



The influence of critical thinking on Christians belief and belief change with reference to the polarities of creationism and organic evolution
by Margaret Gray Towne

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University
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Abstract:

This research centered on the factors which inform the basis for belief and belief change among Christians relating to the subjects of creationism and organic evolution and particularly whether critical thinking was employed when beliefs were established or changed. Both quantitative and qualitative data were collected from 261 participants representing four different populations of Christians in northcentral Montana. Data were gathered from questionnaires, in-depth interviews, and the Watson-Glaser Critical Thinking Appraisal.

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A lack of understanding between belief in creationism and the Christian doctrine of creation was noted. Factors which contributed to or prevented belief and belief change were identified and related to belief formation and modification throughout the vicissitudes of life.

Recommendations include more acculturation in critical thinking throughout the lifespan and within all realms of life, including the sacred, and improved science education to prepare individuals for a complex and scientifically dominated world. More thorough instruction by the church on the varied literary forms of the Scriptures and the diverse means by which they can and should be interpreted may alleviate misunderstanding. Means by which evolutionary theory may be integrated into a Christian belief system are included as are suggestions aiding those who disseminate critical thinking skills or assist in belief change.

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This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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Date

16 April 1995

This paper is dedicated to my father, David McFarlane Gray, who first introduced me to the Scriptures, encouraged curiosity, modeled the joy of learning and, where appropriate, had the courage and honesty to change.

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ABSTRACT

This research centered on the factors which inform the basis for belief and belief change among Christians relating to the subjects of creationism and organic evolution and particularly whether critical thinking was employed when beliefs were established or changed. Both quantitative and qualitative data were collected from 261 participants representing four different populations of Christians in northcentral Montana. Data were gathered from questionnaires, in-depth interviews, and the Watson-Glaser Critical Thinking Appraisal.

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CHAPTER 1

INTRODUCTION

Background

A gulf has existed between the worlds of science and religion in the Western world for most of the 20th century, with each side ignoring, distrusting, or even holding the other in contempt. "Scientists distrust theologians dabbling in science, just as theologians distrust scientists barging into theology" (Dobzhansky, 1967, p. 114). "When a scientist writes about God, his colleagues assume he is either over the hill or going bonkers" (Jastrow, 1992, p. 9). On the other hand, Peacocke states, "A theology that marries the science of today may well be a widow tomorrow" (cited in Mangum, 1989, p. 11). At the very least, there has been suspicion, misunderstanding, and ambivalence between the two disciplines. "The warfare between science and theology is often a struggle to clarify to what extent causal explanations are compatible with or antagonistic to meaning explanations" (Mooney, 1991, p. 319). In recent decades this conflict has erupted in the classrooms and courtrooms of our nation.

The core of the debate between science and religion according to Lepkowski (1984) is that scientists believe "religion skews objective reasoning,

fuels repressive movements, and stifles freedom of thought" (p. 36) and that religionists insist "that science pursued from an agnostic or atheistic base feeds the growing materialism, narcissism, and violence of the current age" (p. 36).

Scientists are not always trained to wrestle with the questions of ethics, philosophy, and the relationship of their data to society. Their commitment to the scientific method can estrange them from matters of faith, transcendence, and the world of religion. Theologians, in turn, are trained more humanistically and some find the mindset and language of science to be somewhat foreign. They tend to be wary of the required belief reorientation and subsequent inevitable societal and institutional transformations which are demanded by the growing body of data which has been empirically derived.

This phenomenon is peculiar to the past one hundred or more years. Prior to the middle of the 19th century, most scientists of the Western world were outspoken and committed in their Judeo-Christian faith. In fact, in many instances, faith was the motivation behind their research. It was expected that science would provide new and convincing evidence for the reality of God (Pannenberg, 1992, p. 300). Newton once wrote that nothing could "rejoice" him more than his science should be used for the purpose of demonstrating the existence of a deity (Wertheim, 1994, p. 38).

