Anthropological study of American cosmological beliefs

John Domitrovich

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AN ANTHROPOLOGICAL STUDY OF AMERICAN
COSMOLOGICAL BELIEFS

By
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B.A., University of Montana, 1969

Presented in partial fulfillment of the
requirements for the degree of
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This study considered a number of aspects of the cosmological belief systems of members of three religious groups: Christian Science, Seventh Day Adventist, and Pentecostal/Charismatic. According to Bryan Wilson (1973), these groups appear to demonstrate unique modes or "responses" to the world at large in accommodating themselves to the realm of the sacred. For example, a group may obtain salvation through a restructuring of the sense of self or through an anticipated destruction/creation of a new world/social order—and so on.

This study assumed that these different responses would be further reflected in the dimensions of centrality, uniqueness, and locus of control. Centrality referred to the sense of locational placement in the universe. The dimension of uniqueness was investigated with respect to a number of associated indices: beliefs regarding animal spirituality, beliefs concerning the existence of other rational life forms in the universe, and beliefs related to evolutionism and creationism. Informants were given a locus of control questionnaire which offered a measure of the degree to which the individuals felt they were in control of their lives versus being controlled by some external power.

All informants were asked to perform drawings of their personal universes, i.e., how they saw the universe structured. A discussion of the history of cosmological thought offered a comparison baseline to fit the cosmographies generated through this study into a historical context.

It was postulated that the Pentecostal/Charismatic group would demonstrate the most marked notion of centrality and that the Christian Science Group would exhibit the most marked tendency toward an internal locus of control orientation. Results indicated that the Christian Science group was the least unique, and the most internally oriented of the three. The Seventh Day Adventist group exhibited the greatest tendency toward centrality and uniqueness. The Pentecostal/Charismatic group fit between the other two groups with respect to centrality and uniqueness.

The most common universe expressed by all groups was a pretwentieth century version of a solar system surrounded by an infinite number of stars.
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I am very grateful to have had the opportunity to meet and share some time with the individuals who were willing to take part in this study. I feel I have learned a great deal from my interaction with them.

I am very appreciative of the invaluable assistance offered by Mrs. Lynn Cragholm for typing, editing, and formatting the final report. Her perseverance in the face of my atrocious handwriting truly was commendable.

Last but not least I thank my family—my wife, Christine, and my children, Nicholas, Nathan, and Maia—for their love, support, and the time they allowed me to research, prepare, and conclude this report.
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Many a night from yonder ivied casement, ere I went to rest
Did I look on great Orion sloping slowly to the west

Many a night I saw the Pleiads, rising through the mellow shade,
Glitter like a swarm of fire-flies tangled in a silver braid.

--Tennyson
Chapter 1

THEORY

Introduction to Study

One starlit evening in 1971, I stood outdoors a slight distance from my home in Asamankese, Ghana, West Africa, gazing intently at the relatively unfamiliar but strikingly beautiful panorama of the southern sky. That evening our cook, Muhammed, also happened to step outside. Placing a hand on my shoulder while gazing in the same direction of the sky as I, he said, "Mr. John, are you looking to your home?"

Needless to say, I was astonished by this statement. One would have thought I should have grown accustomed by that time to the "reality" of other belief systems; but, I was totally astounded by the realization that Muhammed held a set of cosmological beliefs which were at such great odds with typical Western beliefs about the world at large. At the same time I mused how, perhaps, Muhammed had unwittingly glimpsed a reality of tomorrow—a time when a future space-colonizer might reenact the above scene by pointing to a particular star or location in space to indicate where home was amidst the stars.
With his concerned statement, Muhammed instantly became the catalyst leading me toward an increasingly intense interest in worldviews, particularly cosmological worldviews—how people see the cosmos structured and how they glimpse themselves in relation to that cosmos. From dialogues with other Africans, it soon became apparent that there was a great deal of variability in African minds as to how the universe was structured.

Later, when I was back in the United States again, I began to wonder what a study of folk cosmological beliefs of the typical nonscientist American would reveal. Would most Americans subscribe to the scientific paradigm of a universe composed of billions of galaxies separating, at times, from one another with velocities approaching the speed of light? Would they reflect the popular scientific view propagated through the media on nearly a daily basis as in Cosmos on PBS, the Tonight Show with Carl Sagan, newspapers, etc., or would they subscribe to a view which echoed ancient Classical or Medieval concepts?

With this question in mind I began to search the available literature and hoped to find an answer. It quickly became apparent that research in this area of inquiry appeared to be nonexistent. At the same time, a great deal of research was available in a relatively new field: archaeoastronomy. This field, triggered by Gerald S. Hawkins' computer studies on the alignments of the stones at
Stonehenge, has blossomed since the 1965 publication of *Stonehenge Decoded*. This field of study has expanded its areas of interest in the past couple decades and has provided a great deal of information on the astronomical knowledge of ancient peoples, including aboriginal American groups, as reflected in their pictographs, petroglyphs, and stone ruins.

Over the past decade a number of important works have appeared which combine the disciplines of astronomy and archaeology in an attempt to discern the fingerprints of astronomical knowledge as expressed in the archaeological remains of past cultures (Aveni, 1975, 1977; Brown, 1976; Cornell, 1981; Krupp, 1983). A useful contribution to this study is Baity's (1973) article.

A host of excellent sources was available which concerned the heavenly bodies and their associated mythology in the development of the cosmological thought of the major civilizations of the world (Allen, 1963; Cumont, 1960; Hawkes, 1962; Lum, 1953; Neugebauer, 1957; Santillana & Deschend, 1977). Also, a huge corpus of works was available on the development of cosmological thought from the archaic cultures of the Near East up to and including current scientific models of the cosmos.

I was unable to find anything published on cosmological folk models of the typical nonscientist American except some works pertaining to folk cosmological models of a number of
aboriginal American Indian groups. This study was spawned, therefore, to initially chart some of the parameters in this unknown area of inquiry. At the same time I wondered what sort of relationships existed between the religious beliefs held by individuals, their views on the cosmos, and their sense of locational placement within that cosmos. Specifically, do individuals see themselves as unique creations of God or are they the products of chance accumulations of atoms dictated by the natural process of evolutionary thought?

Furthermore, is humankind a unique focus of supernatural creative energies, necessarily created to embrace and fulfill a spiritual blueprint of cosmic salvation? What implications does belief in extraterrestrial life forms have on individual cosmological beliefs? What are the cosmological implications of a human-centered set of spiritual beliefs? Are spiritual beliefs reflected, somehow, in the spatial and temporal limits of cosmological thought?

In seeking even partial answers to these questions, this study's primary concern lies in establishing some of the cosmological parameters associated with three American religious sects: Seventh Day Adventist, Christian Science, and Pentecostal/Charismatic. An attempt also is made to establish a relationship between the cosmological models derived, as reflected in the dimensions of centrality,
uniqueness, locus of control, and the religious belief systems of individuals associated with these sects.

The dimension of centrality refers to the locational placement of humankind/earth at what is perceived by some to be the most critical and significant point in the cosmos—the center point. Centrality of location often is associated with the idea of the human species being the primary focus of the creative energies inherent in the original creation.

There are several ways to approach the dimension of uniqueness. One is to look at it in terms of beliefs pertaining to the creation. If human beings are the result of a special creation a la Genesis, they naturally feel that they have been singled out to fulfill a particular purpose through the original creative act. On the other hand, if they are the culmination of a long and involved naturalistic evolutionary process—including passage through a number of apelike forms—they may not so readily be considered the bearers of cosmic importance. That is, if they were not created "as is," they may not have been created to fulfill any particular purpose of cosmic design or import.

Another way to weigh uniqueness is to investigate beliefs pertaining to the human/animal interface. If people are considered separate from the animal kingdom in the expression of a spiritual nature, such belief may form another indice related to a sense of uniqueness. Finally,
the belief that mankind is the only form of life existent in the universe forms another facet related to the determination of uniqueness. The belief in a number of separate creations carries with it a good many implications surrounding the notion of the death and ultimate redemptive act of Jesus Christ.

The locus of control construct bears a direct relationship to the choice of sects previously mentioned. Each of these groups appears to demonstrate a unique mode by which members accommodate themselves to the realm of the sacred. It is the contention of this study that the above differences in religious orientation should be further reflected in the individual locus of control orientations, i.e., members will see themselves as primary determiners of their fates or as passive pawns of fate, luck, chance, or some powerful others. Responses to a locus of control questionnaire should, therefore, provide some indication as to whether or not members of a particular sect feel themselves to be internally or externally controlled.

The various sects studied demonstrate a wide range in the meanings and functions they ascribe to the human/sacred interface in relation to their quests for salvation. It is postulated that the contrasts exhibited in these groups' orientations toward the sacred will be further reflected in a number of additional components of their individual worldviews, i.e., centrality, uniqueness, and
locus of control. What follows, therefore, is a brief
description of the orientations these groups have toward the
sacred, utilizing a typology of response constructed by

Wilson (1973) expressed the view that the three groups
mentioned typify several distinct responses to the world at
large in terms of the action patterns and concomitant
theological ingredients deemed necessary to achieve
salvation. Salvation here may refer to the attainment of
an ethereal bliss situated in an other worldly realm or it
might refer to a salvation that is to be realized in this
lifetime, i.e., in the present world. Salvation in the
latter instance might refer to a subjective or objective
release from the contingencies which inevitably befall all
individuals living in the world, i.e., sickness, poverty,
illiteracy, lack of control over one's life, etc.

Salvation is a notion which displays a plethora of
meanings; it's a multivocal concept whose innumerable facets
cast a multitude of different faces. Salvation may be
realized in a release from the evils of this world after
death, or it may be realized among the living in the here
and now as expressed in an enhancement of health,
prosperity, and knowledge.

Wilson (1973) saw a basic tension evident in the
response that a particular sectarian group makes toward the
world. This tension may be directed toward the self, world,
or incumbent social order. He classified seven different responses to the world: (1) conversionist, (2) revolutionist, (3) introversionist, (4) manipulationist, (5) thaumaturgical, (6) reformist, and (7) utopian. This study deals only with those responses which are relevant to the scope of this initial inquiry: the conversionist, revolutionist, and manipulationist responses.

Overview of the Three Responses

Conversionist Response

The conversionist response is described by Wilson (1973) as follows:

The world is corrupt because men are corrupt: if men can be changed then the world can be changed. Salvation is seen not as available through objective agencies but only by a profoundly felt, supernaturally wrought transformation of the self. The objective world will not change but the acquisition of a new subjective orientation to it will itself be salvation. Clearly this subjective conversion will be possible only on the premise of a change in external reality at some future time, or the prospect of the individual's transfer to another sphere. This is the ideological or doctrinal aspect of the matter, but the essential sociological fact is that what men do to be saved is to undergo emotional transformation—a conversion experience. This is the proof of having transcended the evil of the world. Since it is a permanent and timelessly valid transcendence, some future condition of salvation is often posited in which objective circumstances come to correspond to the subjective sense of salvation, but the believer also knows, from the subjective change that he is saved now. Thus he can face the evil of the world, the processes of change that threaten men with decay and death, because he is assured of an unchanging condition and feels this. He is not simply concerned with recruitment to a movement, but with the acquisition of a change of heart. (pp. 22-23)
Here the individual sense of self is transformed and placed in an intimate relationship with the sacred. The individual is "touched by God," "infused with the Holy Spirit," "in the presence of God," etc. This sense of an intimate connection and rebirth in tune with the sacred is a common theme in the Pentecostal/Charismatic tradition and, thus, may be said to be reflective of the conversionist response. The influx of the sacred often is accompanied by the manifestation of other "gifts of the Spirit."

Glossolalia or speaking in tongues is a common and highly visible manifestation of the sacred. The onset of the ability to speak in tongues frequently is considered a sign par excellence of a genuine conversion experience. Additional gifts of healing, prophecy, wisdom, interpretation, and knowledge also may be manifested in individuals subsequent to their conversion experiences.

It is important to note here that people are seen as conduits through which the sacred manifests itself. Humankind is the intermediary, the recipient of God's autonomous power. Believers must open themselves up to be regarded as worthy receptacles of God's power and direction. Individuals do not coerce or attempt to manipulate the sacred but attempt to make themselves worthy in the eyes of God—to be chosen as receptacles and active agents of God's will and power. They must reorganize their action patterns to be congruent with God's will and direction; the line
of causation runs from God to and through them. In other words (Wilson, 1973),

God—the convenient symbol for supernatural power, however that power is conceived and designated in particular cultures, is seen as the active agency. Men need do little but realize this and believe it. (p. 28)

Emphasis is on individuals being selected by God to do His will. When selected individuals are being flooded by the Holy Spirit, they often feel as though they are the center of the universe. Schwartz (1970), talking about the Pentecostal belief in general and, more specifically, the conversion experience itself, i.e., the "inpouring of the Holy Spirit," indicated that individuals undergoing the influx of the Holy Spirit are aware of what is happening to them and are able to talk about their experiences after they have occurred:

Pentecostals assert that during these moments they become the center of the universe; God reaches down and, by touching them, distinguishes them from all other men. (p. 156)

This idea of centering is a common theme in religious symbolism traditionally manifest in the symbolism of the "cosmic mountain," "tree of life," or "axis mundi," etc. The basic notion here is that, somehow, the sacred or a particular manifestation of the sacred is located at the junction mediating the three realms of sky, earth, and underworld, i.e., the totality of existence in its most literal sense, however these realms may be conceived. Humans somehow are sensed as being in immediate and
continuous contact with all which exists, seen as a vital and necessary component of existence.

