To the Graduate Council:

I am submitting herewith a thesis written by Stephen A. Cottrell entitled "A Survey of Teacher Knowledge, Preferences, and Practices Concerning Origin of Life Theories." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Curriculum.

R. Lewis Hodge, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

A SURVEY OF TEACHER KNOWLEDGE, PREFERENCES, AND PRACTICES CONCERNING ORIGIN OF LIFE THEORIES

A Thesis

Presented for the

Master of Science

Degree

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ABSTRACT

The purpose of this study was to examine the range of existing practices and beliefs of science teachers in Knox County schools concerning the origin of life, and the degree to which they understand or favor alternative viewpoints. This paper sought to obtain information from respondents concerning how they taught either evolution or creation and what they believed about evolution or creation.

A 25 item survey was developed after numerous conversations with concerned scientists, educators, clergy and lay people. This survey was mailed to all the high school science teachers employed by Knox County during the summer of 1982. The teachers returned these anonymously and the results were tabulated and analyzed for any trends.

Several important findings came from this study. Five are listed here. First, it was found that nearly every individual held a unique interpretation or understanding of what is meant by evolution and creation. Secondly, the majority expressed the idea that presenting only one viewpoint concerning the origin of life was a hindrance to academic freedom. Thirdly, 58% said they believed man has descended from lower forms of life, while 38.5% said they did not. Fourthly, 69% said that they were in favor of both creation and evolution being presented in public schools. Lastly, half of the participants said

they believed that there is some scientific evidence to support a creation viewpoint.

These findings seem to reveal a teacher preference for a change in current curriculum for public schools. The majority of teachers indicated that both sides of the origin-of-life issue should be taught in public schools, yet little has been done to foster this. A fresh discussion of the creation and evolution controversy could help bring new information and provide insights into others' opinions and beliefs.

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CHAPTER I

INTRODUCTION

The question of human origins has long been debated. At present there are two main schools of thought. One is the idea that natural processes can account for how all living things came into existence, a process commonly known as evolution. This process includes the idea that man, along with all other forms of life, has descended from lower forms of life. This process does not require one to presuppose any supernatural element, although many interject that a supreme being could have created everything by this process. An opposing school of thought is that God created all the different kinds of living things in a relatively short period of time, a process known as special creation. The main tenet of special creation is the idea that man has not descended from lower forms of life, but was created essentially as he is today. This idea does require one to presuppose a creator, but proponents claim creation is just as scientific as evolution and that existing data can be interpreted within a creation framework (Gish, 1973).

These opposing schools of thought have generated considerable controversy. Since 1925, the public school has become the battleground for these opposing theories. It was then that the Butler Bill was passed in Tennessee prohibiting the teaching of evolution because such teaching

infringed on the religious beliefs of many people (Butler, 1925, pp. 50,51). Before this time, the biblical account of creation was accepted and taught by most educators.

"Today, evolutionary thinking has been adopted without question in every major discipline of human knowledge" (Moore, 1976). The teaching of evolution has become the norm in virtually every public school and university. Nearly all students "use textbooks that teach only the theory of evolution and that discuss it from cover to cover" (Bird, 1979, p. 1). In 1958, the National Science Foundation funded a variety of curriculum studies.

> One of these, the Biological Science Curriculum Study (BSCS), undertook the task of revising the secondary school textbooks to reflect science as a process and biology as it had become by mid-century. Evolution was one of the major themes identified as pervasive, and the experimental books that appeared in 1960 for field testing in schools used the term evolution freely (Mayer, 1981, p. 66).

Much of the debate centers around the question of what should be taught in public schools. Many people feel that only evolution should be taught because it deals with science, and creation is religion. According to many, evolution is "the only scientifically respectable theoretical account of the origin of life" (Siegel, 1981, p.101). However, some creationists claim "Creation is ... no more religious nor less scientific than evolution" (Gish, 1973). Consequently, there have been efforts to have both creation and evolution taught in public schools.

Recently (Spring, 1982), the teaching of "creation science" was declared unconstitutional by a United States District Judge. In that case, the Arkansas legislature had signed into law a bill requiring that if evolution is taught then creation should also be taught. Both sides offered testimony from scientists who claimed support for their respective positions. At the conclusion of the case, United States District Judge William Overton ruled that the Arkansas law violated the First Amendment's guarantee of separation of church and state (The Knoxville News-Sentinel, 1982, p. D-7). Some "boards of education officially require balanced treatment of evolution and scientific creationism" (Bird, 1979, p. 4). Regardless of recent court rulings, the debate will undoubtedly continue, since it is unlikely that either side will soon abandon their efforts.

Statement of Purpose

The purpose of this study was to examine the range of existing practices and beliefs of science teachers in Knox County schools concerning the origin of life and the degree to which they understand or favor alternative viewpoints.

Need for the Study

Recently efforts have been made to generate legislation that would require "balanced treatment" of both evolution and creation ideas in public schools. Balanced

treatment would require that equal time be given to both evolution and creation ideas in the public classroom presentation of origin-of-life theories. One thing seems to be missing from this controversial picture: Many have taken for granted that only one viewpoint is now being taught, which may not be the case. In short, there is a need to determine how what is being taught de facto corresponds to what is being taught de jure. Regardless of the scientific validity of creation or the allegation that evolution fosters atheism, such laws requiring balanced treatment might be superfluous.

According to a 1981 Associated Press-NBC News Poll, 76% of those polled indicated that they were in favor of both sides of the origin of life question being presented in public schools (The Knoxville News-Sentinel, 1981, p. B-7). In addition to that, another 10% said that they favor the biblical theory only being presented. Since so large a majority desire both sides to be presented, a status study of what is now being taught should be helpful to all concerned parties.

Limitations

This study was limited to science teachers in secondary education in Knox County schools who were employed during the 1981-1982 school year.

Assumptions

Given the opportunity, teachers will give an accurate, honest appraisal of their teaching practices and answer related, value questions.

Procedures

Thirty-nine science teachers in Knox County were mailed a survey to complete regarding their beliefs and practices in the teaching of the origin of life and man. (See Appendix D.) This information was tabulated and data were correlated to determine any statistical trends. This information was also compared to selected items in Leonard's study (Leonard, 1966).

Theoretical Framework

Realizing there may be some confusion to the reader about what is meant by the terms evolution and creation, some distinctions need to be made. The following definitions are those used throughout this study unless otherwise stated.

Definitions

Evolution. All life on earth developed from one or a few simple forms of life (Davidheiser, 1969).[1]

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[1]Bolton Davidheiser, Ph. D. is a graduate of Johns Hopkins University and former professor of biology at both

Creation.

> The bringing into being of the basic kinds of plants and animals by the process of sudden or fiat creation. Here we find the creation by God of the plants and animals,... using processes which were essentially instantaneous (Gish, 1973).[2]

To further clarify these two definitions, several points are listed here to illustrate some of the beliefs corresponding to each viewpoint. These definitions hold many tenets that neither all evolutionists nor all creationists commonly agree upon. Other less rigid, compromising and hybrid definitions do exist; however, for this study the aforementioned definitions will be used.

> The creation model includes the scientific evidence and the related inferences suggesting that:
>
> I. The universe and the solar system were suddenly created.
>
> II. Life was suddenly created.
>
> III. All present living kinds of animals and plants have remained fixed since creation, other than extinctions, and genetic variation in originally created kinds has only occurred within narrow limits.
>
> IV. Mutation and natural selection are insufficient to have brought about any emergence of present living kinds from a simple primordial organism.

Westmont College, Santa Barbara and Biola College at La Mirada, California.

[2]Duane Gish, Ph. D. received his B. S. in chemistry from the University of California, Los Angeles and a Ph. D. in biochemistry from the University of California, Berkeley. He served on post-doctoral research appointments at Berkeley and Cornell, and then for many years as a research biochemist with the Upjohn Company in Michigan. He is also Associate Director of the Institute for Creation Research.

V. Man and apes have a separate ancestry.

VI. The earth's geologic features appear to have been fashioned largely by rapid, catastrophic processes that affected the earth on a global and regional scale (catastrophism).

VII. The inception of the earth and of living kinds may have been relatively recent.

The evolution model includes the scientific evidence and the related inferences suggesting that:

I. The universe and the solar system emerged by naturalistic processes.

II. Life emerged from nonlife by naturalistic processes.

III. All present kinds emerged from simpler earlier kinds, so that single-celled organisms evolved into invertebrates, then vertebrates, then amphibians, then reptiles, then mammals, then primates, including man.