The historian of science must be well aware that it is often the branches of science which seem to have the greatest theological impact that are most rapidly developed (astronomy at all times, geology in the late 19th century, physics in the 20th century). Pascal, Descartes, Newton, Leibniz, Darwin, Pasteur, Kelvin, Lyell, Einstein,

Schrodinger, Heisenberg, Eddington, and Jeans were all involved in theology as well as science. (Jastrow, 1992, p. 119)

Their scientific inquiries were seen as religious quests.

There is strong support for the thesis that science arose as a consequence of Judeo-Christian theology that viewed God as Creator and Supreme Ruler of nature, one who had not only brought the cosmos into being, but governed it by laws that reflected his faithfulness and consistency. The pioneers of science thus embarked on an unprecedented period of exploration with the attitude that God had given them a world to be understood and appreciated through science in much the way that theologians understood and appreciated God through the study of the Scriptures. This reverential attitude is seen in Francis Bacon, Isaac Newton, Clerk Maxwell, and the vast majority of their contemporaries. In this century it was profoundly the experience of Albert Einstein, of naturalist Louis Agassiz, and of physicist Werner Helsenberg. It is also the experience of neurophysiologist Sir John Eccles, and of astronomers Alan Sandage and Owen Gingerich. (Templeton & Herrmann, 1989, p. 7)

In England in the 1660s, the Charter for the Royal Society directed its Fellows in physics, chemistry, and biology "to pursue their studies 'to the glory of God the Creator and to the advantage of the human race'" (Poole, 1990a, p. 71).

What happened during this century which has resulted in the divisions between scientists and theologians?

The change came about as a result of a shift in the philosophy used by scientists, a shift toward antisupernaturalism. The idea of direct acts of creation was rejected in favor of an explanation of origins from a naturalistic point of view using only the laws of chemistry and physics. Nothing supernatural was involved in the new explanation. This trend was also accompanied by a general decline in "religious" faith. (Chittick, 1978, p. 19)

Moore (1983) assesses the problem as "a serious conflict in patterns of thought and belief. It is a conflict between those who espouse analyzing problems

by using data and logic and those who espouse traditional, and often supernatural, beliefs handed down from our forefathers" (p. 96). Some see it as a conflict of heart and mind and an irreconcilable dilemma because the two groups hold opposing world views.

Barbour (1993) suggests this conflict comes from the two extreme world views, scientific materialism and biblical literalism, which reside at opposite ends of the theological spectrum. He believes that each represents a misuse of science, both failing to observe its proper boundaries. "The scientific materialist starts from science but ends by making broad philosophical claims. The biblical literalist moves from theology to make claims about scientific matters" (p. 7). Barbour further states, with respect to evolutionary theory:

Creationists have raised valid objections when evolutionary naturalists have promoted atheistic philosophies as if they were part of science. Both sides err in assuming that evolutionary theory is inherently atheistic, and they thereby perpetuate the false dilemma of having to choose between science and religion. (p. 12)

Science attempts to explain the "how" of existence while the biblical authors seem more interested in the "why" and the "who." To understand the whole story, both disciplines are essential.

The 20th century has experienced an explosion of scientific discovery, and as phenomena which heretofore were attributed to God were explained rationally, some people have experienced an erosion in their faith. Lightning is now understood using the principles of electricity. The Germ Theory of Disease explains many illnesses, and former beliefs that attributed disease to having been

sent from God or the gods have been abandoned. It is now established that many diseases are prevented not by prayer or by living an exemplary life but by avoiding infectious microbes or getting vaccinated. To the faithful, prayer will always be important in the prevention and cure of disease, but it is now also understood that other factors such as cleanliness, good nutrition, and certain avoidance behaviors can play crucial roles in the presence or absence of illness. God can still intervene, but natural laws are operating and must be acknowledged and respected.

During pre-scientific ages humankind was greatly oppressed by a sense of helplessness in the presence of the vast forces of nature. Armed now with the knowledge of science, humans are no longer subject to the caprice of nature and superstition. Most farmers do not hold elaborate ceremonies to pray for rain or an abundant harvest as their ancestors did. They prepare the ground, select the best seed, irrigate and fertilize, all based on sound scientific principles. Before the dawn of modern science, nature was regarded as a realm of perpetual miracle, controlled by gods or God. Science replaced this view with one of natural laws which result in an orderly universe. To many, God is no longer needed to explain the universe (Munk, 1954, pp. 65-67).

