heavy burden of tedious and repetitive operations, but, in carrying out automatically an increasingly wide field of intellectual tasks with complete reliability, would come to replace the human being who would be able to use them without having even the slightest knowledge of the physical and mathematical laws which govern their working.[34]

That Pascal anticipated the philosophical issues attendant upon that "new era" is evident from the *Pensées*. He wrote:

The arithmetical machine produces effects which come closer to thought than anything which animals can do; but it can do nothing which might lead us to say that it possesses free will, as the animals have.[35]

To which Ifrah comments: "[This] is as true today as it was then regarding any calculator or computer."[36]

Charles Babbage

The final figure to be treated here is universally regarded as the most important name prior to the twentieth century in the history of modern computer technology. Babbage's famous Engines were "the true ancestor of our modern computers."[37]

Charles Babbage, perhaps more than any other person, can be considered to be the grandfather of the computer age ... His ideas were so far in advance of his time that they would have fit easily into the early computer work being done by people like Konrad Zuse and Howard Aiken in the 1940s.[38]

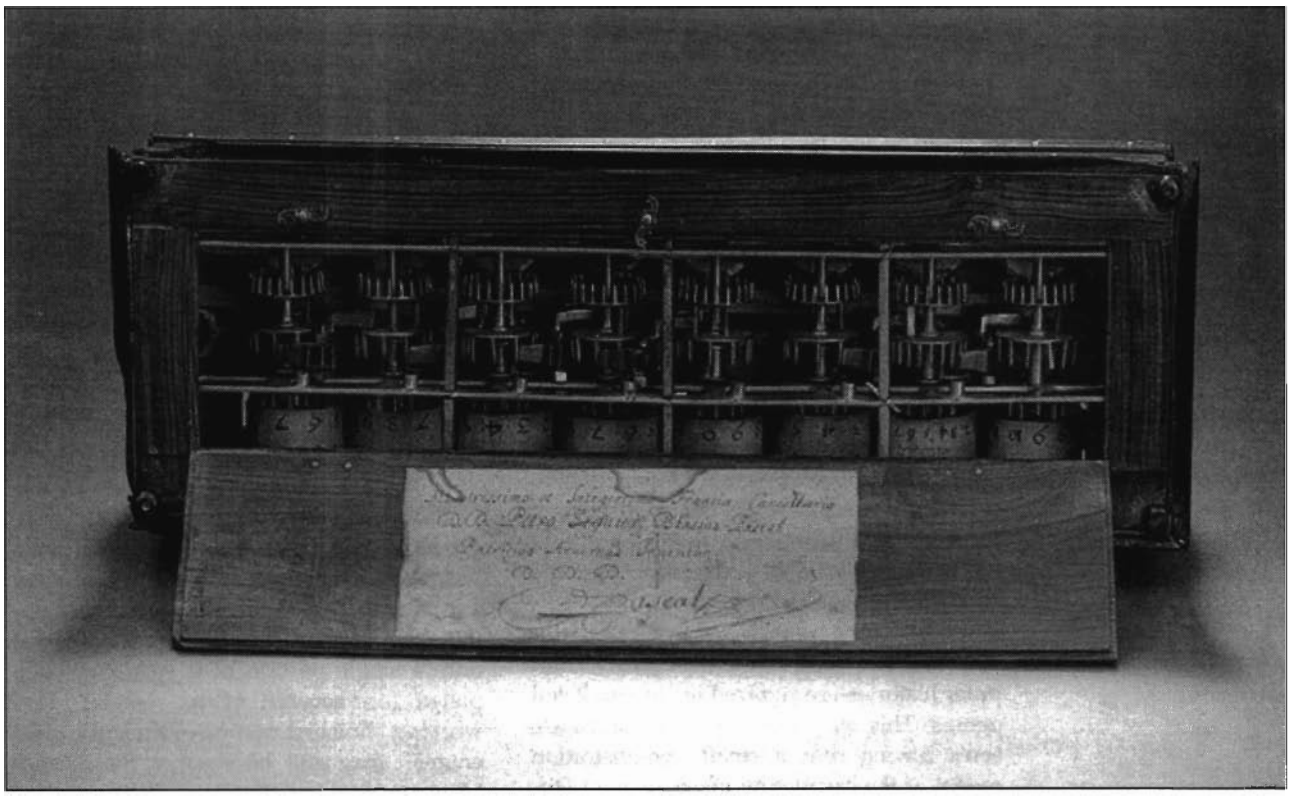
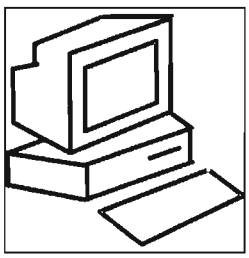


Fig. 9. Pascal's Calculating Machine: Detail of the Mechanism.



Article

Computer Origins and the Defense of the Faith

Babbage's Analytical Engine could actually store the sequence of operations to be performed on the data, thus displaying the character of a modern computer program. In Babbage's work, we see the first automatic computer conceived by humans.

The reason for this was the unique character of Babbage's "Analytical Engine": though never actually constructed, it was far more than a Schickardian or Pascalian calculator capable of storing and then manipulating data by selecting built-in operations; the Analytical Engine could actually store *the sequence of operations to be performed on the data*, thus displaying the character of a modern computer program. In Babbage's work, we see the first automatic computer conceived by humans.

Charles Babbage (1791–1871) was, like Lull, Schickard, and Pascal, "a vigorous polymath."[39] The son of a well-to-do banker, he took a mathematics degree at the University of Cambridge (Trinity College) and his first scholarly contributions lay in mathematical papers and the construction of computational tables. This led to his years of work designing his "Difference" and "Analytical" Engines to automate the preparation of such tables. Constructing these engines was a task so far in advance of the mechanical skills of his day that he himself had to study the nature of manufacturing machinery and improve upon it. This in turn led to his becoming a lay specialist in economic and industrial theory and the eventual publication of his influential book, *On the Economy of Machinery and Manufactures* (1832).[40]

Babbage became one of the founders of the London Statistical Society, the Astronomical Society, and the British Association. He was elected to the Royal Society as early as 1816. From 1828 to 1839 he held his only paid position during his lifetime—that of Lucasian Professor of Mathematics at Cambridge. He obtained less than sufficient support from the government for the development of his Difference Engine No. 1 (Figure 11) and none at all for his Analytical Engine or for the Difference Engine No. 2 (Figure 12); by 1842 the government ceased entirely to support his work.[41] Financial considerations were certainly the root cause of his never completing more than a portion of the Difference Engine and the fact that the Analytical Engine remained only a design. After Babbage's death, his labors were virtually forgotten until twentieth-century computer historians recognized his unparalleled genius. This was due in part to Babbage's son's having sent a small demonstration model of the calculating mechanism of Difference Engine No. 1 to Harvard University, where Howard Aiken, the computer pioneer, saw it (as far as we know) in the late 1930s.[42]

Fig. 10. Charles Babbage (1791–1871) Daguerreotype by Antoine Claudet, 1847–51. Babbage, now in his late fifties, began work in 1847 on the design of his second Difference Engine. In the King William Street studio, he and Claudet experimented during this time with photography of specimens of colors on porcelain, and Babbage sat for several portraits.
National Portrait Gallery, London

A "Difference Engine" is a device which accomplishes multiplication and division by the simpler process of addition, based on the fact that in a series of numbers raised to a given power the differences can be represented by single constants. Thus, for example, the products of a series of numbers squared differ by a constant factor of 2, making the results calculable by machine addition:

$2^2 = 4$ ["4" and
$3^2 = 9$ ["9" differ by "5"; "9" and
$4^2 = 16$ ["16" differ by "7"; "16" and
$5^2 = 25$; etc. ["25" differ by "9"; etc.]
(Note that the bold-face numbers—**5, 7, 9,** etc.—are *always* just ***two*** apart.)

Babbage's Difference Engine No. 1, if completed, would have required 25,000 parts, weighed several tons, and measured 8 ft. by 7 ft. by 3 ft. Trouble with his toolmaker and the high costs of construction meant that only a single portion of it was ever completed (one-seventh of the whole). That working "finished portion of the unfinished engine" may still be seen at the Science Museum, London, England. Babbage used

it at his celebrated Saturday evening soirées to illustrate his argument in behalf of the genuineness of New Testament miracles such as the Resurrection of Christ (more on this below).

The Difference Engine gave Babbage an even more ambitious idea—that of the "Analytical Engine," which, however, never came to realization owing to cost projections and the refusal of the government to finance it. Like the Difference Engine, the Analytical Engine was a sophisticated decimal digital machine.

> The value of a number is represented by the positions of toothed wheels with decimal numerals marked in them. Each digit position in the number has its own wheel and only discrete positions e wheels are valid representations of the numbers.[43]

For the Analytical Engine, Babbage prepared the most extensive set of mechanical drawings ever seen up to his time (they covered 1,000 square feet of paper)[44] and—going far beyond the Difference Engine, which was essentially a high-powered calculator—represented characteristics which we today would associate with full-scale computer sophistication:

1. an *input/output* unit;
2. a unit for setting the machine in motion (for which Babbage did not coin a term), which transferred the numbers from one section to another in order to place them in the correct sequence: it was the machine's *control unit;*
3. a store, which was a numerical memory capable of storing the intermediate or final results of the calculations that had been carried out: it was the machine's *memory,* able to receive the numbers used in the calculations and store the results;
4. a *mill* which was designed to carry out the operations on the numbers that had been introduced into the Analytical Engine: this was the machine's *arithmetic unit,* in which numbers were combined according to the required rules—in other words it was the *processing unit* whose job it was to carry out the calculations by employing the data that had been introduced into the machine and transforming it in order to produce the desired results;
5. finally, a *printing device* to provide the results.[45]

The machine was designed to use punched cards to input data and instructions; it was capable of conditional ("if ... then") branching and looping; and it could handle seventh order polynomials, and would thus have been highly useful in finding trigonometric functions. It benefitted from fail-safe devices: pins and springs forced the wheels back into place if they got out of line and created an automatic shutdown of the machine if the problem was very severe. If one were using the machine to compute tables which did not have a constant difference (e.g., a table of logarithms), one could set it so that a bell would ring after a given number of calculations to tell the operator to reset the difference wheels for a new polynomial. The machine was even capable of computing the rational roots of certain functions—and when a function had imaginary roots the first difference bell would ring to indicate that one should stop computing and find the pair of imaginary roots by inspecting the other axles. Printing involved wheel cams acting against levers whose ends moved arms containing ten steel punches corresponding to the digits 0 to 9; these punches made impressions on a lead or copper plate, from which a stereotyped printing plate could be cast.[46]

Finally, in 1847–1849, Babbage planned a simpler but more elegant version of his Difference Engine No. 1 which would benefit from some of the characteristics of the Analytical Engine. This also was never constructed by Babbage but the Difference Engine No. 2 was successfully reproduced from his plans in the 1990s and the impressive results can be viewed at the Science Museum, London.

In sum:

> Since Babbage's machine required no human intervention in the carrying-out of its sequences of operations, it thus ... synthesized the concept of an

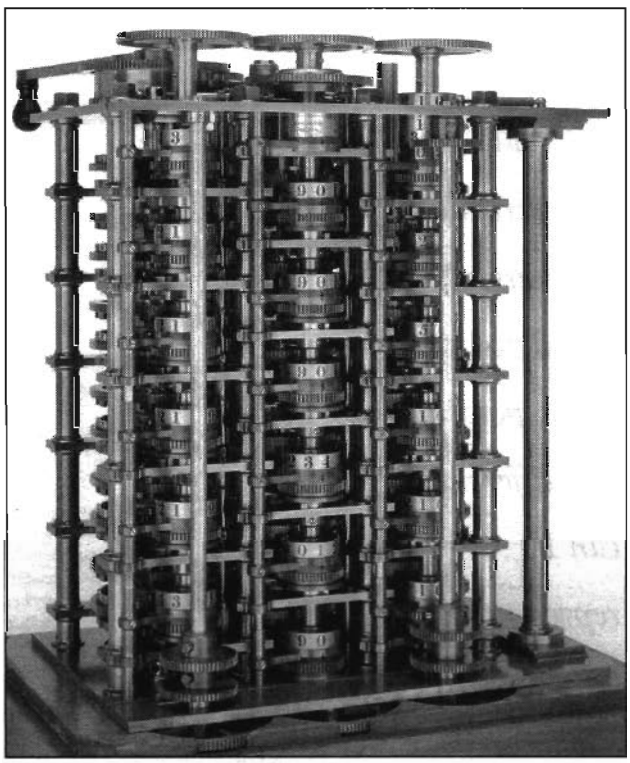
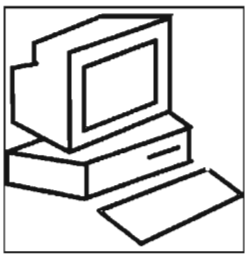


Fig. 11. Charles Babbage's Difference Engine No. 1 – Portion, 1832. This portion of the engine, assembled by Joseph Clement in 1832, is the first known automatic calculator. It represents about one-seventh of the calculating mechanism of the full size engine which was not completed. The portion shown has nearly 2,000 individual parts, and is one of the finest examples of precision engineering of the time. Size: 72 x 59 x 61 cm. 1862–1889.



Article

Computer Origins and the Defense of the Faith

A "Difference Engine" is a device which accomplishes multiplication and division by the simpler process of addition, based on the fact that in a series of numbers raised to a given power the differences can be represented by single constants.

> automatic sequential digital calculator with a non-cyclical automaton governed by a flexible programming system and equipped with a modifiable control unit, independent of the material structure of the corresponding internal mechanisms.
>
> Even more importantly, Babbage defined, for the first time in history, a true precursor of today's universal computers: general-purpose analytical machines that are not specialized for solving only certain categories of problems, but are conceived to deal with a vast range of computable problems.[47]

Charles Babbage had a fascinating personality. He was a convinced, orthodox Christian believer with a finely tuned sense of humor. He begins his semi-autobiographical reflections with a chapter on his "Ancestry" in which he suggests that his lineage derives from Tubal-Cain, since the latter was "a great worker in iron." He says that the force of evidence is pushing him to believe that the age of humankind on the earth is far greater than Ussher's traditional chronology would put it and that "in this single instance the writings of Moses may have been misapprehended."[48] This, however, does not bring him to "the philosophic, but unromantic, views of our origin taken by Darwin."

As a boy, Babbage's enquiring mind led him to want to test the truths of the faith. He tells us that he once tried to get the devil to appear so as to verify what the Bible said about him—fortunately without success. Then, he writes:

> I resolved that at a certain hour of a certain day I would go to a certain room in the house, and if I found the door open, I would believe in the Bible; but that if it were closed, I should conclude that it was not true. I remember well that the observation was made, but I have no recollection as to the state of the door. I presume it was found open from the circumstances that, for many years after, I was no longer troubled by doubts.

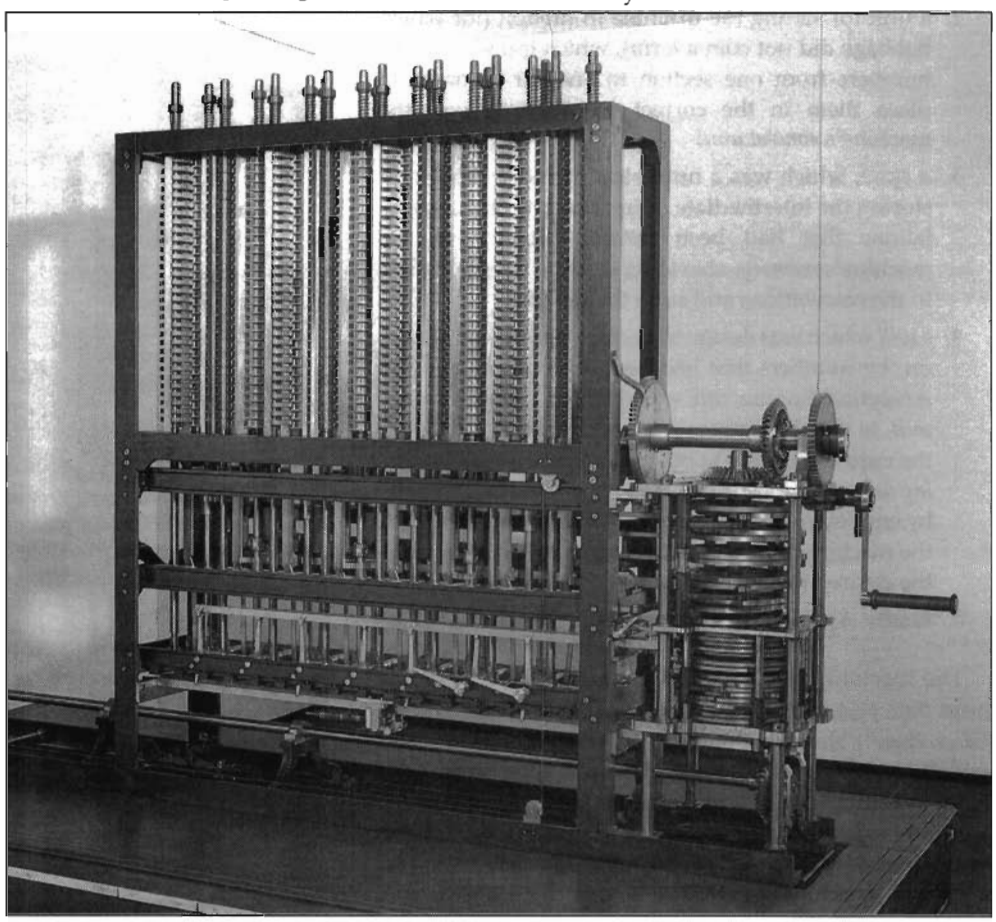


Fig. 12. Difference Engine No. 2 at the London Science Museum
(reproduced by permission of the Museum).

At Cambridge, Babbage tells us, "I came into frequent contact with the Rev. Charles Simeon, and with many of his enthusiastic disciples." Indeed, Babbage abstracted the sermons of that great evangelical divine—though sometimes altering their content in an original, scientific direction. (The "Alexander the coppersmith" of 2 Tim. 4:14 led Babbage to the isomorphous character of copper and to a teacher's reaction which Babbage describes as an "awful explosion which I decline to paint.")[49]

Babbage's Ninth Bridgewater Treatise *shows how Babbage's speciality – machine assisted computation – can have significant apologetic relevance.*

As an adult, Babbage's great apologetic contribution was his *Ninth Bridgewater Treatise: A Fragment*,[50] the circumstances of whose production need to be mentioned. The eighth Earl of Bridgewater (d. 1829) had bequeathed a princely sum to the Royal Society to encourage the creation of works "on the Power, Wisdom and Goodness of God, as manifested in the Creation," i.e., for the defense of natural theology at a time when it was being threatened by more modern geologic theories. The most impactive of the books written under this grant was William Whewell's *Astronomy and General Physics*. Though a serious believer, Whewell expressed the opinion that "deductive" mathematicians lacked "any authority with regard to their views of the administration of the universe; we have no reason whatever to expect from their speculations any help, when we ascend to the first cause and supreme ruler of the universe."

Whewell had unwittingly thrown down the gauntlet, and Babbage did not hesitate to pick it up. Babbage's *Ninth Bridgewater Treatise*, though indeed fragmentary (with intentional—and sometimes irritating—gaps in the text) is a decisive refutation of this viewpoint. It was a labor of love (or of love and spleen) and was never remunerated as were the eight official Bridgewater productions.[51] Most important, it shows how Babbage's speciality—machine assisted computation—can have significant apologetic relevance.

"If it is meant," says Babbage of Whewell's position, "that there is a 'higher region' of *evidence* than that of 'mathematical proof and physical consequence,' then it is in my opinion utterly and completely erroneous." A most valuable illustration of this point in the *Ninth Bridgewater Treatise* is Babbage's refutation of Hume's classic argument against the miraculous: chapters 10 and 11 and the extended mathematical note "E" to chapter 10 are specifically devoted to this end.

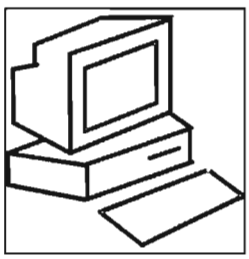
The essence of Babbage's destruction of Hume lies in the latter's inadequate understanding of probability and Babbage's masterly grasp of that mathematical concept. So important is Babbage's argument that it is reprinted in its entirety at the close of Earman's recent, comprehensive critique, *Hume's Abject Failure: The Argument Against Miracles*.[52]

Hume, it will be remembered, declared that it would always be more miraculous if those reporting a miracle such as the Resurrection of Christ were neither deceived nor deceiving (were actually telling the truth) than it would be if the miracle had actually occurred—for "a miracle is a violation of the laws of nature; and as a firm and unalterable experience has established these laws, the proof against a miracle from the very nature of the fact, is as entire as any argument from experience can possibly be imagined."[53] After quoting this passage, Babbage writes:

> The word *miraculous* employed in this passage is evidently equivalent to *improbable*, although the improbability is of a very high degree.
>
> The condition, therefore, which, it is asserted by the argument of Hume, must be fulfilled with regard to the testimony, is that the *improbability* of its falsehood must be GREATER than the *improbability* of the occurrence of the fact ...
>
> The only sound way of trying the validity of this assertion is to *measure* the numerical value of the two improbabilities, one of which it is admitted must be greater than the other; and to ascertain whether, by making any hypothesis respecting the veracity of each witness, it is possible to fulfil that condition by any finite number of such witnesses.
>
> Hume appears to have been but very slightly acquainted with the doctrine of probabilities.

Babbage then subjects the question to a rigorous probabilistic analysis and concludes:

> Pursuing the same reasoning, the probability of the falsehood of a fact which six such independent witnesses attest is, previously to the testimony, $1/100^6$ or it is, in round numbers, 1,000,000,000,000 to 1 against the falsehood of the testimony.
>
> The improbability of the miracle of a dead man being restored, is, on the principles stated by Hume, $1/(20 \times 100^5)$; or it is 200,000,000,000 to 1 against its occurrence.
>
> It follows, then, that the chances of accidental or other independent concurrence of only *six* such



The Ninth Bridgewater Treatise ... employs the principles of Babbage's Difference Engine to make a powerful apologetic point over against the general deistic position ... that miracles are impossible because they would contradict God's original and perfect arrangement of the universe.

> independent witnesses, is already *five times* as great as the improbability against the miracle of a dead man's being restored to life, deduced from Hume's method of estimating its probability solely from experience ...
>
> From this it results that, provided we assume that independent witnesses can be found of whose testimony it can be stated that it is more probable that it is true than that it is false, *we can always assign a number of witnesses which will, according to Hume's argument, prove the truth of a miracle.*[54]

The *Ninth Bridgewater Treatise* does not limit itself to decimating Hume's argument against the miraculous. It also employs the principles of Babbage's Difference Engine to make a powerful apologetic point over against the general deistic position—that viewpoint which sees God as little more than a "Divine Clockmaker"—that miracles are impossible because they would contradict God's original and perfect arrangement of the universe.

> The object of the present chapter is to show that it is more consistent with the attributes of the Deity to look upon miracles not as deviations from the laws assigned by the Almighty for the government of matter and of mind; but as the exact fulfillment of much more extensive laws than those we suppose to exist ...
>
> Let the reader suppose himself placed before the calculating engine, and let him again observe and ascertain, by lengthened induction, the nature of the law it is computing. Let him imagine that he has seen the changes wrought on its face during the lapse of thousands of years, and that, without one solitary exception, he has found the engine register the series of square numbers. Suppose, now, the maker of that machine to say to the observer, "I will, by moving a certain mechanism, which is invisible to you, cause the engine to make one cube number instead of a square, and then to revert to its former course of square numbers"; the observer would be inclined to attribute to him a degree of power but little superior to that which was necessary to form the original engine.
>
> But, let the same observer, after the same lapse of time—the same amount of uninterrupted experience of the uniformity of the law of square numbers, hear the maker of the engine say to him—"The next number which shall appear on those wheels, and which you expect to find a square number, shall not be so. When the machine was originally ordered to make these calculations, I impressed on it a law, which should coincide with that of square numbers in every case, *except* the one which is now about to appear; after which no future exception can ever occur, but the unvarying law of the squares shall be pursued until the machine itself perishes from decay.
>
> Undoubtedly the observer would ascribe a greater degree of power to the artist who had thus willed that event which he foretells at that distance of ages before its arrival.[55]

Atheist Geoff Simons dismisses this argument as presenting God in the guise of "celestial programmer"; it is, for him, little more than a "redraft of the ancient Teleological (design) Argument." "Babbage, like many of his contemporaries, was wedded to the 'other' world, chained to concepts and connotations fashioned in prescientific epochs."[56]

In point of fact, (1) there is nothing logically wrong with the Teleological Argument (particularly when formulated in terms of its foundation, the Argument from Contingency), and (2) more scientific evidence is available today than in Babbage's own time to show the soundness of Intelligent Design in the universe.[57] Sadly, it is those of Simons' persuasion who are living the "prescientific" dream of Naturalism, whilst Babbage stands not only as the grandfather of our computer age but also as a sound apologist for biblical truth which, like its Lord, remains the same yesterday, today, and forever.[58]

Conclusion:

Why the Strong Connection between Computing & Apologetics?