IV. Mutation and natural selection have brought about the emergence of present complex kinds from a simple primordial organism.

V. Man and apes emerged from a common ancestor.

VI. The earth's geologic features were fashioned largely by slow, gradual processes, with infrequent catastrophic events restricted to a local scale (uniformitarianism).

VII. The inception of the earth and then of life must have occurred several billion years ago (Bird, Bliss & Gish, 1981, p. 2).

Uniformitarianism. Uniformity is an attempt to explain the former changes of the earth's surface by reference to causes now in operation (Lyell, 1837).[3]

---

[3] In other words, past geologic history can be explained by the processes that are taking place today. This principle assumes that events took place in the past in the same way they do today.

Catastrophism. The causes now in action (ice, snow, water, wind, and volcanism) are not sufficient to explain the geologic events of the past. The changes in the earth's surface were not mainly attributed to the operation of slowly working causes, but to sudden elevations of whole continents by paroxysmal eruptions, whereas at the same time, large areas of dry land were submerged by the ocean (Hooykaas, 1959).[4]

[4]This belief is based on the assumption that there were forces in operation that are not present today.

CHAPTER II

REVIEW OF RELATED LITERATURE

The creationist viewpoint refers to supernatural intervention; therefore, according to some, that viewpoint is a religious perspective and should be kept out of public education. Although the cause of earth's history could be attributed to God, the evidence to be investigated is treated by scientific methods.

There are many different positions held by people regarding the origin of life. At one extreme there are some who believe God created the earth in seven days and created plants and animals as we see them today. At the other extreme are those who believe evolution provides the sole answer for the origin of life. Myriads of others hold views somewhere in between, believing that God perhaps worked through evolution, or some other such compromise between the evolution and creation extremes. According to T. Huxley, evolution begins with a random chance cause for all things in existence and excludes a need for God (Huxley, 1902). Of course, the creation idea necessitates a creator, which implies faith or a belief in something unseen. According to many scientists today, beliefs also play a great role in evolution. Swiss zoologist A. Portmann has said evolution "projects beyond the scientific facts into the area of faith" (Lever, 1958). G. A. Kerkut's

Implications of Evolution presents many problems with the theory of evolution, and Kerkut states that he believes in evolution because he does not think there is any better alternative (Kerkut, 1960). Philosopher of science, Karl Popper, says that because evolution deals with something we cannot repeat, it cannot properly be called a "theory at all" (Cameron, 1982, p. 30). And prominent scientist Theodosius Dobzhansky states, "The applicability of the experimental method to the study of such unique historical processes is severely restricted before all else by the time intervals involved" (Dobzhansky, 1957, p. 388). In the forward to Darwin's The Origin of Species, Matthews tells us:

> Belief in evolution is thus exactly parallel to belief in special creation - both are concepts which believers know to be true but neither up to the present, has been capable of proof (Darwin, 1971).

Furthermore, according to two other leading scientists, "Our theory of evolution has become ... one which cannot be refuted by any possible observation. It is thus outside of empirical science" (Birch, Ehrlich, 1967, p. 352). According to many, then, beliefs play an important role in both creation and evolution.

An Historical Perspective

Newton, Galileo, Copernicus, Kepler, and Einstein were just a few of the great scientists who declared a belief in a supreme being. Historically, the case can and

has been made that Christianity gave birth to the rise of modern science (Schaeffer, 1976). Many past prominent scientists were professing Christians who also believed that since God created an orderly universe, scientific inquiry can be made. These men saw order and design all around them and described in scientific terms what they saw. Francis Schaeffer, a twentieth century Christian philosopher, contends in several of his writings that a creationist viewpoint was held by many of the founding fathers of modern science.

During the middle ages a mechanistic viewpoint of the origin of the universe was being sought by numerous scientists. The attempt was being made to explain everything in the physical universe by mechanical processes. Many believed that God initiated this great clockwork-like machine called the universe. Some, however, were afraid that if taken too far this mechanistic philosophy might make the need for a supreme being superfluous. Here lie roots of the conflict that continues today. According to some, "evolution is a strictly mechanistic naturalistic and therefore atheistic process" (Gish, 1982, p. 28). Others contend that God created through the evolutionary process.

According to Dr. Duane Gish, the "theory of evolution is an attempt to explain the origin of the universe strictly on the basis of mechanistic, naturalistic processes without the intervention of any outside agency." Gish goes on

to say that if this definition is adequate then it is "contradictory and irrational to profess belief in God as the creator of life and at the same time profess belief that living things arose by mechanistic, evolutionary processes" (Gish, 1982, p. 28). Davis A. Young, professor of geology at Calvin College in Grand Rapids, Michigan, believes God could work through the evolutionary processes. He states that the "human body emerged through the agency of ordinary providentially controlled biological processes" (Young, 1982, p. 44).

Science in its development through the years has always been a stage for controversial topics. Indeed the Ptolemaic geocentric theory of the universe lasted for hundreds of years.

> Only after a prolonged and bitter controversy did the efforts of Copernicus, Galileo and others succeed in convincing the world that the Ptolemaic system was wrong and that Copernicus was right in his contention that the planets in the solar system revolved around the sun (Gish, 1973).

For centuries the principle of spontaneous generation was believed by virtually all scientists. Yet experiments by Pasteur, Redi and others demonstrated that living things only arise from other living things, dispelling the idea that life could spontaneously rise from non life.

These events and others reveal that science is tentative. In the past, some of the greatest leaps in the realm of science have come only after great debate, conflict and even persecution (Butterfield, 1957). The by-word in

science today should be change. Instead of clinging to theories that may or may not have validity or meaning we should always be ready to accept new ideas that can be correlated with the world around us.

Positional Statements of Selected Scientists

Evolutionists have said that none should take seriously the claim that there are a lot of reputable scientists who support a creation view. Professor Theodosius Dobzhansky (himself an evolutionist) claims, "it would be wrong to say that the biological theory of evolution has gained universal acceptance among biologists or even among geneticists" (Dobzhansky, 1963, p. 1134). Some have stated that none of the biologists associated with the creationist viewpoint have done any significant work (Myer, 1981, p. 66). The converse of this appears to be true. At present there are over 650 different scientists with graduate degrees who have stated they find greater credibility in the creationist viewpoint (Morris, 1980, pp. 1-4). A few well-established scientists who hold a creation position are Dr. A. E. Wilder-Smith, Professor of Pharmacology in Boggern, Switzerland, and author or co-author of more than 50 technical publications; Dr. Melvin A. Cook, winner of the 1968 E. G. Murphee Award in Industrial and Engineering Chemistry from the American Chemical Society and also winner of the Nobel Nitro Award; and

Dr. Walter Lammerts, geneticist and famous plant breeder (Gish, 1973).

Two men recently testified on behalf of the state of Arkansas in favor of creation. One was Robert V. Gentry, a visiting scientist at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. Gentry has done work with Polonium halos which seem to indicate a recent age for the earth (Raloff, 1982, p. 44). Nalir Chandra Wickramasinghe also testified in behalf of the creation viewpoint and although he does not hold a Christian fundamentalistic view, he is still convinced that the theory of evolution has immense unsolved problems. Wickramasinghe currently heads the Department of Applied Math and Astronomy at the University College in Cardiff, Wales (Raloff, 1982, p. 44).

There are several organizations that support creationism, the two largest being the Institute for Creation Research and the Creation Research Society. Both of these organizations have produced hundreds of books, tapes, filmstrips, textbooks and other information concerning the creationist position. Many of their scientists hold earned doctorates in the fields of biology, biochemistry, and geology.

Not all scientists who are Christians adhere to a creation idea. V. Elving Anderson is a professor of genetics and acting director of the Dight Institute for Human Genetics at the University of Minnesota in Minneapolis. He is president of Sigma Xi, the scientific research

society, and an editor of Genetic Basis of Epilepsies. Anderson is a professing Christian who believes that God could have worked through the evolutionary process. Davis A. Young, whose credentials have been previously cited, illustrates another viewpoint taken by a fundamentalist Christian. Young agrees with evolutionists' belief in a very old earth, yet does not conclude that an ancient earth validates a belief in biological evolution (Young, 1982, p. 43). Another view is held by Reverend Edward W. Mills, who is chairman of Creationism Committee, Board of Directors in the Connecticut Science Teachers Association and a biology teacher at New Canaan County School, New Canaan, Connecticut. Mills believes creationism deals only with religious faith and belief and cannot be considered a theory. He states that creation cannot be "taught or supported in the science classroom" (Mills, 1982, p. 5).