The phenomenon of using a supernatural God to explain what is unexplainable is called "the God of the gaps." These "gaps" are areas of scientific ignorance or phenomena which cannot be understood by scientific reasoning. "Believers often take comfort by arguing that if science cannot explain why certain things happen, then God's actions may be inserted to fill the gap" (Huchingson,

1993, p. 123). Bube (1993) points out the weakness of this position in that any gap is vulnerable to scientific advance, and the obvious consequence is a retreating and weakening God (pp. 131-140).

An overview of the influential events in the history of the relationship between Western Christianity and science is included in Appendix A.

The Need for Interchange

While science has explained much, there remain questions for which science cannot provide answers. Astronomers have proven that the creation of the universe is the result of forces beyond the reach of scientific inquiry (Jastrow, 1992, pp. 89, 105, 107). Both science and theology have "come to a chastened sense of their respective limits" (Oakes, 1992, p. 534). Geologist Simpson (1949) established at the beginning of his book on the meaning of evolution that "evolution and true religion are compatible. It is also sufficiently clear that science, alone, does not reach all truths, plumb all mysteries, or exhaust all values and that the place and need for true religion are still very much with us" (p. 5). Neither science nor religion can provide an "all-encompassing view of the universe which would explain all the remaining enigmas of the existence of the universe or of the knowing beings born within it" (Oakes, 1992, p. 534). They are now forced to look at each other for additional insight.

Snow, according to Neidhardt (1974), suggests that a means of bridging the gap between science and religion would be compulsory courses in science at all

educational levels. Neidhardt recommends studying both scientific and humanist foundations. There one would find a common bond: an individual's dependence, as he or she creatively seeks to understand all of reality, on faith. "Faith is a valid component of all human knowledge, scientific as well as religious. . . . Faith correctly viewed is that illumination by which true rationality begins" (p. 92).

Ellis (1994) explains that the choices made in all applied science and technological applications depend on values and well thought-out ethical bases. Science is unable to provide the needed value system. "This point is fundamental: there is no scientific test possible for what is good and what is bad" (p. 5). Religion is needed to contribute guidance for wise usage of scientific knowledge.

Frightened first by the development of nuclear weapons and later on by the threat of ecological disaster and by the dangers involved in modern biochemical techniques, a sense of responsibility for the application of their work has led many scientists to look for moral resources that could be mustered in order to prevent or at least to reduce the extent of fatal abuse of the possibilities provided by scientific discoveries. (Pannenberg, 1981, p. 3)

Polkinghorne (1994) maintains that there are some questions which arise from science but which go beyond its narrow power to answer. As the rational beauty of the physical world is revealed as they investigate, scientists are struck with its wonder. To many this points in the direction of religion.(p. 4). Ellis (1994, pp. 1-14) and Swimme (1993, p. 111) both forcefully state the need for collaboration between science and theology, and they suggest that major problems facing the global society (e.g., racism, environmental abuse, social unrest) have arisen because of the separation of these two disciplines.

Roy (1981), from a position of extreme urgency, speaks to the need for science and religion to interact. "Humankind must indulge in cultural genetic engineering or it won't survive. It must interbreed religion and technology" (p. 1). Roy earnestly believes that the prognosis for modern civilization to make it through the next century is very poor and is convinced that science-based technology and religion should mutually interact for human survival. For these two fields to be opposed to each other is a luxury we can no longer afford (p. 1).

Schmidt (1993) acknowledges the scientific way of knowing as being an incredible human accomplishment, enabling the understanding of our natural and social environments, but he believes that to remain deaf to other ways of accommodating the world is limiting.