In 1973, a Federal District Court rightly ruled that the Sperry Rand Corporation, in spite of having created ENIAC in 1946, could not claim a patent for the electronic computer,

thereby obtaining royalties on all electronic data processing from Honeywell and other competitors, since the company had not invented computers as such![59] It is certainly correct that "in this history there cannot be a single invention, still less an inventor."[60]

We are not claiming that Lull, Schickard, Pascal, or even Babbage was *the* inventor of the computer. However, their vital contributions cannot be gainsaid. This being so, the inevitable question arises: Did they have a common motivation in engaging in their scientific work? All four of them were convinced Christian believers who, moreover, were vitally concerned with defending the truth of the "faith once delivered to the saints."

The solidity of Christian conviction on the part of [Lull, Schickard, Pascal, and Babbage] led them to a cosmic perspective in which it was natural to seek maximum generality ...

Are we saying that these intellectual pioneers did their scientific work solely because they were committed Christians? It is plain that native intellectual curiosity—what Aristotle at the beginning of the *Metaphysics* called humankind's inherent "desire to know"—played a part. Babbage, for example, noted in his autobiography that as a child his "invariable question on receiving any new toy, was 'Mamma, what is inside of it?'" The intellectual attainments of great mathematicians outside the faith such as Bertrand Russell or modern secularists in the computer field such as Alan Turing attest to the power of such curiosity, wholly apart from religious faith.[61]

At the same time, it should be evident from the foregoing treatments of the lives of Lull, Schickard, Pascal, and Babbage that their faith was intimately connected with their intellectual endeavors. Common to all four was a serious commitment to the fundamental Christian verities: they believed that the Bible was an objectively truthful revelation from God and that Jesus Christ was no less than the God in the flesh, a miraculous Savior.

This brings us to an important *caveat*: the likelihood of engaging in serious or successful work in this field is seriously diminished if one falls into the ideological camp of the "existentialistically motivated churchmen, neo-orthodox theologians, and all those influenced by the current denigration of propositional truth, formal logic, and the subject-object distinction ... The entire computer concept is founded on the law of non-contradiction: in binary computer language you must choose 'yes' or 'no'—a 'dialectic answer' is no answer at all. There are no neo-orthodox computers."[62]

Moreover, the solidity of Christian conviction on the part of all four of the savants we have treated led them to a cosmic perspective in which it was natural to seek maximum generality: one was not limited to a world of "blooming, buzzing confusion" (to use William James' felicitous expression) or to a universe in which the vast number of particulars (the Many) could never be integrated by way of abstract, general ideas (the One). Babbage, for example, summed up his work in the following terms: "It seems that all of the conditions that allow a finite machine to carry out an unlimited number of calculations have been fulfilled by the Analytical Engine." In other words, Babbage consciously moved from finitude to the realm of unlimited operations, and his unwavering faith in the unlimited God of the Scriptures surely predisposed him to such an endeavor.

Georges Ifrah argues that the combination of *abstraction* and *generalization* were essential to development of the modern computer.

> As abstraction and generalization are closely linked, Babbage accordingly produced a sort of "algebrization" of the fundamental concepts of mechanical calculation. This led him, thanks to his obsession with the difficulties of human calculation and his realization that existing calculators were very inadequate, little by little to a desire to leave behind the great variety of specific data, and so arrive at a much larger construct that approached a universal view.[63]

"Constructs that approach a universal view" are far easier to appreciate when one has met the Christ of the Scriptures, since proper theology is just such a universal construct.[64] And defending that theology intellectually becomes part and parcel of the conviction that God has spoken both in nature and in history and that his Word is the final truth and must be demonstrated to be such.

Despite the temporal distances separating them, therefore, it is entirely sensible to find much in common as we observe Ramon Lull using his Trinitarian "wheels within wheels" to convert the lost, Wilhelm Schickard calculating the years of Daniel's prophecies, Blaise Pascal figuring not just tax receipts but also the most logical reasons to believe the gospel, and Charles Babbage working out a solid base in mathematical probability for the great miracle of Christ's Resurrection. ◆

Notes

[1]Geoff Simons, *Is God a Programmer? Religion in the Computer Age* (Brighton, Sussex, England: Harvester Press, 1988).

[2]James J. Walsh, *Thirteenth Greatest of Centuries* (New York: Fordham University Press, 1943). Catholic Summer School Press issued this work as early as 1913, and it was reprinted by AMS Press in 1981.

[3]Cf. especially the general studies of Aquinas by Etienne Gilson, A. D. Sertillanges, M. C. D'Arcy, and M. D. Chenu.

[4]Lull's productivity—in the widest range of fields, including medicine—was simply enormous, even after excluding the alchemical works falsely attributed to him. According to the latest catalogue, he produced 265 titles, of which 237 have survived. The *Book of Contemplation* alone contains almost a million words. A large number of Lull's writings remain unedited and in manuscript even today.

[5]Samuel M. Zwemer, *Raymund Lull: First Missionary to the Moslems* (New York and London: Funk & Wagnalls, 1902). Cf. Mark D. Johnston, *The Evangelical Rhetoric of Ramon Llull: Lay Learning and Piety in the Christian West around 1300* (New York: Oxford University Press, 1996).

[6]Ramon Lull, *Blanquerna: A Thirteenth Century Romance*, trans. E. Allison Peers (London: Jarrolds, n.d. [1925/1926]).

[7]For example, in the (rather dismissive) treatment given to Lull in W. and M. Kneale's *The Development of Logic* (Oxford: Clarendon Press, 1964), 241–2, where, however, Lull's influence on Leibniz is at least mentioned. Carl von Prantl's older and far more comprehensive *Geschichte der Logik im Abendlande*, 4 vols. (Leipzig, 1855–1870), III:145–77, is much more informative on the details of the Lullian system.

[8]Martin Gardner, *Logic Machines and Diagrams* (New York: McGraw-Hill, 1958), 1-27.

[9]Ibid., 12.

[10]Anthony Bonner, ed. and trans., *Doctor Illuminatus: A Ramon Llull Reader* (Princeton, NJ: Princeton University Press, 1993), 294. This anthology is a shorter version of Bonner's *Selected Works of Ramon Llull (1232–1316)*, 2 vols. (Princeton, NJ: Princeton University Press, 1985).

[11]R. D. F. Pring-Mill, "Lull, Ramon," *Dictionary of Scientific Biography*, ed. C. C. Gillispie, 16 vols. (New York: Scribner's, 1970–1980), VIII:548–9. The accompanying diagrams have been reproduced from this article.

[12]For the central place of Lull's apologetic for the Trinity in his thought, see his *De Quadratura*, originally written in Catalan and accessible in the excellent French edition titled, *Principes et questions de théologie*, ed. and trans. R. Prévost and A. Llinarès (Paris: Editions du Cerf, 1989), especially pp. 36–57, 95–9, 116–56, 246–54. Lull thoroughly integrates Trinitarian doctrine with Christology (his apologetic also covers the Incarnation, the Resurrection, and the Last Judgment).

[13]Lull, *Ars brevis*, in *Opera* (Strasbourg [Argentorati]: Zetzner, 1651), 11, 41. On this influential "final" edition of Lull's works, of which I personally possess a copy, see Bonner, *Doctor Illuminatus*, 67–8. I have modified Bonner's translation at several points on the basis of the original Latin text. The bracketed words appear in the parallel passage in Lull's *Ars generalis ultima*.

[14]John Warwick Montgomery, *Tractatus Logico-Theologicus* (corrected ed.; Bonn, Germany: Verlag für Kultur und Wissenschaft, 2003). Available from the Canadian Institute for Law, Theology and Public Policy: www.ciltpp.com

[15]See John Warwick Montgomery, *Cross and Crucible*, 2 vols. (The Hague, Netherlands: Nijhoff [now Kluwer], 1973), 55. The Introductory Essay to this work has appeared as a journal article in the *Transactions of the Royal Society of Canada*, 4th ser., I (June 1963): 251–70, as well as in *Ambix: The Journal of the Society for the Study of Alchemy and Early Chemistry*, XI (June 1963): 65–86; and it was published in French in the *Revue d'Histoire et de Philosophie Religieuses* (1966): 323–45. See also the author's reinforcement of his argument in F. A. Janssen, ed., *Das Erbe des Christian Rosenkreuz* (Amsterdam, Netherlands: In de Pelikaan, 1988), 152–69.

[16]Montgomery, *Cross and Crucible*, I:48, 69, 144, 176–7; II:545. For biographical articles on Schickard, see the *Allgemeine deutsche Biographie*; Hoefer's *Nouvelle Biographie Générale*; and Michaud's *Biographie Universelle*.

[17]Wilbur Applebaum, "Schickhard, Wilhelm," *Dictionary of Scientific Biography*, XII:163.

[18]Montgomery, *Cross and Crucible*, I:11.

[19]Wilhelm Schickhard, *"Purim," sive Bacchanalia Judaeorum* (Tubingae: Werlin, 1634).

[20]On Anderson's prophetic apologetic, see John Warwick Montgomery, *The Transcendent Holmes* (Ashcroft, BC, Canada: Calabash, 2000), 129–30, 135–9; and Montgomery, "Prophecy, Eschatology and Apologetics," in his *Christ Our Advocate* (Bonn, Germany: Verlag für Kultur und Wissenschaft, 2002), 255–65, and also in David W. Baker, ed., *Looking Into the Future: Evangelical Studies in Eschatology* (Grand Rapids, MI: Baker, 2001), 362–70.

[21]René Taton, "Sur l'invention de la machine arithmétique," *Revue d'histoire des sciences et de leurs applications*, XVI (1963): 139–60, at 144.

[22]Michael R. Williams, *A History of Computing Technology*, 2d ed. (Los Alamitos, CA: IEEE Computer Society Press, 1997), 119–24. One of the illustrations to follow (that of Schickard's machine's carry mechanism) has been reproduced from this work; the others have been obtained from Walter Gerblich et al., *Herrenberg und seine Lateinschule. Zur Geschichte von Stadt und Gäu* (Herrenberg, Germany: Theodor Körner, n.d. [1962]), 176–80 (section contributed by Baron von Freytag Löringhoff).

[23]In 1971, West Germany issued a stamp picturing that reconstruction in honor of the 350th anniversary of Schickard's invention.

[24]Williams, *A History of Computing Technology*, 122–3.

[25]Ibid., 120.

[26]See in particular the excellent treatments of Pascal's thought by Emile Cailliet: *The Clue to Pascal* (London: S. C. M. Press, 1944), *Great Shorter Works of Pascal* (Philadelphia: Westminster Press, 1948), etc. It should be noted that, in spite of his Augustinianism, Pascal clearly distinguishes his theology from that of Calvinism, which he regards as a heresy (ibid., 136–42).

[27]Fortunately, there is a standard numbering of the fragments so that one can (usually, but not always!) locate a given *Pensée* regardless of which edition is being consulted.

[28]H. F. Stewart, *Pascal's Apology for Religion Extracted from the Pensées* (Cambridge, England: Cambridge University Press, 1942), especially pp. vii–xxiv ("Preface"). As an Appendix (pp. 203–31), Stewart gives the French texts from which the content of the *entretien* is known: "The *Discours sur les Pensées de M. Pascal* by Filleau de la Chaise compared with the Preface to the Port Royal edition by Etienne Périer."

[29]Theologians such as Clément Besse (*Le Pari. Avec un Discours critique* [Paris: Gabriel Beauchesne, 1922]) could have avoided much agony over the apparent illogic of the Wager had they paid more attention to the structure of Pascal's 1658 discourse.

[30]He says this specifically in a letter written in the year 1645; the text of this letter is given in Cailliet, *Great Shorter Works of Pascal*, 40–1.

[31]See Taton "Sur l'invention de la machine arithmétique"; and Jacques Payen, "Les exemples conservés de la machine de Pascal," *Revue d'histoire des sciences et de leurs applictions* XVI (1963): 161–78 (with numerous photographs).

[32]Williams, *A History of Computing Technology*, 128.

[33]Mme Périer, "La vie de Monsieur Pascal," in Pascal, *Oeuvres complètes*, ed. Louis Lafuma (Paris: Editions du Seuil, 1963), 19.

[34]Georges Ifrah, *The Universal History of Computing*, trans. and ed. E. F. Harding (New York: John Wiley, 2001), 123–4. It was therefore not without reason that Swiss computer expert Niklaus Wirth named his immensely influential programming language "Pascal."

[35]"La machine d'arithmétique fait des effets qui approchent plus de la pensée que tout ce que font les animaux; mais elle ne fait rien qui puisse faire dire qu'elle a de la volonté, comme les animaux" —Pascal, *Pensées*, 4th ed., 2 vols., ed. Ernest Havet (Paris: Ch. Delagrave, 1887), II:118.

[36]Ifrah, *The Universal History of Computing*, 122. The example of the Pascaline shown here may be seen in the Musée des Arts et Métiers in Paris, where there is also a working reproduction which can be tried by visitors to the museum. Cf. *De la machine à calculer dePascal à l'ordinateur [exposition du 26 avril au 23 septembre 1990]* (Paris: Musée National des Techniques, CNAM, 1990).

[37]Ifrah, *The Universal History of Computing*, 245.

[38]Williams, *A History of Computing Technology*, 154.

[39]"General Introduction," *The Works of Charles Babbage*, 11 vols., ed. Martin Campbell-Kelly (London: William Pickering, 1989), I:14.

[40]This book constitutes Vol. VIII of Babbage's *Works*, ed. Campbell-Kelly.

[41]In fairness to Disraeli, the Chancellor of the Exchequer, it should be pointed out that the government's subsidy to Babbage before payments to him ceased was over twenty times what the Crown paid for Robert Stephenson's steam locomotive, the *John Bull*. In his autobiographical *Passages from the Life of a Philosopher* (*Works*, XI:97–111), Babbage shows that he could never excuse the government's cessation of interest in his projects. His machine, after all, could readily "calculate the millions the ex-Chancellor of the Exchequer squandered"!

[42]Doron Swade, *Charles Babbage and His Calculating Engines* (London: Science Museum, 1991), 36 (with excellent bibliography of primary and secondary materials on Babbage's work).

[43]Ibid., 32. The illustrations below are reproduced from this publication (credit: Science Museum/Science & Society Picture Library).

[44]Thirteen plates or sectional plans for the Engine may be seen in the Campbell-Kelly edition of Babbage's *Works*, III:239–53.

[45]Ifrah, *The Universal History of Computing*, 191.

[46]The London Museum of Science version of the Engine, though 10 ft. long and 6 ft. high and containing 4,000 parts, does not include the printing unit, which was omitted for cost considerations.

[47]Ifrah, *The Universal History of Computing*, 191–2.

[48]In his *Ninth Bridgewater Treatise*, chaps. 4–5, Babbage speaks to this point *in extenso*.

[49]Babbage, "Passages from the Life of a Philosopher," chaps. 2–3, *Works*, XI:7–24.

[50]The 2d ed. comprising Vol. IX of Babbage's *Works*, ed. by Campbell-Kelly. The *Ninth Bridgewater Treatise* was widely read both in England and in America. I have in my personal library a copy of the Philadelphia printing by Lea & Blanchard (1841), which follows the 2d London edition.

[51]For the list, see the editor's preface to Babbage's *Works*, IX:6–7.

[52]John Earman, *Hume's Abject Failure: The Argument Against Miracles* (New York: Oxford University Press, 2000), 203–12; Earman's mathematical analysis of Babbage's case is given on pp. 54–6. See also Montgomery, *Tractatus Logico-Theologicus*, 3.67 and subpropositions.

[53]David Hume, *Enquiry concerning Human Understanding*, sec. X.

[54]*Ninth Bridgewater Treatise*, in *Works*, IX:122–7 (Babbage's italics). In his more comprehensive mathematical demonstration in Note E to chap. 10 (pp. 201–3), Babbage states the italicized conclusion in a slightly different way: "If independent witnesses can be found, who speak truth more frequently than falsehood, it is ALWAYS *possible to assign a number of independent witnesses, the improbability of the falsehood of whose concurring testimony shall be greater than that of the improbability of the miracle itself.*"

[55]Ibid., 92–7.

[56]Simons, *Is God a Programmer?* 3, 78.

[57]Montgomery, *Tractatus Logico-Theologicus*, 3.8.

[58]Significantly, Babbage concludes his *Ninth Bridgewater Treatise* with a quotation from Anglican Archbishop Whately, the great nineteenth-century orthodox Christian apologist who wrote a devastating satire against Hume, *Historic Doubts Relative to Napoleon Bonaparte*, and an equally trenchant decimation of Deistic and skeptical historical criticism of the Old Testament, *Historic Certainties Respecting the Early History of America*. Cf. Craig Parton, ed., *Richard Whately: A Man for All Seasons* (Edmonton, AB, Canada: Canadian Institute for Law, Theology and Public Policy, 1997).

[59]Bizarrely, however, the judge attributed the invention to a pair of researchers at Iowa State University – whose work was on a very basic device lacking even the structure of an analytical calculator. See Alice Rowe Burks, *Who Invented the Computer? The Legal Battle That Changed Computing History* (Amherst: Prometheus Books, 2003).

[60]Ifrah, *The Universal History of Computing*, 283.

[61]However, unfaith cries out for explanation, since Scripture tells us that it is the "fool" who says that there is no God and that there are "many infallible proofs" of the truth of Christ's claims. Serious scholarly work needs to be done on what R. C. Sproul has termed in a book title (but hardly touched on academically), *The Psychology of Atheism* (Minneapolis: Bethany, 1974). The need for such research is particularly evident when one reads in the first volume of Bertrand Russell's autobiography the details of the bizarre anti-religious upbringing he received as a young child.

[62]Montgomery, *Computers, Cultural Change and the Christ* [trilingual: English, French, German] (Wayne, NJ: Christian Research Institute, 1969; now available from the Canadian Institute for Law, Theology and Public Policy, Edmonton, AB, Canada: www.ciltpp.com), 15. Cf. Montgomery, "Automating Apologetics in Austria," *Christianity Today* (November 8, 1968)—abridged in the *International Christian Broadcasters Bulletin* (January 1969).

[63]Ifrah, *The Universal History of Computing*, 246–7.

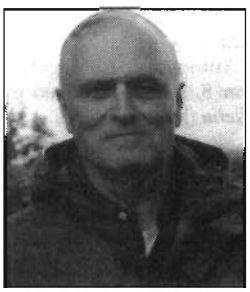
[64]Montgomery, "The Theologian's Craft: A Discussion of Theory Formation and Theory Testing in Theology," in his *The Suicide of Christian Theology*, 2d ed. (Newburgh, IN: Trinity Press, 1998), 267–313; also published in the *Concordia Theological Monthly* (February 1966), and in the *Journal of the American Scientific Affiliation* (September 1966).

Article

James Clerk Maxwell's Refusal to Join the Victoria Institute

James Clerk Maxwell's Refusal to Join the Victoria Institute

Jerrold L. McNatt



Jerrold L. McNatt

Thanks to his enduring theory of electricity and magnetism and his unique statistical approach to gases, as well as numerous other contributions in areas ranging from color vision to cartography, James Clerk Maxwell is generally regarded as the greatest physical scientist of the nineteenth century. Maxwell's personal correspondence and reflective writings clearly demonstrate that he was a serious evangelical Christian with a profound understanding of theology. Nevertheless, he turned down numerous invitations to join the Victoria Institute, which was founded in the 1860s to defend "the great truths revealed in Holy Scripture" against the flood of opposition coming from science and biblical criticism. This paper will explore the influences in Maxwell's life and the circumstances surrounding the formation of the Victoria Institute that combined to lead him to spurn the invitations to join the Institute.

The growing influence of scientific naturalism outside the church and biblical criticism within it alarmed many evangelicals.

James Clerk Maxwell's lifetime (1831 to 1879) spanned the first two-thirds of Queen Victoria's reign, during which time he established "his special place in the history of physics alongside Isaac Newton and Albert Einstein."[1] During this same era, the growing influence of scientific naturalism outside the church and biblical criticism within it alarmed many evangelicals. In particular, the widely discussed *Essays and Reviews* in 1860 and the early volumes of Bishop Colenso's *Pentateuch* in 1862 were cited as threats to confidence in the Bible by a group of evangelical clergy and laypeople and a minority of university professors who united to form the Victoria Institute in 1865. Their purpose was "to defend the truth of Holy Scripture against oppositions arising, not from real science, but from pseudo-science."[2] They clearly spell out what they mean by pseudo-science: cosmological and geological theories which sincere scientists may believe to be true, but which contradict a literal reading of Holy Scripture "must be merely pseudo-science, that is, a false interpretation of nature."[3]

Maxwell's lifelong friend and biographer, Lewis Campbell, reports that Maxwell was frequently invited to join the Victoria Institute, and he records the formal invitation of March 1875, which reads in part:

> Sir I have the honor to convey the special invitation of the President and Council to join this Society among whose members are His Grace the Archbishop of Canterbury, and other prelates and leading ministers, several professors of Oxford and Cambridge and other universities, and many literary and scientific men.[4]

The secretary, Francis Petrie, went on to say he had included "a short paper of the objects of the Society which now numbers 580 subscribing members and associates."[5] (This paper may have been the document "*Scientia Scientiarum*" referred to below.)

Maxwell sketched his negative reply in an incomplete rough draft penned on the initially blank last page of the invitation letter. There he indicated some reasons for his refusal that will be discussed in this paper.

Jerrold L. McNatt *has been a member of the Physics Department at Gordon College since 1971. He has specialized in thermal physics and electricity and magnetism courses for physics majors. He has been particularly concerned with issues connected with energy conversion and the development of modern physical science. Of late, James Clerk Maxwell has been the focus of his interests because of Maxwell's astonishing creativity, intriguing personality, and vital Christianity. An ASA Member, Jerrold and his wife Jolene, a practicing veterinarian, enjoy occasional rounds of golf and their black German Shepherd, Deme. Jerrold can be contacted by e-mail at mcnatt@gordon.edu*

The record of his personal and scholarly writings suggests additional doubts and reservations he would have had about the early Victoria Institute. Three of the possible reasons for his refusal will be examined: (1) the militant tone of the early Victoria Institute documents; (2) Maxwell's broad evangelical views; and (3) Maxwell's view of the relationship between science and theology.

The Militant Tone of the Early Victoria Institute Documents

In the first issue of the *Journal of the Transactions of the Victoria Institute*, the founding committee, which adopted the name Provisional Council of the Victoria Institute, described the four circulars and the two preliminary meetings of 1865 which laid the groundwork for the First General Meeting of the Victoria Institute on May 24, 1866. Also presented was a 25-page, unsigned, document called "*Scientia Scientiarum*" which provided a detailed rationale for the Institute.[6]

"*Scientia Scientiarum*" made clear that the founders of the Victoria Institute were reacting to two significant publications that appeared in the early 1860s and which highlighted the impact and extent of theological liberalism in Great Britain. The first, *Essays and Reviews* (1860), contained papers by six liberal clergy-scholars (Frederick Temple, Rowland Williams, Henry Bristow Wilson, Benjamin Jowett, Baden Powell, and Mark Pattison) and one layman (Charles W. Goodwin).[7] These authors cited the need to modify biblical interpretation in light of historical criticism and the current findings of science so that Christianity could remain a viable faith for contemporary educated people. They argued that the moral authority of the Bible could be maintained only if it could be scrutinized like any other book. Charles W. Goodwin, a distinguished Egyptologist, lawyer and judge, was specifically condemned by the Victoria Institute founders for his paper "The Mosaic Cosmogony," in which he argued that the nebular hypothesis as understood by current geologists was seriously at odds with the Genesis creation account.

The second alarming publication was by Bishop John Colenso of Natal in 1862 and consisted of three volumes of a critical examination of the *Pentateuch* that eventually extended to seven volumes.[8] Bishop Colenso had served in Natal since 1853 and had produced a Zulu language grammar and dictionary as well as having translated instructional books, and large parts of the Bible. Answering the questions of his "intelligent Zulus" led him to the conclusion that a large portion of the Pentateuch was not historical. To make their point, the Victoria Institute founders quote him directly as saying, "the elementary truths of geological science flatly contradict the accounts of the Creation and the Deluge."[9]

These challenges provoked a defiant response from the founders of the Victoria Institute in the "*Scientia Scientiarum*" document. In reaction they laid down a no-nonsense, black-and-white logic for the operation of their organization:

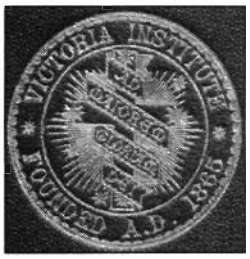
> If science and Scripture are at issue, plainly one of them is wrong—untrue ... it is perfectly clear that men must naturally range themselves either upon the side of Scripture or of science ... They cannot believe equally in both. They must hold to one or the other ... Those who rather distrust the deductions of science than the statements of Scripture are invited to join the new Society ... it may obviously be objected ... that [this] assumes science to be at fault ... the assumption truly represents the state of mind of those who propose to pursue this course ... they do distrust science and do not distrust the Scriptures.[10]

They go on to paint a simplistic picture of science that omits any sense of an exploratory process in which final judgment on theories is often delayed:

> The nebular theory was adopted by the geologists from the astronomers while indifferent to whether it was true or false ... Consider ... how much valuable time has been lost for science ... while this untenable theory has been blindly entertained.[11]

The attitude of the Victoria Institute founders is in striking contrast to Maxwell's sophisticated approach to

Figure 1. The Victoria Institute Seal, which appears on the copies of the publication *The Journal of the Transactions of the Victoria Institute*. Used with the permission of the Secretary to the Trustees of the Victoria Institute. Faith and Thought is the Institute's current operating name. Its web site is www.faithandthought.org.uk and its correspondence address is 110 Flemming Avenue, Leigh on Sea, Essex SS9 3AX, UK. Currently the Institute has a number of US members and welcomes greater interest from the States.