Manipulationist Response

At the other extreme from the conversionist response is the manipulationist response toward the world as exemplified by the Christian Science sect in this study. Here an emphasis on humans as active agents in the world order is deemed necessary to achieve salvation. This orientation dictates a theology which directs adherents to alter their basic subjective orientations toward the world. The culturally sanctioned view of the world is false ignorance, and one truly must recognize this as a first step toward salvation.

Once the nature of reality is apprehended, the knowledge of this reality may be used to an individual's benefit and well being. Happiness, health, prosperity, knowledge, and mastery of fear are but a few of the possible benefits obtainable. The individual is able to partake in a new sense of being in the world and, thus, embarks upon a new life with actions consistent with and directed by an altered ontological status and newly obtained knowledge.

Wilson (1970) outlined a number of Christian Science beliefs pursuant to this response:

Mrs. Eddy's teachings consisted primarily in asserting that God was Mind, and that God alone existed. Man, as God's image, was not a material being but a wholly spiritual one. The material was no more than a
counterfeit of spiritual man, and spiritual man was like God, perfect. Consequently, man could not suffer, sin, be sick or die. These were but the "false claims" of matter. If man could but realize this (and only his false sense contradicted such divine truth), he would realize his true spiritual being—sinless, healthy and undying. Christian Science prayer was the affirmation of these truths in various forms. This, it was held, was the truth which Jesus Christ had come to earth to propound, but he had not been understood: he had himself said that there were many things that men could not then bear, but which they should learn when the Comforter should come. That Comforter, the Holy Ghost to many Christians, was declared to be Christian Science. This was the knowledge of "Mind," which was God, by which all men could be taught to rectify their thinking and to experience universal good and demonstrate "Divine Principle." The system was held to be logical as mathematics, and, if man could but grasp it, part of the natural order of the universe. This then was "salvation": typical of many salvationist sects, salvation is to be held in this world by a mental operation. Little is said of the next world, although the implication is that, sooner or later, men must come to the truth propounded in Christian Science. (p. 146)

**Revolutionist Response**

Revolutionist sects, on the other hand, turn their creative energies toward the overturning of the world through supernatural action as a precondition to salvation. Only through the destruction of the world, of the present social order, can humankind be reborn into a higher spiritual state. The destruction of the world will occur at the hands of the sacred, as will the world's reconstruction into a new social order. Human beings "can do no more than put a shoulder to an already turning wheel and give an earnest [push] of faith to this restructuring process;
essentially man is a passive bystander to this cosmic drama" (Wilson, 1973, p. 23).

People can but wait for the final cataclysm to occur, hoping to be among those chosen by God to be saved. Here, no amount of alteration in how one perceives the world will affect salvation; one must only become aware of the condition of the imminent destruction of the world. The central event in this cosmology is the second advent of Christ and the establishment of a kingdom of the righteous.

Members of the Seventh Day Adventist revolutionist sect see the advent of Christ as imminent. After the final battle between the forces of good and evil, Christ will establish a new kingdom on earth. Those who have followed the path of righteousness will then reside throughout eternity in the presence of God.

Comparing the Three Responses

The three responses vary from one another in a number of ways. The focus of each may be directed toward the objective external world itself or upon an alteration of an individual's subjective sense of self. For example, the focus of the Seventh Day Adventist is on the external world and/or the human social order. Salvation, to this group, is expected through an external action of God resulting in a simultaneous destruction/creation of a new world and social order.
Pentecostal/Charismatic-oriented individuals see salvation occurring as a direct result of God altering their sense of self. In the conversionist and revolutionist responses, people are the passive recipients of God's will. The means to salvation ultimately lies outside the confines of the self. The revolutionist's God appears on the worldly scene at His discretion to reorder the world. The conversionist cannot coerce or attempt to manipulate God in order to be made heir to the influx of the Holy Spirit; people must open themselves up to God, but whether or not they will be chosen is directly under God's control. In both instances they are passive recipients of God's will. To amplify this sense of control by God, the conversionist may, at times, also adhere to the idea of a revolutionary total restructuring of the world order as a direct result of the second advent of Christ.

In contrast to the objective and subjective orientation of the revolutionist and conversionist sects, Wilson (1973) termed the manipulationist response relational. Manipulationists have only to look in their backyards, so to speak, to see the sacred around them. They must learn to alter their perceptions of the world in order to peel off the skins of illusion and apprehend the core or fruit of reality. They have, in reality, nothing to gain because in actuality they never really lost salvation—it was there all along. Steiger (1948) noted:
Whether conscious of it or not, actually the true identity of every man is constantly the divine man, but he who loses himself in common sense naive realism loses sight of the metaphysical nature of his real self. To live in Christ does not mean that a person should live in another person, but that one should be aware of his metaphysical identity and by so doing he will find his experience adjusting itself in accordance with metaphysical harmony. (p. 49)

The manipulationist does not expect a change in objective reality in accordance with an alteration in how that reality is perceived.

Another way of classifying the three responses is in terms of the direction of control. Here the conversionist and revolutionist responses place a greater emphasis on the autonomous power of the supernatural than does the manipulationist sect. Manipulationists remain active in the world but have to alter how they perceive that world.

Figure 1 demonstrates how the different aspects of the various responses come into play. This study postulates that those sects mentioned which are characterized as being subject to the autonomous workings of God, i.e., the revolutionist and conversionist sects would test on the I-E or locus of control scale as more prone to being externally rather than internally oriented.

On the other hand, this author envisions the manipulationist expressing more of an internal control construct. The theology of Christian Science is inconsistent with the assumption that human behavior can be determined by factors that are beyond the control of human beings. There is
<table>
<thead>
<tr>
<th>Group</th>
<th>Orientation</th>
<th>Focus of response</th>
<th>Direction of control</th>
</tr>
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<tbody>
<tr>
<td>CS*</td>
<td>Relational</td>
<td>Alter the perception of the world/humankind</td>
<td>People only have to change how they perceive the world</td>
</tr>
<tr>
<td>P/C</td>
<td>Subjective</td>
<td>Alteration of sense of self</td>
<td>From God to people</td>
</tr>
<tr>
<td>SDA</td>
<td>Objective</td>
<td>The world and the social order</td>
<td>From God to people</td>
</tr>
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Figure 1. Aspects of the three responses
nothing in the universe over which people do not have potential control. A basic assertion of this doctrine is that the world is intrinsically good and man is encouraged to take an active part in the world and enjoy its benefits.

The I-E Scale

The I-E or locus of control scale (Table 1) was developed and tested by Julian Rotter (1966). The term locus of control gives a clue as to its use and meaning. All individuals must have some sense of control over their lives. Admittedly, individuals may vary a great deal in the amount of control they have or feel they have in their lives. The locus of control may reside within the self or it may be seen to reside external to the self.

The relevance of the locus of control construct to religious belief systems is readily apparent and the relationship between locus of control and various belief systems has been extensively studied since 1966—with equivocal results. A strong belief in God has often been associated with a fatalistic attitude toward life in which religiously-oriented persons consciously allow for the direct intervention and control of their lives by a supernatural force outside themselves.

The locus of control construct was developed to measure the presence or absence of just such an outlook on life. The locus of control scale is a forced-choice questionnaire
Table 1

Locus of Control in Regard to the Three Groups Studied

<table>
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<tr>
<th>Group</th>
<th>Orientation</th>
<th>Direction of control</th>
<th>Locus of control</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS*</td>
<td>Relationist</td>
<td>People have unlimited creative potential and control</td>
<td>Internal</td>
</tr>
<tr>
<td>P/C</td>
<td>Conversionist</td>
<td>God to/through humankind</td>
<td>External</td>
</tr>
<tr>
<td>SDA</td>
<td>Revolutionist</td>
<td>God will change the world/social order</td>
<td>External</td>
</tr>
</tbody>
</table>

of 29 items, including 6 filler items. The tendency of an individual to see reinforcements as internally or externally controlled is referred to, respectively, as internal locus of control and external locus of control.

Rotter wrote (cited by Silvestri, 1979) that the degree to which an individual perceives that the reward follows from or is contingent upon his own behavior or attributes versus the degree to which he feels that the reward is controlled by forces outside himself and may occur independently of his own actions—when a reinforcement is perceived by the subject as . . . not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of chance, luck, fate, as under the control of powerful others, or as unpredictable because of the great complexity of forces surrounding him. When the event is interpreted in this way by an individual, we have labelled this a belief in external control. If the person perceives that the event is contingent upon his own behavior or his own relatively permanent characteristics, we have termed this a belief in internal control. (p. 89)

All individuals during their lifetimes develop a general expectancy regarding their abilities to control the events which impinge upon them and are relevant to their lives. Because a number of aspects of religious beliefs bear a similarity in a number of ways with locus of control, studies have appeared which deal specifically with the relationship of locus of control to religious belief. It appears, at first glance, to make logical sense that individuals who rely to a great extent on an influence external to self, such as God, for their daily guidance and direction in life, do not seem to exhibit the same sense of being in control of their reinforcements (positive or
negative) in life as do those who feel and act as if their decisions/actions totally determine what happens to them.

This project assumed this logical stance from its inception. As readers will, however, be aware, some research in the area of locus of control studies seems to directly contradict this viewpoint. To give readers an idea of what tendencies are attempted to be determined by the locus of control scale in relation to religious beliefs, the following discusses some of the research utilizing the I-E construct in association with religious belief systems. In some instances the research cited may have direct bearing on the subject matter of this paper; in others it may not.

Geist and Bangham (1980) administered the I-E scale to students of two major religious denominations: Protestants and Catholics. The researchers hypothesized that, as a group, Catholics would score higher than Protestants in the external direction of the Rotter scale. This significantly was the case.

Geist and Bangham (1980) interpreted their results in terms of how the two groups perceived the conditions necessary to acquire the grace of God, i.e., the Catholics were seen as being guided by laws of the church and the Protestants by their own internal faith. The researchers cautioned that the locus of control parameters of a religious group may vary a great deal due to a tendency for religious groups to be heterogeneous in their beliefs.
Silvestri (1979) investigated the relationship between God dependence—the extent to which individuals perceived God to be an active and controlling force in their lives—and locus of control. He devised a scale to measure God dependence and administered the I-E scale to the same individuals. He found a positive correlation between God dependence and internal locus of control, i.e., those individuals heavily dependent upon the controlling influence of God scored significantly higher in an internally controlled direction. Furnham (1982) noted:

Apparently, then, those who believed that they were in control of their reinforcements also considered that God controlled their lives and insured happiness and prosperity. (p. 131)

Sosis, Strickland, and Haley (1980) investigated the relationship between locus of control and beliefs in astrology. They found a significant positive relationship between a belief in astrology and external locus of control. Benson and Spilka (1973) failed to derive a significant relationship between the locus of control construct and individuals' beliefs concerning the amount of influence they felt God had over their lives.

Furnham (1982) studied the relationship between locus of control and strength and nature of religious belief. He studied clergymen and measured the extent to which they considered themselves to be Liberals or Fundamentalists in their beliefs. It was predicted that the Fundamentalists
would perceive themselves as being more in control of their reinforcements than the Liberals. They would see themselves as receiving their just rewards in life as a necessary consequence of adhering to their religious beliefs. This was found to be the case at the $p < .05$ level of significance.

Strickland and Shaffer (1971) related what Allport (1966) termed the intrinsic and extrinsic religious orientations to the I-E scale. This study indicated that individuals whom one normally would predict to demonstrate an external locus of control orientation may demonstrate the opposite internal locus of control orientation. Allport defined an extrinsic religious orientation as self-serving and self-protecting in contrast to an intrinsic orientation which regards faith as a supreme value in its own right.

Intrinsic individuals perceive their religious beliefs as a meaningful and personal pursuit; they are prone to believe that their behavior reflects what happens to them in life. Reinforcements in life are seen as a consequence of one's behavior. The extrinsic individual, on the other hand, uses religious affiliation as a self-serving agency. Church attendance for this group is infrequent compared to the intrinsic group.