The language and method of science, with its emphasis on objectivity, precision, quantification, and empirical verification, needs to be complemented by an openness to expressions of feelings, commitment and wonder. Science and mathematics may help build skyscrapers, formulate actuarial tables, and send spaceships to the moon, but the language of the heart does not speak in numbers. (p. 80)

Schmidt further suggests that science is narrowly circumscribed by adherence to natural explanations and a need to stick to the "facts" resulting in a limited mode of discourse. "Familiarity with other more intuitive, existential, evaluative, and revelatory ways of knowing and speaking offers a corrective to the limits of science" (p. 81). Schmidt observes that "from a religious standpoint the sacred is revealed or discerned in manifestations that seem more given than exacted, more waited on and listened for than willed or mastered" (p. 84).

van Huyssteen (1993) reflects on the complexity of the world, the search for truth, and the questions which remain unanswered:

Today theologians and scientists, whether they agree or not, and whether they even talk or not, are together in their awe for the way the powers of human reason and imagination manage far to exceed our demands for biological survival, and for the extraordinary ability of the human mind to represent aspects of the world that are inaccessible to our ordinary senses. But scientists are also teaching theologians something today: the baffling and puzzling incompleteness of all our attempts at finding meaning and intelligibility in our world. Our knowledge of the natural world stretches out in two directions: to the basic constituents of physical reality on the one hand and to the higher levels of biological complexity on the other. We should indeed be in awe in the face of the amazing and inventive creativity of the world in which we have evolved: the elusive and unpicturable basic subatomic entities out of which everything is made, including ourselves, have potentialities unknown and indescribable in terms of the physics that discovers and the mathematics that symbolizes them. Therefore, at both the extremes of our comprehension--the subatomic and the personal--we face such baffling depths that even scientists today speak of the mystery of the universe. (p. 114)

To integrate matters of faith and science in this modern world, members of both disciplines are encouraged to communicate, clarify terminology, and recognize limitations. If people are given time, capacity, and motivation, they will attend to and process information which is incongruent with their own. As individuals interact with others who hold conflicting beliefs about the same information understanding can occur on both sides if mutual respect is established, accurate data is presented, and appropriate processing is accomplished (Crocker, Fiske, & Taylor, 1984, p. 205). "If a belief structure cannot be disconfirmed, it is likely that possible belief structure change will come from the interaction with

others who see the same information a bit differently" (Walsh & Charalambides, 1990, p. 519).

Barbour (1993) acknowledges that science and religion are not independent from each other and that state engenders conflict but he suggests that constructive dialogue and mutual enrichment are the benefits which come as a result of this interdependence.

We do not experience life as neatly divided into separate compartments; we experience it in wholeness and interconnectedness before we develop particular disciplines to study different aspects of it. There are also biblical grounds for the conviction that God is Lord of our total lives and of nature, rather than of a separate "religious" sphere. (p. 17)

The process of bringing the scientific and theological communities into dialogue began formally when the American Scientific Affiliation was founded in 1941 by a group of Christians who were scientists. Table 1 summarizes the efforts over the years for dialogue and cooperation between the worlds of science and religion. Many organizations have originated within university and seminary communities and have contributed substantially to interdisciplinary exchange.

More and more scientists and theologians (Barbour, Ellis, Jaki, Margenau, Mills, Oakes, Polkinghorne, Roy, Russell, Van Till to name just a few) are writing on the relationship between science and religion and mutual understanding is developing. Representatives from both areas recognize the contributions made by the other and the necessity for harmony and understanding in this complex world. Conferences and seminars designed to include these separate

Table 1. Timeline Highlighting Science/Religion Cooperation.

| Date | Event |
|------|---|
| 1941 | Founding of the American Scientific Affiliation (ASA) , a group of Christian scientists considering the relationship between faith and science |
| 1954 | Founding of the Institute on Religion in an Age of Science (IRAS) , with Harvard University astronomer Harlow Shapely as its first president |
| 1966 | Publication of the first issue of Zygon: Journal of Religion and Science |
| 1968 | Founding of the Institute for Theological Encounter with Science and Technology (ITEST) , St. Louis, MO |
| 1981 | Founding of the Center for Theology and the Natural Sciences (CTNS) , Berkeley, CA |
| 1987 | "The Church and the Scientific Community: A Common Quest for Understanding," letter from Pope John Paul II to international scientists convened at the Vatican Observatory |
| 1988 | Opening of the Chicago Center for Religion and Science (CCRS) |
| 1989 | First Ecumenical Roundtable on Science and Technology, held annually, with widening denominational participation |
| 1989 | Formation of the Center for Faith and Science Exchange (FASE) , Boston, MA |
| 1990 | "Preserving and Cherishing the Earth," an appeal for cooperation issued to the world's religious communities by an international group of scientists |
| 1991 | "The Joint Appeal in Religion and Science," a response from American religious leaders to the scientists' appeal of 1990 |
| 1991 | Grant awarded to CTNS in Berkeley by the National Institutes of Health to research the theological and ethical implications of the Human Genome Initiative. This is an historic first: a scientific research agency awarding a grant for theological research |