Article

James Clerk Maxwell's Refusal to Join the Victoria Institute

science. He saw it as a slow process requiring patience:

> It is the particular function of physical science to lead us to the confines of the incomprehensible and to bid us to behold and receive it in faith, till such time as the mystery shall open.[12]

Such a view found little to resonate with in the strident tones struck in "*Scientia Scientiarum*."

The attitude of the Victoria Institute founders is in striking contrast to Maxwell's sophisticated approach to science. He saw it as a slow process requiring patience.

Another feature of the "*Scientia Scientiarum*" document that would have disturbed Maxwell was its treatment of two of his scientific friends and guides who were confessing Christians. After making the charge that "the erroneous theories of the eminent have held their ground against the sounder views of less-reputed individuals,"[13] the author(s) cite a series of exchanges between one of the most eminent geologists of the era, Adam Sedgwick, professor of geology at Cambridge, and Sir William Cockburn, Dean of York, who is described as a "practical geologist." Cockburn began with a "straightforward attack upon the nebular theory" at the 1844 meeting of the British Association for the Advancement of Science. Professor Sedgwick replied to the effect that "these theories, if rightly understood, would confirm the truths of revelation."[14] Cockburn was not satisfied with Sedgwick's reply and continued to prod him and the Geological Society, eventually making the following challenge:

> You say that there are geological facts which prove the long existence of the world through many ages. I say there are no such facts ... Produce, then, some one or more of these facts; and if I cannot fairly account for them without supposing the very long duration of the earth, I am beaten! I am silenced! But if you do not produce such facts ... confess, or let your silence confess, that the whole doctrine of a pre-Adamite world has been a mistake.[15]

Because Sedgwick and the Geological Society leaders would not publish their letters to Dean Cochburn or enter into other forms of public debate, the "*Scientia Scientiarum*" author(s) depict them as faint-hearted and weak, too willing to adopt the scientific theories of the day and too timid to take on scripturally conservative challengers.

Maxwell's father, John, was an acquaintance of Sedgwick, and in a letter to his son soon after Maxwell began his undergraduate studies at Cambridge in 1850 he asked, "Have you called on Professor Sedgwick at Trinity ... Sedgwick is a great Don in his line, and if you were entered into Geology would be a most valuable acquaintance; and, besides, not going to him would be uncivil ..."[16] When Maxwell returned to Cambridge as professor of experimental physics in 1871, Sedgwick was still a faculty member. He died in 1873 and was honored by burial in the chapel at Trinity College.

Even closer family ties existed between the Clerk Maxwells and another Scottish family, the Thomsons. The senior member of that family, James Thomson, had been professor of mathematics at Glasgow University since 1832. His oldest son, William, entered Peterhouse College at Cambridge in 1841 and graduated in 1845, second in his class. William Thomson was appointed to the chair of natural philosophy at Glasgow University in 1846 where he remained until his retirement in 1899. In 1892 he was made a peer of the realm and took his seat in the House of Lords as Baron Kelvin of Largs.

Before Maxwell enrolled at Cambridge in 1850, the younger Professor Thomson was one of a number of people his father consulted about the suitability of colleges at Cambridge for his son.[17] After graduating in 1854, Maxwell remained at Cambridge for another year coaching pupils and studying for his Fellowship exam. During this time, his interest in electricity and magnetism grew in no small part as a result of correspondence with William Thomson. In his usual witty way, he summarized his debt to Thomson in a letter to him.

> I do not know the Game laws and Patent laws of science ... but I certainly intend to poach among your electrical images, and as for the hints you have dropped about the "higher electricity," I intend to take them. At the same time, if you happen to know where anything on this part of the subject is to be found it would be of great use to me.[18]

Given this close personal and professional friendship between William Thomson and James Clerk Maxwell, the scorn heaped upon Thomson by the author(s) of "*Scientia*

Scientiarum" would certainly have put Maxwell off. Referring to Thomson's papers on the thermal history of the sun and the earth, the author(s) asserted:

> Recent theories put forward by Professor Thomson ... assuming an intense heat in the sun are utterly irreconcilable with the Newtonian hypothesis ... Professor Thomson's theory destroyed the possibility of the sun being the theoretical centre of the solar system, if universal gravitation be anything like a plausible foundation.[19]

These criticisms of Thomson's papers by the "*Scientia*" author(s) seem to be based on a simplistic understanding of the state of matter in the sun. They noted that Newton's theory of Universal Gravitation requires the sun to be about 350,000 times more massive than the earth and that astronomical measurements indicate its volume is about 1,400,000 times that of the earth. "An intense heat in the sun" seems to be misinterpreted to mean the sun is in a high temperature gaseous state of density so low that within its measured size it can contain a mass only 1,000 times that of the earth, only a small fraction of the mass required. It is ironic that Thomson's attempts to deduce the thermal history of the sun and earth showed that they were formed much more recently than assumed by some of the more prominent contemporary geologists,[20] a result that should have been welcomed by the Victoria Institute founders. A further irony is that Professor Thomson was invited to give the Annual Address to the Victoria Institute in 1897 and more or less restated the positions he took in his papers in 1862.[21]

Maxwell's Broad Evangelicalism

The mid-nineteenth century was an era of turmoil for the established churches of Great Britain. The Disruption of 1843 in one of the churches in which Maxwell was raised, the Church of Scotland, resulted in the departure of a significant number of laypeople and clergy to form the Free Church. The immediate cause of the split was the unchecked authority exercised by aristocratic patrons in the selection of parish clergy; however, the evangelicals who withdrew had already been deeply distressed by the spread of theological liberalism within their national church. The other church dear to Maxwell's heart was the Church of England, which was also torn by theological discord. Maxwell's discussion of the situation in letters written while an undergraduate at Cambridge led his father to make the following complaint:

> Your dissertation on the parties in the Church of England goes far beyond any knowledge. I would need an explanatory lecture first, and before I can follow the High, Broad, and Low through their ramifications.[22]

A brief, simplified sketch of the parties his father listed will help to explain Maxwell's place in the theological spectrum.

Figure 2. Photograph of James Clerk Maxwell at Cambridge in 1855, holding his color top. Used with the permission of the Master and Fellows of Trinity College, Cambridge.

To facilitate discussion of the religious outlook of sophisticated nineteenth-century scientists, one scholar has distinguished between the "conservative" perspective of Cambridge professors Adam Sedgwick and William Whewell (geology and moral philosophy) and the "liberal" outlook of astronomer John Herschel and mathematicians Charles Babbage and Baden Powell with respect to their views of the Bible, natural theology, and miracles.[23] Theological "conservatives" of the nineteenth-century Church of England came in two very distinct varieties. High Churchmen (also referred to as Tractarians, Anglo-Catholics, or Puseyites) flourished as a consequence of the Oxford Movement of the 1830s. They sought authority for their rites and practices in the traditions and scriptural interpretations that evolved over the long history of the institutional church, and formulated their theology along Roman Catholic lines. The other "conservative" party was the Low Churchmen or Evangelicals, who traced their roots back through the Wesleys and Whitefield to the Protestant Reformation, the Church Fathers, and ultimately to the New Testament Church. They claimed the Bible as understood by the individual believer as the prime authority on which to base their beliefs and worship. The doctrine of the Atonement and the centrality of preaching in worship were particularly emphasized.

These two "conservative" parties in the Church of England had leaders who usually publicly opposed scholarship that questioned the historical accuracy or inspiration

Two important aspects of [Maxwell's] beliefs [are] First, ... he maintained an unswerving trust in Christ's atonement and love throughout his life and he continually identified himself with moderate evangelical thought. Second, the scope of his reading and correspondence and his circle of friends ... eagerly embraced ... theologians and skeptics alike.

of the Bible; however, they were often seriously at odds over the issues of ritual and the appointment of bishops. The evangelical social reformer and philanthropist Anthony Ashley-Cooper, the seventh Earl of Shaftesbury, who was the first president of the Victoria Institute, has been described as dedicated "to a constant battle against 'this frightful heresy, this leprous system' of Puseyism."[24]

The "liberal" clerics who made up the Broad Church party pursued the goal of including a wide range of theological viewpoints within the Church of England. Having abandoned both Church and Bible as sources of authority, they appealed to concepts that ranged from intuition and internal assurance to patterns in the lives of saints past and present and even to forms of mysticism. Liberal clergy, in signing the Thirty-nine Articles (the official doctrinal statements of the Church of England) and in reciting the services of the church, were in effect subscribing to at least some doctrinal statements that were at odds with their personal beliefs. Their consciences gained a measure of relief when Parliament passed the Clerical Subscription Act of 1865 that seemed to modify the assent implied in clerical oaths.[25] As stated in the previous discussion of *Essays and Reviews*, liberals were particularly motivated by the desire to make their revised version of Christianity fit with the historical and scientific ideas that prevailed in mid-nineteenth century Britain.

In this paper, Maxwell's theological outlook has been called "broad evangelicalism" to try to capture two important aspects of his beliefs. First, his personal correspondence and the comments of his friends both testify that he maintained an unswerving trust in Christ's atonement and love throughout his life, and he continually identified himself with moderate evangelical thought. Second, he eagerly embraced what he judged to be fruitful thought by all manner of theologians and skeptics alike and included them in his circle of friends.

Maxwell's letters, especially those to his wife, reveal his extensive knowledge and understanding of Scripture. In part these characteristics trace back to his mother's encouragement to memorize long Scripture passages in early childhood. While a preteenage student at Edinburgh Academy in the early 1840s, Maxwell usually attended both St. Andrew's Presbyterian and St. John's Scottish Episcopal churches on Sundays, where he was respectively under the teaching of Rev. Thomas Jackson Crawford and Dean Edward Bannerman Ramsey, both of whom were evangelicals. At Cambridge, many of his close friends were committed evangelicals, many of whom later took leading places in the Church of England. For much of his adult life, he was a ruling elder in the Corsock[26] and Parton[27] Presbyterian churches, which were near his family estate, Glenlair, in the Galloway district of southwest Scotland. Thus, it is clear that in nearly every stage of his life, James Clerk Maxwell was enfolded by the godly influences of friends and family.

However, Maxwell's evangelicalism was more than cultural. During his Cambridge undergraduate studies, he visited an evangelical rector, C. B. Tayler, and his family in the summer of 1853. Maxwell was suddenly taken seriously ill and during his recovery under the care of this pious family, he gained "a new perception of the Love of God."[28] This event has been interpreted as a conversion experience by one historian.[29] In short passages in his personal correspondence, Maxwell made clear the depth of his faith. In a later letter to Rev. Tayler, he wrote of his personal moral situation:

> I maintain that all the evil influences that I can trace have been internal and not external, you know what I mean—that I have the capacity of being more wicked than any example that man could set for me, and that if I escape, it is only by God's grace helping me to get rid of myself, partially in science, more completely in society—but not perfectly except by committing myself to God as the instrument of His will, not doubtfully, but in the certain hope that that Will will be plain at the proper time.[30]

He clearly understood his own sinfulness and his personal need of God's grace and guidance.

In a letter to Miss Katherine Dewar in May 1858 (just before their marriage in June 1858), he related his enthusiasm for an expository sermon by his friend Rev. Lewis

Campbell delivered to the parish Campbell was serving in the south of England:

> In the afternoon ... Lewis preached on "Ye must be born again," showing how respectable a man it was addressed to, and how much he, and all the Jews, and all the world, and ourselves, needed to be born from above (for that is the most correct version of the word translated "again"). Then he described the changes on a man new-born, and his state and privileges. I think he has got a good hold of the people, and will do them good and great good.[31]

His synopsis of the sermon leaves no doubt that his grasp of the doctrine of regeneration is in accord with mainstream evangelicalism.

The high regard Maxwell had for the Bible is indicated in the recollections of a Cambridge student of the 1870s:

> At Clerk Maxwell's we did our papers in the dining-room and adjourned for lunch to an upper room, probably the drawing-room, where Clerk Maxwell himself presided. The conversation turned on Darwinian evolution; I can't say how it came about, but I spoke disrespectfully of Noah's flood. Clerk Maxwell was instantly aroused to the highest pitch of anger, reproving me for want of faith in the Bible! I had no idea at the time that he had retained the rigid faith of his childhood, and was, if possible, a firmer believer than Gladstone in the accuracy of Genesis.[32]

It is clear that Maxwell did not accept the position common to many liberals of his day, namely, that exceptional and mysterious events in the Bible must be deleted to accommodate sophisticated Victorians.

Throughout his life, Maxwell consciously developed the intellectual as well as devotional dimensions of his faith. Lewis Campbell, his friend and biographer, notes that after church he "loved to bury himself in works of the old divines."[33] He also read extensively and critically works of contemporary theology, philosophy, and history. His many letters to his friends and family contain lists of books he was reading, with thoughtful comments about many of them. What is particularly noteworthy is the attention he gave to non-evangelical thought and his respect for serious challengers and the positive aspects of their work. For example, Lewis Campbell remembers discussing with him J. Macleod Campbell's 1854 book on the Atonement, which contained ideas that had earlier been condemned by some evangelicals as heretical. Maxwell's reaction was "we want light."[34] In a letter to Lewis Campbell in 1857, he remarked upon reading Henry T. Buckle's controversial *History of Civilization in England*, one of the first "scientific" histories, that it is "a bumptious book, strong positivism ... but a great deal of actually original matter, the true result of fertile study ..."[35]

Maxwell also was critical of some forms of evangelicalism. The Disruption of 1843 had split Maxwell's own church, the Church of Scotland, when a large group of evangelicals departed to form the Free Church. A brief thought about this event appears in one of his letters.

> The ferment about the Free Church movement had one very bad effect. Quite a few young people were carried away by it; and when the natural reaction came, they ceased to think about religious matters and became unable to receive fresh impressions.[36]

This comment about the effects of Free Church enthusiasm reflects his uneasiness about excessive emotionalism in Christianity.

It is clear that Maxwell did not accept the position common to many liberals of his day, namely, that exceptional and mysterious events in the Bible must be deleted to accommodate sophisticated Victorians.

Another aspect of Maxwell's theological outlook came from his close friendship with a number of theological scholars who did not fit the evangelical mold. His close friend from his days at Edinburgh Academy and his eventual biographer, Lewis Campbell, was an ordained minister in the Church of England but spent most of his life as a Greek scholar at St. Andrew's University. In his undergraduate days at Oxford, Campbell was deeply influenced by the liberal theology of his tutor, Benjamin Jowett.[37] Jowett was one of the churchmen who contributed an article to the book *Essays and Reviews*, the work by theological liberals referred to previously as having helped to provoke the formation of the Victoria Institute.

As an undergraduate at Cambridge, Maxwell was closely connected with Fenton J. A. Hort, the theologian and Greek New Testament scholar. They met through their election to the Select Essay Club, also known as the "Apostles," a club of twelve of the best minds among Cambridge students whose goal was to learn "from people of the most opposite opinions."[38] When Maxwell returned to Cambridge as a professor in 1871, he joined with Hort, B. F. Westcott, J. B. Lightfoot and other faculty to form

The theologian who had the greatest influence on Maxwell was Frederick Dennison Maurice known for his spiritual leadership of the Christian Socialist Movement and his Broad Church theological views. His teachings emphasized the centrality of a personal relationship between a loving God and humanity.

another scholarly club to discuss speculative questions.[39] In addition to the compilation of an accurate New Testament text by Hort and Westcott, these three great Greek New Testament scholars were members of the committee that produced the Revised English Version of the New Testament of 1881 and wrote commentaries and textual criticism that was not always welcomed by contemporary conservatives.[40]

However, the theologian who had the greatest influence on Maxwell was Frederick Dennison Maurice known for his spiritual leadership of the Christian Socialist Movement and his Broad Church theological views. His teachings emphasized the centrality of a personal relationship between a loving God and humanity. Maxwell made many references to Maurice in his letters to his family and close friends, some of which were critical of a number of Maurice's theological positions.[41] Nevertheless, Hort observed that he thought that reacting to Maurice gave Maxwell "considerable aid in the adjustment and clearing up of his own beliefs on the highest subjects."[42]

Maxwell's study of and eventual friendship with Maurice was significant for him in a number of ways. In 1854 Maurice founded in London a Workingmen's College to provide a university level education for clerks and artisans. Soon his followers began similar institutions in other cities. The Workingmen's Colleges were practical outcomes of Maurice's belief in the moral basis of education and the Church's obligation to serve all of society. Maxwell was inspired by Maurice's vision and gave considerable time to evening classes and derived much satisfaction from teaching for over ten years in the Workingmen's Colleges in Cambridge, Aberdeen, and finally London.

Maxwell's spirit of toleration for differing theological views within the Church is traceable at least in part to Maurice and Julius Hare. Maurice's emphasis on the love of God led him to be "obsessive in his search for spiritual unity within society and a determined enemy of the traditional causes of dissention."[43] Maurice in turn was strongly influenced by Julius Hare, his most influential Cambridge teacher and later his brother-in-law. After leaving his post at Cambridge, Hare became Archdeacon of Lewes and in that role wrote numerous sermons addressed to the Anglican clergy in which he lamented the prevailing evangelical spirit that led so frequently to accusations of heresy.[44] In a letter to one of his aunts, Maxwell commented, "I have been reading Archdeacon Hare's sermons which are good."[45] Having imbibed Maurice's spirit of toleration, Maxwell would frequently remark to his friend Lewis Campbell, "I have no nose for heresy."[46]

Another one of Maurice's principles which parallels Maxwell's philosophy was

> a fearless regard for truth, ... a protest against isolating the Christian faith from science and philosophy, and the necessity of meeting and dealing with all doubts and questions in a frank and honest way.[47]

Maxwell declared his personalized version of this principle in a letter to Lewis Campbell written just before he came to know Maurice well. He wrote:

> The Rule ... is to let nothing be wilfully left unexamined. Nothing is to be holy ground ... Now I am convinced that no one but a Christian can actually purge his land of these holy spots ... Christianity – that is, the religion of the Bible – is the only scheme or form of belief which disavows any possessions on such a tenure.[48]

Lewis Campbell often referred to Maxwell's evangelical world view, but he also noted that Maxwell was never "completely identified with any particular school of religious opinion."[49] Maxwell himself identified with evangelical principles when he confessed to Campbell in a letter that "I believe with the Westminster Divines and their predecessors *ad Infinitum* that 'Man's chief end is to glorify God and to enjoy him forever.'"[50] Nevertheless, Maxwell was not dismayed by challenges to the traditional literal interpretations of Scripture, and he seems to prefer a Church where the tares and wheat grow together to one where charges of heresy enforce a strict orthodoxy. In contrast to Maxwell's view, the Victoria Institute seemed to be setting up a "holy ground" in their defense of prevailing literal interpretations of Scripture, particularly the Mosaic writings.

Maxwell's View of Relations between Science and Theology

The last sentence in Maxwell's draft of his reply to the Victoria Institute invitation is incomplete, but it seems to be starting a thought about the nature of scientific knowledge.

> For it is the nature of Science, especially of those branches of Science which are *continually spreading into unknown regions to be continually* ...[51]

A hint at how he might have continued these thoughts is found in his Inaugural Lecture given at Marishal College, Aberdeen, in 1856. He has a picturesque view of the ever increasing, ever changing, and ultimately limited nature of scientific knowledge.

> While we look down with awe into these unsearchable depths and treasure up with care what with our little line and plummet we can reach, we ought to admire the wisdom of Him who has so arranged these mysteries that we can first find that which we can understand at first and the rest in order so that it is possible for us to have an ever increasing stock of known truth concerning things whose nature is absolutely incomprehensible.[52]

Maxwell's references to the "unsearchable depths" of the natural world, the "little line and plummet" of the investigator, and the "truth concerning things whose nature is absolutely incomprehensible" reflect the fact that he recognized the conditional and provisional nature of most scientific knowledge. When he was a nineteen-year-old student at Cambridge, he reflected on human knowledge using an interesting mathematical perspective:

> The true logic for this world is the Calculus of Probabilities ... Understanding, acting by the laws of right reason, will assign to different truths ... different degrees of probability. Now, as the senses give new testimonies continually ... it follows that the probability and credibility of their testimony is increasing day by day, and the more man uses them the more he believes them ... When the probability ... in a man's mind of a certain proposition being true is greater than that of its being false, he believes it with a proportion of faith corresponding to the probability ... When a man thinks he has enough of evidence for some notion of his he sometimes refuses to listen to any additional evidence pro or con, saying "It is a settled question."[53]

Thus, according to Maxwell, scientific knowledge undergoes a continual process of refinement not only with respect to its form but also with respect to its certainty.

Maxwell's reluctance to link the particulars of shifting scientific thought with biblical interpretation is shown in letters he exchanged in 1876 with Anglican Bishop C. J. Ellicott (who was an accomplished New Testament scholar with whose writings Maxwell was acquainted). The Bishop asked Maxwell whether he agrees with the theologians who claim that creation of light on the first day and the sun on the fourth day "involves no serious problem." Maxwell replied as follows:

> If it were necessary to provide an interpretation of the text in accordance with the science of 1876 (which may not agree with that of 1896), it would be very tempting to say that the light of the first day means the all-embracing aether ... But I should be very sorry if an interpretation founded on a most conjectural scientific hypothesis were to get fastened to the text in Genesis ... The rate of change of scientific hypothesis is naturally so much more rapid than that of biblical interpretations, so that if an interpretation is founded on such an hypothesis, it may help to keep the hypothesis above ground long after it ought to be buried and forgotten.[54]

For Maxwell, any reconciliation of the particulars employed in the current formulation of science with religious beliefs is subjective and transitory and has little enduring value.

But perhaps the most surprising part of Maxwell's views was expressed in his Victoria Institute reply in the sentence that immediately precedes the sentence fragment discussed above.

> But I think that the results which each man arrives at in his attempts to harmonize his science with his Christianity ought not to be regarded as having any significance except to the man himself and to him only for a time and should not receive the stamp of a society.[55]

Thus, for Maxwell, any reconciliation of the particulars employed in the current formulation of science with religious beliefs is subjective and transitory and has little enduring value. Such efforts, when poorly done could even bring reproach. For example, Maxwell was especially scornful of the use of the aether concept in *The Unseen Universe*,[56] a book written by his friends and fellow evangelical scientists, Peter Guthrie Tait and Balfour Stewart. They speculated that the presence of a second aether would form the basis of an eternal, invisible universe where human

souls receive their form and which provides "continuity" with the physical universe thus explaining the immortality of the soul. The immense popularity of *The Unseen Universe* did not deter Maxwell from ridiculing it in a review in *Nature*. He used an ironical reference to the anti-materialism in one of the dialogues of the idealist philosopher George Berkeley.

> We shall therefore make the most of our opportunity when two eminent men of science ... have betaken themselves to those blissful country seats where Philonous long ago convinced Hylas that there can be no heat in the fire and no matter in the world.[57]

Maxwell's belief that "in physical speculation there can be nothing vague or indistinct"[58] led him to point out that the authors of *The Unseen Universe* were suggesting "a question far beyond the limits of physical speculation."[59]

Although Maxwell expressed his considerable doubts about the objective value of linking biblical interpretations with contemporary scientific theories, he did not call for the divorce of theology from science or science from theology.

Although Maxwell expressed his considerable doubts about the objective value of linking biblical interpretations with contemporary scientific theories, he did not call for the divorce of theology from science or science from theology. As he said in the Aberdeen Inaugural Address:

> Those who intend to pursue the study of theology will also find the benefit of a careful and reverent study of the order of creation.[60]

Likewise in his reply to the Victoria Institute he commented:

> I think Christians whose minds are scientific are bound to study science that their view of the glory of God may be as extensive as their being is capable of.[61]

He seems to call for continual interaction between the theologian and the scientist, but does not favor a detailed harmonization of their respective insights.

For Maxwell a more profound issue than harmonization was specialization. In contrast to the preponderance of non-specialists in the Victoria Institute, Maxwell acknowledged and welcomed the professionalization of science:

> As the boundaries of science are widened, its cultivators become less philosophers and more specialists ... This is the inevitable result of the development of science, which has made it impossible for any one man to acquire a thorough knowledge of the whole ...[62]

This view is in sharp contrast with the viewpoint of the "*Scientia Scientiarum*" author(s) who lament the fact that "the sciences have been too much separated and the great majority have devoted their minds to the details of some narrow speciality."[63] One aspect of this professionalization was the early nineteenth-century struggle led by some of Maxwell's older Cambridge faculty colleagues like Adam Sedgwick and William Whewell, who maintained their commitment to the Christian faith while arguing the right to develop scientific ideas free from restraints imposed by theologians or churches.[64]

Maxwell also respected the professionalism developing in theology. Through their writings or in some cases by personal interaction, Maxwell knew the theologians of his day. He even expressed at times his preference for the company of those interested in theological matters to those whose exclusive focus was science.[65] Like Newton he dedicated a considerable portion of his intellectual efforts to matters of theology but unlike Newton he did "not wish to be set up as an authority on subjects (such as historical criticism) which, however interesting to him, he had not had leisure to study exhaustively."[66]

Furthermore, Maxwell's perception of the independent value of both science and theology led him to a different conclusion than the founders of the Victoria Institute as to what was the crucial theological issue of the last half of the nineteenth century. For the Victoria Institute founders, it was the fact that many prominent scientists and theologians were no longer conforming their scientific theories to traditional, more or less literal interpretations of the Bible. For Maxwell, it was the rising influence of scientific naturalism, which implied a diminishing influence for theology and religion.