Strickland and Shaffer (1971) found that individuals who had been assessed as indicating an extrinsic orientation, demonstrated an expectancy of external control of reinforcement whereas intrinsic individuals scored
lower on the I-E scale, i.e., they professed an expectancy of internal control of reinforcement. A number of other interesting and informative correlations were found in this study: intrinsic informants were more likely to be female, older, and better educated than the extrinsics. They also demonstrated a higher degree of church attendance:

When one considers that an external response suggests that a person's expectancy about the events that happen to him include God or powers beyond his control, one might expect that person's assessed as external would fall toward the intrinsic end of Allport's dimension. On closer theoretical examination, however, those persons who actively use their religious beliefs as bases on which to make decisions in their personal life, who respond to Biblical injunction to behave in a Christian manner, and who utilize their concern for others in daily activities ("intrinsic qualities") would be expected to be persons who believe that what happens to them is under their personal control (internal control). In contrast, persons who are using religion as a social tool, who are looking to religion for solace and endorsement of one's chosen way of responding to social demands, and who report that they do not use religion in their everyday life ("extrinsic") would be expected to be those persons who do not feel that they have active mastery over what happens to them (external control). (pp. 366-369)

Coulson and Johnson (1977) investigated the relationships between glossolalics and locus of control. They postulated that glossolalics versus nonglossolalics would demonstrate an expectancy of external control. To the contrary, results indicated that glossolalics tended to be more internally oriented than nonglossolalics. These investigators cited the tendency of glossolalics to associate themselves with nontraditional religious groups as
further evidence of their demonstration of an internal orientation.

In summary, it appears that there may exist a paradoxical relationship between locus of control and religious belief. It does not matter how one believes that reinforcement is internally controlled. An internal locus of control orientation may be reflected through personal effort or through belief in a just and moral world in which God rewards those who adhere to His precepts.

God controls individuals' lives and ensures their prosperity, health, and happiness. Chance or fate have no impact on what they receive in life. Those who live their religions are able to approach life with a greater degree of certainty and sense of control than those who do not live their religions.

**Current Study**

This study attempted to determine if adherence to a particular religious belief system--herein the Pentecostal/Charismatic, Seventh Day Adventist, and Christian Science sects--reflected a particular locus of control orientation. This inquiry took an opposite stance to that suggested in the cited research. That is, those sects characterized as subject to the autonomous workings of God (revolutionist and conversionist groups) would test on the I-E scale as being more externally oriented than the
manipulationist group (Christian Science). Among the conversionist group (Pentecostal/Charismatic) the experience of "baptism in the Holy Spirit," at least initially, is not subject to the control of individuals. They, subsequent to baptism, are receptive to God's influence and direction and may be chosen by God to demonstrate one or more "gifts of the Spirit."

Coulson and Johnson (1977) stated in their discussion of the interrelationship between locus of control and glossolalia that

a third possible source of hypotheses lies in the religious practices and stated beliefs of persons affiliated with churches in which glossolalia is believed to be a "gift of the Holy Spirit." It seems clear that it is believed that "a divine power is controlling the person" (emphasis mine). (pp. 313-314)

Manipulationists must, on the other hand, through personal efforts, make themselves aware of the true nature of existence. They thus must break through the veils of ignorance to ultimately alter their perceptions of the metaphysical basis of existence--to attune their perceptions in line with the real. As per this reasoning, this author hypothesized that manipulationists (Christian Science) would demonstrate an expectancy of internal locus of control. The Christian Science orientation seems to cater to self-reliant and responsible types who direct their energies in a pragmatic and, thus, worldly direction.

A great deal of reliance is placed on individual effort within the Christian Science group. Individuals are seen
as competent to attain correct belief through personal efforts. They are encouraged to achieve this goal through personal study of Mary Baker Eddy's (1875) *Science and Health* in conjunction with a reading of the Bible.

Buttressing this is the total lack of interpretation offered within the theological context of Christian Science dogma subsequent to selected *Science and Health* readings and readings from the Bible at Christian Science services. Also, class instruction of Christian Science healers discourages note-taking. One could surmise, therefore, that this would facilitate the ascription of a set of personal meanings and interpretations to the instructional context generated.

Additional dimensions were investigated in relation to the belief systems of the subjects. The dimensions of centrality and uniqueness supplemented the locus of control construct in the discernment of the cosmological beliefs of the informants. The notion of centrality refers to a propensity of individuals to see themselves/earth centrally situated in space with respect to the rest of the universe/creation.

Humans have had a long history of considering themselves and the earth as situated at the center of existence. This anthropocentric notion remained in vogue from at least the fourth century B.C. through the seventeenth century A.D. In some instances, when it became
apparent that the earth and human beings were embedded within the larger system of the Milky Way galaxy, people still clung to the anthropocentric notion of centrality and placed the earth at the central point of this gigantic stellar disk.

This galactic form of anthropocentrism finally was discarded in the second decade of this century. The 1918 observational results of Harlow Shapley's research on the distribution of globular star clusters indicated that humankind/earth was not located at the center of our local galaxy but, in actuality, was offset from the center by some 33,000 light years.

Historically, people have had a difficult time accommodating themselves to the idea that their locational placement in the universe is of no great theological or philosophical importance. Some plausible reasons for this reluctance are traced in a later section of this paper. It thus should be apparent that a combination of astronomical, theological, and metaphysical ideas have contributed to the prolonged retention of this idea.

A question remains: Is the notion of centrality a dead and long forgotten idea or is it present in current folk cosmological models to any degree? Hopefully, the data in this study yielded some indication as to its continued presence or absence.
Schwartz' (1970) study of Pentecostal beliefs suggested that a sense of centrality very well may form a vital component of the experience of coming into intimate contact with the Holy Spirit. When people are flooded with the Holy Spirit they feel as if they are the center of the universe. This experience gives them a sense of feeling powerful and singled out and distinguished from others. The study postulated that individuals who have a Pentecostal/Charismatic affiliation would see themselves as more centrally located in space than members of the other two groups.

The dimension of uniqueness is an aspect of belief that, this author feels, is directly related to the idea of centrality. The notion of centering contains the idea of being most important or pivotal in relation to that which surrounds us. The word unique carries with it a meaning of being without a like or an equal. This study postulated that the dimensions of uniqueness and centrality would "adhere" in the data generated, i.e., where one dimension is found, another should be equally represented.

An issue directly related to the concern of uniqueness and this study is the cluster of beliefs associated in the cosmogony related to the origin of the human species. Is humankind the direct result of a special creation as recorded in Genesis? Do other life forms akin to human beings exist in the universe, thereby relegating them to a
level of minor insignificance in relation to a creator God? These questions, hotly debated these days, get to the heart of the matter as to whether or not humankind is the result of a special creation at a relatively recent time in the past or the end result of a long and complex naturalistic evolutionary process.

The stance taken in regard to these questions carries implications with respect to how and when the universe came into being. Here, a cosmology based on the notion of humankind as a product of a special creation carries with it the notion that the universe came into being at a finite time in the past.

Another aspect of uniqueness relates to the human/animal interface. Whether or not other animals are to be placed on a nearly equal footing with people in respect to the creative energies of the universe bears directly on the question of human uniqueness. Will these creatures share on an equal footing in the final salvation, or are they merely "beast machines" totally devoid of feeling and independent thinking processes? Do the animals share in the same spiritual nature as people or are they merely masses of protoplasm bearing no special significance in the grand scheme of creation? Ideas related to the ontological status of animals are generated in this study so as to gain additional insights into the question of uniqueness.
Last, a major focus of this study was geared toward delineating some of the parameters associated with the cosmological models generated (drawn) by members of the groups investigated. This researcher hoped that the array of individual strands pertaining to the dimensions of locus of control, centrality, and uniqueness in association with the cosmographical maps (drawings) would allow the formation of a number of general statements about the cosmological and eschatological worldviews of the groups studied. More specifically, what are the component structures perceived as belonging in the universe, and how are these structures related to each other? Did the universe have a beginning and, if so, will it eventually have an end? Does the universe have spatial limits? Where do the cosmological models generated fit into the overall scheme of the history of cosmological thought?

In summary, this study attempted to gather a number of strands in the cosmological warp and woof of three selected religious groups: Seventh Day Adventist, Christian Science, and Pentecostal/Charismatic belief systems. It attempted to relate the above-mentioned sects' responses to the world in regard to their cosmographies and the associated dimensions of centrality, uniqueness, and locus of control. Also, the cosmographical patterns generated throughout the drawings are placed into their proper context when juxtaposed with the history of the development of cosmological thought.
Chapter 2

LITERATURE REVIEW

The major focus of this inquiry concerns the personal universes or cosmographies of the individuals interviewed. The word cosmography here indicates a "map" of the cosmos. Cosmography, as exemplified in sixteenth century usage, originally referred to a comprehensive study of the terrestrial and celestial regions of the cosmos and their associated relationships. Here the word cosmos originally carried with it an all-pervasive sense of order, harmony, and beauty in the world. In its broadest sense, cosmography was subdivided into a number of related disciplines, each focusing on a particular slice of existence. Astronomy dealt with the celestial region, geography with the terrestrial region, and astrology with the relationships between the first two.

In our modern age this sense of interdependence between the heavenly and terrestrial realms has been adulterated somewhat by the propensity to see the heavens as belonging to the scientist or solely to N.A.S.A. Heaven, seen throughout much of human history as a mirror of the social order and a prime source of the richness of myth and sacred energies, now all too often is viewed as a profane and
secularized realm. The comment of one of the first Soviet cosmonauts into space is pertinent here: "I went out into space, and nowhere did I find God" (Santillana & von Dechend, 1977, p. 60).

The rapid progress and advancements in knowledge gained in astronomy and astrophysics in the twentieth century has increased people's sense of insignificance when confronted with an ever-expanding universe of space and time. Santillana and von Dechend (1977) compared archaic and modern people with respect to their sense of being at home in the universe:

The science of astrophysics reaches out on a grander and grander scale without losing its footing. But man pays a terrible price for these achievements. Man as man cannot do this. In the depths of space he loses himself and all notion of his significance. He is unable to fit himself into the concepts of today's astrophysics short of schizophrenia. Modern man is facing the nonconceivable. Archiac man, however, kept a firm grip on the conceivable by framing within his cosmos an order of time and an eschatology that made sense to him and reserved a fate for his soul. Yet it was a prodigiously vast theory, with no concessions to merely human sentiments. It too, dilated the mind beyond the bearable although without destroying man's role in the cosmos. (pp. 5-6)

In this discussion I hope to relay a general account of man's changing picture of the universe from archaic times to the present. Few individuals of any particular age have been fully aware of all the intricacies involved in explaining the appearance of the heavens. Laymen always have been selective in what they consider to be the significant aspects of the universe. Scientists may have a
clear knowledge of all the finer details of a particular cosmological model and, at the same time, be fully aware of the tentative epistemological status of the model. On the other hand, laymen may be only partially aware of the finer details and implications of a distinct cosmological model. They may, at the same time, accept their limited knowledge as "fact."

A model can be described as an approximation of reality which is in a continual state of flux and refinement. The nonstatic nature of cosmological models has been all too well demonstrated throughout the history of cosmological thought to attach any sense of finality to any one model as an ultimate explicans of reality. Models are adjuncts to the scientific process: They attempt to explain phenomena with a minimal number of assumptions, they never are statements of fact, and they always are approximations of reality.

Cosmological Models

Cosmological models undergo a continual process of addition, deletion, and reformulation. This study attempts to delineate the parameters of cosmological models of a number of informants. One might think that with the current dissemination of a popular scientism through the mass media, the cosmological models generated would bear a semblance to the main outlines of current scientific thought. If this expectation is not borne out by the data generated by this
study, an attempt will be made to fit the pattern or patterns derived into their proper context when placed in juxtaposition with the historical development of cosmological thought.

First, some statements concerning cosmological models in general. The universe may be conceived in any number of ways by a particular culture. For example, Reichel-Dolmatoff (1971) described the universe of a group of Amazonian Indians as an intricate cosmic model which consists of a complex network of interactions which function to relate the cosmological model to the maintenance of an ecological balance between the resources of the environment and the demands of society. This group of Tukano Indians see the universe as being in a perpetual state of deterioration or disorder, necessitating an institutionalized means of recreating the world and its order through ritual means. This particular cosmic order is an example of a cyclical type of universe in which the universe goes through a continual sequence of birth, decay, and renewal. Other cosmologies may be termed steady state models or evolving models.

A steady state cosmology assumes that the universe in its major aspects and appearance maintains a static condition through time. This is not to say that change does not occur in this type of world order. In a sense, here is a cosmology without a cosmogony. An example of a steady
state cosmology is found in the fifth century B.C. works of Heraclitus. To Heraclitus fire was the only substance in the world and it took on different states or conditions through a series of natural transformations of fire, earth, and water. For Heraclitus everything was in constant change, and in each instance of flux one of the states of fire existed--only through the death of another state.