There are also many scientists who hold that if evolution is true, no room is left for the idea of a supreme being. Speaking of evolution, D. M. S. Watson said, it is "A theory universally accepted not because it can be proved by logically coherent, evidence to be true, but because the only alternative, special creation, is clearly incredible" (Watson, 1929, p. 233). Others who felt that evolution excluded the need for a supreme being were Dr. George Gaylord Simpson, retired professor of Vertebrate Paleontology at Harvard University; Sir Julian Huxley,

noted British biologist and author; Dr. Jacques Monod, French biochemist and joint recipient of the 1965 Nobel Prize for Medicine and Physiology; and Theodosius Dobzhansky, geneticist and Professor of Zoology at Colombia University and later the University of California.

A wide spectrum of beliefs is apparent. There are numerous fundamentalists who hold to a creation idea and several who believe instead that God worked through evolution. It also appears that there are many who disregard the idea of a supreme being in addition to rejecting the theory of evolution for what they feel is lack of evidence. Others do not believe in God and profess that evolution is indeed a naturalistic process that can successfully explain origins without the need for any supreme being.

Survey Data

Recently, many surveys have been conducted to extract the public's position on the question of what to teach in science with regard to the origin of life. There is strong support for inclusion of the creationist viewpoint in the public schools. As cited earlier, 76% of the public polled by Associated Press-NBC News in 1981 indicated a preference for inclusion of a creation viewpoint along with an evolution one in public schools (The Knoxville News-Sentinel, 1981, p. B-7). A survey in Del Norte County Unified District in California indicated that 89% of the people

polled in 1,346 homes said they thought creation should be taught in public schools. Another survey conducted in Cupertino Union School District in California indicated that 84% of 1,995 homes contacted said, "yes," when asked if scientific evidence for creation should be presented along with evolution. A telephone survey conducted by the Institute for Creation Research Midwest Center in 1978 revealed that 64% thought evolution and creation should be taught together. Of considerable interest is the fact that 18% wanted creation only taught (Bliss, 1978, p. 2).

A study done by James R. Leonard in 1966 in Knoxville, Tennessee, asked science teachers in public secondary schools questions dealing with the origin of life. The purposes of Leonard's study were to:

> review the Tennessee antievolution law and describe its effects on the teaching of biology in the public secondary schools of the Knoxville City School System and the Knox County School System located in the metropolitan area of Knoxville, Tennessee (Leonard, 1966, p. 1).

Parts of his study are significant in that five questions asked in this thesis survey were similar to questions asked in Leonard's study. It was against the law to teach evolution in the state of Tennessee until 1967; consequently, several of the responses given by the participants in 1966 are interesting. This study will be referred to in more detail in Chapter 3.

A random telephone survey taken by this author in the greater Knoxville area in 1980 found that 84% of the people who responded said that they would be in favor of both scientific evidence for creation and scientific evidence for evolution being presented in public schools. An additional 7% said they would be in favor of the biblical presentation in schools. These surveys seem to indicate that most people are in favor of both evolution and creation being presented in public schools.

Also pertinent to this study is an experiment that was performed by Richard Bliss of the Institute for Creation Research. This experiment was to determine the statistical relationship between students studying the origin of living things when they had two models to choose from, as opposed to students who studied evolution only. Results showed that students who received the two model approach made a significant gain when post tested, indicating more effective learning took place (Bliss, 1978, p. 3).

A Religious and Educational Issue

"It is bigotry for public schools to teach only one theory of origins" (Bird, 1979, p. 4). This statement was made by Clarence Darrow in the infamous Scopes Trial. Darrow was the defense attorney for John Scopes, the young science teacher who admitted to teaching evolution in his classroom in 1925. Thus, part of the defense of teaching

evolutionary theory was the position that evolutionary theory should be taught along with a creationist theory. Darrow was referring to the fact that the evolutionary theory was being rejected in public schools. His claim was that if the biblical view of man's origin was being presented, then the evolutionary viewpoint of man's development should also be presented. In the last 50 years, a reversal has taken place. The evolutionary view is now the predominate view; many creationists recite Darrow's words while attempting to establish the balance they were once unwilling to share.

Part of the controversy stems from the idea that the implications of a creation theory point to a creator, which could be viewed as a religious idea. According to some, this would be in violation of the constitutional amendment requiring separation of church and state. Of course, evolution could also be viewed as a violation of the constitution because it tampers with religious ideas. In teaching some (though not all) forms of evolution, public schools are teaching beliefs contrary to particular religions, thereby placing a burden on religious freedom. Indeed, according to some of the leading proponents of an evolutionary theory, a strict adherence to the evolutionary view would oppose a belief in a god. Jacques Monod, French biochemist, states that belief in God is absurd and points out that "chance alone is at the source of every innovation

of all creation in the biosphere ...." He continues that not only is evolution the best hypothesis for the origin of the world guided by pure chance, but that, "It is the sole conceivable hypothesis" (Monod, 1971). In his book, Lucy: The Beginnings of Humankind, co-author Donald C. Johanson reaffirms Charles Darwin's conclusion that the theory of evolution proves that man was not divinely created in 4,000 B. C. (Johanson, 1981, p. 54). T. Huxley also stated that, "Evolution excludes creation and all other kinds of supernatural intervention" (Huxley, 1902, p. 6). This kind of teaching is in conflict with many peoples' religious beliefs.

> Classroom instruction that presents only evolution without an alternative theory puts a burden on religious freedom. Teaching only one theory of the origin of life and man indoctrinates creationist students in that evolutionary theory and the Supreme Court has ruled that public schools cannot undermine religious beliefs (Bird, 1979, p. 2).

According to G. H. Harper, the methods of teaching Darwinism, or the general theory of evolution are "suspiciously similar to indoctrination" (Harper, 1978, p. 83). Harper says we indoctrinate to the degree we:

> 1)expose children at an early age to the theory we want them to learn; 2)we do not present alternative theories, or if we do then inadequately; 3)if alternatives are presented, this happens at a later age; 4)we state that the theory or parts of it are proved; 5)we suggest that the theory is validated by a method which is inapplicable; 6)we make statements and ask questions that assume that the theory is true; 7)we cast aspersions on those who do not conform (Harper, 1978, p. 83).

Sir Julian Huxley claims that,

> Hypotheses are valuable and necessary instruments of the human mind for its dual task of adding to and organizing knowledge. But they become dangerous when they are erected into absolute affirmation or dogmas, and pernicious when they claim immunity from constant testing against fact (Huxley, 1957, p. 257).

This could well be applied to the evolutionary theory.

Academic freedom is one point that is paramount in this issue.

> Courts have recognized that school authorities can and must decide what subjects will be taught in public schools. A decision to add scientific creationism to the curriculum does not violate academic freedom any more than a decision to add evolution in the 1920s did. Instruction in both theories enhances academic freedom for the student because it gives him a neutral choice among alternative theories rather than indoctrination in one theory (Bird, 1979, p. 4).

Dr. G. G. Simpson, an advocate of evolution affirmed this same idea when the evolutionary theory was being suppressed from the schools a few decades ago:

> Education will be stultified if properly qualified teachers are not free to teach what they believe to be true either from their own competence or on acceptable authority in the relevant field of research (Simpson, 1961, p. 619).

Summary

The question of man's origin will probably always have at least two answers. Since no one was there when man first came into existence, uncertainty is forever sealed. Undoubtedly the public schools will continue to be a beachhead for disagreements between evolution and creation

proponents. Most everyone is concerned about what students are taught concerning the origin of life in public schools, because within these issues are raised some of life's most stirring questions. This author believes that an open forum discussion concerning the origin of life can only help to enlighten each generation.

CHAPTER III

ANALYSIS OF SURVEY MATERIAL

Introduction

The purpose of this chapter is to present an analysis of data collected from the 39 science teachers in the seven high schools of Knox County as it pertained to their knowledge, preferences, and practices concerning the origin of life. During the summer of 1982, questionnaires were sent to all 39 teachers, and 26 returned them completed. The data are presented in tabular and written form in this chapter.

The survey that was sent was designed to obtain information concerning the following areas:

1. Age and teaching experience,
2. Emphases in academic background,
3. Participants' understanding of the terms evolution and creation,
4. How the origin of life is being taught in their classes,
5. Academic and religious freedoms regarding this issue,
6. Personal beliefs,
7. Comparison to a similar survey taken 14 years ago (Leonard, 1966), and
8. Comparison of specific questions.