Scientific naturalism was being skillfully mixed with scientific popularization by the masterful rhetoric and persuasive writing of scientists like John Tyndall, Thomas Huxley, and a host of others both in and out of the "X Club."[67] For these men, science was the only truth-seeker and problem-solver humankind needed. Religion and its theology were

nothing but a source of obscurantism and obstruction. As historian Colin Russell has described their plan:

> Religion was not allowed to usurp the role of science but science (or scientific naturalism) was to take every opportunity to invade the territory of religion.[68]

Tyndall boldly asserted the strategy in his famous Belfast Address to the British Association for the Advancement of Science in 1874:

> We claim and we shall wrest from theology the entire domain of cosmological theory. All schemes and systems which thus infringe upon the domain of science must ... submit to its control and relinquish all thought of controlling it.[69]

Maxwell answered Tyndall's outrageous claims for the supremacy of science indirectly through a humorous poem published under a pseudonym in a popular Scottish magazine in 1874. A few lines from the poem illustrate its tenor:

> *From nothing comes nothing, they told us,*
> *nought happens by chance, but by fate;*
> *There is nothing but atoms and void,*
> *all else is mere whims out of date!*
> *Then why should a man curry favour*
> *with beings who cannot exist,*
> *To compass some petty promotion*
> *in nebulous kingdoms of mist?*[70]

The founding committee of the Victoria Institute spelled out in "*Scientia Scientiarum*" that their primary concern was to promote an immediate and literal agreement between scientific theory and biblical theology. In contrast, Maxwell summed up his theological expectations concerning the process of doing science in a poem he wrote while a Cambridge undergraduate, which reads in part:

> *Teach me so Thy works to read*
> *That my faith – new strength accruing –*
> *May from world to world proceed,*
> *Wisdom's fruitful search pursuing;*
> *Till, Thy truth my mind imbuing,*
> *I proclaim the Eternal Creed,*
> *Oft the glorious theme renewing*
> *God our Lord is God indeed.*[71]

Maxwell's participation in the development of scientific understanding was for him an act of worship, part of a careful reading of God's revelation in nature.[72]

Concluding Remarks

In summary, James Clerk Maxwell's refusal to join the Victoria Institute first of all stemmed from its narrow defensive aims and its inclination to turn on men who Maxwell saw as Christian comrades. Second, its theological banner was planted far to the right of Maxwell's broad evangelicalism. Finally, Maxwell's view of the growing professionalism of science and theology led him to oppose

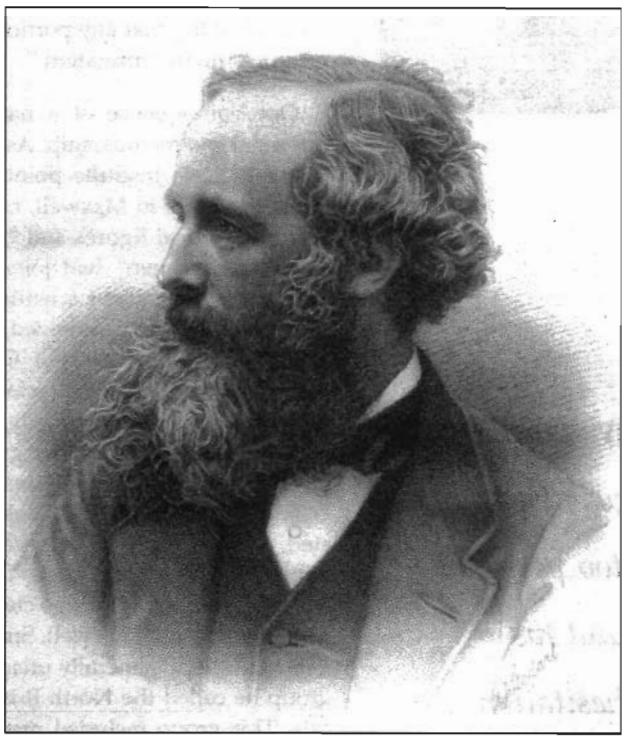


Figure 3. Steelplate engraving by Stodart after a photograph by Fergus of Greenock which appeared as a frontispiece in Campbell and Garnett's *The life of James Clerk Maxwell.* By courtesy of Edinburgh City Libraries.

scientific naturalism without trying to reestablish the dominion of theology over science.

In a larger sense, James Clerk Maxwell's refusal to join the Victoria Institute can be interpreted as symptomatic of harmful flaws in the outlook of both the Victoria Institute and Maxwell himself. The Institute initially adopted a perspective that proved to be too narrow and thus limited its effectiveness. On the other hand, the toleration that Maxwell typified was so broad that it nullified most attempts at church discipline in matters of theology.

"*Scientia Scientiarum*" and the other circulars used to promote the founding of the Victoria Institute were too narrow in several ways. First, they focused extensively on the issues involving contemporary geology and Genesis. The impact of Darwin's *Origin of Species* (1859) is never mentioned. Furthermore, the author(s) supported an explanation of geological strata in terms of Flood Geology, a viewpoint that had few adherents in the Royal Geological Society in the 1860s. Second, the view of biblical interpretation the author(s) adopted was strict literalism. They charged their opponents with being willing to "force upon" Scripture new interpretations that are nothing but the "explaining away of plain language, which requires no interpretation in order to be understood."[73] The existence of a number of distinct evangelical theological traditions each claiming to come directly from the Bible should have made the Victoria Institute founders a bit more cautious

Article

James Clerk Maxwell's Refusal to Join the Victoria Institute

about claiming that any portion of Scripture "requires no interpretation."

One consequence of a narrow outlook was a narrow membership. As the Secretary of the Victoria Institute pointed out in his invitation letter to Maxwell, numerous outstanding clerical figures and "many literary and scientific men" had joined. However, only a few prominent scientists who were professing evangelicals joined. In a recently published study, historian Crosbie Smith identified three informal scientific-cultural groups that vied for credibility and prominence as the concept of energy was shaped into the controlling idea of physical science.[74] Besides the devotees of a theologically liberated, professionalized science inspired by Huxley, Tyndall, and their "X Club" colleagues and the Cambridge clerical dons led by Sedgwick and Whewell, Smith identified a third, hitherto generally unacknowledged, group he called the North British Evangelicals. This group included many prominent physical scientists of the period: James Joule, William Thomson (Lord Kelvin), Peter Guthrie Tait, Fleeming Jenkin, Macquorn Rankine, Balfour Stewart, and James Clerk Maxwell. It is noteworthy that none of this group joined the Victoria Institute between the time of its founding (1865) and the formal invitation to Maxwell (1875). The failure to attract many prominent evangelical men of science clearly diminished its influence in the science-religion dialogue of the mid- to late-Victorian era. In a classic history of the Victorian Church, the Victoria Institute has received only a two-sentence reference.[75]

It should be noted that the views set forth in the founding documents of the Victoria Institute were modified as the organization matured. Cambridge University physicist George Gabriel Stokes, who was one of Maxwell's undergraduate teachers and a friend and colleague in later life, succeeded the great social reformer Ashley-Cooper as President in 1886. He reflected a much changed perspective in remarks recorded in the Institute Journal.

> We all admit that the book of Nature and the book of Revelation come alike from God, and that consequently there can be no real discrepancy between the two if rightly interpreted. The provinces of Science and of Revelation are, for the most part, so distinct that there is little chance of collision. But if an apparent discrepancy should arise, we have no right on principle, to exclude either in favour of the other. For however firmly convinced we may be of the truth of revelation, we must admit our liability to err as to the extent or interpretation of what is revealed; and however strong the scientific evidence in favour of a theory may be, we must remember that we are dealing with evidence which, in its nature, is probable only, and it is conceivable that wider scientific knowledge might lead us to alter our opinion.[76]

Had he lived to read these remarks by his mentor and friend Stokes, Maxwell might have been more favorably disposed toward the Victoria Institute and its mission.

Turning to Maxwell's attitude of theological toleration, it should be noted that his willingness to take on the scientific naturalists, if only to a limited extent, is commendable. However, his failure to detect the perils of theological liberalism is lamentable. Heresy charges by more conservative evangelicals were probably too glibly raised in some instances, but there were a number of important cases in both the Church of Scotland and the Church of England in which the verdicts, in effect, tolerated views that were far from historic Christian orthodoxy. For instance, two of the contributors to *Essays and Reviews*, Rowland Williams and Henry B. Wilson, were tried in church courts for their views on inspiration, justification, and the future state of the dead. They were initially found guilty on some of the charges and sentenced to suspension for one year. On appeal, the verdict was overturned. This and other cases meant that "few clergymen, whatever they taught, were in danger of prosecution because their sermons or books contradicted the articles of religion."[77]

Maxwell's tolerant approach was shared by far too many evangelicals, and his claim to have "no nose for heresy" proved to be no virtue in Victorian Britain as theological liberalism prospered. Maxwell's faith was basically too personal and his hesitation about speaking out concerning matters outside his area of expertise severely limited his influence at a critical time in church history. ◆

Maxwell's faith was basically too personal and his hesitation about speaking out concerning matters outside his area of expertise severely limited his influence at a critical time in church history.

Notes

[1]P. M. Harman, *The Natural Philosophy of James Clerk Maxwell* (Cambridge: Cambridge University Press, 1998), 1.
[2]"*Scientia Scientiarum*," *The Journal of the Transactions of the Victoria Institute* 1 (1867): 5. Following the completion of this paper, a web site with the full text of "*Scientia Scientiarum*" has been discovered. The address is www.creationism.org/victoria/. The web site also attributes the authorship to James Reddie who was the founding Secretary of the Victoria Institute.
[3]Ibid., 1:7.
[4]Letter from F. Petrie, 12 March 1875, University Library, Cambridge, Add. MSS 7655, II, 95. A shortened version of the letter also appears on pages 404–5 of the Campbell and Garnett biography cited in reference 16 below.
[5]Ibid.
[6]"*Scientia Scientiarum*," 1:5–29.
[7]Henry B. Wilson, et al., *Essays and Reviews* (London: Parker and Son, 1860). An annotated critical edition has recently been published: *Essays and Reviews: The 1860 Text and Its Reading*, ed. Victor Shea and William Whitla (Charlottesville: University Press of Virginia, 2000).
[8]John William Colenso, *The Pentateuch and Book of Joshua Critically Examined* (London: Longman, Green, Longman, Roberts and Green, 1862).
[9]"*Scientia Scientiarum*," 1:8.
[10]Ibid., 1:7–9.
[11]Ibid., 1:21, 22.
[12]Inaugural Lecture, Aberdeen, 3 November 1856, *The Scientific Letters and Papers of James Clerk Maxwell*, vol. 1, ed. P. M. Harman (Cambridge: Cambridge University Press, 1990), 1:427 (hereafter cited as *Scientific Letters and Papers*).
[13]"*Scientia Scientiarum*," 1:10–1.
[14]Ibid., 1:17.
[15]Ibid., 1:19.
[16]Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell* (Cambridge: MacMillan and Co.,1882), 150. A printable version of the entire biography is available on the web. James C. Rautio, the founder and president of Sonnet Software Inc., has made it available at the following web site: www.sonnetusa.com/bio/maxwell.asp.
[17]Ibid., 146.
[18]Maxwell to William Thomson, 13 September 1855, *Scientific Letters and Papers*, 1:323.
[19]"*Scientia Scientiarum*," 1:28–9.
[20]Silvanus P. Thompson, *The Life of William Thomson* (London: MacMillan and Co., 1910), 535.
[21]Ibid., 997–8, 1095.
[22]Campbell and Garnett, *Life of Maxwell*, 194.
[23]Michael Ruse, "The Relationship Between Science and Religion in Britain, 1830–1870," *Church History* 44 (1975): 505–23.
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[25]Owen Chadwick, *The Victorian Church* (New York: Oxford University Press, 1966), 2:132–3.
[26]Rev. George Sturrock, *Corsock Parish Church: Its Rise and Progress* (Castle-Douglas: Adam Rae, 1899), 11.
[27]Campbell and Garnett, *Life of Maxwell*, 371.
[28]Ibid., 170.
[29]Paul Theerman, "James Clerk Maxwell and Religion," *American Journal of Physics* 54 (1986): 312–7.
[30]Campbell and Garnett, *Life of Maxwell*, 188.
[31]Ibid., 311.
[32]Karl Pearson, "Old Tripos days at Cambridge," *Mathematical Gazette* 20 (1936): 27–36, quoted in Crosbie Smith, *The Science of Energy* (Chicago: The University of Chicago Press, 1998), 307.
[33]Campbell and Garnett, *Life of Maxwell*, 321.
[34]Ibid., 431 n.
[35]Ibid., 295.
[36]Ibid., 420.
[37]John Burnet, "Lewis Campbell," in *Dictionary of National Biography, Second Supplement*, vol. 1, ed. Sidney Lee (London: Smith, Elder and Co., 1901), 300–1.
[38]Peter Allen, *The Cambridge Apostles* (Cambridge: Cambridge University Press, 1978), 4.
[39]Campbell and Garnett, *Life of Maxwell*, 366, 418, 434.
[40]Herbert Exon, "Fenton J. A. Hort," in *Dictionary of National Biography, First Supplement*, vol. 2, ed. Sidney Lee (London: Smith, Elder and Co., 1901), 443–7.
[41]Campbell and Garnett, *Life of Maxwell*, 172, 191, 192, 194, 218.
[42]Ibid., 418.
[43]Allen, *Cambridge Apostles*, 205.
[44]Julius C. Hare, *Charges to the Clergy of the Archdeaconry of Lewes: 1840 to 1854* (Cambridge: 1856).
[45]Campbell and Garnett, *Life of Maxwell*, 170 n., 184.
[46]Ibid., 322.
[47]Torben Christensen, *The Divine Order: A Study in F. D. Maurice's Theology* (Leiden: E. J. Brill, 1973), 17.
[48]Campbell and Garnett, *Life of Maxwell*, 178, 179.
[49]Ibid., 170 n.
[50]Ibid., 158.
[51]Ibid., 405.
[52]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:427.
[53]Campbell and Garnett, *Life of Maxwell*, 143–4.
[54]Ibid., 393–4.
[55]Ibid., 405.
[56]Peter Guthrie Tait and Balfour Stewart, *The Unseen Universe or Physical Speculations on a Future State* (London: Macmillan and Co., 1875).
[57]James Clerk Maxwell, "Paradoxical Philosophy," in *The Scientific Papers of James Clerk Maxwell*, 2 vols., ed. W. D. Niven (1890; reprint 2 vols. in 1, New York: Dover Publications, 1965), 2:756 (hereafter cited as *Scientific Papers*).
[58]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:425.
[59]James Clerk Maxwell, "Ether," in *Scientific Papers*, 2:775.
[60]Inaugural Lecture, Aberdeen, 3 November 1856, *Scientific Letters and Papers*, 1:430.
[61]Campbell and Garnett, *Life of Maxwell*, 404–5.
[62]James Clerk Maxwell, "Whewell's Writings and Correspondence," in *Scientific Papers*, 2:528.
[63]"*Scientia Scientiarum*," 1:24.
[64]Ruse, "Science and Religion in Britain," 505–23.
[65]Ivan Tolstoy, *James Clerk Maxwell* (Chicago: University of Chicago Press, 1981), 56–7.
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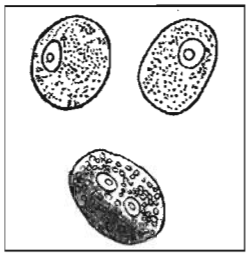
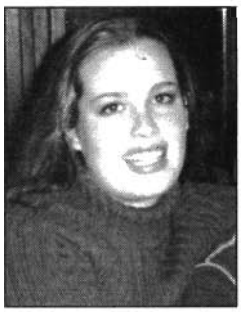
[71]Ibid., 596.
[72]Martin Goldman, *The Demon in the Ether* (Edinburgh: Paul Harris Publishing, 1983), 69.
[73]"*Scientia Scientiarum*," 1:10.
[74]Crosbie Smith, *The Science of Energy* (Chicago: The University of Chicago, 1998).
[75]Chadwick, *The Victorian Church*, 2:25.
[76]George Stokes, "Note by the President on the Origin of the Books of Revelation, and of Nature," *The Journal of the Transactions of the Victoria Institute* 22 (1888–1889): 22.
[77]Chadwick, *The Victorian Church*, 2:133.



An Evaluation of Three Religious Perspectives on Stem Cell Research

Kristyn A. Mannoia



Kristyn A. Mannoia

Ian Barbour, in his book When Science Meets Religion, *outlines four relationships between the fields of science and religion. This paper explores the usefulness of these categories in developing a religious perspective on stem cell research. First, I present Barbour's four possible relationships between science and religion as they could be articulated in the context of bioethics. Second, I consider which of Barbour's models are forwarded in Orthodox Jewish and Roman Catholic perspectives on stem cell research. Finally, I present an evangelical Wesleyan appraisal of stem cell research as it might be crafted if Barbour's model were introduced as a structural resource at the outset.*

Ian Barbour, an authority on the interplay of science and religion, has developed four possible relationships between science and religion ...

Throughout human history, technological advances have emerged as issues of controversy for both scientific and religious communities. Both spheres have had to determine the extent to which the other has influence, and society has had to integrate information from both spheres to define the ethics and morality of new technologies within that context. Of current concern and debate is the development of human embryonic stem cell (hES) technology. In theory this technology presents nearly limitless possibilities for new treatments and cures for diseases that are ravaging the world today. However, these potential benefits come with a cost. In order to obtain these miracle cells, an embryo must be sacrificed. Is this price too high? Religion and science intersect around this issue.

Ian Barbour, an authority on the interplay of science and religion, has developed four possible relationships between science and religion that can be applied to the issue of hES research: Conflict, Independence, Dialogue and Integration.[1] In this paper, I will briefly describe these four frameworks, and then will consider how three important Judeo-Christian religious viewpoints on hES research—the Orthodox Jewish, Roman Catholic, and evangelical Wesleyan—can be classified into one of these frameworks. Finally, based on these classifications, I will make some tentative conclusions concerning the ethics of hES research.

Barbour's Frameworks

Conflict

The first relationship outlined by Barbour is Conflict. It is the premise that religion and science make opposing claims about the same area and both cannot be correct. Thus, one must choose between religion and science as the ultimate truth. Two very different examples of the science-religion Conflict given by Barbour are the viewpoints he calls scientific materialism and biblical literalism. He defines scientific materialism as the premise that matter is the ultimate reality and all knowledge and understanding comes from the scientific method. It is empirical in its epistemology and in it, interaction between science and religion results in the dismissal of all scientifically untestable religious claims. In contrast, the view he calls biblical literalism asserts that the Bible is the sole source of truth and the ultimate authority. Biblical literalists hold that the Bible is

Kristyn A. Mannoia, *a student ASA member, is currently an undergraduate student at Azusa Pacific University, working toward double degrees in biology and philosophy. She plans to graduate in 2005, take a year off from school, and then attend medical school. She loves to travel and in her spare time she teaches piano. Kristyn can be contacted by e-mail at: kmellowyellow@apu.edu.*

perfectly inerrant and authoritative on scientific matters; therefore the interaction between science and religion results in the dismissal of some claims of modern science. Both scientific materialism and biblical literalism are examples of conflicts between religion and science.[2]

In terms of stem cell research, Conflict appears to be a predominant framework used by conservative, far-right Christian groups and also by materialist, scientific communities, including many people not officially affiliated with these groups, but ascribing to their views nonetheless.[3] On the one hand, groups such as the Christian Coalition of America say that science today has gone well past the limitations God set for us.[4] They would describe the regular occurrence of abortion today as a violation of the sanctity of human life, and would consider embryonic stem cell research as an expansion of that violation. Biblical literalists say embryonic stem cell technology further indulges our sinful desire to manipulate creation and usurp God's position as Creator. On the other hand, much of mainstream scientific culture, which could be classified as scientific materialism, has set aside religious considerations altogether when developing and evaluating new technologies.[5] In the case of hES research, scientific materialists would consider the embryo, from which stem cells are derived, as merely a group of cells. From these undifferentiated cells, many different cell types could be grown and used to cure many currently incurable diseases, such as Parkinson's, spinal cord injury, and even cancer. This is the end toward which materialists work, regardless of the means. A scientific materialist would not associate an embryo with personhood or religious significance, but instead would see it as a potentially useful resource. With no moral dilemma in using an embryo for research and therapeutic purposes, utilitarian principles may prevail. Scientific materialists would see the use of embryos to derive cells for treating diseases as a morally and ethically sound act.

Independence

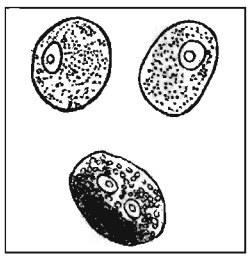
Barbour considers Independence to be a position taken by many evangelical conservative Christians, as well as neo-orthodox Protestants and various scientists, who maintain that science and religion exist on different planes that should not intersect. Religious subscribers to an Independence view focus mainly on Christ as the center of everything. The only way to know God is through his revelation, not through human scientific discovery. They say that the Bible should be taken seriously, but not literally. This avoids any conflict with the scientific realm. Barbour uses the testimony of Langdon Gilkey, who was a witness at the Arkansas creation trial, to make four points of distinction. First, science deals with objective, public data while religion has to do with inner experiences. Second, science asks "how" questions, whereas religion addresses "why" questions. Third, logic and experimentation are the final authorities in science, but God is the ultimate authority in religion. Lastly, science uses quantitative language and makes predictions that can be tested while religion depends on symbolism to represent God.

When applied to stem cell research, the Independence viewpoint results in a compartmentalized understanding of the limits of science. Since proponents believe that the Bible only reveals Christ and should not be taken literally, its components can be disregarded as metaphorical and nonscientific.

When applied to stem cell research, the Independence viewpoint results in a compartmentalized understanding of the limits of science. Since proponents believe that the Bible only reveals Christ and should not be taken literally, its components can be disregarded as metaphorical and nonscientific. Thus, almost any avenue of research is available to scientists studying stem cells so long as they avoid "why" questions or symbolic language purporting to represent God.

Dialogue

Barbour contends that while there are distinctions between the fields of religion and science, they can learn some things from each other. This forms the basis of the Dialogue perspective. This approach focuses on similarities in the nature of the presuppositions, methods, and concepts in each field rather than the differences between them. Limits to the similarities, however, raise questions regarding where one field ends and the other begins. For instance, scientists are able to empirically observe order and pattern in the universe, though they are not able to identify the source of this rationality. Here science is limited and must appeal to metaphysics. A scientist with a Christian world view would hold that in some fashion God created the heavens and the earth. Meanwhile a naturalist, one who only believes in what is physically observable, would argue that the current order has evolved from a prior, less ordered state. Nevertheless, both science and religion share foundational philosophical presuppositions in this discussion. Scientific inquiry assumes that the



An Evaluation of Three Religious Perspectives on Stem Cell Research

With regard to stem cell research, a Dialogue perspective acknowledges the limitations of [science and religion]. Practitioners ... would agree that human life is valuable. However, the application of this assumption may differ depending on beliefs about the nature of human embryos.

world has discernable patterns. Religious beliefs coincide, extending the presupposition to affirm that an intelligent creator is the source of these patterns. Furthermore, Barbour asserts that methods and concepts in both fields are very similar. He quotes authors such as John Polkinghorne and Holmes Rolston, who hold that there are "*significant parallels* in the methods of the two fields including the use of criteria of consistency and congruence with experience."[6]

With regard to stem cell research, a Dialogue perspective acknowledges the limitations of both fields. Practitioners within the fields of science and religion would agree that human life is valuable. However, the application of this assumption may differ depending on beliefs about the nature of human embryos. A scientific materialist may say that the value of human life compels science to use the resources it has, including human embryos, to alleviate human suffering due to disease. Stem cells could be actively harvested from embryos created for therapeutic purposes. Some religious people applaud scientific advances to alleviate suffering. However, their regard for human life in another form, namely the embryo, would take priority over the benefits of research. They would object to the embryo's destruction under any circumstances. Other religious people would contend that research on stem cells is acceptable when the harvested embryos would be destroyed anyway, as in the case of excess human embryos not used for assisted reproductive procedures. This example indicates that within a science/religion dialogue there are many possible conclusions.