Vlastos (1975) said:

To conjure up a physical model that would fall within his own experience, let us take an oil lamp. Its flame exists ("lives") by the constant extinction ("death") of the oil (liquid, hence "water"); so fire "lives the death of water." The same would be true of a wood or a charcoal fire, where the victims are solids and would probably count as "earth" for Heraclitus. So "fire kindling" is water and earth turning into fire, and fire extinguished would be the converse, fire turning into water or earth, thus "living its own death." This is happening always, and always "according to measure." If the "measures" of the converse processes, fire kindling and fire extinguished were the same in all occurrences of fire in the universe, fire would indeed be "ever living." For then as much of fire would be turning into water and earth at any given time, as of water and earth into fire at the same time, and then the quantity of fire would remain constant. And if the corresponding thing happened in the case of water and earth, their quantities too would remain constant. And since these three comprise all the matter there is, its distribution as between fire, water, and earth would remain invariant, and the universe as a whole would be eternal, in spite of incessant change throughout its length and breadth. (pp. 5-6)

Bondi, Hoyle, and Gold proposed a steady state model of the universe in 1948. Here the universe maintains the same appearance over time although the galaxies in the universe continually recede from one another. These scientists
postulated that new matter was continually being created from nothing in the space between existent galaxies, thus leading to the formation of newly created galaxies to fill the space between receding galaxies. This was termed the Continuous Creation Theory. To an observer situated anywhere in the universe, it maintained a static appearance over time. Here was a universe in which matter was being created continuously out of nothing, and this model did not necessitate the presence of a creator God.

This theory lost credence with the discovery in the 1960s of an isotropic background microwave radiation which was interpreted as the remnant of a colossal cosmic explosion. The Big Bang model—still in vogue—is an example of an evolving universe. Here the universe appears to have come into existence at some finite time in the past, and the present structure and state of the universe is the direct result of evolutionary processes subsequent to the Big Bang.

At this time the galaxies appear to be receding from one another in a linear fashion, i.e., a galaxy twice as far from our galaxy as another is moving away from our galaxy at twice the velocity as the other. Extrapolating backward in time, utilizing the linear relationship between velocity and distance (Hubble's Law), gives a rough estimate for the time of the initial explosion. Current estimates vary between 15 and 20 billion years ago. This model implies
a supernatural agent as the initial creator of the matter in the universe and as the directive force behind the initial explosion.

A new twist enters the above-described model if the average density of matter in the universe exceeds a critical value. That is, if there is a sufficient density of matter in the universe to generate the gravitational force necessary to slow down and ultimately stop the expansion of the galaxies, we have an oscillating or cyclical model of the universe. The galaxies would then partake in a cosmic contraction to the initial state preceding the Big Bang. What then would occur would be another Big Bang and, possibly, an infinite series of expanding and contracting universes.

This oscillating model still is in serious contention as one of the reigning models of present-day science. A great deal of current research is geared to ascertaining the value of the total amount of matter in the universe to arbitrate a decision on the existence of one or the other model. The idea of a perpetually oscillating universe does not require the notion of a creator God because it does not necessitate a beginning point in the series of oscillations.

The idea of an eternally recurring universe is, according to Jacki (1977, p. 238), "the reappearance in a new garb of a very old idea, the idea of eternal recurrence." The idea of a cyclical notion of time
versus a linear notion has been expressed by a large number of cultures in the world. For instance, the repetition of cosmic time as seen in Hindu, Jainist, and Buddhist philosophies. A similar notion can be found in the Greek, Mayan, and Chinese cultures.

Nietzsche's Theory of Eternal Return fits under the rubric of a cyclical model of the universe. Nietzsche assumed the existence of a finite amount of force placed within the context of an infinite amount of time. From this initial premise he concluded that the number of different states and changes which possibly could occur through the workings of his force are in practice immeasurable but in truth finite in number. Therefore, given the finite nature of force and the infinite nature of time, every possible state and combination of force must have occurred at some time and, in fact, it must have been attained an infinite number of times in the past.

Santillana and von Dechend (1977), utilizing the corpus of world mythology, attempted to establish a pattern among the myths to explain references to the occurrence of a number of successive world ages. Here the motif of a successive number of world ages is denoted by an accumulated oral tradition making reference to the slowly changing position of the vernal equinox due to the precession of the earth, i.e., the precession of the equinoxes. Because of the toplike motion of the earth with respect to the
stars—completing a cycle once every 26,000 years—the point where the sun crosses the celestial equator slides westward through each of the 12 signs of the zodiac, taking approximately 2,000 years to traverse each sign. Every passage of the sun through a particular sign of the zodiac is associated with a particular age. The equinoctial point which ushered in the birth of Christ has been located in Pisces (the fish). We now are ushering in a new age of Aquarius (water carrier). The equinoctial point will continue to slowly traverse the breadth of the constellation of Aquarius for the next 2,000 years before ushering in a new age.

Greek philosophy was steeped in the idea of an eternal reoccurrence. This clashed head on with the Christian belief in a linear notion of sacred history leading to the human's ultimate salvation and redemption. Jacki (1977) discussed this confrontation:

That a very different course of events was to follow from the confrontation of biblical monotheism with the Greek worldview can be seen from the first major phases of that confrontation, which occurred during the third and fourth centuries of our era. From Origen to Augustine the fathers of the church kept decrying the idea of the great year as a pernicious doctrine utterly irreconcilable with such cardinal points of the faith as creation, incarnation, and final resurrection. With an eye on the Greek worldview, the church fathers considered time and time again the possibility of Judas betraying Christ not once but time and again in each succeeding world age, nay in an infinite number of times, and denounced it as wholly inconceivable within the Christian outlook for which existence is not cyclic but linear in the spiritual as well as in the physical realm. As to the pagan Greek philosophers, the church
fathers called their attention to such implications of their belief in the great year, as Socrates, the noblest of all Greeks, drinking the hemlock not once but time and again, in an infinite number of ages. (p. 242)

It is obvious from the above admittedly superficial discussion of cosmological models that there can be a great variation in how individuals or cultures may envision the workings and ultimate fate of the universe. The dimensions of space and time may be arranged in a number of ways offering totally different casts to the various worldviews seen in the world.

The following discussion centers on how human beings have constructed and altered, over time, their views on the structure of the universe. Because a great deal of Western civilization's thought has its initial impetus in the philosophy of the Greek civilization, I begin with the Greek worldview.

Greek Worldview

The worldview of the fourth century Greek consisted of a geocentric and geostatic spherical earth estimated to be at the exact center of a larger rotating sphere to which were attached the naked-eye stars. The sphere of the stars rotated daily in an east to west direction to account for the progression of the heavens. The present-day notion of the stars being located at varying distances from the earth was not part of the Greek worldview. They saw all the stars
as being attached to the inside of a solid and crystalline rotating sphere which completed one revolution in 24 hours.

The outer sphere of the stars framed the outer limit of the universe. This two-sphere universe was quite an ingenious construction in that it was able to account for most of the movements of the heavens. The outer sphere of stars was located at a finite distance from the earth out of logical necessity for if, according to Aristotle, the sphere of the stars was located at an infinite distance from the earth, it would be impossible for this sphere to traverse an infinite distance in a finite amount of time unless its velocity were equally infinite in magnitude.

It readily could be seen that the sphere completed its circular course in the finite span of 24 hours. The outer sphere must, therefore, be of a finite size and the universe also must be finite. The infinite cannot be traversed in the finite time of 24 hours.

A means used by the early Greek scientists to demonstrate the static nature of the earth utilized the phenomena of parallactic displacement. Here, if an object is gazed at from two opposite ends of a baseline, the object appears to shift position in relation to its background—if the object is not too distant. Because the early Greeks did not observe a displacement of the stars over time, this suggested to them that the earth was stationary. The Greeks were not able to envision the correct basis for the lack of
an observed displacement, i.e., that the stars were in actuality too distant to exhibit a displacement. A number of additional proofs were offered to explain the lack of a logical basis for assuming that the earth moved, i.e., the proof utilizing the addition and subtraction of velocities of the earth's rotation and revolution as it circled the sun and the common sense perception that the clouds and birds would not be able to maintain their relative positions above the earth if it moved, etc.

It is important to note that, in the retention of the two-sphere model, its existence was a direct result of a great deal of imaginative thought and common sense perception of the world. This model accounted for a large number of the movements of the heavenly bodies in a relatively straightforward and simple fashion. The two-sphere model is utilized by many astronomers today to instruct would-be astronomers in the attainment of a conceptual insight into the movements of the heavens. This model readily explains the variation seen in the paths of the stars as a function of the latitude of the observer on earth. It accounts for the apparent perpendicularity of the paths as seen from the equator, the horizontal paths as seen from the poles, the oblique angled paths as seen from intermediate latitudes, and the existence of the circumpolar star paths varying as a function of latitude.
The Greeks situated the planets in their individual locations between the sphere of the earth and the outer sphere of the stars. The planets initially were seen as traveling around the earth in perfectly spherical orbits. A question is posed: Why did the Greeks envision their cosmology in terms of circular or spherical components? There are reasons for this predilection, a number of which have been based purely on theological grounds or empirical considerations. One has but to gaze at the night sky to gain the impression that one is looking at the inner shell of a hemispherical structure to which the stars appear to be attached. It also is easy to take the next step of imagining the other half of the sphere residing below the surface of the earth—the two hemispheres joined together to complete the spherical shell of the heavens.

Although the notion of a spherical dome of the sky is common among the world's cultures, it is by no means a universal one. An alternative design was explicated by Wilbert (1981) as a result of his fieldwork among the Warao and Yekuana people of Venezuela. These people incorporate into their cosmology a concept of the shape of the sky and the universe which is not spherical at all. They see the sky as a bell-shaped tent which is supported at the zenith by the world's axis.

It should be noted that the idea of two joined hemispheres is reflected within the mythological fabric of a
number of the world's cultures. Lum (1948) indicated that the Mongols called the Milky Way the Heavenly Seam, thinking it the line where the two parts of heaven are sewn together. The Babylonians also thought the Milky Way joined the two celestial hemispheres together. They alluded to the faint glow of the stars of the Milky Way as a reflection of the fires of the outer world shining through the seam.

That the stars appear to trace circles around a line joining the celestial axes offers additional credence to the idea of a spherical heaven. This observation is particularly explicit among the circumpolar stars which are seen to trace complete circles around the north celestial pole. One can also find many instances of objects of a spherical or circular shape in nature--the sun, the moon, water rings, and droplets, birds' nests, etc.--whereas the basic triangle and square shapes are rarely found in the natural state. It appears that there exists an inherent trend toward circularity and sphericity in nature. This has been found to be the case. The sphere, according to mathematicians, is the solid which is able to encompass the greatest amount of volume within the least amount of space and, therefore, this shape occurs fairly regularly in nature.

The circle always has been used as a symbol for eternity--time without beginning or end. The mental picture of a circle is a shape that is without beginning or end.
Every point on the circle's circumference is equally distant from the circle's center. Its shape is symmetrical and perfect.

Because the stars appear to trace a circular motion in the sky and because they never appear to alter their relative positions with respect to each other, it was a natural conclusion to fit the stars onto the inside of a gigantic sphere. By the same token, since the stars always appeared to rise and set at their appointed times—night after night, month after month, year after year—without any semblance of change, they exhibited and exemplified a sense of the eternal. It is seen later, particularly in Aristotle's cosmology, that precisely because of their unchanging movements the stars were assimilated to the realm of the divine and the eternal. The sphere of the stars inherently demonstrated the ability to revolve eternally upon itself.

The geometric motif of circularity played a critical role as the major structural principle of all cosmologies created up to the time of Johannes Kepler (1571-1630). In some instances it retains a role in a number of present-day cosmological models. It was the insistence on the primacy of the circular pattern which figured so prominently in the homocentric spheres of Eudoxos and Aristotle, the epicycles and deferents of Ptolemy, and the revolutionary cosmology of Copernicus. Its use as a major structural guide in the
creation of a host of cosmologies finally lost favor with
the introduction of the use of the ellipse as a planetary
explicans by Kepler in the seventeenth century, although the
conic sections--other than the circle--had been known for an
extended period prior to their application to cosmological
pursuits. Sambursky (1962) noted:

Before Kepler nobody thought of conceiving the courses
of the planets as ellipses even though the geometry of
conic sections, including the ellipse, had been
developed in Greece as early as the second half of the
fourth century B.C. and had reached its peak at the
beginning of the second century in the work of
Appolonius of Perga on conic sections. The circle was
just as inseparable a part of the Greek cosmos as the
straight line later became of the Newtonian cosmos.
(p. 82)

The earth was situated at the aesthetically satisfying
location at the center of the universe. The human species
was located at the pivotal point in the cosmos around which
the rest of existence moved. The human cosmic placement was
equally related to the orbs of the stars and the planets.
People resided on a unique and centrally located spherical
(the spherical-shaped earth mimicked the perfectly created
figure into which the universe itself was cast) body which
must have given them a sense of grandeur and cosmic
importance. This centering of humankind played a vital role
during the next several thousand years in the determination
of an exaggerated sense of self in relationship to the
world at large.