(God and Science, 1993)

disciplines are available in a variety of settings and are well attended; professional journals are published; newsletters abound. In 1993, for the first time in history, an institution of higher learning dedicated a chair to the two disciplines of theology and science when Princeton Theological Seminary appointed a Professor of Theology and Science (Roberts, 1993, p. 6).

Pope John Paul II has endorsed interaction between the two disciplines stating that science "can purify religion from error and superstition" while religion "can purify science from idolatry and false absolutes" (Sheler, 1991, p. 58). There is optimism that the gulf will be bridged at least in part as such efforts expand and members of both communities are open to dialogue and work for greater understanding. Vatican astronomer Corbally is quoted saying, "Always, the great minds in science have had this spiritual dimension, and this is something the Church encourages" (Dricks, 1994, p. 18). The Catholic Church was once a symbol of dogmatic opposition to scientific ideas that clashed with theology. However, in recent years it has sponsored conferences on subjects once considered taboo, such as cosmology and human evolution, indicating that the church has itself evolved over the years (p. 18).

The Anthropic Principle

Another inducement for the interchange between science and religion is the widespread interest in the anthropic principle which is similar to argument from design (which holds that God exists because of the organized complexity of

creation; a device so complicated and well adapted could only be consciously made) (Appleyard, 1992, p. 241). The anthropic principle suggests,

Significant alteration of either physical laws or boundary conditions at the beginning of the universe would prevent the existence of intelligent life as we know it in the universe. If physical laws were altered by a remarkably little amount, no evolutionary process at all of living things would be possible; so these laws appear fine-tuned to allow the existence of life. (Ellis, 1994, p. 5)

Appleyard (1992) explains:

In its weak form this says simply that our observations and theories must take into account the fact that we are here. The universe must have lasted long enough for conscious, carbon-based life forms to have evolved so the results of our observations of its present condition must be conditioned by the passage of that specific length of time. In its strong form the principle says that all the astonishing coincidences of physics, chemistry and biology that have conspired to produce us indicate that the fact that conscious life has evolved is the central, unique fact about this universe. (p. 238)

Scientists and theologians are aware of a number of critical considerations which, taken together, produce a fairly tight series of constraints on the way the world must be in order that we could be here to contemplate it. It seems more than coincidental, many believe, that the very precise conditions for life, and intelligent life at that, just happened. Many ponder, research, and publish on this topic (Barrow & Tipler, 1986; Davies, 1988, 1992; Gilkey, 1959; Munk, 1954; Ross, 1991; Russell, 1989).

The basis for the anthropic principle is the observation that the intricate chain of events--from the Big Bang to the formation of galaxies, of stars, of such heavy atomic nuclei as carbon, of life--is very fragile in regard to small disturbances in the laws and forces of nature. For instance, if you postulate that the strong nuclear force that keeps nuclei together had been stronger or weaker by a small

percentage, the whole delicate chain would have burst. Life would have been much more difficult, even for stars. We seem to live in an optimal universe, optimal for most complex structures that we can imagine. (Gustafsson, 1989, p. 7)

Jaki (1978) relates the number of astounding cases of mimicry, parasitism, and adaptations of organs which, if explained by natural selection, amounts to explaining "miracles by magic." He accuses Darwinians of looking at such examples all too briefly and suggests that purpose is a nightmare in the Darwinian universe (p. 283).