Data Related to Age and Teaching Experience

Questions two and three asked participants to list what age category they were in and the range of years they had been teaching. The questions and summary of responses are presented as follows:

2. How long have you been teaching: 6 1-5 years
   7 6-10 years 13 over 10 years.
3. Your age is 7 21-30 9 31-40 3 41-50
   6 51-60 1 over 60.

Question two dealt with the amount of experience each teacher had. Half (13 or 50%) indicated they had over ten years of experience; half had less than ten years of experience. A minimum of 178 years of teaching experience can be inferred from the totals. This would seem to indicate a fairly experienced and seasoned group of educators. Corresponding with this, question three asked the age of each participant. There was a fairly even distribution across age groups with the majority in the 31-40 age group. Data gathered from questions two and three revealed many years of teaching experience from educators of widely varied ages.

Data Related to Academic Background

Questions one, four and nine asked participants to reveal the degrees they had received and the courses they had taken, or information they had received regarding the

origin of life. Questions and summaries are presented as follows:

1. What is your college background? 8 B. A. 5 M. A. ___ Ph. D.- Ed.D. 2 Other 7 B. S. 4 M. S.

4. What college courses have you had containing information on the origin of life?

18 A. General zoology	13 G. Geology (historical)
17 B. General botany	8 H. Anthropology
9 C. Taxonomy	3 I. Paleontology
17 D. Genetics	___ J. Specific course on creation
11 E. Ecology	5 K. Other.
2 F. Specific course on evolution	

9. Have you received any training or information concerning an alternate viewpoint on the origin of life (excluding the Bible)? 8 Yes. 17 No.

Question one asked what educational degrees were held. A slight majority (57%) held either a Bachelor of Arts or a Bachelor of Science degree, while the rest (33%) held Master of Arts or Master of Science degrees or some other type of degree.

Question four asked what college courses each teacher had taken concerning the origin of life. Here courses were listed that might contain content regarding evolution or creation. Most participants listed education in several areas, but three catagories received little or no response.

Only two people in the survey said that they had taken a specific course on evolution. Of these one stated he believed man had developed from lower forms of life, the other did not. Both opted for a preference that God was involved. Only three had taken a paleontology class (the study of fossils), and none had taken a class on the creation theory. Interestingly, few people had taken courses which dealt primarily with creation or evolution. In reviewing other data from the survey, one should consider the very little formal exposure respondents have had to either theory. There is the possibility that respondents are not well informed in this area. If more individuals were given the opportunity to know more about both the creation and evolution theories, opinion might be quite different from the ones expressed in this survey. One of the purposes of this survey was to see if educators favored both sides being presented in public schools. Understandably, opinion will be influenced by prior information.

Question nine asked if the participants had received any training or information concerning alternate viewpoints on the origin of life excluding the Bible. Eight people had received some training or information on this topic. It is not clear whether they intended to say the information dealt with creation theory, although it seems significant that eight (31%) of those surveyed did have some knowledge that differed from the theory of evolution.

Data Related to Participants' Understanding of the Terms Evolution and Creation

Questions five and six asked the participants about their understanding of the terms evolution and creation. (Note here that more than one response was given on question five by a few participants.)

5. Which of these best describes your understanding of the term evolution?

5 A. All living things developed from one or a few simple organisms.

18 B. Evolution means change.

6 C. Evolution means the coming into being of the entire universe by natural processes.

3 D. Evolution means survival of the fittest.

Briefly explain or comment on what you understand the term evolution to mean:

6. Which of these best describes your understanding of the term creation?

2 A. All living things were created at the same time.

19 B. God created everything but the Bible doesn't say how He did it.

4 C. All major kinds of organisms were created at the same time and there has been variation within kinds.

1 D. All species were created in seven days and there are no new species coming into existence today.

Briefly explain or comment on what you understand the term creation to mean:

On both questions one answer was predominant. Most educators, (18 or 69%), said that evolution means change. Six people (23%) said that evolution means the coming into being of the entire universe, while five people (19%) said that evolution means all living things developed from one or a few simple organisms. Only three (12%) stated they believed in the Darwinian concept of the survival of the fittest. Four people (15%) stated that creation means all major kinds of organisms were created at the same time and there has been variation within kinds. Only two (8%) said that all living things were created at the same time, and only one (4%) said that creation meant all species were created in seven days and there are no new species coming into existence today. Each participant was also given opportunity to express his or her views more completely by writing out what they understood these two terms to mean. These responses are listed in Appendix A. From these findings, it is apparent the words evolution and creation do not connote the same meaning to each individual.

Data Relating to How the Origin of Life is being Taught in the Classroom

The method of teaching evolution or creation or the omission of either was the subject of questions seven and eight. The questions and responses are as follows:

7. How is evolution taught in your class? (check as many as apply)

2 A. Omitted.

4 B. Evolution is the only scientific explanation for the origin of life.

6 C. When a student asks, I tell him or her that I believe in it but explain that some don't believe in it.

2 D. Teach it but call it development or animal history.

1 E. Teach it but stop short of man.

11 F. Teach the scientific pros and cons about evolution and let the student decide.

2 G. Teach it completely.

9 H. Teach that evolution only means change.

7 I. Other. (explain briefly)

8. How is creation taught in your class? (check as many as apply)

9 A. Omitted.

3 B. Creation is the only scientific explanation for the origin of life.

2 C. When a student asks, I tell him or her that I believe in it but explain that some don't believe in it.

3 D. Teach it but don't teach any specific doctrine or religion.

4 E. Teach the scientific pros and cons about creation and let the student decide.

___ F. Teach it completely.

7 G. Teach that creation simply means God was the author of all life.

4 H. Other. (explain briefly)

The respondents were not limited to just one response so percentages are not in order.

Two people reported omitting evolution, and nine omitted creation from their classroom teaching. This was not surprising since no one reported having taken a college course in creation. Four people said that evolution was the only scientific explanation for the origin of life, while three stated the same conclusion for the creation theory. Other answers were varied, but the majority answered that they teach the scientific pros and cons regarding evolution and then let the student decide. Here again teachers were allowed to express their ideas more fully by writing in any other way they might teach either of these two subjects (see Appendix B). Evidently, a variety of ideas concerning this topic are now being taught in public school classroom. Although there are no textbooks provided specifically by Knox County or the schools themselves which include creationist ideas, several classes still receive information regarding the creation theory.

Data Related to Academic and Religious Freedoms

Questions ten, 11, and 15 through 18 were developed to obtain information about what the participants believed

concerning academic and religious freedoms with regard to the evolution - creation controversy. From this point on in the study, the following definitions were to be used in describing evolution and creation:

Creation - Man was created by God a distinct individual and man, along with all other forms of life, has not descended from any lower forms of life.

Evolution - Man may or may not have been created by God, but man, along with all other forms of life, developed from one or a few simple forms of life.

10. Do you believe it is a hindrance to academic freedom to present only one viewpoint concerning the origin of life? 17 Yes. 8 No.

11. Would you be in favor of both scientific evidence for creation and scientific evidence for evolution being presented in public schools? 18 Yes. 6 No.

15. Do you feel that instruction that presents the evolutionary viewpoint puts a burden on religious freedom? 3 Yes. 21 No.

16. Do you feel that instruction that presents the creation viewpoint puts a burden on religious freedom? 6 Yes. 18 No.

17. Do you believe that the theory of evolution has had any effect on religious thought? 21 Yes. 5 No.

18. Do you believe there is a conflict with the general theory of evolution and a literal interpretation of the Bible? 17 Yes. 8 No.

Question ten asked if the participant believed it is a hindrance to academic freedom to present only one viewpoint concerning the origin of life. Seventeen (65%) said yes. When asked in question 11 if they would be in favor of presenting scientific evidence for both creation and evolution in public schools, 18 (69%) said yes and only six (23%) said no. The majority, therefore, were implying that it is wrong to present only one viewpoint on the origin of life in public schools.

Questions 15 and 16 asked if instruction that presents the evolution or creation viewpoint, respectively, puts a burden on freedom of religion. The majority said it did not, although more said creation put a burden on freedom of religion than did evolution. Two people did not answer each question. While conveying the belief that the teaching of evolution or creation does not put a burden on religious freedom, participants did indicate that the theory of evolution has had an effect on religious thought, and that the general theory of evolution does conflict with a literal interpretation of the Bible. One thing might account for this seeming inconsistency. These responses could be reflecting the belief that God worked through evolution; therefore, there is no burden on freedom of religion because the Bible could be interpreted freely by everyone. There may be other rationale for these answers, but data showed that at least some felt

that their constitutional rights of freedom of religion were being violated by the presentation of creation or evolution ideas.