Integration

Integration brings all aspects of science and religion together in one complementary picture of reality. It depicts these two realms as spheres of influence that completely overlap. Barbour distinguishes between three integrative philosophies. First, he discusses natural theology, which looks at the world from the perspective of theology and sees it as evidence for theological beliefs. Barbour lists Aquinas' teleological argument as well as the modern anthropic principle as examples of this world view. Both argue that the existence of a supernatural being is the only explanation for the structure and order that is observed in the universe. Second, Barbour outlines a theology of nature, which looks at the world through the lens of science. Theology is still foundational, but it is subject to review based on scientific information. There is no provision for disagreement; as we learn more about science, we will continue to adapt our theology. Third, Barbour examines systematic synthesis, an example of which would be process philosophy, which envisions God as the creative source and the beginning of order, but not as a completely transcendent sovereign. He is limited to time and therefore experiences things just as we do. His purpose and character do not change, but his action in the world changes as he experiences new things. Thus, we should be open to new interpretations of God as we learn more about his creation.[7]

Practical application will differ depending on which interpretation of this framework one subscribes to—natural theology, theology of nature, or systematic synthesis. Taking the stance of natural theology, a person might say that all of nature belongs to God. While it was made specifically for our use, we also have the responsibility to protect it from misuse. Thus, stem cell research might be unacceptable because it destroys God's creation in the form of an embryo. In a theology of nature, a doctrine regarding the beginning of life would be informed completely by scientific observations. There is no theological absolute regarding hES technology; our theology would continually adapt to include farther-reaching scientific possibilities. From a systematic synthesis perspective, the means (the continual pursuit of new technology) justify the ends (the potential results of hES research). Process is paramount. The progress made in the scientific community coupled with the possibilities for more development would justify any stem cell research.

Orthodox Jewish View

In Jewish law, the Torah is the ultimate, authoritative rule upon which every other is based. The many different pieces of literature that form the Jewish code are derived from this. They have been developed over years of study and dialogue among the rabbinic community, similar to American case law in our legal system. There are four main movements within the Jewish tradition. Each of these maintains a different adher-

ence to the law. Reform, Reconstructionist, and Conservative movements allow for flexibility in the interpretation of the law. The fourth, the Orthodox movement holds that "the Torah is the literal word of God and that Jewish law is to be determined by reference to the codes and *responsa* of the past."[8] Jewish *Halachah*, or ethical legal tradition, is derived from many perspectives and allows for different interpretations. It attempts to establish "epistemological commonality" as a basis for any discourse, and form social applications from this collaboration.[9] A prominent representative of the Orthodox community and the subject of this analysis is Laurie Zoloth, of San Francisco State University.[10] She points out:

> Reflection on all innovative scientific research is constrained by the fact that none of the specific issues raised by new technology is directly addressed by Talmudic conversations ... nor in the elaborate medieval commentary that carried the most considerable weight in the classic tradition.[11]

The Orthodox Jewish movement is a clear example of a Dialogue framework. Zoloth and others, such as Eliott N. Dorff,[12] encourage communication within a community and attempt to find presuppositions that may serve as a springboard for applications. Instead of mandating actions in a vacuum, "cultural practices and aesthetic sensibilities create the landscape upon which the locus of Jewish discourse ... meets."[13] Differing cultural practices result in many interpretations of the law, all of which vary regarding the role of science. Zoloth points out three main questions in the Jewish debate regarding stem cell research.

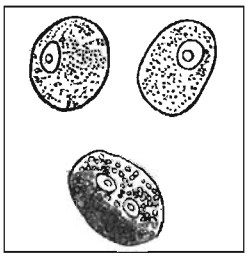
First and overall, there is "the problem of *telos*," or goal. Presumably the object of stem cell research, or any type of medical research, is to combat disease and disability by reconstructing tissues. However, what constitutes illness? Are mental illnesses included or only physical ailments? When does the risk of the cure outweigh the risk of the disease? Zoloth says: "We lack a coherent theory that allows broad philosophic agreement on the issues of definition of disease and normalcy."[14] Infirmity could be interpreted as only what happens after birth, or it could include genetic defects present from conception. One may believe, then, that the use of human embryonic stem cells should only be used to replace tissue in a person after their birth, such as faulty nerve cells. Others might argue that Parkinson's and Alzheimer's are examples of ailments that could be prevented by treatment before birth using hES research.[15]

The second issue Zoloth addresses has to do with the process of the research on stem cells. She asks questions about informed consent, risks in the procedure, and unintended consequences. All of these are issues today in other areas of medicine and scientific research and so have relatively well-developed responses in the Halachic law. At the heart of this debate, though, is another that is continuously a source of fiery contention: the matter of abortion. Currently, the stem cells with the most potential come from embryos approximately five days after fertilization. Any removal of stem cells at this stage would destroy the embryo. Therefore, depending on one's view on abortion, pursuing hES research can be strongly encouraged, strictly forbidden, or accommodated somewhere in between.[16] There are differences between abortion and hES research, so comparisons can only be taken so far. For example, if one believed that a fetus could be considered a person when it is three months old, an abortion after that would be morally wrong, but hES research could be permitted as it would occur before the three-month limit. However the fundamental issues are the same, so relevant arguments regarding abortion can be applied to the debate regarding hES research.

The Orthodox Jewish movement is a clear example of a Dialogue framework ... Differing cultural practices result in many interpretations of the law, all of which vary regarding the role of science.

The third problem has to do with context.[17] How will the products of the research be used in the world today? Should the possibility of ill usage prevent research from advancing? Most importantly, though, how will people be affected by the results of more exploration? It is this question that Zoloth uses to answer all the others. She argues that "the task of healing in Judaism is not only permitted, it is mandated."[18] While the primary focus of Western thought today is the individual, Judaism is "other-based." For Jews, "the framing questions will be those of obligations, duties, and just relationships to the other."[19]

In this light, Zoloth draws the conclusion that the potential benefits of stem cell research far outweigh the drawbacks. According to Jewish law, an embryo is "mere water" until forty days after conception.[20] In harvesting stem cells, according to the Jewish definition, no person is harmed and many could potentially be saved. Zoloth balances the mandates of Judaism with the potential benefits of science. There are some limitations: the law still condemns the use of another man's sperm to artificially inseminate a woman as adultery, or an unlawful marriage



The Roman Catholic position must be classified as Dialogue. Science is taken into account and not viewed as essentially unnatural ... Ultimately, however, in the Roman Catholic view, religion has authority over science and takes precedence in the hES research debate.

between relatives could occur unknowingly. However, "to save even one life, the Halachah states, it is permissible, and in fact mandated, that all other *mitzvoth* [regulations] can be abrogated (except for the case of the prohibitions against murder, adultery, and idolatry)."[21] Thus, Zoloth's work clearly supports a Dialogue framework. She is willing to examine and take advantage of the benefits of hES research in light of her Orthodox position, but not without limitations. This dialogue is evidenced by her words:

> Given such positive Halachic responses, the nearly universal communal response to all genetic advances that can promote health and increase fertility has been enthusiastically positive in the Jewish world.[22]

Roman Catholic View

At the Council of Trent, almost four hundred and fifty years ago, Roman Catholic Church leaders met to discuss the urgent threat of the Protestant Reformation. They strongly refuted what they regarded as the heresy of Protestant leaders and upheld the ancient theory of *jus naturale,* or natural law. This law expressed "the classical view of nature as essentially changeless reality."[23] God's sovereignty was emphasized, thus every human faculty had a God-ordained purpose. Sexual intercourse was intended for reproduction; pain was part of a purification process; thinking was to glorify God. Anything "unnatural" and not according to God's will was considered sinful. In the seventeenth century, this law was strict and prohibitive. Over time the code was developed to preserve not only individual human capabilities, but also the natural condition of the body as a whole. Amputations were allowed to save a patient, on the basis of "the principle of totality," even though they interfered with natural progression by preventing death and lengthening life spans. These were considered "ordinary" means of preserving life and were sanctioned by the Church, in contrast with "extraordinary" measures, such as cryogenics or artificial life-support machines.[24]

The Roman Catholic Church has changed doctrinally since the Council of Trent, and it is being forced to deal with issues that could not have been anticipated by the early Church leaders. The Vatican and the American Catholic bishops still strongly endorse the theory of natural law, however. Four criteria were developed to determine what is permissible under natural law for moral issues. These criteria are based upon what is called the principle of double effects, or double consequences, in which one effect is good, and the other bad. Certain relationships between these two consequences of an action must exist, or not exist, in order for the act to be morally acceptable for natural law adherents. First, the fundamental action by itself, independent of its consequences, must not be morally evil. Second, evil consequences resulting from a morally good action must not be the means to achieve a further good effect. Third, all evil consequences must be genuinely unintended, and merely tolerated if they happen. And fourth, the good consequences of the original action must outweigh any evil consequences. To be permissible under Roman Catholic natural law, an action must conform to these four standards.[25]

A traditional Catholic who adheres to the current interpretation of natural law must find a way to reconcile hES research and natural law in order for it to be permissible. Kevin William Wildes of Georgetown University states: "I do not think one can argue that there is, in Roman Catholic thought, opposition to stem cell research itself."[26] Thus, not considering the derivation of the stem cells or their usage, the research itself is not morally evil. This meets the first criteria.

However, once the derivation of the stem cells is considered, this research violates the second criteria mentioned above. The Roman Catholic position states that human life begins at conception. Hence, taking a human life is necessary to achieve the potential good consequences resulting from hES research. The evil consequence is undeniably the means to what is considered the good effect. As Michael Mendiola states: "It is the destruction of embryos that poses the greatest challenge or barrier from this tradition's perspective."[27]

In violation of the third criteria, the evil effect would be intended and would be necessary for research to proceed. Embryonic stem cell derivation entails the destruction of an embryo in order to harvest the pluripotent cells that are thought to have the

most potential for growth into cell types desirable for therapeutic purposes. The evil consequence in embryonic stem cell derivation, for example, the destruction of embryonic human life, is known beforehand and is necessary in order to facilitate production of useful therapeutic cell lines.

The loss of life in the harvesting of stem cells would not outweigh the potential, unknown benefits. Thus, the fourth criteria is not met. There are dissenters among Roman Catholics. Mendiola, for example, suggests that we can adhere to natural law, "yet still allow public practices that go against those convictions on good ethical grounds."[28] However, the "good" of those ethical grounds is then relative to human judgment, and thus susceptible to misinterpretation. In contrast, the Conference of Catholic Bishops presents strict criteria for ethical action in its adherence to *jus naturale*.

Three of the four conditions of natural law therefore are not met in hES research. It is considered by traditional Catholics to be unethical and immoral. It upsets the natural order and its use would constitute extraordinary means of sustaining life. Although in this case science and religion are not in agreement, the Roman Catholic position on this issue would represent a Dialogue relationship between the two. According to the first stipulation in the natural law, hES research is not inherently evil. Hence, if a technique were ever developed to harvest human embryonic stem cells without killing the embryo, Roman Catholics would endorse the research. This would eliminate the objections raised by the other three requirements and allow science and religion to coexist without conflict. Yet when the current circumstances are considered, the Roman Catholic position must be classified as Dialogue. Science is taken into account and is viewed as not necessarily in conflict with religion, as evidenced by Wildes' statement above. Ultimately, however, in the Roman Catholic view, religion has authority over science and takes precedence in the hES research debate.

An Evangelical Wesleyan Perspective

An evangelical Wesleyan perspective can be developed using the framework of the Wesleyan Quadrilateral containing the elements of personal experience, Christian tradition, reason, and Scripture. The Wesleyan Quadrilateral is used to judge the veracity of statements and positions with theological implications. From this perspective, our lives are holistic and theology should be integrated into every aspect, including the issue of stem cell research. This is not to say that theology and science must agree in every aspect. Thus, an evangelical Wesleyan perspective agrees with a Roman Catholic position of Dialogue, although as a Wesleyan Protestant variant.

Personal Experience

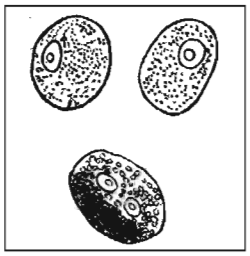
Key factors in embryonic stem cell research are inextricably linked with the abortion debate, as the life of the fetus is ultimately at issue. What makes a human being a person? Gilbert Meilaender argues that this divorce of personhood and humanity results from our socialization. We have been conditioned to believe that they are two separate things, when in reality they are intertwined. He says that "a person is not someone who has a certain set of capacities; a person is simply ... 'someone who'—a someone who has a history."[29] His or her very existence is reason enough to protect a fetus. That embryo is "someone who," someone who does have a history, albeit a short one, that is valuable and should be preserved.

From an evangelical Wesleyan perspective, our lives are holistic and theology should be integrated into every aspect, including the issue of stem cell research.

Along these lines, Stanley Hauerwas argues that we must be truthful to ourselves and face our intuitions.[30] Our natural inclination is to use terms relevant to our experience. Many instinctively think of an embryo as a baby, acknowledging the inherent human value we attribute to it even in its undeveloped state. This sense can be related to experience, one of the Quadrilateral components. It illuminates one facet of truth when we consider our basic intuitions regarding the status of the human embryo and its relationship to stem cell research. Following Hauerwas' reasoning, our intuition, based on everyday life experience, may suggest that embryos are indeed persons and that, while human embryonic stem cells could potentially be used for healing, this ought not to occur at the expense of human life.

Christian Tradition

In this circumstance, it is beneficial to consider early Christian tradition, another element in the Wesleyan quadrilateral. From the time of Jesus, Christians were concerned with healing physical ailments. Jesus healed lepers and paralytics as well as forgiving sins.[31] The flesh, where our sinful nature resides alongside God's spirit, is still "God's creation, which would one day experience redemption and resurrection."[32] Throughout the New Testament are admonitions to care for the body, as it is a temple of God, indwelled by the Holy Spirit.[33] Early Christians even sug-



Science has no experiment that determines the presence of human life. Nor does the Bible speak explicitly on the subject of the status of embryos. Consequently, a somewhat arbitrary point must be chosen in the developing human's growth to define the beginning of personhood.

gested that providing for the physical needs of others is more important than preserving one's own health. In the teachings of Jesus, "One finds a much stronger imperative to alleviate the ills of others than to seek to lessen one's own sufferings."[34]

In this light, the case of stem cell research is not a question of merely neglecting the embryo, if one does presuppose it to be a person. Rather, the embryo is destroyed to potentially further the health of others. This action would directly contradict Jesus' teachings. Nowhere in Scripture do we find justification for sacrificing an innocent life to help others. Two examples stand out as possible contradictions to this statement, yet they have a key distinction. First, in Joshua chapter 7, the Israelites stone Achan for the benefit of the rest of the community. However, Achan blatantly disobeyed God's command to take no devoted things when the army conquered Jericho. An embryo is not guilty of disobedience, thus there is no reason for it to be destroyed. The second example in Scripture is that of Christ and his ultimate sacrifice in exchange for all of our lives. Christ voluntarily allowed himself to be crucified. Even if there were an embryo capable of atoning for our sins, it would not be able to choose to give its life. Rather than demonstrating the utilitarian concept of sacrificing one for many, Scripture explicitly condemns destruction of human life as murder.[35] This teaching presents science as conflicting with religious themes found in the Bible, according to Barbour's typology. Granted, the issue still is the personhood of the embryo. If it is determined to be merely a grouping of cells, none of these arguments hold and an integration position is still possible.

Reason

To this end, we can use another Wesleyan understanding of truth. Reason is considered to be equal to both tradition and experience. As a result, this God-given capacity can facilitate a defense of our position in this debate. Science has no experiment that determines the presence of human life. Nor does the Bible speak explicitly on the subject of the status of embryos. Consequently, a somewhat arbitrary point must be chosen in the developing human's growth to define the beginning of personhood. Because so much of the developmental process is unknown, if such a point is not established, an infinite regression of the definition of human life is possible. This regression would lead to almost absurd, nonbiblical conclusions, from a Wesleyan perspective.[36] We can guess that human life begins when the spinal cord develops or at the advent of a heartbeat, but do either a spinal cord or a heartbeat make us human? Even the development of a brain and the presence of brainwaves is not a sufficient condition for human life.

Rather than setting an arbitrary limit at any of these points, it seems most logical for human life to begin at conception. At this point, the sperm fertilizes the egg, creating a unique being. The nucleus of the sperm passes into the egg, where the genetic material contained in it fuses with that of the egg. This results in a combination of the genetic material of the parents and an undeniably distinct life form. By assuming this is the beginning of human life, and also of personhood, we eliminate the possibility that we are wrong about any of the other points. For example, if we arbitrarily decide that personhood begins at a certain developmental stage, but in reality personhood began earlier, any destruction of embryos at earlier stages would be murder. Our ignorance may lessen our moral responsibility, but it would not alter the fact that the act was executed. Conception is the earliest stage where human life may exist. Some may argue that selection of conception as the beginning of human life leads to an infinite regression as well, as both a sperm and egg are alive. This argument, however, depends on flawed logic. Neither a sperm nor an egg is capable of producing a viable human on its own. The fertilized egg is the first stage at which a human being can potentially form.[37] Thus this is the first point that could be defended.

Early Church leaders concurred. According to Darrel Amundsen and Gary Ferngren: "Abortion was widely practiced in antiquity, but Christian authors from at least the second century without exception condemned the practice."[38] Tertullian wrote: "For us, indeed, as homicide is forbidden, it is not lawful to destroy what is conceived in the womb while the blood is still being formed into a man."[39] The Church resoundingly denounced the practice of abortion and formed legislation to strongly punish those who violated its position. These statements,

clearly in conflict with abortion, have influenced not only the Roman Catholic stance, but also Protestant positions since then. One could argue that this holds not only for abortion, but also for hES research, as it too involves something "conceived in the womb."

Rather than merely defaulting to a position, however, or defaulting to an established position, we can provide a viable argument. Biologist Walker Percy says:

> It is common place of modern biology, known to every high-school student and no doubt to you the reader as well, that the life of every individual organism, human or not, begins when the chromosomes of the sperm fuse with the chromosomes of the ovum ...[40]

And as Meilaender argues, this humanity should not be divorced from personhood. An early church father, Tertullian, wrote in the third century AD: "To prevent being born is to accelerate homicide ... He who is a man-to-be is man, as all fruit is now in the seed." Though Tertullian was mistaken in his belief that the sperm naturally and solely produces a child, his principle remains the same. The fertilized egg will develop into a full-grown human and ought to be protected for its nascent humanity. Extrapolating from this, just as we think of an apple seed as inherently *apple*, with all the components and essentials for growing into that apple tree, we should think of an embryo as inherently *human* or *person*.

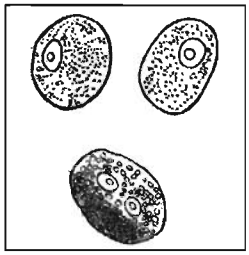
Scripture

The ultimate source of truth in the Wesleyan Quadrilateral is Scripture. Reason, experience, and tradition all submit to its primacy. Consequently, in the evangelical Wesleyan view, Scripture serves as the authoritative source from which to evaluate hES research. Psalm 51:5 says: "Indeed, I was born guilty, a sinner when my mother conceived me." This verse suggests that we had inherent moral status from the point of conception. Marvin E. Tate comments: "The emphasis is on the sin of the speaker, who admits that sin ... goes back to the root of personal existence."[41] This verse implies that the beginning of personal existence is at conception, or at least before birth. God knew the psalmist and was able to see his sinfulness even before he was born. Even translated somewhat less than literally, it implies that God knew us from the first, which the inspired writer asserts is when his mother conceived him. How would a nonhuman embryo be able to be unworthy and guilty? Some sense of agency had to be present in order for it to be at fault. Walter Elwell goes so far as to say, "Personhood, however defined, may be a useful category, but it is not a biblical one."[42] The Israelites had no concept of the divorce between the physical and spiritual aspects of a person. Personhood was linked to mere existence, as Meilaender proposes. This verse and others like it are applicable not just to our physical being, but to our spiritual beginning. With its faint glimmer of humanity, the embryo should be protected for its nascence.

In the evangelical Wesleyan view, Scripture serves as the authoritative source from which to evaluate hES research.

In Isaiah 49:1, Isaiah describes God's purpose for him, known even before the prophet was formed. "The Lord called me before I was born; while I was in my mother's womb he named me." God has a unique calling for each of us.[43] Again in Psalm 139:16, the psalmist recognizes that "Your eyes beheld my unformed substance. In your book were written all the days that were formed for me, when none of them as yet existed." This "draws attention to the extent of God's knowledge, spatially ... and *temporally*" (emphasis added).[44] Thus, as Leslie Allen observes, "The psalmist regards himself as the object of God's creative workmanship before his birth."[45] These passages are poetic, yet they demonstrate a common theme in the Bible. God knew us before we were even formed; there is a purpose and a plan for each of us that require our lives. That purpose and plan would be aborted along with a human being if an embryo were destroyed to harvest cells.

In the first part of the Gospel of Luke, the author tells the story of the birth of Jesus. Before having her baby, Mary the mother of Jesus visited her relative Elizabeth, who was also pregnant. The Scripture tells us that Elizabeth's unborn child moved in her womb when Mary spoke. She tells Mary, "As soon as the sound of your greeting reached my ears, the baby in my womb leaped for joy."[46] Many scholars believe that Luke used Mary as a source for his account of Jesus' life, suggesting that this passage is more than figurative.[47] John the Baptist, still in his mother's womb, sensed the presence of the Son of God and acknowledged it. "The verb *skirtao* suggests an eschatological recognition (cf. Ps. 113:4, 6 and Mal. 4:2)" and alludes to more than just a natural shift of the fetus in the womb.[48] A mere bundle of tissues without any sentience would not be aware, let alone able to respond spiritually to its surroundings. While this does not specifically address the status of early embryos, it affirms their early personhood in responding to their environment. And if fetuses are already able to respond thus, who is to say that their precursor is not just as much a person?



An Evaluation of Three Religious Perspectives on Stem Cell Research

All three religious perspectives examined fit surprisingly into Barbour's category of Dialogue, although an Orthodox Jewish position is prepared to accept hES research while Roman Catholics and evangelical Wesleyans are not.

Further Reflections

Meilaender looks at the hES debate as a challenge to be overcome, not as a beast to be tamed. Human embryonic stem cell research evokes philosophical questions having to do with the human will and reason, rather than a medical procedure to be regulated by religious precepts. Human embryonic stem cell research is an indicator of our society's decline into the desire for instant and complete gratification. We know that through it a quick fix is potentially available for many of the evils the world faces, so we put aside moral and ethical concerns in favor of pragmatic expediency. C. S. Lewis describes it in terms of humankind and its desire to conquer Nature: "As soon as we take the final step of reducing our own species to the level of mere Nature, the whole process is stultified, for this time the being who stood to gain and the being who has been sacrificed are one and the same."[49]

Meilaender responds to this concern and challenges the scientific community to a road less traveled: "Only by declining to use embryos for this research do we awaken our imaginations and force ourselves to seek other sources for stem cells ..."[50] We do not have to settle for second best in research; if we can discover how to use stem cells from an aborted embryo, we would most likely be able to figure out how to use those from "bone marrow or from the placenta or umbilical cord in live births."[51] When coupled with arguments encompassing the four cornerstones of the Wesleyan Quadrilateral, Meilaender's challenge presents a convincing argument for the rejection of hES research.

Like the Catholic position, this evangelical Wesleyan perspective on hES research can be looked at many ways. At first glance, it seems that the religious conclusions are in stark contrast to scientific advances. Adhering to the quadrilateral, though, evangelical Wesleyans do not dismiss reason and science out of hand. Science, as well as tradition and experience, is used to verify certain theological points. There is no compromise, however. Wesleyan theology in no way accommodates science in its perspective in order to make it fit nicely. It supports scientific research and yet resists subverting Christian morals to its authority. It affirms the authority of Scripture regardless of whether it fits with science. Thus there is a healthy dialogue between science and an evangelical Wesleyan perspective.

Conclusion

In conclusion, all three religious perspectives examined fit surprisingly into Barbour's category of Dialogue, although an Orthodox Jewish position is prepared to accept hES research while Roman Catholics and evangelical Wesleyans are not. They each use a different model to come to their conclusion: Jewish case law, or *Halachah*; Catholic natural law; and the Wesleyan Quadrilateral, respectively. In theory, since each uses its respective standard to determine its stance on all ethical issues, the Dialogue position that applies to hES research should be applicable to every moral problem faced by these three faiths. If Roman Catholics hold a Dialogue position regarding stem cell research, when the research is evaluated using natural law, it should follow that their positions on environmental issues and politics would reflect the same Dialogue framework. Using this broader model, we can hopefully understand more about other religious perspectives as well as our own. ◆

Notes

[1]As outlined in Ian G. Barbour, *When Science Meets Religion* (San Francisco: HarperSanFrancisco, 2000).
[2]Ibid., 10–7.
[3]Ibid., 15.
[4]See Faithlinks, "Thorny ethical issues surround human cloning," (www.faithlinks.org/viewarticle/asp?ID=805, 2/2/2003).
[5]See Carl Sagan and Ann Druyan, "The Question of Abortion: A Search for Answers," (www.2think.org/abortion.shtml, 1997).
[6]Barbour, 27.
[7]Ibid., 27–36.
[8]Elliot N. Dorff, "The Jewish Tradition," in *Caring and Curing*, ed. Ronald L. Numbers and Darrel W. Amundsen (Baltimore, MD: MacMillan Publishing Company, 1986), 7.
[9]Laurie Zoloth, "The Ethics of the Eighth Day: Jewish Bioethics and Genetic Medicine. A Jewish Contribution to the Discourse," in *Ethical Issues in Human Stem Cell Research*, National Bioethics Advisory Committee (2000): J-4.
[10]Represented in *Ethical Issues in Human Stem Cell Research* and Suzanne Holland, ed., *Embryonic Stem Cell Debate*, (Cambridge: The MIT Press, 2001) among other works.
[11]Zoloth, "The Ethics of the Eighth Day," J-11.
[12]Represented in *Caring and Curing* and *Embryonic Stem Cell Debate*, among others.
[13]Zoloth, "The Ethics of the Eighth Day," J-7.
[14]Ibid., J-8.
[15]Ibid., J-7–J-9 and J-12–J-17.
[16]Ibid., J-9–J-10 and J-17–J-20.