Westhelle (1989) observes the large number of coincidences within the very minimal fractions of the first second. "From this remarkable coincidence comes the anthropic principle which says that what we can expect to observe must be restricted to the conditions necessary for our presence as observers . . . we are not mere chance outcomes of an evolution" (p. 33). Polkinghorne (1990) asserts "it is not just any old world which is capable of producing men and women" (p. 1). This principle has been around since Aristotle propounded the concept of teleology, or final causation, supposing that individual objects and systems subordinate their behavior to an overall plan or destiny (Davies, 1988, p. 6).

Bowker (1981) speaks of a more recent term, teleonomy, a word which has been evoked by the sheer pressure of data. It refers to the reality that "some features of the evolutionary process seem to exhibit goal-directedness or channelling, somewhat of the kind found in programmed behavior" (p. 107).

Furthermore, Bowker states:

The continuity between science and theology is that what we observe in all cases in this universe, including ourselves, is the transaction and transformation of energy. Much of our analysis, therefore, focusses on the question of constraint: what is it that constrains an event (short-lived or long-lived, from a molecule or less to a mountain or more) into the particular outcome which presents itself evidentially and makes demands on our comprehension? What cannot be ruled out at present (i. e., on the basis of our present understanding of the universe and of ourselves) - and in my guess is unlikely ever to be ruled out - is the possibility that among the constraints, which control energy transacted through the human system into its outcomes, are those which are derived informationally from a resource external to the human subject, which has traditionally been characterized theistically - as God . . . The possibility cannot be ruled out that God can participate in the human programme, particularly where it is looked for in faith. (pp. 121-122)

Along with questions posed by theologians, many scientists also attest to the perplexities associated with evolutionary theory and the major questions which persist in spite of much research. They are not so quick to dispose of former beliefs.

Many of these biologists, in trying to understand evolution, are still wedded to the old-fashioned but highly enigmatic notion of chance. Almost all of them feel, however, that the original Darwinian concept needs some qualification, needs an invocation of some directedness, perhaps even goal-directedness, but they are embarrassed and unwilling to call it purpose or design. (Margenau, 1984, p. 32)

Robert Frost pondered this dilemma:

What had the flower to do with being white,
 The wayside blue and innocent heal-all?
 What brought the kindred spider to that height
 Then steered the white moth thither in the night?
 What but design of darkness to appall? --
 If design govern in a thing so small.

The Darwinian claim that all the adaptive design of nature has resulted from a random search . . . is one of the most daring claims in the history of science. It is also one of the least substantiated. No evolutionary biologist has ever produced any quantitative proof that the designs of nature are within the reach of chance. (Denton, 1986, p. 324).

Munk (1954) states that if it is difficult to believe in God as the creator of this mysterious universe, the belief in chance requires even more faith. The probabilities against chance are so vast from the standpoint of mathematics that one can be reasonably certain that the universe did not come in this way, and God is the most promising alternative. Chance is the rock upon which atheism always shatters (p. 72).

Evolution: An Apparent Threat

In spite of various efforts at rapprochement, there remain some significant areas of misunderstanding and even conflict between the disciplines of science and theology. A prime example of a gulf which remains between many Christians and the world of science is that surrounding the theory of evolution. When Charles Darwin published The Origin of Species in 1859, he precipitated a controversy which raged for many decades both on the European continent and in North America. "Seldom in the history of the Christian church have theologians reacted as violently to a nontheological book" (Pelikan, 1965, p. 37). The new theory rocked the basic life and faith assumptions of many and continues to impact some parts of Christendom to this day. "Biological hypotheses such as that of Charles Darwin . . . contributed to the apparent fallibility of religious insights" (Wells, 1962,

p. 62). "To admit the findings of science raised doubts of the inerrancy of the Bible, and hence science was the Antichrist to be defeated at all costs" (p. 303).