Data Related to Personal Beliefs

The remaining items in the survey dealt with personal beliefs concerning the origin of life. The items are grouped here for review according to the format of the question. The first set contains four questions that solicit a yes or no response and one a preference for evolution or creation. The second set is listed as a series of statements where participants are asked to mark whether they strongly agree, agree, are neutral, disagree or strongly disagree. The last section listed is a group of statements, and the participants were to mark the one that came closest to their ideas.

Question 12 through 14, and 19 and 20 provided five forced choice questions where the participant could respond in only one of two ways, limiting perhaps the views of some.

12. Do you know of any scientific evidence that is inconsistent with evolution? 10 Yes. 16 No.
13. Do you know of any scientific evidence that is inconsistent with creation? 13 Yes. 13 No.
14. Do you believe the scientific data best supports evolution or creation? 17 Evolution. 9 Creation.

19. Do you believe man has gradually developed from lower forms of life? 15 Yes. 10 No.

20. Do you believe biology can be adequately taught without reference to the idea that man has gradually developed from lower forms of life? 12 Yes. 14 No.

Questions 12, 13 and 14 were intended to record what the participant believed concerning the scientific evidence in support of either theory. Asked if they knew of scientific evidence inconsistent with either evolution or creation in questions 12 and 13, participants' answers were equally distributed between yes and no. Ten (38%) knew of evidence which they considered inconsistent with evolution, and 13 (50%), evidence inconsistent with creation. Sixteen (62%) did not know of any evidence which they considered inconsistent with evolution, and 13 (50%) knew of none inconsistent with creation. Notably, of the science teachers in Knox County who responded to this survey, 50% said they did not know of any evidence which they considered inconsistent with the theory of creation. Although some respondents might have had different ideas in mind regarding the meaning of creation, definitions of the terms evolution and creation were given immediately prior to these questions. If the participants' answers were correctly interpreted, this indicates that 50% of the science teachers who responded indicated they did not know of any scientific evidence inconsistent with creation.

Question 14 asked which idea is supported by scientific data: evolution or creation. Seventeen (61.5%) said evolution, nine (34.5%) said creation, and one (4%) a combination of the two. According to this, 17 people were saying that man, along with all other forms of life, has developed from lower forms of life. Nine people stated that man was created by God and has not descended from lower forms of life, to the best of their knowledge. One person indicated the scientific data supported a combination of the two ideas. Again the participants were to use the definitions given as a base for their answers; however, the person that posted a combination of ideas seemed to be stating a contradiction. From the definitions it is clear that there is a choice to be made between the idea that man has descended from lower forms of life, or that he has not, regardless of belief in the involvement of a supreme being in either.

Question 19 is very similar to question 14. Question 19 asked teachers if they believed man has gradually developed from lower forms of life. Fifteen (58%) said yes, ten (38%) said no, and one (4%) said he did not know. A slight change has taken place from question 14 to 19. Although only nine said they believe the data best supports creation, ten said they personally believe the creation theory.

Question 20 asked if teachers thought biology could be taught adequately without reference to the theory that man has gradually developed from lower forms of life. Twelve replied it could, and 14 said it could not. A few comments were made regarding beliefs on this topic; they are listed in Appendix C.

Five statements were made regarding beliefs in questions 21 through 25, and participants were asked to mark accordingly either strongly agree, agree, neutral, disagree, or strongly disagree with the statement.

21. The evolution of man has been proven.

    3 SA 7 A 2 N 9 D 5 SD

22. If the evolution of man's development could be shown to be false, this might change some of my personal beliefs. ___ SA 11 A 5 N 7 D 3 SD

23. I believe, along with T. Huxley that if the evolution of man is true, then there is absolutely no need for God. ___ SA 1 A 1 N 9 D 11 SD

24. I believe there is some scientific evidence to support a creation viewpoint of the origin of man.

    5 SA 8 A 6 N 3 D 4 SD

25. The most objective thing I could say about the subject of origins is that nothing is certain, and that I am open to alternative views that can be correlated with known data. 8 SA 9 A 3 N 1 D 5 SD

Item 21 stated that the evolution of man has been proven. Ten people either agreed or strongly agreed with this, while 14 either disagreed or strongly disagreed. About 38% of these educators believe that man's descent from lower forms of life has been proven. A majority (54%) implied that evolution is not proven, although most indicated a personal belief in evolution.

Item 22 stated that if evolution could be shown to be false, it would change some personal beliefs. Eleven agreed, five were neutral and 11 either disagreed or strongly disagreed. Item 23 stated that if evolution were true, there would be no need for God. To this only one person agreed, one was neutral, and the rest disagreed. Item 24 stated that there is some scientific evidence to support a creation viewpoint of man's origin. To this 13 (50%) stated they either strongly agreed or agreed, six (23%) were neutral and the remaining seven (27%) either disagreed or strongly disagreed. There seems to be a tolerance, if not acceptance, of the idea that there is some scientific evidence to support a creation viewpoint. The last statement, item 25 asserted that nothing about the subject of origins is certain, and that he or she would be open to alternative views that could be correlated with known data. Six people either disagreed or strongly disagreed with this statement, while three remained neutral and the rest (65%) either agreed or strongly agreed.

To close the survey, a group of eleven statements were made ranging from a dogmatic belief in evolution to a dogmatic belief in creation. Participants were asked to mark the one statement that came closest to their ideas. A wide range of selections prevailed. It should be noted that only 22 of the participants marked choices on this final question.

Preference Scale

On the following scale, place an "X" on the blank next to the statement that you feel comes closest to your ideas. Mark only <u>one</u> "X".

___1. Evolution is true because almost all scientists and educated people believe this.

__2 2. Evolution is a fact that has been proven by scientific studies.

__6 3. The evolution of all life seems fairly certain from scientific studies.

__1 4. The evolution of some living things is possible, but something else caused much of the life we see.

__5 5. Evolution occurred with the help of God.

___6. Neither evolution nor creation is a very good idea about how life came to be.

__3 7. Creation started all life, but some evolution was necessary.

___8. Creation is possible, but something else caused much of the life we see.

__1__ 9. The creation of all life seems fairly certain from scientific studies.

____10. Creation is a fact that has been proven by scientific studies.

__4__ 11. Creation is a fact because God has revealed it to us.

Several people chose statements that illustrated a belief in a mixture of ideas. Nine (35%) stated that they believed in evolution but that something else caused the origin of much that we see today. Six (25%) indicated that evolution seems fairly certain from scientific studies, and two (8%) said evolution has been proven by scientific studies. One person said the creation of all life seems fairly certain from scientific studies, while four (15%) marked the choice that creation is a fact because God has revealed it to us.

Data Related to a Similar Survey taken in 1966

Several questions raised in this survey were similar to those in a survey conducted in 1966 by James R. Leonard (Leonard, 1966). Two differences between this study and Leonard's need to be mentioned. Leonard's study included responses from 30 (91%) biology teachers that taught during the 1965-1966 school year in either the Knoxville City or the Knox County schools. This thesis gathered information from 26 (67%) teachers in the Knox County school

system only who taught any science course. Following are excerpts of the questions from the 1966 study with their responses given in percent, in comparison with similar questions from this thesis survey.

In Leonard's survey a tabulation was made of the participants who agreed with the statement that, "Man has evolved from lower forms of animals." Forty-seven percent stated agreement. Question nineteen of this thesis survey asked teachers if they, "believe man has gradually developed from lower forms of life." Sixty percent said they did. From this comparison, a slight increase seems to have occurred in the percentage of people who hold the idea that man has developed from lower forms of life.

In 1966, Leonard posed the following question: "Do you believe that there is any conflict between the theory of evolution and the Bible?" Thirteen percent replied in the affirmative, 80% said no, and 7% were undecided. The survey in this thesis also asked: "Do you believe there is a conflict with the general theory of evolution and a literal interpretation of the Bible?" Sixty-five percent said they did, 31% said they did not, and one person abstained. Although the wording of the two questions are different, and Leonard's survey does not include the idea of a literal interpretation of the Bible, with recognition of these limitations, comparison can be made. Only 13% of those surveyed in Leonard's study believed

that there is any conflict between the theory of evolution and the Bible. The word "any" invites the respondent to scrutinize earnestly for conflicts between evolution and the Bible. A similar question in this survey also invited the participants to carefully consider the implications of evolution and note any conflict between the "general theory of evolution and a literal interpretation of the Bible." In this thesis, 65% stated their belief that there is conflict between a literal view of the Bible and evolutionary thought. Considering the differences in the two questions, it seems apparent that the idea of conflict between the Bible and evolution has become more prevalent. If the majority attitude of the general public parallels the 65% in this survey, one could expect the lobbying of various groups in favor of presenting both the creationist and evolutionary theories in public schools.