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It should be mentioned here that it is very difficult to rid oneself of the idea (a common sense view) that the earth is not fixed at the center of the universe. The sun, moon, planets, and stars seem to rise and set in their daily movements. One must make a leap in abstraction to become aware that it is the earth which is moving and not the objects in the heavens. And yet, we do not feel this motion; we seem to be absolutely stable and at rest in the universe.

With the basal structure of the two-sphere cosmology intact, the history of cosmological thought from the fourth century B.C. to the revolutionary and cosmic transforming ideas of Copernicus in the sixteenth century A.D. can be summarized in the thought of two men, Aristotle (384-322 B.C.) and Ptolemy (second century A.D.). Their cosmological systems were to dominate the astronomical and cosmological conceptions throughout the Medieval and Renaissance periods. This does not mean that their views were the only ones expressed then. To the contrary, a number of alternate views were promulgated. These alternate views, although important to the development of astronomical thought, never really gained a foothold to become dominant threads in subsequent cosmological thought.
Aristotle's Cosmology

Aristotle's cosmology—a two-sphere universe containing the additional series of nested homocentric spheres of the planets—formed the basic paradigm for a great deal of subsequent cosmological speculation. His universe was a finite and spherical-shaped body which always had existed. The universe was bounded at its outer limits by the sphere of stars. Outside this limit, nothing existed—no void, no space, no matter. Aristotle's universe was a plenum, i.e., the region enclosed by the sphere of the stars was filled with matter—matter and space seen as being necessarily coexistent.

The notion of an outer bound in Aristotle's cosmology is closely linked with the idea, propounded by Plato in Timaeus, of the universe as a living organism. Furley (1981) took the analogy between the universe as a living organism one step further:

There are also reasons that one might say come more from the heart than the head, or more from poetry than from science. Even the most mechanistic of Greek philosophers of nature retained elements of a different, nonmechanistic model of the world—the model that gets its most powerful expression in Plato's Timaeus. The world is a ZOON, a living creature. But an animal needs a skin: the world's skin is its outer sphere. (p. 574)

The idea of a universe filled with continuous matter, i.e., the plenum, eschewing the existence of a vacuum, was a necessary requisite to Aristotle's theory of dynamics. Aristotle followed and amplified Eudoxus' scheme of a
number of interlocking homocentric spheres, as a basis in accounting for the transference of motion from the outer sphere of stars to the planets and, ultimately, to the central core of the universe, the earth.

Looking at the world around him, Aristotle found himself faced with an obvious contrast between the celestial and terrestrial realms. The terrestrial world in which he lived was one of constant flux—a world of continual birth, decay, change, and death. A totally different situation appeared to exist in the heavens: The movements of the heavens were regular, constant, and appeared to be eternal in nature. Here infrequent intruders which appeared in the sky, such as meteors and comets, were thought of as belonging to the terrestrial region.

Aristotle's universe was, therefore, dichotomized into two distinct regions. The terrestrial region he termed Nature and the celestial region Sky. These ontologically distinct realms were seen as being quite different in terms of their material composition. The four elements of earth, air, fire, and water comprised the region of Nature. The four elements sorted themselves naturally in space according to their lightness or heaviness.

Earth, the heavier element, gathered itself at the center of the universe (earth = center). Situated on or near the earth was located the lighter water; above it was the still lighter air. Fire, the lightest element of all,
collected itself naturally upward in a sphere coincident with the outer limit of Nature—the orbit of the moon.

The moon's orbit was, therefore, seen to form the line of demarcation between the terrestrial and celestial regions. The fire on earth was considered an impure form of the elemental fire which naturally formed a spherical layer immediately adjacent to and below the orbit of the moon. This pure fire was envisioned as being totally transparent and, hence, invisible to human eyes.

The sphere of the stars, and the intervening space between this space and the lower sphere of the moon, was filled with a substance unlike any of the terrestrial elements. Here was located the aether or quintessence—a solid, clear, crystalline, and weightless substance which exhibited a natural and eternal circularity of motion. Everything in the universe was compartmentalized. Everything had its proper place. The spheres of the stars and planets (including the sun and moon) were composed of aether. Each of the planets were embedded within their individual planetary spheres, and each of the spheres were nested one inside the other. Of course, all the planetary spheres were nested inside the outer sphere of the stars (Fig. 2).

The aether was viewed as a manifestation of the divine; it exhibited a sense of the majestic and the eternal in the
Figure 2. Aristotelian universe composed of central earth, water, air, and fire elements. The planets above the moon were composed of the aether as was the crystalline sphere of the stars.
regularity seen in the movements of the stars and planets. Cumont (1960) stated:

Not only were the stars of the heavens an object of worship, but also the subtle substance which lit their fires, the aether which filled the lofty spaces of the heavens. Sacrifices were offered to it, or it was celebrated in hymns as the source of all brightness, and the worshippers even dedicated inscriptions to this pure and serene air that it might chase away the devastating hail. (p. 66)

Just as each region of the universe consisted of a particular material strata, each region also had its own pattern or patterns of motion associated with it. This was not a universe governed by a number of mechanical laws of nature but one in which there existed an impulse or striving within matter itself which directed it to move in a particular manner in order to seek its natural state or location within the universe. Although everything had its proper place, the terrestrial region was an area of change and disturbance in which the four elements became joined and mixed together. In an undisturbed state, each of the elements remained in their proper locations; but, once disturbed, the elements moved naturally upward or downward in a rectilinear fashion to regain their natural placements within the universe.

Here we are dealing with an absolute motion with respect to the center of the universe (earth). C. S. Lewis (1964) asked that we put ourselves in the shoes of our ancestors to gain a feeling for this universe:
You must go out on a starry night and walk for about a 
half an hour trying to see the sky in terms of the old 
cosmology. Remember that you now have an absolute up 
and down. The earth is really the centre, really the 
lowest place; movement to it from whatever direction is 
downward movement. As a modern you located stars at a 
great distance. For distance you must now substitute 
that very special, and far less abstract, sort of 
distance which we call height; height which speaks 
immediately to our muscles and nerves. (p. 98)

The circular motion of the heavens was seen as being 
higher in scale of cosmic value than the simple rectilinear 
motion of the sublunar realm. Circular motion was primary 
to rectilinear motion because circular motion was complete 
(it had no starting or ending point), whereas rectilinear 
motion was not continuous or complete. Because the aether 
was already located in its appropriate region, above the 
moon, it had no tendency to rise or to fall; it tended 
to move perpetually in a sideways manner around the geometric 
center of the universe--the earth.

Aristotle saw the outer sphere of the stars as being 
the source and generator of all motion in the universe 
except for the return to Natural position of the terrestrial 
elements. Because the universe was conceived as being 
filled with matter, the spherical shells of the stars and 
planets were constantly in contact. An impetus initiated at 
the level of the sphere of stars would be transferred on 
down through the universe by the frictional rubbing of sphere 
on sphere. For example, the outer sphere of stars would rub 
against the sphere of Saturn (the outermost planet).
Saturn, in turn, would impart its motion on the next innermost planet, Jupiter, and so on. Ultimately, this frictional drive would be transferred below the frontier of the moon to jostle and mix the terrestrial elements of air, earth, fire, and water. All terrestrial change, therefore, had its origin in the outer sphere of the stars.

The notion of a frictional drive generated from the outer sphere of the stars played a crucial role in providing a mechanism for the transference of celestial occurrences to the terrestrial world, i.e., it provided a major justification for the belief in astrology. This outward motion, terminating at the central kernel of the earth (the center of the universe), was made all the more powerful an influence because of its emanation from the divine and eternal realm of the sky. One therefore could not help feeling very important and unique in being the direct recipient of all the sacred energies issuing from the heavens. Here we have an added justification for the sense of importance and uniqueness attached to the central earth.

The full universe of Aristotle had a finite boundary and a determinable center. Here the universe had no location within an infinite space but, to the contrary, the universe itself framed the location for everything in existence. The notion of a finite universe was a necessary aspect of Aristotle's theory of motion in which heavy objects (earth and water) always naturally moved toward the
center of the universe and light objects (air and fire) always moved away from the center. Naturally, the aether of the heavenly realm always moved around the central point of the universe--the earth.

The Aristotelian theory of motion lost its validity when placed within the context of an infinite universe. Each location in an infinite universe would be just like any other point. Without a center point there would be no natural location or absolute reference point for the elements to refer to when moving.

Kuhn (1959) related the crucial importance of the idea of a full and finite universe, with a determinable center, to the integration of the whole of Aristotelian cosmology:

The multifarious roles of a full universe in Aristotelian thought is our one full-dress example of the coherence of a cosmology or a worldview. The plenum is implicated in pneumatics, the endurance of motion, the finitude of space, the laws of motion, the uniqueness of the earth. The list could be extended. Note that the plenum does not logically necessitate either the uniqueness, or the central position, or the immobility of the earth. It simply fits into a coherent pattern in which the unique, central, and immobile earth is a second essential strand. Conversely, the earth's motion does not necessitate either the existence of a vacuum or the infinite nature of the universe. But it is no accident that both these views won acceptance shortly after the victory of the Copernican theory. (p. 90)

It should be noted here that other views were promulgated which were diametrically opposed to the conception of a finite universe. Stoics held the opinion that outside the sphere of stars existed an infinite expanse
of empty space. Atomists also held the view of an infinite expanse of space and infinite amount of matter, which is more in line with current reasoning in which a plurality of worlds is postulated. The possibility of an infinite expanse or space had to wait until the demise of the Platonic-Aristotelian picture of the closed world to gain respectability.

A number of ingenious arguments were utilized by some scholars in arguing against the notion of a finite universe. For example, if the universe is limited by something, that something is not the limit because there would have to be something more, i.e., that which is limiting. This line of reasoning led one to conclude that there existed no ultimate limit.

Furley (1981, p. 578) mentioned another argument in which a question was asked by an individual: "If I were at the edge of the world, could I stretch out my hand or a stick into the outer region or not?" That is, if one can stick one's hand into the outer region, there must be somewhere for it to go, and if one can't stick one's hand into the outer region, something must exist outside the finite world to stop it. In either case, something must exist outside the finite world.

Some general comments concerning the planetary bodies are in line before continuing with a discussion of the subsequent Ptolemaic system. The planets, known to the
ancients as the Wanderers, included seven bodies: Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn. (Uranus, Neptune, and Pluto were added to the list only after the advent of the telescope.) These seven bodies, together with the sphere of the stars, were the only bodies recognized as celestial in classical times. The Sun and Moon were included under the rubric planet and were seen to circle the earth as did the other planets.

The planets were seven in number and the importance traditionally attached to the number seven may have been derived from its planetary association. Another plausible explanation was seen in the numerical equivalent in directionality, i.e., seven major directions or locations were recognized: the four cardinal directions, the zenith and nadir, and the point where all the directions coincided, i.e., the center.

Temple (1976) offered another possible explanation based on the visibility of the star Sirius in ancient Egypt. To the Egyptians, Sirius was very important because its heliacal rising (shortly before the sun) signaled the rising and flooding of the Nile. The rising of Sirius followed its prolonged absence from the sky for 70 days. This time was equivalent to seven decans in the Egyptian system of time reckoning utilizing the stars.

The system was based on monitoring a chosen number (36) of stars throughout the year as they followed one
another in rising above the eastern horizon. Here, each
cstar was used to measure a 10-day tract of time (1 decan)
before another star took its place. It is interesting that
Sirius was thought to be in the underworld during its 70-day
absence; this period also was the traditional length of time
required in the mummification process.

The planets were arranged in their circular orbits
between the earth and the sphere of the stars, their
respective placements from the earth based on their
increasingly orbital periods. Because Mercury and Venus had
orbital periods similar to the sun's and because of their
closeness to the sun, a great deal of controversy surrounded
their exact placement with respect to the earth. For a long
period in antiquity, Mercury's and Venus's morning and
evening phases were considered to be appearances of
different planets. Generally speaking, the planetary order
in Ptolemaic astronomy (ordered from the earth) was the
Moon, Mercury, Venus, Sun, Mars, Jupiter, and Saturn.
Because of the confusion with respect to the placements of
Venus, Mercury, and the Sun, a previous scheme had them in
the order of Moon, Sun, and Venus.

**Planetary Motion**

It now is necessary to enunciate some anomalies
associated with planetary motion. The first point is that
the planets do not share in the general movement of the

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heavens, i.e., the movement of the celestial sphere of stars. They appear to move in angles inclined to the general rotation of the stars.