[17]Ibid., J-10–J-11.
[18]Ibid., J-15.
[19]Ibid., J-4.
[20]Babylonian Talmud Yevamot 69b.
[21]Zoloth, "The Ethics of the Eighth Day," J-12.
[22]Ibid., J-17.
[23]Marvin R. O'Connell, "The Roman Catholic Tradition Since 1545," in *Caring and Curing*, 138.
[24]Ibid., 138–40.
[25]Ibid., 140.
[26]Kevin Wm. Wildes, in *Ethical Issues in Human Stem Cell Research*, I-3.
[27]Michael M. Mendiola, "Human Embryonic Stem Cells: Possible Approaches from a Catholic Perspective," in *Human Embryonic Stem Cell Debate*.
[28]Mendiola, "Human Embryonic Stem Cells," 122.
[29]Ibid., 143.
[30]Cited in Gilbert Meilaender, in *Ethical Issues in Human Stem Cell Research*, E-5.
[31]See Luke 5:17, Matt. 8:13, Matt., 15:28, Mark 5:29, among others.
[32]Darrel W. Amundsen and Gary B. Ferngren, "The Early Christian Tradition," in *Caring and Curing*, 46.
[33]See Rom. 8:11, 1 Cor. 3:16–17, Eph. 5:29.
[34]Amundsen and Ferngren, "The Early Christian Tradition," 47.
[35]Exod. 20:13.
[36]An example would be one of the acts prohibited by the original Catholic doctrine of natural law: sexual intercourse not for the sake of reproduction. However, even conservative Catholic theologians have since determined this to be invalid. A statement from the *Catechism of the Council of Trent* established sexual relations in the context of marriage as "morally licit for some reasons—the fostering of love, physical health, even venereal pleasure which might otherwise be sought in an adulterous union—other than procreation." O'Connell, "The Roman Catholic Tradition Since 1545," 126.
[37]This leads to questions regarding fertilization that occurs in a test tube. While the egg is fertilized, the environment is such that there is no chance for it to fully develop. Does this then make it less human?
[38]Amundsen and Ferngren, "The Early Christian Tradition," 50.
[39]*Apologeticum ad nations* 1.15. Quoted in Amundsen and Ferngren, "The Early Christian Tradition," 50.
[40]Quoted in Marion L. Soards, "Scripture and Stem Cells: Seeking Biblical Guidance When There is No Obvious Biblical Word," *Ex Auditu: An International Journal of Theological Interpretation of Scripture* 17 (2001).
[41]Marvin E. Tate, *Psalms 51–100*, vol. 20, *Word Biblical Commentary* (Dallas: Word Books Publisher, 1990), 19.
[42]*Evangelical Dictionary of Theology*, 1997 ed. s.v. "Abortion," by Walter A. Ellwell, (http://bible1.crosswalk.com/Dictionaries/BakersEvangelicalDictionary/bed.cgi?number=T5).
[43]Also Jer. 1:5, Isa. 44:2, Isa. 49:1.
[44]Craig C. Broyles, *Psalms, New International Biblical Commentary* (Peabody, MA: Hendrickson Publishers, 1999), 486.
[45]Leslie C. Allen, *Psalms 101–150*, vol. 21, *Word Biblical Commentary* (Waco, TX: Word Books Publisher, 1983), 262.
[46]Luke 1:44.
[47]See William Barclay, *The Gospel of Luke*, vol. 3, *The Daily Study Bible Series* (Philadelphia: The Westminster Press, 1975).
[48]Luke Timothy Johnson, *The Gospel of Luke* (Collegeville, MN: The Liturgical Press, 1991), 40.
[49]Gilbert Meilaender, "Some Protestant Reflections," in *Human Embryonic Stem Cell Debate*, ed. Suzanne Holland, Karen Lebacqz and Laurie Zoloth (Cambridge: The MIT Press, 2001), 144.
[50]Ibid., 144.
[51]Ibid., 145.

Book Reviews

Ethics

BOOK OF LIFE: God, Cosmos, and Man: A New Understanding of Human Nature by Victor Shane. Summerland, CA: Para-Anchors International, 2003. 308 pages. Paperback; $26.95. ISBN: 1878832042.

This book's lofty aim is to explain the disorder and violence in the world by reconciling the biblical model of human nature with thermodynamic principles. The central theme of the book is that entropic disorder is synonymous with the devil, a theme that is subsequently woven throughout the following chapters on evolution, idolatry, economics, health, and sin. Shane, for whom no biography is available, writes from the perspective of an amateur scientist as is evident from several unusual scientific interpretations.

The central theme of the book stems from Shane's view of the world as being inherently evil. Shane identifies the devil as "an anthropomorphization of the statistical tendency to disorder in all flesh" (p. 35), and then redefines the devil as the Cosmic Constable, creating a confusing double metaphor that often appears to be mutually contradictory. For example, assuming that "the Constable was endowed with the gift of speech his decree would be heard bellowing throughout the cosmos: 'Order, Order, Order in the universe!'" (p. 132) which contradicts the "Cosmic Constable directing the course of universal change from low entropy states to high entropy states" (p. 37). Logical discrepancies are compounded by the writing style which rarely states arguments directly, but argues by analogy.

Shane argues that an inherent evil present in all matter is responsible for the universe's increase in entropy and the evil in people—an argument that Shane supports with a historical survey of humankind's ills (chap. 2). Questionable assumptions aside, the validity of the arguments are, in many cases, lost in the constant tirade against the ills of humankind, while in other cases the arguments are suspect or plainly fallacious. For example, Shane appears to argue that legal tender is the cause of national debt (p. 125) and that cancer is caused "... more than anything else, [by] the junk food that man puts into his mouth ..." (p. 183). The author believes that if the world used pure, unrefined oils "instead of the usual cheap hydrogenated abominations, the incidence of worldwide cancer might be cut in half within a decade" (p. 187). Scientific support for such assertions is conspicuously lacking.

Shane's premise that the Fall influences atoms at the molecular level is intriguing. Less tenuous is his fundamental assertion of entropy being evil and his scientifically questionable arguments in support of his thesis. The combination of questionable assumptions, indirect arguments, and scientific inexperience leaves the reader searching for Shane's meaning amidst a dogmatic, poorly-constructed, and often contradictory text.

Reviewed by Fraser F. Fleming, Associate Professor of Chemistry, Duquesne University, Pittsburgh, PA 15282.

Faith & Science

WHEN SCIENCE AND CHRISTIANITY MEET by David C. Lindberg and Ronald L. Numbers, eds. Chicago: The University of Chicago Press, 2003. xii, 357 pages, notes, guide, index. Hardcover; $29.00. ISBN: 0226482146.

God and Nature (1986), the editors' earlier work, offered an excellent summary of the field but was difficult reading for even the best undergraduates enrolled in the science and religion courses that proliferated in the 90s. *When Science & Christianity Meet* provides twelve case histories that illustrate a variety of encounters between Christianity and science at a level appropriate for a semester college course.

The eleven authors have worked under strong editorial hands resulting in accounts that fit together—even reveal a pattern—"... in address[ing] the varied relationships between two powerful cultural traditions attempting, sometimes, to occupy the same intellectual and social ground" (pp. 4–5).

David C. Lindberg provides an appropriate opening with "The Medieval Church Encounters the Classical Tradition: Saint Augustine, Roger Bacon, and the Handmaiden Metaphor." Augustine (354–430) was the key early church father who set the tone for medieval Christian attitudes to pagan science, while Bacon (ca. 1220–1292) challenged religious authority in justifying the place of natural science. Each saw science as the handmaiden of theology. For Lindberg, "Augustine was more worried about the threat to theology posed by classical natural philosophy than the threat to classical natural theology posed by Christian theology; whereas in Bacon's hierarchy of worries the order appears to have been reversed" (p. 30).

Lindberg's "Galileo, the Church, and the Cosmos" travels over familiar ground in retelling a classical story. Rather than reducing the episode to a clash between the Church and science over cosmology "... the outcome was a product not of dogmatism or intolerance beyond the norm but of a combination of more or less standard (for the seventeenth century) bureaucratic procedure, plausible (if ultimately flawed) political judgements and a familiar array of human foibles and failings" (p. 60).

William Ashcroft Jr.'s "Christianity and the Mechanistic Universe" and Thomas H. Broman's "Matter, Force, and the Christian Worldview in the Enlightenment" effectively cover the Scientific Revolution and the eighteenth century. "Noah's Flood, the Ark, and the Shaping of Early Modern Natural History" (Janet Browne) illustrates problems associated with "... the interplay between reliance on empirical data gathered in the field and the status of authoritative religious sources that addressed the same issues" (p. 137).

Chapters on pre-Adamic man, the encounter between Darwinian science and Christian tradition, and the place of miracles and prayer focus primarily in the well-worn territory of nineteenth-century Britain. While science often created problems for the Christian, the end result could be seen as mutually reinforcing. Occasionally, "heresy even-

tually became an apologetic weapon used to defend the Christian faith" (p. 181).

The twentieth century receives the attention of three chapters. Jon H. Robert's "Psychoanalysis and American Christianity, 1900–1945" opens new ground and should attract the interest of psychology majors to the course. "The Scopes Trial in History and Legend" offers Edward J. Larson's engaging take on what may have been the paradigmatic event of American science and religion in the last century: "... the Scopes trial grew to symbolize not simply anti-evolutionism, but religiously motivated intrusions into public policy generally ... because they embody the characteristically American struggle between individual liberty and majority rule and cast it into the timeless debate over science and religion" (pp. 263–4).

Ronald Numbers' "Science without God: Natural Laws and Christian Beliefs" brings perspective to more recent concerns over the place of God in nature—including the efforts of "partisans of ID ... to rewrite the ground rules of science to allow the inclusion of supernatural explanations of phenomena" (p. 283).

Notes on each chapter and a guide to further reading offer valuable supplements to the text. The chapters are well integrated and the work is accessible for the general reader. *When Science & Christianity Meet* should be part of the library of any Christian who seeks to understand the influence of science on faith.

Reviewed by J. W. Haas, Jr., Emeritus Professor of Chemistry, Gordon College, Wenham, MA 01982.

TIME TRAVELING WITH SCIENCE AND THE SAINTS
by George A. Erickson. Amherst, NY: Prometheus Books, 2003. 180 pages. Hardcover; $25.00. ISBN: 1591020352.

This book proposes that Christianity has not been a friend of science but an enemy. Erickson describes it like this: "History reveals that religion in general and Christianity in particular has retarded social and scientific progress and been the source of immeasurable woe." In general, argues Erickson, Christianity has supported dictators instead of human rights, incited warfare instead of peace, and promoted religious bigotry instead of tolerance.

Erickson continues. During its first sixteen hundred years, the church suppressed views considered contrary to orthodoxy. It has been argued that while Christianity sometimes hindered scientific progress, on balance it has a more positive than negative influence. Not so, writes Erickson. The rise of Christianity impeded the advancement of science by overwhelming its opposition with non-scientific, irrational stances. Illustrations of this backward Christian influence is seen in the Crusades, the Inquisition, witch hunts, persecution of science and scientists, and religious excommunications.

Science was able to free itself, writes Erickson, from its Christian captives because of heroic empiricists such as Bruno, Copernicus, Galileo, Darwin, and Linnaeus. Since science has been liberated from dogma and dogmatists, it has moved civilization forward in medicine, education, culture, and technology.

Noteworthy is the dedication of the book to Giordano Bruno, a sixteenth-century scholar, whose dedication to science led to a conflict with church zealots and eventually to his death during the Inquisition. Writes Erickson: "Without the long struggle against powerful, antiscience Christians by men like Giordano Bruno, the freedom to speak our minds might not yet exist." The title of the book is supported by a seven-page time line which parallels the history of science and religion from 3000 BCE to the present.

This is a relatively short book with large, easily read type. It consists of seven chapters, index, and bibliography. Its author, George Erickson, is a member of the National Center for Science Education, a member of the Council for Secular Humanism, and the author of the adventure book, *True North: Exploring the Great Wilderness by Bush Plane.*

Erickson's view is not shared by many scholars. For instance, Del Ratzsch, a professor at Calvin College who specializes in philosophy of science logic, writes: "Since most scientists historically were religious believers, we have to attribute intellectual blindness, self-deception, or hypocrisy to those scientists who" think science and supernaturalism incompatible. The incompatibility "charge would indict the majority of scientists who ever lived as not fully grasping what they were doing. This seems implausible" (*Contemporary Debates in Philosophy of Religion* [Malden, MA: Blackwell Publishing, 2004], 74).

Whether Christianity has been an asset or a liability to the advancement of science will continue to be debated. A strong case can be made that the Reformation freed science to produce the marvels of modernity, although it must be acknowledged that some reformers viewed science as destructive. (Erickson argues that Christianity produced the Dark Ages.) However, history provides ample evidence of missteps by the church which too often put it on the wrong side of science. Erickson wrote this book "to counter the many pro-Christianity books that ignore its multitudinous sins" (p. 11).

If you want the history of science written from a dogmatic, humanistic viewpoint, this book may provide the stimulation you crave. While arguing with some of Erickson's facts may be difficult, debating their interpretation is another matter. Many people are willing to concede that Christianity has sometimes impeded science. Whether it has been more of a negative than positive influence is debatable.

Christian insight on the interface of science and Christianity can be obtained from books by ASA members: *Being A Christian In Science* by Walter R. Hearn; and chapters in *Science Held Hostage* by Howard J. Van Till. Hearn profiles people who "have contributed to science ... while clearly identifying themselves as Christian believers" (p. 138). Van Till thinks science has no warrant for rejecting a theistic view on life, and he is not willing to concede that everything can be understood in terms of material behavior alone (p. 146).

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

Book Reviews

BRIDGING SCIENCE AND RELIGION by Ted Peters and Gaymon Bennett, eds. Minneapolis, MN: Fortress Press, 2003. 260 pages, index. Paperback; $17.00. ISBN: 0800636252.

This book was produced by the Center for Theology and Natural Sciences (CTNS) at the Graduate Theological Union in Berkeley, CA, as an outreach of their Science and Religion Course Program. The co-editors of this volume are the Director (Ted Peters) and Communications Coordinator (Gaymond Bennett) for this program. Ted Peters is also professor of systematic theology at Pacific Lutheran Theological Seminary and the Graduate Theological Union. Their stated purpose for producing this book is to provide a basic resource for university courses in Science and Religion.

The book consists of thirteen chapters divided into three sections, endnotes for the chapters, each author's bibliography and recommended reading list, an index, an introduction by Bennett, and a forward by Robert John Russell (founder and director of CTNS and professor of theology and science in residence at the Graduate Theological Union).

The other contributors to the volume are (in order of appearance): Kirk Wegter-McNelly (doctoral candidate in theology at the Graduate Theological Unions and editing coordinator of the CTNS), Nancey Murphy (professor of Christian philosophy at Fuller Theological Seminary), Martinez J. Hewlett (professor in the Department of Molecular and Cellular Biology at the University of Arizona), Philip Clayton (professor of philosophy at California State University at Sonoma and principle investigator for Science and the Spiritual Quest at CTNS), Peter M. J. Hess (associate program director of the Science and Religion Course Program of the CTNS and adjunct faculty member at the University of San Francisco), Muzaffar Iqbal (founder and president of the Center for Islam and Science in Islamabad, Pakistan), Richard K. Payne (dean and associate professor of Japanese Buddhism at the Institute of Buddhist Studies of the Graduate Theological Union), Eduardo Cruz (professor of religious studies at the Pontifical Catholic University of São Paulo, Brazil), Varadaraja V. Raman (professor of physics at the Rochester Institute of Technology), George L. Murphy (pastoral associate at St. Paul's Episcopal Church in Akron and adjunct faculty member of Trinity Lutheran Seminary in Columbus, OH), and Laurie Zoloth (professor of social ethics and Jewish philosophy and director of the Program in Jewish Studies at San Francisco State University).

In the first section, "Methodology: How Bridges Are Built," the fundamental philosophy of the book is described. In these authors' views, the bridge metaphor is the most useful of the many possible modes for the interactions between science and religion: science and religion can be joined in a multidisciplinary and interdisciplinary *dialogue* that is mutually beneficial, with insights from one field crossing over the bridge to be incorporated in the other field.

In the second part, "Constructing Scientific Spans," the results from some of the modern sciences (cosmology, evolution, genetics, and neuroscience) are summarized without much discussion of the theological implications. The notable exception is chapter three, "Natural Law and Divine Action," in which Russell and Wegter-McNelly discuss various theological responses to cosmology and evolution, including views of human nature, redemption, and eschatology.

In the last section, "Constructing Religious Spans," representatives from many religious traditions (historical Christianity, Islamic, Buddhist, Catholic, Hindu, Lutheran, and Jewish) briefly describe some of the results of their faith's response to modern science. This section is the most educational one, especially for those unfamiliar with religious traditions other than Protestant Christianity.

This book is a unique resource, combining philosophical, historical, and religiously pluralistic views of the interactions between science and religion. The bridge metaphor for dialogue between science and religion was used consistently throughout the book. The strongest part of the book is the bibliographies that each author provides. The main weakness of the text is the varying quality of each chapter. In addition, the emphasis on dialogue biased the text against traditional Christian theology.

The book is written for the nonscientist. I would hesitate in using this book for an undergraduate course in science and religion, since some chapters are too introductory, while others used advanced terms without defining them. This may be an appropriate text for an introductory graduate course along with more substantive texts, such as one of the suggested readings in each author's bibliography.

Reviewed by Keenan E. Dungey, Assistant Professor of Chemistry, University of Illinois at Springfield, Springfield, IL 62703.

FINDING GOD IN THE QUESTIONS by Timothy Johnson. Downers Grove, IL: InterVarsity Press, 2004. 216 pages. Paperback; $16.00. ISBN: 0830832149.

Johnson, medical editor for ABC News, completed seminary before attending medical school. His first encounter at seminary led to anxiety caused by loss of faith. Slowly he came to understand what he believed and to live with what he couldn't understand. With his sixty-fifth birthday approaching, Johnson decided to examine what he believed and why. This book records his journey and conclusions. It records Johnson's struggles to come to terms with such conundrums as life and death, theism and atheism, wealth and poverty, pleasure and pain.

The book's three sections deal with three questions: (1) does God exist; (2) what is God like; and (3) what are the implications of being a theist. To the first question, Johnson answers in the affirmative and thinks that "our world is the result of design" (p. 37). He thinks the human race has evolved over millions of years into complex organisms. As to the second question, Johnson writes: "I deeply revere the Bible" (p. 82). Johnson explains what God is like in the two chapters on Jesus' character and teachings. In answering the third question, Johnson discusses how faith in God's control and goodness should shape life.

Among Johnson's conclusions are: (1) the universe did not happen by chance (p. 41); (2) humans are "autono-

mous creatures" (p. 59); (3) there is evidence of "divine footprints" in the cosmos (p. 60); (4) the Bible is not primarily intended to give a detailed guide for living (p. 82); and (5) Jesus' way is the most healthy and whole way of life (p. 192).

Albert Schweitzer, who gave up a life of ease to become a doctor in Africa, has had a strong influence on Johnson who will devote time to serve the needy after his ABC contract expires. He has made a good start by stipulating that proceeds from the sale of this book will be donated to charitable organizations serving the poor and disadvantaged.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

SCIENCE AND SPIRITUALITY: The Volatile Connection by David Knight. New York: Routledge, 2004. vii + 231 pages, notes, index. Paperback; $24.95. ISBN: 0415257697.

PSCF readers are familiar with British (and some American) scientists who have left lab for clerical collar and an interest in faith/science questions. Less well known are the British chemists who have moved to history of science and the interaction of science and Christianity, for example, Colin Russell (*Cross-Currents*) and John Brooke (*Science and Religion Some Historical Perspectives*). Russell, Brooke, and now Knight have each written broadly on science and religion history. Russell has written from an evangelical perspective, Brook from a more detached but sympathetic Christian view. Knight has written from within the Church, asking religious questions and lamenting the inability of evangelicals to address the important questions.

Knight, emeritus professor at Durham University, former president of the British Society for the History of Science, and lay-preacher at Durham's St. Oswald's Church, offers a history of (primarily) British interaction with science and faith focusing on ways that scientists (professional and amateur) have dealt with religious institutions, the Bible, and theology. "[*Science and Spirituality*] ... details the cultural and intellectual politics that ignited the descriptive 'cause' of science, eventually bringing about its ideological separation from its former ally, the Church" (p. ii). At the same time, he seeks to challenge the myth that a "volatile connection" will necessarily lead to conflict and argues that despite a changing landscape, spiritual and moral values remain important in science.

The book's subtitle is one of many examples of his use of language and metaphors familiar to chemists. Chemists get more attention than in most works of this sort; Berthollet, Beddoes, Children, Davy, Priestley, Parkes and others are featured along with the usual collection of physicists, natural historians, biologists, churchmen and gentlemen scientists. Knight offers a different, sometimes intimate and "racy" take on familiar characters such as T. H. Huxley, Robert Chambers, William Buckland, and Humphry Davy reminiscent of Desmond and Moore's *Darwin*. The author writes from within the church, avoiding the dry outsider academic stance of most writers on the same themes. He knows church history, the biblical stories, basic theology of Scripture, the changing ways Scripture has been understood, and the odd bit of clerical gossip.

> We are familiar with Unitarian Priestley's denunciation of established churches, and the separation of church and state urged by his Deistic friends Franklin and Jefferson; but even so, it was possible to support establishment even if one were a cool and sensible skeptic—a worldly wiseman rather than a keen churchman. Indeed enthusiasm aroused alarm in the late eighteenth century, just as in our day many people dread fundamentalism and cults, and feel uneasy about "alpha" courses, "Toronto blessings," happy-clappies and charismatics (p. 75).

Knight approaches his subject in thirteen chapters with headings suggestive of science/religious themes or metaphors: Something greater than ourselves, Christian materialism, Watchmaking, Wisdom and benevolence, Genesis and geology, High-church science, God working his purpose out? Lay Sermons, Knowledge and faith, Handling chance, Clergy and clerisy, Mastering nature, Meaning and Purpose, cover the period from the French revolution to the present with a predominately British focus.

Perennial subjects such as naturalism, altruism, anthropic principles, design writ large and small, evolution, prayer, and spirituality all fall under his lens.

Knight's closing comment in this thoughtful work is instructive, perhaps even familiar:

> There is plenty to reflect on, now as in the past. For one thing, in a faith refined or distilled by science, how is it that centuries of development of the Christian tradition by thinking people has led to an intellectually timid, politically conservative and sex-obsessed evangelicalism emerging as the predominant expression of Christianity ... of course we are fallible: but we can look forward in hope as well as humility. For, like Isaac Newton, though we are still playing on the seashore, yet the great ocean of truth lies waiting, undiscovered, before us—an ocean of spiritual truth as well as scientific truth (p. 196).

Science and Spirituality is a keeper.

Reviewed by J. W. Haas, Jr., Emeritus Professor of Chemistry, Gordon College, Wenham, MA 01982.

ORIGINS & COSMOLOGY

DOUBTS ABOUT DARWIN: A History of Intelligent Design by Thomas Woodward. Grand Rapids, MI: Baker Books, 2003. 303 pages, index. Hardcover; $19.99. ISBN: 0801064430.

Philosophical naturalism is widely presupposed throughout science and takes the universe to be self contained. The last twenty years has seen the rise of the modern Intelligent Design (ID) movement claiming that nature points beyond itself. In *Doubts about Darwin*, Woodward, an ASA member, traces this story from its inception in 1986 to the present. This history revolves around four well-known

publications that have caused no small stir in academic circles and are increasingly in the media.

1. In 1986, molecular biologist and self-confessed agnostic, Michael Denton published *Evolution: A Theory in Crisis*, which claimed that neither of the two fundamental axioms of Darwin's macro-evolutionary theory—the concept of the continuity of nature, and the belief that all adaptive design of life has resulted from a blind random process—has been validated by one single empirical discovery or scientific advance since 1859. Denton's skepticism was triggered by discoveries of molecular machines manifesting such transcendent brilliance of design that it violates common sense to suppose they are reducible to a simple, continuous, random process.

2. In 1991, lawyer Phillip Johnson published *Darwin on Trial*, claiming that Darwinian macro-evolution is ultimately grounded on the philosophical assumption of naturalism and not on empirical evidence. In addition, when Darwinism is brought into question, it is routinely protected by empty labels, semantic manipulations, and faulty logic. Johnson sees Darwinism functioning as the central cosmological myth of modern culture—a quasi-religious system that is known to be true a priori, rather than as a scientific hypothesis that must submit to rigorous testing.