In 1966, the Butler Bill was still in effect, prohibiting the teaching of evolution in Tennessee public schools. Leonard's survey asked, "Do you believe that the antievolution law is an infringement upon your rights of academic freedom?" Seventy percent said it was. Question ten of this survey asked, "Do you believe it is a hindrance to academic freedom to present only one viewpoint concerning the origin of life?" Sixty-eight percent said it was, while the rest said no. From this comparison, one could conclude that teachers' attitudes toward academic

freedom have altered little. Although there is no law prohibiting the presentation of creation theory today, most textbooks bought and used by public schools as well as many curriculum guides present only the evolutionary viewpoint on the origin of life.

Question 12 of the 1966 survey asked, "How is evolution taught in your class?" Thirty percent reported that they taught the scientific pros and cons about evolution and let the student decide, and 28% said that they taught evolution completely. Question seven of this survey was identical. Forty percent reported teaching the scientific pros and cons about evolution and letting the student decide, and 8% stated teaching evolution completely. An apparent decrease in those who teach evolution completely can be inferred.

In 1966, the question was asked, "Do you believe that biology can be adequately taught without reference to evolution?" Two percent said it could. Question 20 of this survey asked, "Do you believe biology can be adequately taught without reference to the idea that man has gradually developed from lower forms of life?" Fifty-four percent of those surveyed answered yes.

Comparison of Specific Questions

Question 19 of this study asked if participants believed man has descended from lower forms of life.

Fifteen (58%) said yes, ten (38%) said no, and one said he was not sure. These figures will be referred to throughout this section; hence, two groups have been designated accordingly. Those who said yes will be referred to as the "evolution group" and those who answered no, the "creation group."

Question one on the survey asked the participants to give their college background. In the evolution group there were seven (47%) who held Bachelor of Arts or Bachelor of Science degrees, seven (47%) Master of Arts or Master of Science degrees and one (6%) other type of degree. In the creation group there were seven (70%) Bachelor of Arts or Bachelor of Science degrees, two (20%) Master of Arts or Master of Science degrees, and one (10%) other type of degree. More people in the evolution group held Masters' degrees.

Question three asked the participants their age. The question raised here was whether any particular age bracket of those surveyed tended toward a certain view. Three of the age brackets favored evolution, and two favored creation. In the 21 to 30 age division, five people were from the creation group while only two were from the evolution group. The only member in the over 60 age group was from the creation group. The remaining age divisions favored evolution. Table 1 lists the breakdown of these groups.

TABLE 1

COMPARISON BETWEEN AGE AND BELIEF IN ORIGIN THEORIES

Favors Creation		Favors Evolution	
Age	Number	Age	Number
21-30	5	21-30	2
31-40	1	31-40	6
41-50	1	41-50	3
51-60	2	51-60	4
Over 60	1	Over 60	0

Question ten asked participants if they believed it is a hindrance to academic freedom to present only one viewpoint concerning the origin of life. As stated earlier, 17 (65%) said yes, eight (31%) said no and one did not answer. A closer look reveals which group said what. Of the ten in the creation group, seven (70%) said yes and three (30%) said no. Of the 15 in the evolution group, nine (60%) said yes, five (33%) said no and one abstained. Figure 1 illustrates this comparison.

Question 11 asked if the respondent would be in favor of both scientific evidence for creation and scientific evidence for evolution being presented in public schools. Eighteen (69%) said they would, and eight (31%) said they would not. When compared to question 19, it

	CREATION	EVOLUTION
YES	70%	60%
NO	30%	33%
NA		7%

FIGURE 1

COMPARISON OF CREATION AND EVOLUTION GROUPS REGARDING ACADEMIC FREEDOM

was found that seven (70%) of the creation group answered yes, and three (30%) answered no on question 11. In the evolution group, ten (67%) said yes, they would be in favor of both sides being presented in public schools, while five (33%) said they would not. Figure 2 illustrates this comparison:

	CREATION	EVOLUTION
YES	70%	67%
NO	30%	33%

FIGURE 2

COMPARISON OF CREATION AND EVOLUTION GROUPS REGARDING PRESENTATION OF SCIENTIFIC EVIDENCE FOR BOTH THEORIES IN PUBLIC SCHOOLS

The surveys of the ones who answered no to this question were examined further. The five in the evolution group seemed adamantly opposed to the theory of

creation and strongly in favor of the theory of evolution. Four of the five made comments alluding to the idea that there is no scientific evidence for creation and voiced other comments in this regard. They all answered on the preference scale that evolution has either been proven by scientific studies or is fairly certain from scientific studies. The three in the creation group seemed adamantly opposed to the theory of evolution and strongly in favor of the theory of creation. Two of the three made extra comments alluding to their strong convictions. All three of these indicated on the preference scale that they believed creation to be a fact because God has revealed it to be true.

Question 18 asked if there is a conflict with the general theory of evolution and a literal interpretation of the bible. Seventeen (65%) said yes, eight (31%) said no and one (1%) did not mark a choice. In the creation group six (60%) said yes, three (30%) said no and one did not make a choice. In the evolution group ten (67%) said yes and five (33%) said no. Figure 3 illustrates this comparison.

Item 22 made the statement that if the evolution of man's development could be shown to be false, "this might change some of my personal beliefs." Eleven (42%) agreed, five (19%) were neutral and ten (38.5%) either disagreed or strongly disagreed. From the creation group, one (10%)

	CREATION	EVOLUTION
YES	60%	67%
NO	30%	33%
NA	10%	

FIGURE 3

COMPARISON OF CREATION AND EVOLUTION GROUPS REGARDING CONFLICT BETWEEN THE GENERAL THEORY OF EVOLUTION AND A LITERAL INTERPRETATION OF THE BIBLE

agreed, five (50%) disagreed and four (40%) were neutral. Of those in the evolution group, ten (67%) agreed, four (27%) disagreed and one (6%) was neutral. A large majority of those who either agreed or disagreed with this statement were from the evolution group. See Figure 4 for illustration of this comparison.

	CREATION	EVOLUTION
AGREE	10%	67%
DISAGREE	50%	27%
NEUTRAL	40%	6%

FIGURE 4

COMPARISON OF CREATION AND EVOLUTION GROUPS REGARDING A CHANGE IN PERSONAL BELIEFS

Item 25 stated, "The most objective thing I could say about the subject of origins is that nothing is

certain, and that I am open to alternative views that can be correlated with known data." Seventeen (65%) said they either agreed or strongly agreed, three (12%) were neutral and six (23%) either disagreed or strongly disagreed. In the creation group six (60%) either agreed or strongly agreed, and four (40%) either disagreed or strongly disagreed. In the evolution group, 13 (87%) either agreed or strongly agreed and two (13%) disagreed or disagreed strongly. It would seem apparent that those in the creation group are not as open to alternative views as those in the evolution group. Figure five illustrates the comparison.

	CREATION	EVOLUTION
AGREE	60%	65%
DISAGREE	40%	23%
NEUTRAL		12%

FIGURE 5

COMPARISON OF CREATION AND EVOLUTION GROUPS REGARDING OPENNESS TO ALTERNATE VIEWS

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to examine the range of existing practices and beliefs of science teachers in Knox County secondary schools, and the degree to which they understand or favor alternative viewpoints concerning the origin of life. The practices and beliefs of the teachers were gathered from responses they gave to questionnaires concerning the origin of life which were sent out to all science teachers of Knox County secondary schools.

The survey that was sent was designed to obtain information concerning eight areas. The questions used in the survey were developed after many long and varied conversations and readings with concerned educators, scientists, clergy and lay people. Care was taken in developing the survey to balance any potentially volatile question which stressed one side of this controversy with its countering viewpoint.

A review of recent court rulings was made and the viewpoints of different educators, scientists, and clergy were considered and discussed. An analysis of the information was made and results were presented in tabular and written form.

The following important findings were gathered from this study:

1. Nearly every individual held a unique interpretation or understanding of what is meant by evolution and creation.
2. There seems to be a wide range of information being taught concerning evolution; however, a large majority of the respondents said that they teach the scientific pros and cons regarding this issue and let their students decide. Concerning creation, most said they omit it, but of those who include classroom exposure to creation theory, the prevalent definition was that God created, with no explanation of how in the Bible.
3. Sixty-five percent expressed their opinion that presenting only one viewpoint concerning the origin of life was a hindrance to academic freedom.
4. Eighty-one percent indicated that the teaching of evolution did not put a burden on religious freedom, and 69% said the same for creation.
5. Eighty-one percent indicated belief that evolution has had an effect on religious thought and 65% expressed belief that it is in conflict with a literal interpretation of the Bible.
6. Fifty-eight percent said they personally believed that man has descended from lower forms of life.