In the opinion of many theologians Darwin threatened the trustworthiness of the Scriptures by casting doubt upon the literal accuracy of the narratives in the book of Genesis . . . The traditional Christian definition of the image of God in man seemed to clash with the idea of his descent from earlier and lower forms of life . . . Faith in the direction of divine providence over nature . . . could not stand if Darwin was right. Darwin's suggestions about the descent of man appeared to make the Augustinian doctrine of original sin through the fall of one human couple untenable . . . All these Christian doctrines, and many others besides, seemed to lose their moorings when Darwin cut the rope between man and Adam. (Pelikan, 1965, pp. 38-39)

The claim that the Bible is a unique and infallible revelation from God had been challenged by Newtonian science before Darwin. It gave use to a mechanical philosophy where nature was understood as a law-bound system. This view was incompatible to the Hebrew concept of nature where events were referred to the will of God and the line between the ordinary and the miraculous was very thin (Greene, 1961, pp. 5-6).

The revolution in scientific thinking associated with the theory of evolution as well as the changes it brought to theological thinking has resulted in much confusion and division within the Christian community as well as between the worlds of science and religion. It has also served as a catalyst which has stimulated research in biblical criticism and hermeneutics which has resulted in new approaches to Scripture interpretation and this has resolved the contradictions between Scripture and science for many Christians. They have found it

unnecessary either to negate their beliefs in God or to distort the significant role of Scripture in their lives by relying upon a more figurative and less literal view of some of the Scriptures which deal with the natural world. Many have made a belief change and have undergone a paradigm shift from a creationist viewpoint to that of a theistic evolutionist viewpoint which incorporates divine initiative with natural law. They have felt secure that their faith would withstand the substantial and credible evidence coming from science. They do not fear that their creator God might be contradicted by observable data from his creation. They see science as a noble and enriching quest that helps to make sense of the world in an objective and methodical manner. They understand it does not deny a meaning behind existence (Davies, 1992, p. 21).

It should also be noted that many people have made belief changes from the evolutionist viewpoint to that of the creationist viewpoint. Some of the factors which result in both types of change are included in this research project.

At the outset it must be clarified that the theory of evolution speaks to the evolution of life not the origin of life which is a separate inquiry in the scientific world (Vogel, 1984, p. 1). The theory of evolution is supported by evidence from geology, paleontology, and many other fields of science. The current hypotheses on the origin of life, however, do not have the substantial level of credibility and support given the theory of evolution. Many scientists and Christians believe the premises of the theory of evolution but do not have the data to make claims about any origin theory. While some interesting experiments have been produced

pertaining to origins, no strong claims are made for the resulting hypotheses. In this research effort, the theory of evolution makes reference only to the evolution of life, not to its origin.

Statement of the Problem

Many people have been taught the literal interpretation of the Scriptures and with it the two creation accounts in Genesis Chapter 1 through Chapter 2 Verse 3 (see Appendix B) since childhood. This literal means of interpretation is fundamental to their belief and faith for it establishes for them the authority of all Scripture and, in this particular case, the role of God in creation. For many Christians, especially within the Protestant community, scriptural authority is the foundation of faith in God, for comfort and guidance in this life and for the hope of a life to come. Changing the way in which the Scriptures are interpreted is understandably met with strong resistance, and belief change, when and if it occurs, comes slowly and painfully. Any change, even positive change, is accompanied by stress (Cell, 1984; Kotter & Schlesinger, 1979; Watson, 1972).

Exposure to conflicting belief can cement one's beliefs even more securely especially if the belief is central to one's life rather than peripheral. Messages that are discrepant with existing beliefs seem to reinforce those beliefs (Slater & Rouner, 1992, p. 597). Also, people cling to initial beliefs to a degree that is normatively inappropriate, a phenomenon called belief perseverance (Ross & Anderson, 1982). Zemke and Zemke (1988) hold that "information that conflicts

sharply with what is already held to be true, and thus forces a re-evaluation of the old material, is integrated more slowly" (p. 58). If the factors which aid belief modification as well as those which present the severest challenges could be understood more clearly, adults could more adequately be supported and guided as they attempt to make significant paradigm shifts.

How are profound belief changes accomplished? What factors contribute to these changes and what barriers exist for others who seek to correlate what they learn in the science classroom with what they learn in family devotions, a church sanctuary, a city-wide seminar, or seminary classroom? Is there a relationship between a particular belief or one's educational level and belief change? Most importantly, what role does critical thinking play in these shifts?