3. In 1996, Michael Behe published *Darwin's Black Box* arguing that molecular machines, such as those involved in a bacterial flagellum, are irreducibly complex and, like a mouse trap, will not operate if any one part is missing. A mousetrap has only five working parts; a flagellum has forty, most of which could not have been co-opted as they have no other function in the cell. Darwinian theory was proposed before anything was known about molecular structure and, for Behe, everything points to the fact that the theory will never be able to account for the "systems of horrendous irreducible complexity" that inhabit the cell.

4. In 1999, mathematician William Dembski published *Intelligent Design*, important for its explanatory filter—a three-tier system of conceptual sieves that formalizes the detection of design as currently applied to forensics, SETI, and archaeology. To be a candidate for design, an event must be a low probability event and conform to a specification—an independently given pattern. Dembski's filter places ID within the context of acceptable science, merely proposing to apply to biology what astronomers are already applying to radio signals.

Doubts about Darwin is a highly readable, and at times fascinating, account of ID and must itself be considered a major contribution to the movement. It is not simply a history of ID. The background story of the key characters, texts and interactions is highlighted, creating its own rhetoric of persuasion. The rhetoric employed by both sides in the debate is detailed. Many stories are recorded of ID proponents seeking to argue on empirical grounds only to face "severe and malignant distortion" by opponents. Many Darwinists are not prepared to concede that philosophical naturalism is open to question and wish to rule out the possibility a priori. On the other hand, instances are recorded of cordial and fruitful debate.

Woodward himself promotes ID by telling the movement's dramatic story which begins with the profoundly misguided pronouncements of scientists who claimed overwhelming evidence in favor of macro-evolution. Increasingly, the evidence has been shown to be woefully lacking in factual support, and within molecular biology points compellingly to some sort of creative intelligence. In *The Icons of Evolution* (2000), Jonathan Wells charges textbook publishers not only of misinformation in promoting Darwinism, but of toleration and even propagation of known fraud (Woodward, p. 190).

Unfortunately, this telling and retelling of the stories from different perspectives results in the book's greatest weakness: unnecessary repetition. However, those wishing to become conversant with ID could do no better than to start with Woodward's well-researched and well-written history of the movement.

Reviewed by Bryan Ezard, Translation Consultant, Summer Institute of Linguistics, Australia.

ORIGINS OF LIFE by Fazale Rana and Hugh Ross. Colorado Springs: NavPress, 2004. 296 pages plus notes and index. Hardcover; $19.99. ISBN: 1576833445.

This is Rana's first book and Ross' fifth. The book proposes a biblical theory for the origin of life which the authors contend is testable. They call their theory the RTB model. The book has seventeen chapters covering such topics as the testability of various theories, the timing of life's arrival on earth, the primordial soup, the handedness of life's chemicals, panspermia, and life's complexity.

They outline a set of predictions made by the RTB model for life's origin. These include that life arose early and abruptly on earth, persisted through hostile conditions, involves complexity in its minimal form, displays the marks of chemical design, was initially qualitatively different from life that came later, and suggests a purpose. Some of these "predictions" will cause some raised eyebrows. The strength of the book is the breadth of topics covered. The authors have addressed all of the relevant issues involved in the origin of life: the formation of the cell wall, the origin of the chiralic molecules, thermophilic bacteria, the RNA world, and panspermia. They are of the opinion that most origin of life researchers believe that panspermia is the answer.

The book starts by noting that many Christians think that by pointing out errors in the origin of life theories, they have proven their case. But then the authors proceed to do little except criticize evolutionary views. And given the problems with their "predictions" even when they claim observational support, that data also supports the evolutionary position.

The biggest issue in the book is its poor scholarship. References often do not prove what is claimed. The authors' claim (p. 216) that removing greenhouse gases from the atmosphere by continental erosion must keep pace with the sun's increasing luminosity. They cite an article which is dealing with the temperature of sinking slabs and says nothing about erosion, the sun, or the atmosphere. They also miss-cite an article claiming that it proves that Yockey's analysis of the number of proteins which will perform the function of cytochrome c (10^{93})

is complete. The article does not support what they claim. It does not mention Yockey.

The authors claim (p. 139) that it would be impossible to find a functional protein of 100 amino acid length by random search, yet the citation given for proof merely says that it could not be found in one step. It would only take 10^{24} random sequences to find such a functional protein. This is much less than the 10^{100+} probabilities which fill the book. The authors fail to inform their readers of this. They claim (p. 220) the atmosphere did not become oxygenated until half a billion years ago. Two citations claim oxygenation occurred 2–1.5 billion years ago, and one discusses the deep oceans not the atmosphere.

Twice the authors claim (pp. 82, 213) that "different" nuclear reactions turned on and off during the collapse of the solar nebula. Hugh Ross ought to know better. The only nuclear reaction which turns on is the fusion of hydrogen to helium. They claim (p. 220) that there are seventy phyla of animals. No source will give more than thirty-two (many say fewer) modern complex animals and no more than twenty extinct animal phyla. These factual problems may be due to the fact that only supporters of RTB were called upon to review the manuscript.

This review is from an uncorrected proof. It is hoped that these flaws will be fixed in the final product. As it stands, the book has serious flaws. Its strength is that it discusses aspects of life's origin about which the reader may be unaware.

Reviewed by Glenn Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.

PHILOSOPHY & THEOLOGY

PRAGMATISM AND RELIGION: Classical Sources and Original Essays by Stuart Rosenbaum, ed. Champaign, IL: University of Illinois Press, 2003. 325 pages. Hardcover; $49.95. ISBN: 0252028384. Paperback; $24.95. ISBN: 0252071220.

Rosenbaum, philosophy professor at Baylor University, has brought together a distinctive collection of readings that feature such luminaries as William James and John Dewey as well as contemporary theorists such as Richard Rorty and Nancy Frankenberry. The writers address one central theme: does espousing a pragmatic understanding of epistemology automatically commit one to a disregard of western religious traditions.

Including essays by Jonathan Edwards ("Sinners in the Hands of an Angry God") and James (selections from *The Varieties of Religious Experience*) might seem to imply that pragmatism and religion could comfortably co-exist. A closer reading of selections by Dewey (*A Common Faith*) and Rorty (*Pragmatism as Romantic Polytheism*) contradict that presumption. Key issues here are a pervasive distrust of foundationalism (supernaturalism?) as a basis for knowledge coupled with profound confidence in idealistic behavior rather than creeds or beliefs.

As might be expected, pragmatism does not let the matter rest here. Underneath the distrust in foundationalism is a parallel conviction that knowledge comes from rational discourse and experience. Cultural values becomes synonymous with the "gods," and "religion" (if such an enterprise continues to exist) becomes conscious behavior that supports society's ideals. The reader might begin this volume presuming that pragmatism and religion would be compatible because both emphasized action in behalf of ideals (faith that leads to works). It turns out that the pivotal assumption of the western religious tradition that a Creator God has been revealed to the world is swept away by a contrary theory.

It is no accident that two of the three religious writers in this volume (the rest are philosophers) are from seminaries known for their "liberal" approach to theology. They do not consider the Bible's authority superior to human experience, reason, or tradition. Probably, if the truth be known, they consider many of the assertions of traditional Christianity to be metaphorical at best and they elevate contemporary experiential reason to be the prime basis for truth. Although a number of the writers deny this, this approach to truth seems destined to be trapped in the relativism of pure post-modernism.

As statements of contemporary philosophical descriptions of the nature of truth and the basis for knowledge, these selections are probably seminal and accurate. It is probably true that the average citizen lives life in a pragmatic fashion in which culture both prescribes the avenues for success and proscribes behaviors to be avoided. Further, values and ideals are very "culture specific" in that citizens automatically concur with achievements that are applauded and decry actions in other cultures that are different. The theories espoused by the writers in this book could, therefore, best be depicted as descriptions of how human beings live and think. However, one wonders if they truly address the religious question: "are there foundational truths and ideals that transcend culture and beckon adherents to action in behalf of ultimate goals?" In the final analysis, the ideas espoused by these writers seem to have descriptive, but not substantive, value. I predict these theories are doomed to perennial relativism founded in a naive view of progress.

The question remains, of course, whether one should expect more from philosophy. As a reviewer, I am inclined to think not. In epistemological reasoning and linguistic analysis about all that philosophy can do is to describe. It cannot make ultimate judgments about what is real. Philosophy is limited by the nature of its subject matter, i.e., human beings. When left to their own designs, human beings can only think in the way philosophy provides. But to take the additional step of reducing the content of thought to nothing other than rational discourse is to engage in a pessimism that I, for one, feel is unfounded. Of course, I have to admit that I accord a place in human cognition to both personal experience of transcendent reality as well as to the supra-natural revelation of truth resulting from the independent action of a divinity who has being outside of human history.

This is a provocative volume particularly for those who continue to affirm the tenets of traditional western religion (Christianity, Judaism, Islam, e.g.). It is not an easy read. As a collection worthy of consideration for use in graduate classes in philosophy, it may turn out to be a classic. Were it to be considered for classes in religion, however, I would recommend it be put alongside some philosophy of reli-

gion text that included a defense of foundationalism and other traditional approaches. In my mind, while the intent of the volume might have been to investigate the relationship between pragmatism and religion, the project ends with a resounding INcompatibility—at least when the assertions of contemporary monotheism are considered.

Reviewed by H. Newton Malony, Graduate School of Psychology, Fuller Theological Seminary, 180 North Oakland Avenue, Pasadena, CA 91101.

RELIGION AND CHRISTIAN FAITH

C. S. LEWIS' CASE FOR THE CHRISTIAN FAITH by Richard Purtill. San Francisco, CA: Ignatius Press, 2004. 192 pages. Paperback; $13.95. ISBN: 0898709474.

This book title accurately indicates Purtill's aim "to present in a clear and understandable form, the main lines of C. S. Lewis' defense of and arguments for Christian belief and practice" (p. 9). It is intended for everyone, from neophyte to expert, interested in Lewis and Christianity. Purtill admits he's a biased writer who finds little to fault in Lewis or the Christian faith.

Purtill has written nineteen books, one of which is about the philosophy and fantasy of C. S. Lewis and J. R. R. Tolkien. He is emeritus professor of Philosophy at Western Washington University in Bellingham. Purtill published the original edition of this book in 1981. Now he has produced this 2004 revision.

Purtill is well-acquainted with Lewis' writings and a Lewis admirer. He writes that he tried to resist quoting extensively from Lewis, but I think he failed. There is a Lewis quote on almost every page, sometimes more than one. What we have in this book are rather extensive Lewis' quotes with insightful commentary by Purtill. By quoting Lewis, Purtill provides us with many of Lewis' trenchant expressions. For instance, in a discussion of suffering, Lewis wrote to an Anglican nun that "what God wants of us is a cheerful insecurity" (p. 54). Lewis was tagged by *Time* as the twentieth century's "most-read apologist for God."

It is easy to understand why. Lewis puts eternal truths in contemporary, relevant, understandable language. For example, this is Lewis' assessment of science and religion:

> When I accept Theology I may find difficulties, at this point or that, in harmonising it with some particular truths which are imbedded in the mythical cosmology derived from science. But I can get in, or allow for, science as a whole....If, on the other hand, I swallow the scientific cosmology as a whole, then not only can I not fit it in Christianity, but I cannot even fit in science ... I believe in Christianity as I believe that the Sun has risen not only because I see it but because by it I see everything else (pp. 125–6).

While Lewis is considered a Christian apologist, he also had a good deal to say about Christian living. He disagreed with the view that certain things are right because God commanded them. To the contrary, God commanded certain things because they are right, that is, instructions intended to enrich life. Lewis didn't spend all his efforts defending Christianity: "A man can't always be defending the truth; there must be time to feed on it" (p. 128).

Purtill summarizes Lewis' thoughts in ten chapters including topics like faith and reason, miracles, prayer, and death. He also includes a helpful index, and lengthy lists of books by Lewis, about Lewis, and by Purtill. Even for those folk well-acquainted with Lewis' writings, Purtill's summary of Lewis' life and thoughts may stimulate and bless.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

ON THE RELIABILITY OF THE OLD TESTAMENT by K. A. Kitchen. Grand Rapids, MI: Eerdmans, 2003; 662 pages. Hardcover; $45.00. ISBN: 0802849601.

Kenneth Kitchen, a long-time Egyptologist, is professor emeritus of the University of Liverpool. This book is both a detailed historical reference for Old Testament studies and a rebuttal of the Wellhausen evolutionary theory of late (post-exilic) dating of Deuteronomy and Old Testament documents generally. Unlike Old Testament *apologia* strong on rhetoric and weak on historical content, the depth of detail and scope of coverage in this book places Kitchen as one who speaks with authority on the subject-matter, "and not as the scribes."

The book starts with more recent Old Testament history and works backward, a millennium at a time, with emphasis upon the late first and second millennium. As an Egyptologist, Kitchen deals at some length with the Israelite exodus from Egypt, including political and social setting, location of Goshen, probable route, location of Mt. Sinai, and dating.

In a chatty and engaging yet scholarly style, using charts and drawings, Kitchen constructs a chronology of political Israel at its zenith, when there is the most extra-biblical data. He is willing to explore some of the more speculative issues, such as evidence for David, the Queen of Sheba and Ophir, a table of nations from Noah's sons, and the location of the Garden of Eden, so far as there is data. Among the prophets, he covers the format of Isaiah—is it two books or one—with some new insights. He discusses the problem of the use of numbers in the Bible, such as the ages of pre-flood patriarchs. Every Old Testament issue that seems to come up in church Bible classes he addresses.

Later in the book, he rebuts "minimalism" at length, concluding that "... Wellhausen worked in a near vacuum and could speculate freely" (p. 487) and that the vast data now available negates this nineteenth-century view of biblical history. One evidence is that the textual language, form of covenant, tabernacle design, etc., are unique to specific, earlier times.

Kitchen critiques less severely another recent Eerdmans' author, American archaeologist William G. Dever, whose recent book, *What Did the Biblical Writers Know and When Did They Know It?* (2001), proceeds to show that the lack of archaeological evidence in Canaan for any

major population invasion in Joshua's time casts doubt upon the usual interpretation of the account. Dever settles for small bands of Israelites, over time, diffusing into Canaan and settling amidst the Canaanites, who contribute to the early population of Israel. Kitchen counters by noting that Joshua's raiders always returned to their base at Gilgal and land allotments were determined for *future* occupation; the Bible gives no settlement narrative, but archaeology suggests one.

A masterpiece, this book is recommended both as a Bible study resource and for its coverage of the history and state of Old Testament studies in our time. Pastors and scholars will especially benefit from it, though it is readable by anyone interested in the historical reliability of the Bible.

Reviewed by Dennis L. Feucht, Cayo, Belize.

SOCIAL SCIENCE

SECULAR STEEPLES: Popular Culture and the Religious Imagination by Conrad Ostwalt. Harrisburg, PA: Trinity Press International, 2003. Paperback; $22.00. 261 pages. ISBN: 1563383616.

Secularization has long been a major concern among students of religion. Many scholars have contended that as secularization increased, religion would decrease. Ostwalt presents a convincing argument that counters this in two ways: (1) secularization cannot, and does not, destroy religion—religion persists; and (2) secularization occasions a shift in the locus of authority for expressing religiosity. This shift away from the importance of religious institutions results, according to Ostwalt, in both secularizing the sacred and sacralizing the secular.

After an intuitive survey of the forces that provoked a change from the medieval sacred culture to modern secular post-modernism, Ostwalt develops his thesis about religion in three areas: place, text, and image. These three pertain to the ways in which religion has reshaped itself in places (mega-churches in contrast to traditional parish churches), texts (religion in literature in contrast to revealed Scripture), and image (religion in film in contrast to ritual and liturgical drama). In each of these areas, Ostwalt demonstrates how religion has adopted secular forms to better express its truths (secularizing the sacred) at the same time that religious themes have found their way implicitly into overtly secular formats (sacralizing the secular).

Adopting a contemporary functional definition of religion as "the search for meaning," Ostwalt avoids the traditional substantive approach to religion typified among many Christian theologians and adherents. His is a more sociological, descriptive approach that allows for examining dispassionately religious changes across the years of the nineteenth to the twenty-first centuries. He is not a cynic about the place of religion in contemporary life. Quite the opposite. But he is convinced that the persistence of religious issues in contemporary life find their expression in ever evolving manners and differing ways.

Readers will find in Ostwalt's volume an erudite and lively survey of current theorists coupled with an original model for understanding how the forces of secularism interact with the timeless search for meaning in modern humans. His volume will serve as a worthy introduction to sociological, literary, and multimedia thinking about the role of religion in modern life. Perhaps the prime insights of the volume lie in Ostwalt's extensive critiques of extant literature and film.

While this approach may seem novel and overly descriptive to physical scientists, the perceptive way in which Ostwalt affirms but analyzes contemporary culture will be informative and helpful. The approach is somewhat confessional in undertone but realistic in its awareness that the influence of traditional institutional religion is changing in both content and form.

Reviewed by H. Newton Malony, Senior Professor in the Graduate School of Psychology, Fuller Theological Seminary, 180 North Oakland Avenue, Pasadena, CA 91101.

BIBLICAL STORIES FOR PSYCHOTHERAPY AND COUNSELING by Matthew B. Schwartz and Kalman J. Kaplan. Binghamton, NY: Haworth Press, 2004. 220 pages. Paperback; $24.95. ISBN: 0789022133.

This book relates the stories of such Old Testament characters as Adam, David, Samson, Elisha, Joshua, and Jonah. From these stories, lessons are derived on such topics as anger, suicide, misfortune, family problems, and drunkenness. For example, from David and Jonathan are developed lessons on "friendship and love"; from Naomi and Ruth come "reciprocity between generations"; from Elijah comes "recovering from weariness"; and from Jeroboam comes "undone by ambition."

Issues of human experience are examined through biblical stories. Examples include: finding meaning in life when tragedy strikes (David faced this after his son died); meeting challenges when natural ability is limited (Moses and Aaron leading Israel); coping with sin (Adam and Eve after eating forbidden fruit); coping with temptation (Joseph's attempted seduction by Potiphar's wife); and coping when life falls apart (Job's testing).

Altogether the book contains fifty-eight biblical stories covering a variety of practical problems, all of which can be used in advising, counseling, and therapy. They also provide good leads and useful material for teaching or preaching. The authors write "the unique contribution of our book is to present biblical stories that can be used by therapists, clergy, and patients/clients alike, and also people who simply want to help themselves psychologically in a manner that addresses their spiritual concerns" (p. 2). Laypersons may be more likely to find this book useful since one study showed 90% of them believe in a personal transcendent God compared with only 40% of clinical psychologists.

Sigmund Freud, a Jew who founded psychoanalysis, used Greek rather than Hebrew stories as a basis for psychoanalysis. The intriguing question dealt with in the epilogue is why? The authors' conclusion is that the Hebrew stories trumped free-will whereas Freud believed in determinism. They write that since God created nature,

he is able to change it, but determinism holds "that nature creates the gods and, in fact, governs them. Freud correctly understood that ..." (p. 197). R. F. Paloutzian in his foreword alludes to the distinction between Greek (Athens) and Hebrew (Jerusalem) stories which illustrates why Freud chose Greek legends: "A contrast is drawn between the assumptions about human nature that come from classical Greece and those originating in biblical Israel. This is illustrated by ... a Greek tragic view of life ... versus a Hebraic view that views humans as created with the ability to act and effect change" (p. xi).

Schwartz, who specializes in Graeco-Roman and Jewish thought, teaches ancient history and literature. Kaplan, who specializes in interpersonal and international relations, teaches psychology. Both work at Wayne State University in Detroit, Michigan, and both have written books previously. *Biblical Stories* has received pre-publication high praise from scholars who call it "brilliant," "compelling," "illuminating," and "much-needed."

This book's eleven chapters also include an introduction, epilogue, bibliography, and index; it is also available in hardcover. Haworth Press publishes all its books on paper approved by the American National Standard for Information Sciences-Permanence of Paper for Printed Material. This is worth mentioning because this standard assures that the paper is pH neutral, acid free, and intended to wear well over time. Not every publisher imbeds this assurance in their books.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

Is Aardsma's Flood Theory Both Scientific and Biblical?

Paul Seely recommends reconciling science with the biblical account of Noah's flood by conceding that Genesis 1–11 is scientifically and historically inaccurate. He suggests that God used fictional stories about mythical events to tutor us, "accommodating his theological lessons to the mentality and preconceptions of his young children, aware that in time they would learn better of both history and science."[1] In other words, "God accommodated his theological revelation in Genesis 1–11 to the now antiquated science/history of the times."[2] Seely contrasts his position with what he calls concordism, misrepresenting the message of the Bible to fit scientific facts, and creation science, misrepresenting facts to fit the Bible. He evidently lost all hope of finding any alternative that upholds the total historicity of Genesis while totally respecting both witnesses. Aardsma's approach may meet this higher standard.

Aardsma has found secular and scientific evidence that tends to confirm his flood theory, and no such evidence, not even the ice core evidence Seely presented, rules it out as a viable candidate.[3] Naturally, more extensive evaluation could expose flaws requiring theory adjustments or even replacement.

Seely charged creation science with "rejecting the overwhelming consensus of the best-trained scientists in the relevant sciences and substituting in its place private interpretations of the scientific data."[4] If Aardsma's ideas are dismissed, may it not be because they contradict the overwhelming consensus of experts that Genesis 1–11 is only myths of purely human origin. One does not find truth by taking a vote. Science freezes if a consensus always overwhelms new ideas while they are still unfamiliar. Think of Galileo. No consensus is fixed. Minds can be changed. What really qualifies as disrespect for the witness of science is stubbornly or dogmatically accepting a favorite interpretation of data while rejecting a better, more reasonable one.

What about respect for the witness of the Bible? Seely said, "The ocean, which is not fresh water, cannot be employed as a means of flooding the globe (or half the globe à la Godfrey/Aardsma) without doing the same thing that concordists are doing: replacing the history in Genesis 1-11 with a private interpretation."[5] Seely cited no other alleged conflict with the Bible in Aardsma's theory, but this is evidently all he needed to categorize it as concordist and, by his definition, unbiblical. Aardsma certainly is not "replacing the history ... with a private interpretation."

To support his questionable claim, Seely relied on Dick Fischer's interpretation of *fountains of the great deep* (Gen. 7:11). Fischer admitted that *deep* "can mean the sea," presumably, even a saltwater sea,[6] but concluded that it must refer to fresh water here, just because related terms in other languages suggest this.[7] Even if Fischer's doubtful interpretation is correct, Seely's critique may not hold water. His assuming that Genesis mentions every major floodwater source is like assuming that the ark was confined to calm seas, since we read nothing about waves.

Seely also criticized creation science for "find[ing] evidence in Scripture for items which Old Testament scholars do not find there, like multiple volcanoes exploding at the time of the flood." If speculation or theories about volcanoes misrepresent the Bible message, then similar criticism also applies to Aardsma's theories. Creationists, however, do not claim that Genesis explicitly states that volcanoes erupted. Neither does Aardsma find any statement that the southern oceans shifted to the north. These are theories considered consistent with what the Bible does say.[8]

We may agree with Seely that "the accuracy of the historical books in Scripture is contingent upon the quality of the [human] sources employed,"[9] but while he considers chapters 1–11 to be "of rather poor historical worth," we can in good faith accept Noah and New Testament apostles as equally credible eyewitnesses to real history.[10] If these "historical" chapters are actually fiction, given to teach "theological lessons," has our Tutor ever explained their mystical meaning? If Seely's accommodationism is rejected, may it not be because it contradicts some overwhelming consensus but rather because we share a reasonable faith in the historicity of even Genesis 1–11.

Notes

[1]Paul H. Seely, "Beyond the Hills of Concordism and Creation Science," *PSCF* 55, no. 2 (2003): 138–9.

[2]Paul H. Seely, "Concordism's Illusion That It Is Upholding the Historicity of Genesis 1–11," *PSCF* 56, no. 1 (2004): 75. His objection in

note 1 to calling the stories in Genesis *fiction* or *myth* applies only if one treats Genesis as just another theory about what might have happened, not as eyewitness accounts.

[3]Paul H. Seely, "The GISP2 Ice Core: Ultimate Proof that Noah's Flood Was Not Global," *PSCF* 55, no. 4 (2003): 252–60. Although he argued convincingly against the idea that the Greenland ice sheet formed after the flood, Seely may have overstated his case against global flood theories in general and Aardsma's in particular, as explained in my letter, "Do Ice Cores Disprove Aardsma's Flood Theory?" *PSCF* 56, no. 1 (2004): 76–7. See my first letter, "On the Hills of Concordism and Creation Science," *PSCF* 55, no. 4 (2003): 278, for a brief introduction to Gerald E. Aardsma's flood theory, or visit www.biblicalchronologist.org to begin a detailed study of his scientific claims.

[4]Paul H. Seely, "Concordism's Illusion," *PSCF* 56, no. 1 (2004): 76. Seely apparently prefers a private definition of the word *private*, since the interpretations he described as private have been well publicized and widely debated for years, and everybody is welcome to accept them. Whatever he meant, we should agree that every interpretation, whether public or private, implies faith in some expert, authority, or one's own ability to approach or recognize the truth. It is seldom a matter of discovering consensus.

[5]Paul H. Seely, "Concordism's Illusion," *PSCF* 56, no. 1 (2004): 76. Aardsma deserves full credit for his own theory, so the Godfrey name does not belong on it.