7. Sixty-nine percent were in favor of both evolution and creation being presented in public schools.
8. Forty-six percent said that biology could be taught without reference to the idea that man has gradually developed from lower forms of life.
9. Sixty-seven percent who believed in man's gradual development from lower forms of life indicated that their personal beliefs might change if evolution could be proven false.
10. Seventy percent of the teachers in the youngest age bracket did not believe that man has developed from lower forms of life.
11. Only two (8%) had taken a specific course on evolution, and none had taken a specific course on creation.
12. Fifty percent of the participants said they knew of scientific evidence that was inconsistent with creation, and 38% said the same for evolution.
13. Fifty percent of the participants said they believed that there is some scientific evidence to support a creation viewpoint.

Conclusions

Part of the purpose of this study was to show what was being taught concerning the origin of life, and the preferences of what should be taught by those who teach

science in the Knox County high schools. There is a wide range of information now being presented about this topic, although much of what is being taught is not found in any of the textbooks, but is the product of the individual teachers' beliefs.

While the majority of educators expressed their belief that man has descended from lower forms of life, several indicated they believe man did not descend. The curriculum that is supposed to be used by the science teachers seems favorable to those who hold to the evolutionary idea of the origin of man, yet abrogates the ideas of those who hold to a creation idea. The curriculum process has left no room for divergence of ideas concerning this topic. These findings seem to reveal a teacher preference for a change in current curriculum for public schools.

Those who develop curriculum and instruction would benefit by listening to the voice of those who teach and to members of the community. In the last several years the great majority of the general public and educators alike have stated their preference for the presentation of both sides, yet little has been done to promote this idea in the public schools. Fifty percent of those who responded to the survey said they believe there is some scientific evidence to support a creation viewpoint. Is this information important enough to be included in science curriculum and supported by the government? A fresh discussion of the

creation and evolution controversy could help bring new information and provide insights into others' opinions and beliefs.

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APPENDIXES

APPENDIX A

Following are quotations of additional definitions of the terms "evolution" and "creation" as given in response to question five of the Teacher Survey on the Origin of Life.

Evolution

Evolution is changing slowly over a long period of time due to natural selection.

A broad term covering many topics and ideas, some facts and some theories. Theory - All existing creatures descended from simple life forms through variability and adaptability. Fact - Many living things have changed through time.

I understand that "evolution" relates to genetic change over time and through the process of natural selection mutations could occur passing advantageous genes to offspring.

Changes due to changes in the environment.

Natural processes have brought about the universe as it is today - this includes the process of higher life evolving from simpler organisms.

Genetic changes that allow an organism to adapt to its environment.

To make this question clear you should have stated evolution of what. If you mean evolution of life on earth then it means the gradual change of life forms over a long time due to changes in their genes which allowed them to survive in the environment in which they existed and to reproduce.

Change within the species.

Life (plant, animal, otherwise) (progresses, developed) evolved from simpler organisms into more or most complex ones.

Evolution is simply a mechanism through which organisms have diversified.

Evolution means to evolve or change.

The organism with the best characteristics to survive its environment at a particular time is the one that is most likely to pass those characteristics on.

Living things change over time.

Creation

God put life into living creatures, He began, or created them.

Again a broad term meaning different things depending upon which television evangelist, minister, layman, etc. you are listening to. That all things were created by a supreme being adhering to teleology.

God has a time table man is not to question, whether it is seven days or seven million years makes no difference. The fact remains He "created."

That God created all things and that day doesn't mean 24 hours.

I do not think the "creation" theory of life is supported by any scientific facts therefore it is not science.

The organic development of "life forms" beginning with pro-life self-replicating nucleotide-type molecules.

God created all things that were created both in heaven and on earth, visible and invisible whether thrones or dominions or rulers or principalities - all things have been created by Him and for Him. And He is before all things and in Him all things hold together.

Creation means a plan or scheme by which "things" came into being or existence.

A religious construct used to explain and give reason and purpose to life.

APPENDIX B

Following are quotations of additional methods educators use in teaching evolution or creation as given in response to question eight of the Teacher Survey on the Origin of Life.

Evolution

We cover many aspects of the broad term evolution as well as its facts, theories, misconceptions, etc... In addition to creationism and also scientific creationism.

Taught in entropy section in chemistry.

Teach scientific and creationism pros - cons and let the students decide.

Point out that I personally see no conflict between evolution and religion, but that I'm not allowed to teach religion.

I mention it so students are aware of what men say, but tell them I'm totally against it.

Any time situations arise I explain mostly that evolution is slow change as a result of natural selection.

It is not really taught in my classes because it is not part of the subject matter but does come up indirectly.

Creation

There is nothing about creation that is scientific.

Includes Genesis.

I believe in orderly arrangement of the atom and the universe are in agreement.

Teach several ideas about beginning of life.

I allow input from all viewpoints.

APPENDIX C

The following are quotations of specific comments that occurred in the study. Some are in reference to particular questions, others are not.

Regarding Question 10:

> Do you consider an alternate viewpoint on gravity? On $\sqrt{2}$?
>
> In our region, students have been exposed to the Biblical teaching of creation anyway.

Regarding Question 8:

> This is a science, not a religion, class. I do not teach religion.
>
> This is irrelevant - there is nothing about creation that is scientific.

Regarding Question 11:

> Yes, but only if the teacher is objective and comfortable with the subject.

Regarding Question 12:

> Yes, depending upon definition of scientific.

Regarding Question 17:

> Yes, mostly through misconceptions and bad information.

Regarding Question 20:

> No, at least presented as one of many theories.
>
> No, This is one of the major concepts of the science of biology.

Regarding Question 21:

> Strongly agree, not proven but substantiated - nothing is ever proven.

Regarding Question 25:

Strongly disagree, I am open to alternative views from both sides; but I also feel that among the information and theories of both sides that there are some certainties.

General Comments:

I'm not sure I like the wording of some of the choices in this survey.

I believe in teaching science which is answering questions by controlled collection of facts. We are able to do this only as far as our resolution can reach at this point in time.

When will intelligent people stress the compatibility of the points of view rather than their opposition. We need both science and religion for our continued survival. Not polarization of the two hyped by T. V. Evangelists.

There is no scientific evidence for creation.

APPENDIX D

Teacher Survey on the Origin of Life

1. What is your college background? ____ B. A. ____ M. A. ____ Ph. D.- Ed. D. ____ Other.
2. How long have you been teaching? ____ 1-5 years ____ 6-10 years ____ Over 10 years.
3. Your age is ____ 21-30 ____ 31-40 ____ 41-50 ____ 51-60 ____ over 60.
4. What college courses have you had containing information on the origin of life?

____A. General zoology
____B. General botany
____C. Taxonomy
____D. Genetics
____E. Ecology
____F. Specific course on evolution
____G. Geology (historical)
____H. Anthropology
____I. Paleontology
____J. Specific course on creation
____K. Other.

5. Which of these best describes your understanding of the term evolution?

____A. All living things developed from one or a few simple organisms.
____B. Evolution means change.
____C. Evolution means the coming into being of the entire universe by natural processes.
____D. Evolution means survival of the fittest.

Briefly explain or comment on what you understand the term evolution to mean:

6. Which of these best describes your understanding of the term creation?

____A. All living things were created at the same time.
____B. God created everything but the Bible doesn't say how He did it.

C. All major kinds of organisms were created at the same time and there has been variation within kinds.
D. All species were created in seven days and there are no new species coming into existence today.

Briefly explain or comment on what you understand the term creation to mean:

7. How is evolution taught in your class? (check as many as apply)

__A. Omitted.
__B. Evolution is the only scientific explanation for the origin of life.
__C. When a student asks, I tell him or her that I believe in it but explain that some don't believe in it.
__D. Teach it but call it development or animal history.
__E. Teach it but stop short of man.
__F. Teach the scientific pros and cons about evolution and let the student decide.
__G. Teach it completely.
__H. Teach that evolution only means change.
__I. Other. (explain briefly)

8. How is creation taught in your class? (check as many as apply)

__A. Omitted.
__B. Creation is the only scientific explanation for the origin of life.
__C. When a student asks, I tell him or her that I believe in it but explain that some don't believe in it.
__D. Teach it but don't teach any specific doctrine or religion.
__E. Teach the scientific pros and cons about creation and let the student decide.
__F. Teach it completely.
__G. Teach that creation simply means God was the author of all life.
__H. Other.(explain briefly)

9. Have you received any training or information concerning an alternate viewpoint on the origin of life (excluding the Bible)? ____ Yes. ____ No.