Furthermore, the planets' positions are always found within a fairly narrow band of sky (zodiac) centered on the apparent path of the sun (elliptic) with respect to the background of stars (see Fig. 3). Due to the $23.5^\circ$ tilt of the earth's axis with respect to the plane of its orbit, the sun appears to trace a circle in the sky inclined to the general rotation of the stars by some 23.5 degrees.

The planets—excluding the sun and moon—exhibit another idiosyncratic movement termed retrograde motion. The planets in their general eastward motion will, at regular intervals, slow down and stop, then begin to move backward in a westerly direction, then slow down again and stop before moving once again in an easterly direction (see Fig. 4). We now know this effect is due to the differential rotation rates of the planets which at regular intervals change their apparent positions with respect to the backdrop of the fixed stars (see Fig. 5).

In the two-sphere cosmology the planets were seen as traversing the heavens in earth-centered circular orbits; they also moved in a direction (easterly) contrary to that of the fixed stars (westerward). The circular orbits accounted fairly well for the paths of the sun and moon but
Figure 3. Celestial sphere indicating the band of the zodiac centered on the ecliptic. The extension of the earth’s equator against the sphere of the stars is inclined 23° to the plane of the ecliptic.
Figure 4. (a) Retrograde motion of planets. (b) All stars (except the circumpolar stars) rise in the east and set in the west without a retrograde motion.
Figure 5. Because of the faster orbital velocity of the earth the planet appears to shift its motion back and forth with respect to the stars.
failed to account for the retrograde motion and the variation in brightness exhibited by the other planets.

The above-mentioned problem of the planets, first recognized by Plato, plagued cosmologists for nearly 2,000 years before being satisfactorily explained. Plato noted the problem in his *Timaeus*, but he never dealt with it in an explanatory fashion as noted by Humphreys (1973):

Even though Plato fixed all celestial motions to the rotation of one mighty celestial axle, he did not help us visualize how, on his hypothesis, the planets could move at different speeds (forwards and backwards), and also be inclined at all angles to the celestial equator up to 24 degrees. Although well-known before Plato, the necessity and the difficulty of reconciling the two major facts of the heavens are seriously felt only in the *Timaeus*. Before this, cosmologists could speculate on the design of the universe with absolute freedom. Mathematicians and philosophers were now obliged, however, to search out some single explicans which would harmonize observations of planets and stars, and set out their mechanical relations in some intelligible order. It was no longer possible simply to recognize planetary misbehavior and then shrug it off as a temporary awkward datum. This had now to be faced as the central problem of cosmology and astronomy. (p. 39)

A number of techniques were utilized in an attempt to solve the problem of the planets. Eudoxus (408-355 B.C.) came up with a series of 33 interconnected concentric spheres to reproduce the planetary movements. Aristotle tacked on an additional 22 spheres for a grand total of 55 spheres to further complicate the picture. Here the spheres revolved at constant velocities (varying for each sphere) around different axes and in different directions. The combinations of all the spheres operating at a single
instant of time reproduced the empirical motion of the planets.

One major difficulty with this method was that it did not account for the variation in the brightness of the planets. When the planets moved in concentric earth-centered orbits, their brightness did not fluctuate over time because of the invariant distance between the earth and individual planets. When, however, they retrogressed, they did vary in brightness. This method of attacking the problem was abandoned when a more adequate explanation appeared in the works of Apollonius and Hipparchus (third century to the end of the second century B.C.). Not all was abandoned, however; a number of remnants of the homocentric system continued to play a part in subsequent cosmological systems. The idea of solid crystalline spheres, as well as emphasis on circularity of motion, played an important part in cosmological thought up through the seventeenth century.

Hipparchus and Apollonius developed a novel method of dealing with planetary motion which was picked up and amplified in the following Ptolemaic system. Here the motion of a planet was demonstrated in terms of a large earth-centered circle, called the deferent, on which was centered a smaller circle, called the epicycle, on which the planet moved. Both circles moved with a constant velocity. The planet going through this combination of movements, seen
edgewise, would seem to stop, move westward, stop again, then continue to move eastward. By varying the velocities of the epicycle and deferent, all sorts of combinations of motion could be derived to fit the observable planetary movements. This scheme was able to account for the variation in brightness of a planet (because its distance from the earth varied during an epicyclic rotation) as well as its retrograde motion (see Fig. 6).

We now know that the planets vary in their brightness due to their constantly changing distances from the earth as a direct consequence of their following elliptical orbits in space. The ancients were not, however, able to dispense their bias toward a circularity of motion and, thus, they had to come up with an alternate explanation of celestial motion.

**Ptolemy's System**

Ptolemy (second century A.D.) utilized the geometrical technique of compounded circular orbits in explaining the retrograde motion of the planets. The Ptolemaic system implicitly assumed that the planets actually traversed the sky in perfect circular orbits—the appearance of retrograde motion to the contrary. The task at hand was to explain retrograde motion in terms of circular planetary motion.

Ptolemy's greatest work, *The Almagest*, explicating his theory of planetary motion, formed the basis of much
Figure 6. Epicycle-Deferent System utilized by Ptolemy to explain the retrograde motion of the planets.
mathematical astronomy through the seventeenth century. It was also the primary source of a great deal of Greek astronomical knowledge.

As expressed in The Almagest, the movement of each planet was broken into a number of compounded circles. The earth was located near the center of a large circle (deferent) and the deferent moved around the earth in an easterly direction—reflecting the easterly component of the planet's motion with respect to the backdrop of the zodiacal constellations. Each planet, in addition to revolving uniformly around the deferent, revolved uniformly on a secondary circle (epicycle) which was centered on the circumference of the deferent. This epicycle-on-deferent system "saved the appearances" because it was able to mimic the retrograde motion of the planets. It must be noted here that the epicycle-on-deferent system was placed in toto within the plane of the ecliptic, and the entire system—minus the central earth—was carried along with the diurnal rotation of the sphere of stars. The rates of revolution of the epicycle and deferent could be varied to produce any desired effect.

Looking at the epicycle-on-deferent system edgewise, it's readily apparent how it could explain the retrograde motion and the variation in brightness of a particular planet. When the planet on the epicycle was outside the deferent (A), it appeared to move in an easterly direction;
when the planet on the epicycle was inside the deferent (B), it appeared to move in a westerly direction with respect to the background of the stars. When the planet was at either position (C or D), it appeared to stop before reversing its direction of motion. By the same token, when the planet was located at position A, it was located at a greater distance from the earth than when at position B; therefore, it appeared dimmer to the eye than when at position B.

Ptolemy also proposed a number of minor variations in the epicyclic motion to account for a number of idiosyncratic motions of the planets. For example, the epicycles pertaining to the moon and sun moved in a westerly direction contrary to the epicycles of the other planets. The rate of rotation of the moon's epicycle was construed to be nearly equal to the rate or rotation of its deferent. The net effect of this combination of movements was not a retrograde motion but an alteration in the velocity of the moon as it traversed the sky. Here, the moon would alternately speed up and slow down, thus the Ptolemaic cosmology was able to account for the variable speed of the moon. The same situation was true for the sun. Of course, the period of revolution of the deferent of the sun was one year.

The inferior planets, Mercury and Venus, always are positioned near the sun and, thus, the centers of their epicycles were aligned directly with the center of the sun.
Once aligned in this manner they forever kept in step with the sun.

Each planet had its unique combination of circular movements. By varying the velocity of the epicycle, the number of loops each planet made could be increased or decreased at will to fit a particular planet. In the case of Jupiter there were 11 loops and for Saturn there were 28 loops.

The Ptolemaic system, when employed, made it possible to account for a large number of observations with a remarkable degree of accuracy. My rendering of this system is a simplified version of the theory. In response to those who equate the old or primitive with the simple and unsophisticated, the Ptolemaic theory of planetary motion offers a system which is complex and imaginative in detail.

A question remains as to the ontological status of the epicycle-on-deferent system, i.e., did Ptolemy see the epicycles and deferents as actual existent entities? Kuhn (1959) indicated that there were serious misgivings about the existence of the epicycles and deferents; but, at the same time, the existence of these spheres was a difficult belief to dispense with:

The set of epicycles and deferents, which replaced homocentric spheres for purposes of mathematical astronomy, did not fit very well into crystalline spheres like those proposed by Aristotle. As a result, the attempt to find a mechanical explanation of the epicyclic motions was often neglected after the fourth century B.C. and the real existence of the crystalline
spheres was occasionally questioned. It is not, for example, clear from The Almagest whether Ptolemy believed in them at all. But in the period separating Ptolemy and Copernicus most educated people, including astronomers, seem to have believed in at least a bastard version of Aristotle's spheres. They allowed one spherical shell for the stars and one for each planet, and they supposed that each planetary shell was just thick enough for the planet to be at the inner surface when closest to the central earth and at its outer surface when farthest from the earth. Men who did not know or care about the irregularities of planetary motion could take the thick spheres quite literally: Each planet was fixed in and carried around by its sphere. Planetary astronomers used epicycles, deferents, equants and eccentrics to account for each planet's motion within its own thick spherical shell. For them the shells had at least metaphorical reality, but they rarely bothered with a physical explanation of a planet's motion within its sphere. (pp. 80-81)

Perhaps Ptolemy's system was seen by him as a convenient geometrical method to explain the appearances of the celestial phenomena. There is no doubt that his theory was an improvement over Aristotelian cosmology. Ptolemy's system was taken up by a number of individuals following his death (170 A.D.) to the time of Copernicus. In many instances his system was made more complex by subsequent theorists as minor epicycles were added onto epicycles, but the basic system created by Ptolemy was left intact. The existing elements of his system were modified, but it formed the basis of the Copernican revolution over a millenium later.
Summary

To briefly summarize the history of cosmological thought up to this point, the classical and Ptolemaic systems were based on Plato's basic assumption that all the observed motions of the heavens were to be accounted for by their resolution into a series of uniform circular motions. Eudoxus and Aristotle accounted for the movements of the heavenly bodies through the use of a number of homocentric spheres.

The idea that the heavens consisted of a single sphere was torn asunder by the recognition that all the planets, including the sun and moon, appeared to revolve in a direction contrary to that of the stars. The subsequent notion that the planets were also fixed into a number of crystalline spheres which moved from west to east, or which merely moved more slowly than the sphere of stars from east to west (thus accounting for the appearance of an easterly movement), was nullified by the recognition of retrograde motion.

The homocentric spheres of Eudoxus and Aristotle did not account for the variation seen in planetary brightness, neither did they account for the inconsistency seen in the retrograde motion of the planets.

Ptolemy's subsequent theorizing, utilizing the epicycle-on-deferent system, was able to account for both the above-mentioned observations pertaining to the planets.
His system was to form the basis of subsequent cosmological thought. He recast planetary motion into a new light and, at the same time, retained many assumptions of Aristotelian cosmology. Retained was the concept that the stars were affixed to the inside surface of a solid rotating sphere of the stars. The earth continued to be viewed as a motionless sphere located at the center of a finite universe. Also retained was the notion of celestial circularity, albeit a cosmology based on compounded circularity. In its major aspects, Ptolemaic cosmology was essentially Aristotelian in outlook.

**From Copernicus to the Present**

The 1543 publication of *De Revolutionibus Orbium Caelestrum* by Nicholas Copernicus set forces in motion which were to alter once and for all how the universe was to be henceforth envisioned. This work retained a number of Aristotelian and Ptolemaic elements; but, in its overall outlook, it made a sharp break with the previous systems in its denial of an earth-centered and earth-static universe.

Copernicus saw an earth-centered universe creating as many problems as it explained. He considered the Ptolemaic system too complex and decided that there must exist a simpler way to explain the appearances. He was able to simplify the situation by developing a theory in which the sun and not the earth was at the center of the universe.
Copernicus explained his theory based on the principle of relative motion in which the appearance of the sky is the same whether the sun or earth is moving. The earth rotates about its axis and this motion makes the stars appear to rotate about the earth. The daily eastward displacement of the sun, contrary to appearances, was due not to a movement of the sun but to the earth tracing an orbit around the sun. Here the earth was reduced to the status of a planet having a daily and annual motion.

By accepting the motion of the earth, Copernicus was able to lay to rest the daily motion of the outer sphere of stars. Yet the belief in a solid and crystalline sphere of stars persisted. It now, however, was viewed as a static sphere.

One must not assume that Copernicus was the first individual to envision an alternative to a geostatic and geocentric earth. Aristarchus of Samos (third century B.C.) had anticipated, long before Copernicus, the major elements of the heliocentric system in which the earth exhibited an axial and an annual motion. Heraclides, in the fourth century B.C., expressed the view that the apparent motion of the heavens was due to an axial rotation of the earth.