[6]Dick Fischer, "Young-Earth Creationism: A Literal Mistake," *PSCF* 55, no. 4 (2003): 227.

[7]Fischer and Seely apparently agree that those other flood stories are older, but even this idea loses credibility if Aardsma is correct in making a 1000-year correction in biblical chronology, also explained in my letter, "On the Hills," *PSCF* 55, no.4 (2003): 278.

[8]See Henry M. Morris, *The Genesis Record*, (San Diego, CA: Creation-Life Publishers, 1976), 195-7, for one example of a creationist discussion of the flood and volcanoes. Morris concluded, "This entire phenomenon merits much further research and analysis, but ... the simple statement of [Gen 7] verse 11 provides the basic information needed to explain the physical cause of the great Flood ..." (p. 197). Morris and Aardsma disagree dramatically on what they think the physical cause was, but each one believes his own theory is compatible with the Bible.

[9]Paul H. Seely, "Concordism's Illusion," *PSCF* 56, no. 1 (2004): 75. We can agree that the historical accuracy of the Bible is not "provable from Scripture" alone, but agreement with secular history strengthens belief in it, and several passages suggest that God knows the tutorial value of true history (Gen. 9:12–17; Ex. 13:1–16, 20:11, 31:17; Deut. 6:20–25; Josh. 4:1–7; Ps. 111:4; Jer. 2:1–7; Mic. 6:3–5; Rev. 14:7).

[10]See the letter by Henry F. Blank, "On the Structure of Genesis," *PSCF* 56, no. 1 (2004): 74–5, for support of the idea that Genesis combines accounts originally "written by the patriarchs who were intimately concerned with the events related." See Morris, *The Genesis Record*, pp. 26–30, for a fuller discussion of the same point.

Thomas James Godfrey
707 Burruss Drive
Blacksburg, VA 24060
godfrey@verizon.net

Accommodationism's Illusion of Solving Biblical Problems

In his *PSCF* letter, "Concordism's Illusion That It Is Upholding the Historicity of Genesis 1–11,"[1] Paul Seely claims that God accommodated his revelation to ancient cultural concepts which contradict historical/scientific facts. He even claims that "Jesus showed that he believed Scripture is sometimes accommodated to ingrained cultural concepts which are not merely scientifically defective, but which are morally defective (Matt.19:8/Mark 10:5)."

Seely charges creation science with "rejecting the overwhelming consensus of the best-trained scientists in the relevant sciences and substituting in its place private interpretations of the scientific data." In this I fully agree with him. But then he parallels that with charging "concordism ... [with] rejecting the overwhelming consensus of the best-trained Old Testament scholars and substituting in its place private interpretations of the biblical data." Here he leaves objectivity behind.

He calls "concordists" those who try to understand the biblical texts in a way which concords with reality, respecting scientific facts and biblical texts as they stand, being hesitant to jump to conclusions of contradictions. Seely bases his unproven assumption of accommodation on his conviction that a biblical text allows for only one correct interpretation. He appeals to the authority of the majority (90% in his argument) of "commentaries on Genesis by qualified Old Testament biblical scholars." Science no longer appeals to authorities, but discusses problems explicitly, until there is unanimity.

One commentary Seely recommended is Alexander Rofé's *Introduction to the Composition of the Pentateuch*.[2] Rofé's approach is typical of source criticism, dissecting the texts into many fragments and completely rewriting Israel's history. Early Genesis chapters are claimed to be late copies of Mesopotamian myths. But making myths—even theologically refined—out of apparently historical narrative does not solve problems of interpretation, but sidesteps them. Many Old Testament scholars disagree with this approach.

We know ancient Hebrew from virtually nothing but the biblical texts themselves. A Hebrew concordance allows an inspection of all known usages of a given expression in all available contexts. But with rare expressions, it may become difficult to be sure about a "correct" interpretation, no matter how many commentaries agree. We may have to remain undecided between several possible interpretations—and they may not even be mutually exclusive.

This openness is what characterizes the harmonizing approach—vilified as "concordism." In fact it "allows both the Bible and the scientific data to freely say what they say"—a praise Seely bestows on his accommodationism only. Are Rofé and other source critics, in the tradition of Wellhausen, Bultmann etc., really allowing the Bible to freely say what it says? Are they not often pressing the text into the Procrustean bed of their own preconceptions?

Seely's caricature of "concordism" incorrectly assumes that the Bible is made to "teach science," even "modern science." But the only claim that is in fact made is the feasibility of an interpretation compatible with reality—although a text may allow other interpretations, as well. Why should a theory of biblical inspiration not allow for the possibility of God gently directing his prophets' thinking to choose formulations he—not they—knew are compatible with reality? Even if this reality covers scientific facts unknown to the prophets, the resulting texts would not explicitly teach such unknowables—or any science at all. It is not claimed, either, that the Bible provides accurate history in the modern sense, since its indications are manifestly incomplete. Compatibility with reality is sufficient. I agree with Seely that God delegated the discovery of science and history to humankind.

Letters

God gave the Bible for all times and all cultures, and he may have had his reasons for preventing avoidable offenses for later readers. This expectation of harmony cannot be proved, but it seems significant that no unambiguous case of explicit incompatibility with known facts has been documented. Accommodationism leads to unnecessary or even destructive offenses, particularly if moral accommodation is included. There is sufficient unavoidable offense in the cross of Christ.

Notes

[1]Paul H. Seely, *PSCF* 56 (March 2004): 75.

[2]A. Rofé, *Introduction to the Composition of the Pentateuch* (Sheffield Academic Press, 1999); personal communication by P.H.Seely. For my commentary on Rofé's book, see my post of 25 Nov 2002 on "The Pentateuch dissected and revised" to the ASA internet discussion group, archived under www.calvin.edu/cgi-bin/archive.

Peter Rüst
ASA Fellow
CH-3148 Lanzenhäusern
Switzerland
pruest@dplanet.ch

Would God "Play" This Way?

Robert Boomsma's article "Embryonic Stem Cells and a Reformed Christian World View" (*PSCF* 56, no. 1 [2004]: 38–48) is a helpful and insightful review of Christian arguments for hES research, but I respectfully disagree with his conclusions. Boomsma begins by discussing the creation and our God-ordained stewardship over it. He suggests that "humans are called to play God, to be his agents in developing the creation," as long as this is done "as God plays God." I would grant that biotechnology can be a part of our stewardship over creation, but there are clearly-defined scriptural limits.

A powerful and compelling counter-argument can be made by a proper understanding of the word "play" in this context. "Playing God" is usually used in a much stronger sense, where "play" means to act in a role or to play a part. Used in this way, "playing God" means "to act in a role as God," or even "to usurp God's place." This is clearly prohibited. After all, this is the sin to which the serpent tempted Adam: "You will be like God, knowing good and evil"[1] Here, "knowing good and evil" means having moral autonomy or making one's own decisions independent of God.[2] Such a way of playing God goes beyond stewardship to hubris, and is seen in attempts to manipulate the nature of human life itself. This defies God's own declaration of human persons as "very good."[3]

Boomsma too quickly rejects the conception view of human personhood traditionally held by the Christian church. He claims this "places too much emphasis on an individual's genetic composition." He adds that "A human person is more than his or her genetic code." I agree, but a person is *at least* that. The uniqueness of an individual begins at the moment of *syngamy*, the establishment of the diploid order. This happens during fertilization/conception. Boomsma correctly points out that fertilization is a process that extends over thirty hours. Yet the fast block to polyspermy that occurs at the union of sperm and ovum is a three-second process that "locks in" the genetic material so that syngamy will inevitably happen, making this a strong candidate for the moment of personhood.[4]

In moving away from fertilization/conception as a decisive moment, Boomsma discusses the idea of twinning, as a possible counter-example to the idea of human uniqueness from conception. He cites my analogy that if a clone were made from an adult cell, no one would doubt that a full individual existed prior to the creation of such a "twin." But he claims that this doesn't help, because it is not clear which individual is "continuously present before and after." Here, Boomsma confuses epistemic certainty with ontological reality: our knowledge of something does not change its nature. It is clear from the cloning analogy that one individual is present from conception and the other is present from the moment of the split. It does not matter if we know which one is which.

The larger issue here is the dualistic nature of human beings, that persons are both body and soul. On this view, there is both a physical side and a spiritual element that lives on after bodily death. Surely Christianity depends upon this metaphysical reality. A corollary to this view is that persons have continuity back to their earlier selves. This means that an embryo is the necessary substantial precursor to the adult individual, and that this continuity extends back to the moment of syngamy.[5]

Human beings begin at their biological beginnings, and there are no philosophically or theologically compelling reasons to reject their moral value at this point other than sheer utilitarianism. That is why Christians should not accept such a cold calculus, but should reject hES research. Jesus said that all men shall know us as His disciples if we love one another.[6] Our fidelity to this principle will be demonstrated by the way we love the smallest and most defenseless in our midst.

If, as Boomsma suggests, "Humans are called to play God," then we must ask regarding hES research, "Would God play in this way?"

Notes

[1]Genesis 3:5b.

[2]See, for example, V. P. Hamilton, "The Book of Genesis," in *The New International Commentary on the Old Testament*, ed. R. K. Harrison (Grand Rapids: Eerdmans, 1990).

[3]Genesis 1:31.

[4]For an extensive discussion of these ideas, see D. M. Sullivan, "The Conception View of Personhood: A Review." *Ethics and Medicine* 19, no. 1 (2003): 11–34.

[5]For an in-depth development of Christian substance dualism, see J. P. Moreland and S. B. Rae, *Body and Soul* (Downers Grove: InterVarsity Press, 2000).

[6]John 13:35

Dennis M. Sullivan
Professor of Biology
Cedarville University
Cedarville, Ohio 45314
SULLIVAN@cedarville.edu

Articles Lack Real Science and Faith

The articles in this journal are becoming more and more philosophical and theological, that is, they are removed from the realities of science and the Christian faith. Science is the study of the physical world from quantum physics to the cosmos. If we accept that God is the Creator, then we do not need philosophy to study science; we should actually study science as it is. It is God's second book.

The Bible brings us the Christian faith in a very practical form, without much theology. Theology and philosophy tend to cloud over the Christian faith and will eventually change it into something like the Hindu religion. The Christian faith has to be lived in real life and not become a mental exercise. The content of *Perspectives on Science and Christian Faith* is slowly losing true science and the actual teachings of Jesus as well.

Daniel Heinrichs
CSCA Associate Member
1107 - 333 Vaughan St.
Winnipeg, MB, Canada R3B 3J9.
danielhe@mb.sympatico.ca

Are Dangerous Animals a Consequence of the Fall of Lucifer?

David Snoke in "Why Were Dangerous Animals Created?" (*PSCF* 56, no. 2 [2004]: 117–25) ascribes to God the creation of "violent and ferocious creatures." Snoke argues against Christians who believe that all natural evils arose as a direct consequence of the Fall of Man. In addition, Snoke disagrees with Christians who believe that "demons created all natural cruelty in nature." Snoke selectively considers the views of some Christians but ignores the belief of many that the real source of evil and aberrations in nature is Satan. This omission seems strange since Satan plays such a central role in the woes of Job whose book is the main source of Snoke's view that God created the dangerous species.

God created the laws that govern all of the workings and actions of his creation. God created creatures with free will that eventually disobeyed him. The consequences that followed were an integral part of the created entities. God did not create evil, evil is a result of disobedience. Evil results from the abuse of free will by rational creatures.

Animals are sentient beings that have no consciousness. C. S. Lewis writes: "From the doctrine that God is good we may confidently deduce that the *appearance* of reckless divine cruelty in the animal kingdom is an illusion, and the fact that the only suffering we know first hand (our own) turns out not to be a cruelty will make it easier to believe this. After that, everything is guesswork."[1] Lewis indicates that: "Man was not the first creature to rebel against the Creator, but that some older and mightier being long since became apostate and is now the emperor of darkness and (significantly) the Lord of this world."[2] Also, "The Satanic corruption of the beasts would therefore be analogous, in one respect, to the Satanic corruption of man."[3] And, finally, "Man is to be understood only in his relation to God. The beasts are to be understood only in their relation to man and, through man, to God."[4]

Lewis speculates: "I do not doubt that if the Paradisal man could now appear among us, we should regard him as an utter savage, a creature to be exploited or, at best, patronized. Only one or two, and those the holiest among us, would glance a second time at the naked, shaggy-bearded, slow-spoken creature: but they, after a few minutes, would fall at his feet."[5] Curiously, this description of Paradisal man before the Fall is reminiscent of Chance the Gardener, played by Peter Sellers in the movie *Being There*. In this state, Paradisal man may have had eternal physical life, which he lost at the Fall and was prevented from regaining it by eating from the Tree of Life.

Humans were created in the image of God and animals are subordinate to them. The physical death of humans was a consequence of the Fall. Must that not automatically affect animals? Can superior human beings die whereas inferior animals not die? Therefore, animals were either already affected by the Fall of Lucifer or else the Fall of Man affected animals so that they would always be different in kind from humans. Hence, it is more logical to attribute animal pain and death to Satan and not to an omnipotent God. The millennium reign of the Messiah will be characterized by the restoration of the harmony in the whole of creation (Isa. 11:6–9) that was broken not by the sin of Adam and Eve but by Satan (Rom. 8:18–22).

In closing, Snoke's analysis may be partially successful in casting doubt that the Fall of Man gave rise to the viciousness and death in the animal kingdom. However, Snoke does not even mention the Fall of Lucifer (Isa. 12:14) and so his inference that such features of the animal world were created by God leaves much to be desired.

Notes

[1]C. S. Lewis, *The Problem of Pain* (New York: The Macmillan Company, 1971), 129.
[2]Ibid., 134.
[3]Ibid., 135.
[4]Ibid., 138.
[5]Ibid., 79.

Moorad Alexanian
ASA Member
Department of Physics and Physical Oceanography
University of North Carolina at Wilmington
Wilmington, NC 28403-5606
E-mail: alexanian@uncw.edu

From Whence Evil?

The explanation offered by David Snoke (*PSCF* 56, no. 2 [2004]: 117–25) for the fact that nature is red in tooth and claw is inevitable only if one accepts the fundamental premise of Calvinism: God, from all eternity, did, by the most wise and holy counsel of his own will, freely, and unchangeably ordain whatsoever comes to pass. Arminians believe the character of God, which emerges from the Bible taken in its entirety, is inconsistent with Calvinism and, consequently, with the conclusion that God created nature as we know it today.

According to Scripture, the universe was originally good and the glory of God is still evident in it (Rom. 1:20). But something else—something frightfully wicked—is evident in it as well. Of their own free will, Satan and other spiritual beings rebelled against God in the primordial past and now abuse their God-given authority over certain aspects of creation. Satan, who holds the power of death (Heb. 2:14) exercises a pervasive, structural, diabolical influence to the point that the entire creation is in bondage to decay. The pain-ridden, bloodthirsty, sinister and hostile character of nature should be attributed to Satan and his army, not to God. Jesus' earthly ministry reflected the belief that the world had been seized by a hostile, sinister

lord. Jesus came to take it back. This explanation of evil in nature is persuasively set forth in Gregory Boyd's *Satan and the Problem of Evil* (InterVarsity Press, 2001).

Evidence suggests that Satan, not the Christian God, is the author of evil (1 John 5:19; Rom. 8:20–22; Isa. 13:11; Pss. 5:4; 97:10; Job 34:10). Perhaps Isaiah 11:6–9 reveals a true reflection of God's character in nature.

Bruce McLaughlin
ASA Member
Associate Professor of Physics and Mathematics
North Greenville College
Tigerville, SC 29688
bmclaughlin@ngc.edu
www.christianapologetic.org

Cold Facts about the GISP2 Ice Core and the Flood

Derek Eshelbrenner's letter (*PSCF* 56, no. 2 [2004]: 156–7) regarding my paper on the GISP2 ice core suggests that some clarification is in order. I called my paper the "ultimate proof" against a global flood not because it is an absolute proof in a mathematical sense but because compared to other evidences that the Flood was not global, the GISP2 ice core offers the most direct and most difficult evidence for a YEC (Young Earth Creationist) to refute, making it particularly valuable for addressing the YEC illusion.

Eshelbrenner may have a legitimate complaint that I did not present enough evidence to remove the possibility of the Greenland ice sheet having floated at the time of Noah's flood but not floated away. One reason I did not spend much time on that possibility is because YECs are generally agreed that there was no ice sheet on Greenland or anywhere else before the Flood. And, from a scientific point of view, glaciologists are agreed that the Greenland ice sheet is indigenous.

When I asked Richard Alley, one of the world's leading glaciologists, about the possibility of the ice sheet having floated in a flood, he answered, "Highly unlikely!" for "lots of reasons." He mentioned the absence of "marine ice," which I mentioned in the paper and also said:

> If it floated free and then sat back down, we should either see sea water that soaked into the margins, or that froze on the bottom, or else if you suppose really warm waters, then it would have melted off the old basal ice that is there.

I did not ask for other reasons, but if anyone is interested I am sure he or other glaciologists could convert "lots of reasons" into specifics.

The scientific evidence is that the Greenland ice sheet was neither covered by a global flood nor made to float as Gen. 7:19–8:4 virtually demands. Its untouched and long-time presence on Greenland testifies, therefore, that there was no global flood in the time of Noah. Eshelbrenner, however, is not ready to say science has proven there was no global Flood, only that such a Flood "appears naturally improbable." But, this is too weak a conclusion. Indeed Eshelbrenner seeks to sustain his conclusion by implying that Noah's flood may have been not only supernaturally caused (which I in no way deny) but so unique that despite its unprecedented dimensions, it left neither sediment nor erosion behind it as it drained away! He would thus save the possibility of a global Flood by absolving it of any need to leave behind the most probable naturally expected evidence. It is an approach which virtually removes the Flood from history in order to save its historicity.

It should be added that in addition to glaciology and geology testifying that there was no global Flood, archaeology testifies that there were people all over the world and even in Mesopotamia in the time of Noah who were undisturbed by a supposed global Flood.[1] Yet only a global Flood could get an ark into the mountains of Ararat in such a way that all surrounding mountains were covered with water (Gen. 7:19; 8:3–5), and the consensus of Old Testament scholars is that Genesis is describing a flood that covered the entire earth.

I think we must conclude that the Flood was a local event, which we know was described by the Sumerians as destroying all humankind yet covering only cities in southern Mesopotamia, later described by the Babylonians as destroying all humankind and covering all of Mesopotamia, and finally described by the writer of Genesis 6–9 as destroying all humankind and covering all the world he knew, the entire Near East. He thus adapted traditional materials in order to communicate more effectively theological lessons to his generation.

The writing of the Flood story is thus similar to Jesus using traditional materials to say the kingdom of God is like a mustard seed, which "is smaller than all other seeds; but when it is full grown, it is larger than the garden plants, and becomes a tree, so that the birds of the air come and nest in its branches" (Matt. 13:32). The statement is not scientifically accurate: the mustard seed is not smaller than *all* other seeds, it does not become a *tree*, and although birds light on it, they do not build *nests* in it. The description is scientifically inaccurate because Jesus was using traditional materials in order to communicate more effectively theological lessons to his generation.

The purpose of the divine revelation in Scripture is to guide us in the area of faith and morals. The Bible's history and science are inspired in order to teach faith and morals, but this does not make its history qua history or its science qua science a divine revelation. Inspiration guarantees the inerrancy of the divine purpose for which Scripture was given, nothing more.

Note

[1]The earliest possible date for Adam because of his Neolithic culture is c. 10,000 BC, and the probable date for Abraham is c. 2000 BC. The genealogies of Genesis 5 and 11 both place the Flood in the middle of that 8,000 year difference, thus, roughly at c. 6000 BC for the earliest possible date. I believe Carol Hill and Dick Fischer are correct that the actual event was a local flood around 2900 BC.

Paul Seely
ASA Member
1544 S.E. 34th Avenue
Portland, OR 97214
Phseely@aol.com

Light on the Special Theory of Relativity

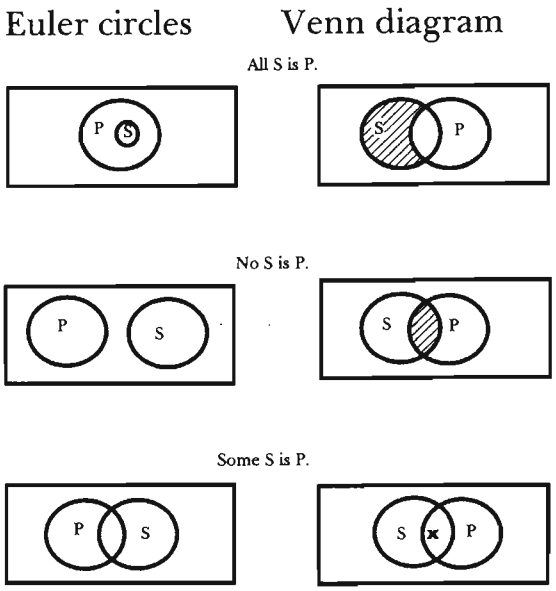
George Bate in his article, "A Conceptual Key for Deeper Insights into Continuous Causation of the Reality Flow of the Universe" (*PSCF* 56, no. 2 [2004]: 89–101), shows a lack of understanding of the special theory of relativity. In the section "Probing Century-Old Mysteries," he questions the simple logic that the speed of light is the same for all sources and observers, regardless of their motion. I suspect that this is illogical for him because he is trying to hold onto a Newtonian view of time. His introduction of a medium or ether with the purpose of solving this so-called mystery would destroy the beauty, elegance, and simplicity of special relativity.

Let me explain several features about the speed of light. It is a fundamental constant, which relates time to space. Time is not independent of space. Specifically a twin, who travels round-trip through space, away and back again to his or her sibling, will age less than the sibling who did not accelerate. Secondly, the speed of light is in some sense an infinite speed. Specifically, I can move myself to any far object in the universe and not age even one second, if I am traveling at the speed of light. The reason the speed of light is a finite number is because space and time are dependent on each other and we measure distance traveled and elapsed time from a single inertial frame of reference. In any inertial frame, there will necessarily be either time dilation (the reference frame clocks run faster than any moving clock in its frame) or spatial contraction (distance between two objects is reduced in an inertial frame moving along the line connecting the objects). This means that observed motion in a single inertial frame must have either the distance shortened or the time prolonged. The factor by which time (distance) changes approaches infinity (zero), respectively as the velocity approaches the speed of light, c. Remember that speed is distance/time. Without either the time dilation factor or the spatial contraction factor the speed of light would be infinite, but with either of these factors the speed becomes finite. The only mystery is why it has its specific value. This is one of the fundamental constants of nature. Assuming God fine-tuned all of the fundamental constants, the teleological interpretation of the anthropic principle explains its value. A much different value would not allow us to exist, because the space-time metric would be different.

William R. Wharton
ASA Member
Physics Department
Wheaton College
Wheaton, Il 60187
William.R.Wharton@wheaton.edu

Some Confused Diagrams and Laws

Professor Kišš, in "Venn's Diagrams in Mathematics and Its Application to Theological Ethics" (*PSCF* 56, no. 2 [2004]: 126–30), mislabels his diagram. Venn diagrams require overlapping circles or ellipses, parts of which may be shaded. His figure is an Euler diagram, named after the noted mathematician Leonhard Euler, a century senior to logician John Venn. However, the circles were already used a century earlier than Euler's presentation. Whatever the labeling, this type of diagram has pedagogical benefits.



Unfortunately, Kišš confuses matters thoroughly by introducing "*lex amoralis*" to include "murder, rape, and pedophilia" (p. 130). First, *amoralis* is not the standard Latin term for such acts. They are immoral, *immoralis*, using the proper Latin negative particle *in-*, which becomes *im-* before *m*. "Amoral," according to the *Oxford English Dictionary*, was coined about 1880, using the Greek alpha privative. The word normally specifies something that cannot be evaluated morally, like having hot or cold cereal for breakfast. This is not what Kišš intends. Beyond this, coupling the term to *lex* is nonsense. What law, rule, principle, standard promotes murder, rape or pedophilia? Such acts are clearly prohibited by natural law, implicit human law, statute law. Were I classifying such acts using New Testament language, I would label them *anomia*, lawlessness, rather than *hamartia*, missing the mark. Perhaps what Kišš intends is a classification of human *actions* under various attitudes. This suggestion also fits what he says about cheating under *lex gentium* (p. 130). I know of no "law" that promotes cheating. It is a matter of student mores in spite of official prohibitions.

A point favorable to Kišš's broad use of *lex* is that neither it nor *jus* demand enactment by a legislature. *Lex naturalis* is understood as the law written in the heart, to which conscience reacts—when it is not seared. It is held to be identical to *lex moralis*, except that the latter is given by revelation.

David F. Siemens, Jr.
ASA Fellow
2703 E. Kenwood St.
Mesa, AZ 85213
dfsiemensjr@juno.com

Erratum

In the letter, "Mature Creation" (*PSCF* 56, no. 2 [2004]: 155), the last sentence of the first paragraph should have read: "This criticism, however, presupposes that God could [not: "would"] have made a young universe without the appearance of age." We are sorry for the error.

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American Scientific Affiliation
55 Market Street, Suite 202
PO Box 668
Ipswich, MA 01938-0668

Phone: (978) 356-5656
FAX: (978) 356-4375
E-mail: asa@asa3.org
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