10. Do you believe it is a hindrance to academic freedom to present only one viewpoint concerning the origin of life? ____ Yes. ____ No.

For the remainder of the survey, use these two definitions as guidelines to answer your questions:
Creation - Man was created by God a distinct individual and man, along with all other forms of life, has not descended from any lower forms of life.
Evolution - Man may or may not have been created by God, but man, along with all other forms of life, developed from one or a few simple forms of life.

11. Would you be in favor of both scientific evidence for creation and scientific evidence for evolution being presented in public schools? ____ Yes. ____ No.
12. Do you know of any scientific evidence that is inconsistent with evolution? ____ Yes. ____ No.
13. Do you know of any scientific evidence that is inconsistent with creation? ____ Yes. ____ No.
14. Do you believe the scientific data best supports evolution or creation? ____ Evolution. ____ Creation.
15. Do you feel that instruction that presents the evolutionary viewpoint puts a burden on religious freedom? ____Yes. ____No.
16. Do you feel that instruction that presents the creation viewpoint puts a burden on religious freedom? ____ Yes. ____No.
17. Do you believe that the theory of evolution has had any effect on religious thought? ____Yes.____ No.
18. Do you believe there is a conflict with the general theory of evolution and a literal interpretation of the Bible? ____ Yes. ____ No.
19. Do you believe man has gradually developed from lower forms of life? ____ Yes. ____No.
20. Do you believe biology can be adequately taught without reference to the idea that man has gradually developed from lower forms of life? ____ Yes. ____ No.

Check the answer which best describes your reaction to each statement: SA-Strongly agree, A-Agree, N-Neutral, D-Disagree, SD-Strongly disagree.

21. The evolution of man has been proven.
___ SA ___ A ___ N ___ D ___ SD
22. If the evolution of man's development could be shown to be false, this might change some of my personal beliefs.
___ SA ___ A ___ N ___ D ___ SD
23. I believe, along with T. Huxley that if the evolution of man is true, then there is absolutely no need for God.
___ SA ___ A ___ N ___ D ___SD
24. I believe there is some scientific evidence to support a creation viewpoint of the origin of man.
___ SA ___ A ___ N ___ D ___ SD
25. The most objective thing I could say about the subject of origins is that nothing is certain, and that I am open to alternative views that can be correlated with known data.
___ SA ___ A ___ N ___ D ___ SD

Preference Scale

On the following scale, place an "X" on the blank next to the statement that you feel comes closest to your ideas. Mark only one "X".

___1. Evolution is true because almost all scientists and educated people believe this.
___2. Evolution is a fact that has been proven by scientific studies.
___3. The evolution of all life seems fairly certain from scientific studies.
___4. The evolution of some living things is possible, but something else caused much of the life we see.
___5. Evolution occurred with the help of God.
___6. Neither evolution nor creation is a very good idea about how life came to be.
___7. Creation started all life, but some evolution was necessary.
___8. Creation is possible, but something else caused much of the life we see.
___9. The creation of all life seems fairly certain from scientific studies.
___10. Creation is a fact that has been proven by scientific studies.
___11. Creation is a fact because God has revealed it to us.

Cover Letter Mailed with the

Teacher Survey on the Origin of Life

Dear Fellow-Teacher,

Enclosed is a survey concerning the origin of life. Your input is needed to help complete my thesis work at U. T. for a Masters' Degree in Curriculum and Instruction. Please take about ten minutes to answer the questions thoughtfully as this is intended to examine existing preferences and practices of Knox County science teachers. This is an anonymous survey, so please do not sign your name. The results will be published by U. T.

Enclosed is the survey with a self-addressed stamped envelope. Please complete the form and return it to me at your earliest convenience.

If you have any questions feel free to call me at 966-2104. Thank you for your participation in this project!

Sincerely,

Stephen A. Cottrell

Stephen A. Cottrell
Powell High Teacher

APPENDIX E

FORM B

CRP#____

Date Received____

THE UNIVERSITY OF TENNESSEE, KNOXVILLE

Application for Review of Research Involving Human Subjects

I. Identification of Project: Thesis survey Date: for Masters' Degree in Curriculum and Instruction.
Project Director and Co-Director: Stephen A. Cottrell and Dr. Lewis Hodge.
Title of Project: Survey of Teacher Knowledge, Preferences, and Practices concerning Origin of Life Theories.
Department: Educational Curriculum and Instruction.
Supporting Agency and Identification Number: NA
Estimated starting date and completion date: June 1 through August 1, 1982.
Grant submission deadline: NA

II. Objectives of Project: The purposes of this study were to examine the range of existing practices and beliefs of science teachers in Knox County schools and the degree to which they understand or favor alternative viewpoints concerning the origin of life.

III. Description of Subjects: Secondary teachers of Knox County science classes, and science teachers in attendance at U. T. 1982 summer school will be surveyed. The subjects are at a minimal risk, and all data reported will be treated with anonymity.

IV. Methods or Procedure: The survey will be distributed through the mail to each Knox County participant.

Science teachers attending U. T.'s summer school will be given the survey directly. There will be no experimental or control groups.

V. Specific Risks: None.

VI. Method of Obtaining "Informed Consent" from Subjects: The signing of a release form would violate the anonymity of the survey. The return of the survey demonstrates consent of the participant.

VII. Qualifications of the Investigator: NA.

VIII. Adequacy of Facilities to support Research: NA.

IX. Responsibility of Project Director:

By the compliance with the policies established by the University Committee on Research Participation, the Project Director subscribes to the broad principles stated in "The Declaration of Helsinki" and standards of professional ethics in all research, development and related activities involving human subjects under the auspices of The University of Tennessee, Knoxville.

a. When appropriate, Form DHHS 569 will be completed and returned to the Office of the Vice Chancellor for Graduate Studies and Research, 404 Andy Holt Tower.

b. Approval will be obtained from the University Committee prior to instituting any change in project protocol.

c. Development of any unexpected risks will be reported to the University Committee.

d. Signed consent statements will be kept for the duration of the project and for at least three years thereafter.

e. A status report (Form D) will be submitted at 12 month intervals, or as requested, attesting to the current status of the project.

Signature:

Project Director_____

Date_____

X. Departmental Review:

COMMENTS/RECOMMENDATIONS:

The application described above has been subjected to departmental review and has been approved.

Signatures:

Department Head_____ Date _____

Chair, Departmental

Committee_____ Date _____

APPENDIX F

THE UNIVERSITY OF TENNESSEE, KNOXVILLE
KNOXVILLE 37996-0140

OFFICE OF THE VICE CHANCELLOR FOR
GRADUATE STUDIES AND RESEARCH

June 10, 1982

Stephen A. Cottrell
Educational Curriculum & Instruction
3F Claxton Education Building
CAMPUS

Dear Mr. Cottrell:

The project you submitted entitled, "Survey of Teacher Knowledge, Preferences, and Practices concerning Origin of Life Theories," CRP #1411, qualified for expedited review and is approved.

The responsibilities of the investigator during the conduct of this project include the following:

1. Obtain prior approval from the Committee before instituting any changes in the project.

2. Retain signed consent forms from subjects for at least three years following completion of the project.

3. Submit a Form D to report termination, to renew approval, or to report changes in the project at 12-month or less intervals.

The Committee wishes you every success in your research endeavor.

Sincerely yours,

W. B. Cebik, Chair
Committee on Research Participation

cc: Dr. L. Evans Roth
Dr. Lewis Hodge
Dr. J. J. Bellon
Dr. W. W. Wyatt

VITA

Stephen A. Cottrell was born in Oak Ridge, Tennessee on October 1, 1954. After moving to Knoxville, he attended both elementary and high school at Farragut, where he was graduated with honors in June, 1972. Following study at The University of Tennessee, Knoxville, and Carson-Newman College, he received a Bachelor of Arts degree with a major in General Science Education from Carson-Newman in May, 1977.

After graduation, he was employed by the Knox County Department of Education to teach at Powell High School. In June, 1980, the author began graduate studies at The University of Tennessee, Knoxville. He received the Master of Science degree with a major in Curriculum in December, 1982.

Mr. Cottrell will continue his teaching career with the Knox County school system after graduation.

He is married to the former Martha Lee Johnson, also of Knoxville, Tennessee.