In the fifth century B.C. Philolaus, a follower of the Pythagoreans, developed an ingenious cosmology based on a daily revolution of the earth around an idealized central
point in space called the central fire or universal fire.

Munitz (1965) said:

The universal fire, the central point of the celestial procession, was known by many names: "mother of the gods," the "citadel of Zeus," and so forth. Two of its titles were especially characteristic: the "altar" of the universe and the "hearth of the universe." The planets revolved around the sacred source of all life and motion, like worshippers round an altar, and the universal hearth was the center of the world or cosmos as a human's domestic hearth was honored as the sacred center of the home, or as a flame that burned and was never extinguished in the civic hearth of the Prytaneum which formed the holy rallying point of every Greek community. (p. 36)

The idea of a procession about a central point of great significance was echoed in the mythology associated with the circumpolar stars--those stars whose paths are centered on the polar axis and which do not rise or set but which always are seen above the horizon.

According to Lum (1953), the Chinese modeled their social order on the order evinced among the stars. This correspondence was demonstrated in the stationary aspect of the pole star around which the circumpolar stars appeared to revolve. The pole star, known as the throne of heaven or ruler of heaven, was the point around which the circumpolar stars moved in paying homage. Here the pole star was considered the focal point of the world of heaven--just as an emperor formed the crux or pivotal point of the social order on earth.

A terrestrial mimicry of the heavens appears to have been quite a common theme among many of the world's
civilizations. Eliade (1974) saw this process at work in the construction of cities and temples and when taking possession of a territory; people forever create according to an archetype:

The world that surround us, then, the world in which the presence and the work of men are felt—the mountains that he climbs, populated and cultivated regions, navigable rivers, cities, sanctuaries—all these have an extraterrestrial archetype, be it conceived as a plan, as a form or purely and simple as a "double" existing on a higher cosmic level. (p. 9)

To continue with Philolaus—he envisioned the moon and sun as also revolving around the central fire; the moon taking a month and the sun one year to complete a revolution (see Fig. 7). The other planets completed their cycles according to measure in longer periods of time, and the sphere of stars was seen to have a slight movement around the central fire also—possibly to account for precessional effects.

Human beings were thought to inhabit only one side of the spherical earth. Therefore the inhabited side of the earth would alternately face toward the sun and away from the sun as the earth completed its 24-hour revolution around the central fire—giving the impression of the succession of day and night.

Because the sun and planets moved from west to east in their circular orbits, each day they appeared a bit farther east with respect to the backdrop of stars than on the previous day. This system accounted well for the gradual
Figure 7. Philolaus' system: the earth completes one revolution in 24 hours and the sun completes a revolution in 1 year. In a 24-hour cycle the inhabited side of the earth alternately faces toward and away from the sun.
slippage eastward of the planets. There was, however, no mechanism in the system to compensate for the retrograde motion of the planets. Although this scheme was not equipped to handle all the movements of the heavenly bodies, nevertheless it was quite a descriptive and ingenious system.

Why didn't Philolaus take the next major step—substituting the familiar sun of our experience for the central fire, a truly heliocentric scheme? Gompertz suggested that the reason lay in the exact similarity seen in the sun and moon (Munitz, 1965). The sun and moon, of apparent equal size, seemed to work together in functioning as sources of light and as means of measure. Gompertz expressed the notion that it was illogical to think that of these two luminaries of the sky, seemingly so closely connected, the sun was condemned to eternal rest while the other, the moon, was condemned to eternal motion. Thus, out of necessity, those two bodies must display motion.

Copernicus pictured the solar system essentially in the same manner taught to school children today. At the core of the system is the sun and around the sun move the planets, including the earth. Copernicus retained the use of minor epicycles (an epicycle centered on another epicycle) and concomitantly retained the notion of the paths of the heavenly bodies consisting of circular or compounded circular motions. The break from the mold of circularity
waited until the appearance of Kepler's laws of planetary motion in the latter half of the sixteenth century. The transposition of the sun to the previously held location of the earth altered people's awareness of their place in the universe in ways unforeseen by Copernicus. People never again would look at the world as they had done for several millenia.

An immediate consequence of the Copernican system was the abolition of the necessity of major epicycles in the explanation of planetary motion. According to Copernicus, the retrograde motion of a planet was an apparent motion produced by the differential orbital rates of the planets (see Fig. 8). In this diagram the earth, orbiting closer to the sun than the planet P, would move at a swifter pace in its revolution around the sun than planet P. Successive positions of the earth are seen in E₁ through E₇ and successive positions of the planet P are seen in P₁ through P₇. The distance traveled from P₁ to P₂ is the same time interval as from E₁ to E₂.

Because the earth moves faster than the planet P, it would overtake and pass the planet at position E₄. The planet's apparent position with respect to the backdrop of stars would successively change from P₁ to P₇. From P₁ through P₃ the planet would appear to move eastward, and from P₃ through P₄ the planet would appear to regress or move westward. From P₄ through P₇ the planet reverses its
Figure 8. Retrograde motion of planet (P). The apparent movement of the planet would change from east to west and back again to the east as the earth orbited the sun.
trend and begins to move eastward once again. The general apparent motion of the planet against the backdrop of the stars is illustrated at the top of Figure 8 (previous page).

For an inferior planet (one between the earth and sun) the situation is reversed, i.e., Mercury and Venus orbit faster than the earth. It can readily be seen that planets retrogress only when the earth in its orbit overtakes a planet or when a planet in its orbit overtakes the earth—when the earth and planet are at a minimal distance from each other and, thus, when the planet in question appears to be at its greatest brightness. Here the variation in a planet's brightness over time is adequately addressed without the necessity of epicycles.

The geometry of the Copernican system offered a simpler and more elegant account of Venus' and Mercury's motions in respect to the sun than the Ptolemaic system. In the Ptolemaic system these planets required an epicycle centered on the sun to explain the observation that these planets never strayed far from their solar companion.

In the Copernican system these planets are situated in relatively small-diametered orbits between the earth and sun. The geometry seen in the placement of these planets becomes an explanation for the observation of the perpetual proximity of these planets to the sun.

Copernicus also was able to explain the phenomena of precession. Precession was due to a toplike motion of the
earth in which the earth's axis traced out a complete circle in the sky over a period of 26,000 years. Because of this phenomenon, the position of the north celestial pole is seen to constantly change over time. For example, in approximately 14,000 A.D. Polaris, our current North Star, will no longer be the star nearest the extension of the earth's northern axis against the background of stars. The star Vega in the constellation of Lyra will then be the North Star.

The list of facets of the Copernican system which demonstrated an elegance, simplicity, and economy of explanation above that of the Ptolemaic system could be extended, but at this point it is important to concentrate on the more critical implications of the Copernican system. The Copernican system was a tremendous impetus in critically altering the ontological status of the sphere of stars as well as the concomitant ontological status of the celestial/terrestrial dichotomy of Aristotelian cosmology.

By plucking the earth from its previous location at the center of the universe and placing it within the context of the planets, Copernicus began the process of tearing down the celestial/terrestrial distinction. At the same time, the idea of a moving and rotating earth led to the demise of the notion of a rotating sphere of stars. This ultimately led to the infinitization of space.

The earth moved and not the sphere of stars. This truth alone did not destroy the idea of the crystalline
shell's existence, but it did make its relevance less important and it became easier to entertain the idea of dispensing with the sphere of stars altogether. The stars did not, therefore, have to all be located at a constant distance from the earth; they now could be imagined as being located at varying distances from the earth. The possibility could even be envisioned of the stars extending infinitely out into space. The conception of a unique and finite universe, held in the minds of humans for several millenia, could now be seriously questioned.

A number of individuals had, of course, entertained the notion of an infinite universe previous to Copernicus, but this radical idea never really gained a solid footing in the mainstream of cosmological thought. The idea, held for so long, of the majesty of the heavens in opposition to the corruptible and ephemeral terrestrial realm also began to be modified once the corruptible earth was placed on an equal footing with the other planets in the celestial region of the universe. No longer could the earth be considered the low point in the cosmic hierarchy.

Koyré (1957) said:

To tell the truth, the world of Copernicus is by no means devoid of hierarchical features. Thus, if he asserts that it is not the skies which move, but the earth, it is only because it seems irrational to move a tremendously big body instead of a relatively small one, that which contains and locates and not that which is contained and located, but also because the condition of being at rest is considered as nobler and more divine than that of change and in constancy; the latter
therefore, is more suited to the earth than to the universe. And it is on account of its supreme perfection and value—source or light and or life—that the place it occupies in the world is assigned to the sun; the central place which following Pythagorean tradition and thus reversing completely the Aristotelian and Medieval scale, Copernicus believes to be the best and the most important one.

Thus, though the Copernican world is no more hierarchically structured (at least not fully: it has, so to say, two poles of perfection, the sun and the sphere of fixed stars with the planets in between), it is still a well ordered world. Moreover, it is still a finite one. (pp. 29-30)

Copernicus refused to proffer an opinion on the possibility of extending the stars out into the cosmos; he left this question to the philosophers. He retained the existence of the crystalline spheres of the stars and of the planets because he still needed some sort of mechanism to carry the planets in their orbits, and some sort of medium to contain the stars and form an outer frame of reference for the internal central location of the sun. The all-encompassing shape of the Copernican universe was, therefore, essentially spherical in shape.

Because of the lack of a demonstrable parallax seen in the stars, Copernicus reached the conclusion that the diameter of the earth and the diameter of the earth's orbit was very small in comparison to the distance to the celestial sphere of the stars. The dimensions of the universe were, therefore, expanded considerably as a result of the Copernican system—an interminable but yet a finite universe. According to Koyré (1957), the approach to
infinity had to come in degrees because it seemed more logically and psychologically satisfying to approach this idea in a stepwise fashion rather than in a single leap of thought: "The world bubble had to swell before bursting" (p.35).

Several individuals have been credited with taking the initial leap of postulating the infinity of the universe subsequent to the dissemination of the Copernican system. The Englishman, Thomas Digges, is credited by many scholars for replacing the closed and finite worldview with an infinite universe. Digge's diagram of the Copernican universe, which appeared in 1576, is reproduced in many textbooks as genuine evidence for the appearance of the notion of an infinite universe. Seen here is a basic Copernican cosmography with one significant addition. Above the sphere of Saturn the drawing depicts a host of stars extending in all directions upward from the sphere of the stars. The basic details of the drawing are reproduced in Figure 9.

Koyré (1957) viewed Digge's extension of the system of stars as an expression of a theological heaven versus a strictly astronomical sky. He then echoed Arthur O. Lovejoy's view that it was not Digges but Giordono Bruno (1548-1600) who presented the first clear indication of a belief in a physical extension of the stars outward and upward from the sphere of the stars:
Figure 9. A simplistic rendition of Thomas Digges' 1576 diagram of the solar system surrounded by what appears to be an extension of stars out into space.
Later in the century, as a recent interesting discovery has shown, the English astronomer, Thomas Digges, added to his exposition of Copernicus an assertion of the infinity of the "orb" of the fixed stars, "garnished with lights innumerable and reaching up in 'sphaerical altitude' without end." No specific deduction of this conclusion from the Copernican scheme of the solar system is attempted by Digges; the only reason given for it is that this is a suitable way of conceiving of "the glorious court of ye great God, whose unsearcheable works invisible we may partly by these his visible conjecture, to whose infinit power and maiesty such an infinit place surmounting all other both in quantity and quality only is convenient."

Though the elements of the new cosmography had then found earlier expression in several quarters, it is Giordono Bruno who must be regarded as the principal representative of the doctrine of the decentralized, infinite, and infinitely populated universe; for he not only preached it throughout western Europe with the fervor of an evangelist, but also first gave a thorough statement of the grounds on which it was to gain acceptance from the general public. (p. 116)

Bruno based his new cosmography on what Lovejoy (1936) termed the principle of plenitude:

No genuine potentiality of being can remain unfulfilled, that the extent and abundance of the creation must be as great as the possibility of existence and commisurate with the productive capacity of a perfect and inexhaustible source, and that the world is the better, the more things it contains. (p. 52)

To limit the potentiality of an infinite and all-powerful God is a contradiction. God must have created a full world, i.e., an infinite number of stars and planets befitting His creative potential. To deal with finite quantities is an impairment not befitting a God with unlimited creative potential.

Tycho Brahe (1546-1601), one of the major figures of astronomical history, not only developed a number of
instruments for accurately measuring the positions of the heavenly bodies—his accurate measurements proved to be indispensable to Johannes Kepler's subsequent formulation of elliptical planetary motion—he also made a number of critical observations which began the process of dismantling one of the basic tenets of Aristotelian cosmology, i.e., the existence of the solid and crystalline spheres.