Do Christians apply critical thinking skills as they establish beliefs within the faith? Do they critically think when they listen to teachers, pastors, or seminary professors? Are they comfortable applying critical thinking skills when they read religious books or listen to Christian radio? Do they feel it is appropriate to use such skills when they read the Bible? Is critical thinking a part of scientific research?

Purpose of the Study

A great deal has been written in recent years on the conflict among Christians between belief in organic evolution and creationism as well as in the fields of belief and belief change and critical thinking. One purpose of this study is

to combine these three subjects to determine whether critical thinking has a strong influence in establishing belief or directing belief change with reference to evolution and creationism and to identify what other factors may be operating to influence belief in these areas. Another purpose is to inform and aid students, parents, pastors, congregants, museum educators, seminarians, teachers or other interested persons in understanding the issues which surround the subjects of creationism and evolution.

The ultimate purpose is to shed light on a subject which has resulted in dissention and controversy, with the hope that Christians might be informed and more open to the many facets of this dilemma and as a result be more understanding and tolerant of one another's convictions. This could only have positive results for the Kingdom of God in this world.

Research Questions

This research is concerned with three problems:

- (1) Upon what bases do Christians arrive at belief with respect to creationism and organic evolution? Is critical thinking utilized?
- (2) How do Christians undergo belief change with respect to the subjects of evolution and creationism? Is critical thinking utilized?
- (3) Is there a relationship between level of education, critical thinking skills, doubt or certainty, or type of biblical interpretation and belief in creationism or organic evolution?

Definition of terms

Attitude: Less stable than belief; determined by socio-cultural and psycho-biology factors and closely related to an individual's personality; may shift with new experiences and learning (Gordon, 1971, p. 246). The relation between two entities where one is a person and the other is a person or an object as well as the contextually defined relationship between them (Palmerino, Langer & McGillis, 1984, pp. 181-182). At times, used interchangeably with belief.

Belief: Relatively stable emotional and cognitive disposition, usually associated with major abstract issues, particularly religious or those of high emotional significance (Gordon, 1971, p. 245). One of the overt expressions of faith or an avenue to faith; the holding of certain ideas (Smith, 1979, pp. 12, 17-18). "Tools we use to make sense of the world" (Chaffee, 1985, p. 178). At times, used interchangeably with attitude.

Creationism: The belief that God created the world by divine fiat, ex nihilo (out of nothing), as is literally expressed in Genesis 1, in six 24-hour (solar) days, no more than ten thousand years ago; (Institute for Creation Research, undated). Plant and animal "kinds" were miraculously created and are essentially fixed (Moore, 1993, p. 43).

Creation science: "The scientific evidence for creation and inference from those evidences" (LaFollette, 1983, p. 15-16). See "Scientific creationism."

Critical thinking: The ability of the mind to objectively and effectively question its own assumptions and the sources underlying its belief; to shape belief by phenomena other than custom, fear, reward, punishment, or chance. The art of identifying and removing bias, prejudice, half-truths and distortions. "Critical thinking is disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking" (Paul, 1990, p. 33). Critical thinking is "the careful, deliberate determination of whether we should accept, reject, or suspend judgment about a claim--and of the degree of confidence with which we accept or reject it" (Moore & Parker, 1992, p. 4). "Critical thinking is reflective and reasonable thinking that is focused on deciding what to believe or do" (Ennis, 1985, p. 45). "Making sense of our world by carefully examining our thinking (and the thinking of others) in order to clarify and improve our understanding" (Chaffee, 1985, p. 33).

Christian Doctrine of Creation: The universe is the handiwork of a divine creator who brought it into being ex nihilo. "The Creator means the God of the historical revelation, the Father of our Lord Jesus Christ, the Triune God; and by "creation" it means that event which is founded in the revealed divine decree of Creation" (Brunner, 1952, p. 5).

Evolutionary naturalism: That form of naturalism which claims that the scientific concept of evolution provides a sufficient basis for rejecting the idea of divine governance of natural processes (Van Till, Young, & Menninga,