In 1572 Tycho observed a supernova or new star in the constellation Casseiopeia. Such phenomena, we now know, are caused by an explosion of a massive star in which there exists an imbalance between the outward and inward (gravitational) pressures of the star. Once the new star became visible to Brahe, he with a number of other astronomers, including Thomas Digges, measured the star's parallax. The parallax indicated that the new star was situated at a respectable distance beyond the frontier of the sphere of the moon.

The reader will recall that, according to Aristotelian cosmology, the region of existence beyond the moon was seen as unchanging and eternal; here the substance which comprised the spheres of the stars and planets was the aether. Errant occurrences such as meteors and comets had traditionally been thought of as essentially sublunar phenomena—they were part of the region which was thought to be corruptible, changing, temporal, and generally inferior in ontological status to the celestial realm. The
majesty of the heavens could not be tainted by allowing unwelcome interlopers in the back door.

It now appeared to Tycho that the new star resided amid the realm of aether which previously had been viewed as admitting no change. The egg had been cracked. As the methods of observation were improved and their number accumulated, the spell of the solid and incorruptible aether gradually was lifted.

Tycho also observed a comet in the sky in 1752. Subsequent triangulation methods established that it also was situated at a greater distance from the earth than the moon. Tycho was able to show geometrically that the comet moved directly through the alleged "solid" spheres of Aristotelian cosmology. He thus showed that the celestial spheres had no objective reality; they were a figment of the Greek imagination. As an explicans for the notion of the stars and planets, the solid moving spheres had performed a valuable function. When seriously questioning their existence, a question arose as to what kept the planets in their orbits. If not solid, crystalline, and moving spheres, then what? A number of explanations were offered leading to and culminating in Isaac Newton's eighteenth century grand synthesis of universal gravitation.

Tycho Brahe, perhaps the greatest celestial observer of the Renaissance, rejected the Aristotelian-Ptolemaic universe because he was unable to reconcile the
aforementioned observations with the supposed crystalline spheres and celestial immobility. At the same time, he was unable to accept the Copernican theory. In spite of his painstaking measurements and calculations, he was not able to discover a parallax in the stars and this made it difficult for him to accept the motion of the earth around the sun. He also found it difficult to reconcile the motion of the earth with the opposite view expressed in Biblical scripture. He therefore designed a cosmology which accommodated a number of elements of the Copernican scheme while retaining the notion of a geocentric and geostatic universe.

A compromise solution that could be accepted was an alternative to a strictly Copernican scheme. According to Kuhn (1959):

Once again the earth lies stationary at the geometric center of the stellar sphere whose daily rotation accounts for the diurnal circles of the stars. As in the Ptolemaic system, the sun, moon and planets are carried westward daily with the stars by the outer sphere, and they have additional eastward orbital motions of their own. The circles of the moon and sun are centered on the earth; to this point the system is still Ptolemaic. But the centers of the five remaining planetary orbits are transferred from the center of the earth to the sun. (pp. 201-202)

In this system the orbit of Mars intercepts the orbit of the sun. Present, therefore, is the implication that the planetary bodies are not embedded in the solid and crystalline spheres of Aristotelian cosmology.
Johannes Kepler (1571-1630), a contemporary of Tyche Brahe and an avid Copernican, took the final steps in tearing down the last vestiges of the Ptolemaic and Aristotelian systems. For several millenia cosmology had been based scientifically, theologically, and philosophically on the premise that all movements of the heavenly bodies could be reduced to uniform circular motion. What could be more appropriate for an eternal celestial body than motion in a circle, a geometric form without beginning or end?

It was the precise and systematic observations of the planets by Brahe that made it possible for Kepler to take the next decisive steps toward the creation of a new model for planetary motion. Kepler envisioned the planes of the planetary orbits coinciding in the sun versus the earth and, thus, he was able to explain the range in planetary deviation from the plane of the ecliptic (the apparent path of the sun with respect to the stars).

After a prolonged attempt to improve on the description of the planetary motion of Mars in terms of a compounded uniform circularity of motion, Kepler attempted to utilize a number of other geometrical motifs as a basis of planetary motion. Ultimately, he was able to describe the appearance of the heavens quite elegantly through the adoption of the use of elliptical orbits. His 1609 publication, *On the Motion of Mars*, laid out his newly developed laws of
planetary motion. Here the planets moved around the sun in elliptical orbits—the sun forming one of the foci of the ellipse. The planets did not, therefore, move uniformly in compounded circular orbits but, in reality, in elliptical shaped orbits. The age-old mold of uniform circularity had been swept away by the sheer beauty, elegance, and flexibility of Kepler's elliptical planetary mechanics.

Galileo Galilei's (1564-1642) major contributions to the development of cosmological thought lay principally in his use of and discoveries made with the telescope created in 1608 by Hans Lipershay, a Dutchman. The discoveries offered a tremendous amount of evidence in favor of the validity of the Copernican cosmology. Galileo was the first to turn the telescope toward the sky, and he saw it as no man ever had seen it before. His book, *The Starry Messenger*, published in 1610, detailed the results of his observations.

When Galileo turned his telescope to the "perfect" crystalline sphere of the moon, he found it marred with craters and mountain bulges. The moon was seen not to differ a great deal from the terrestrial earth. He was able to calculate the heights of several of the moon's mountain peaks and found that some were comparable to the tallest of those on earth.

Galileo erroneously thought the dark lowland areas of the moon (mare) were seas; these darker areas still carry an
association with water, i.e., the Sea of Crisis, Sea of Tranquility, etc. Not only was the surface of the moon pitted and marred, but the sun also carried a number of dark blemishes on its crystalline face—the sunspots of modern astronomy. Further observations of these spots indicated that they appeared to traverse the face of the solar disk in approximately one month, offering evidence for the rotation of the sun and an indirect justification for belief in the axial rotation of the earth.

Perhaps the most significant discovery by Galileo was the observation of the four brightest moons of Jupiter circling their mother planet. These satellites appeared to move around Jupiter in a periodic fashion, like a miniature solar system, a visible paradigm of the Copernican system.

A direct proof in rejection of the Ptolemaic system was the telescopic observations of the phases of Venus as it circuited the sun. According to the epicyclic theory, with Venus' epicycle continually aligned with the sun, only the crescent phase of Venus should have been seen. Galileo observed a whole range of phases from crescent to gibbous—further evidence consistent with a sun-centered orbital path of Venus.

The seventeenth century formed a watershed in the development of cosmological thought. With the theoretical advances of Copernicus and Kepler, and the observations of Brahe and Galileo, forces were set into motion which
gradually destroyed the Medieval paradigm of a geocentric and geostatic universe.

Because of the lack of a demonstrable parallax in the stars subsequent to the Copernican formulation, the stars were viewed as being more distant from the earth than previously imagined. Although Copernicus still retained the notion of a finite universe—contained within the solid shell of stars—now its outer limit had been moved farther into space. The wholehearted acceptance by most men of science (during the Classical and Medieval periods) of a finite and closed universe was a difficult notion to dispense with! Nevertheless, Copernicus created the basic framework of thought on which the spatial reconstruction of the universe henceforth was to be cast.

Koyré (1957) stated that it was a normal response for Copernicus, who took the first step in enlarging the universe and arresting the idea of the sphere of stars, to not take the next step of dissolving it into boundless space. To ask him to enlarge the world so as to make it immeasurable was enough—to ask him to make it infinite in extent was asking too much.

It is important in a comparison of the dimensions of the changing universe during different historical periods not to think of the pre-Copernican world as the epitomy of the very small. This world was, in truth, quite sizable in its own right. Koyré (1957) said:

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Great importance has been attributed to the enlargement of the Copernican world as compared with the Medieval one--its diameter is at least 2,000 times greater. Yet, we must not forget, as Professor Lovejoy has already pointed out, that even the Aristotelian or Ptolemaic world was by no means that snug little thing that we see represented on the miniatures adorning the manuscripts of the Middle Ages and of which Sir Walter Raleigh gave us such an endearing description. Though rather small by our astronomical standards, and even by those of Copernicus, it was in itself sufficiently big not to be felt as built to man's measure: about 20,000 terrestrial radii, such was the accepted figure, that is, about 125,000,000 miles. (p. 34)

With the possibility of the existence of an infinite world expressed by Bruno and Digges, the path was cleared for discussion on how the universe now was to be constructed; but, the discussion of the possibility of an infinite world was tempered with caution because of a potential conflict with scripture. One must not forget that Bruno was burned at the stake in 1600 for espousing such a radical view. Previous conceptions of the world had espoused a world created by God, a world in which God resided just beyond His creation. An infinite universe allowed no room for God's allotted space outside normal existence. Where was God to be located in an infinite universe?

On the other hand, a number of writers, including Bruno and Nicholas of Cusa, saw the existence of an infinite world as totally consistent with the creative potential of an infinitely powerful God. Only God could have created a world--infinite in extent--commensurate with His nature. To
ascribe anything less to God was limiting and, therefore, nonsensical.

The pressing need to effectively account for planetary motion was the driving force behind most pre-Copernican cosmological speculation. Copernicus was able to devise an elegant and simple theory of planetary motion which was able to account for a large number of observations concerning the planets. Thus the focus now shifted from speculation on the planets to a concern with the stars.

Munitz (1961) derived four main stages of growth in the history of cosmological thought: (a) the gradual changeover from the use of myth, expressed in anthropomorphic terms, to an approach based on physical and mathematical ideas, (b) the classic and well-rounded Aristotelian cosmology of a finite and geometric universe, (c) the growing emphasis on the stars from the changes in outlook generated by the Copernican revolution to the second decade of this century, and (d) the confirmed breakthrough into the universe of galaxies. Munitz talked about the changing focus of the third phase of his classificatory scheme:

What is important in this and other early speculative ventures, as well as in later more refined astronomical investigations, is the fact that they now exhibit a new frame of reference for thinking in cosmology. For in taking the collection of stars as the domain of greatest inclusiveness, as "the universe," the variety of efforts made in cosmological speculation and astronomical inquiry was now concentrated upon determining its structure. Indeed, once having made
the sun a member of the family of stars, there was no longer strictly any need as either Copernicus or Digges felt it, to assign a unique, central position to our own sun. Does then the stellar system as a whole have a particular pattern of spatial distribution? If finite is it isolated in space or are there other comparable systems? These questions and the efforts of answering them begin to come into prominence beginning in the eighteenth century. Effectively reliable answers however, were not forthcoming until our generation. (pp. 27-28)

Isaac Newton (1642-1727) considered the universe to be homogeneous, isotropic, and static. Here was an infinite universe with an invariant number of stars per unit of volume present at any particular place. The universe looked pretty much the same no matter which direction one looked into space. The Newtonian universe was static, i.e., it did not take part in any overall movement. No motions on a large scale were envisioned. It was not until the early 1920s that an overall expansion of the universe of galaxies became an accepted tenet of cosmological thought. Of course, Newton was not aware of this expansion, so he could not take its effects into account.

The Newtonian universe was infinite in extent. Newton reasoned that, because of the universal force of gravitation acting on all matter, a finite universe would contract to a single spherical mass. This was seen not to be the case and, therefore, the universe was infinite in extent.

In Medieval cosmology the sphere of the moon divided heaven from earth. As a result of Newton's development of his theory of gravitation, explicated in his classic work
the *Principia* (1687), both realms were shown to be subject to the same inexorable law. The law of gravity implied a maker in Newton's mind; God created the world, set it in motion, then retired from the scene. This mechanical model was analogous to the running of a clock in which once it was wound up it thereafter ran by itself with, perhaps, some slight modifications. This mechanical paradigm led to a more abstract notion of God than was seen in the Medieval period. God became more distant and disconnected from the processes occurring in the universe. It became increasingly difficult for humans to conceive themselves created in the image and likeness of God because God took on a more nonhuman and abstract nature.

With improvements being continually made in the construction and use of telescopes, Newton's idea of a uniform distribution of stars came under attack. Jacki (1972) stated that Newton and others of the seventeenth century were so mesmerized by the concept of an infinite space containing a uniform distribution of matter that they failed to notice the obvious evidence contrary to this position presented to them in the form of the Milky Way. Wright said that "Newton could defend and deify the infinite homogeneous space in which stars were evenly distributed, without ever realizing that the Milky Way gave a resounding lie to such a conception of the starry realm" (Jacki, 1971, p. 202).
It should be recalled here that Galileo's first use of the telescope early in the seventeenth century enabled him to determine the stellar nature of the Milky Way. Once this nature of the milky-white band was established, it should have been obvious to Newton and others that the band was formed from an abnormally high density of stellar members when compared with the rest of the sky.

One of the early explorers in the reconstruction of the world was Thomas Wright, an Englishman, who presented an alternate explanation in 1750 for the homogeneous distribution of stars. He took the Milky Way as an initial clue and suggested that the total system of stars be considered a finite system, likening it to a disklike-shaped assemblage of stars (see Fig. 10). An individual situated on or near the center point of the disk, or on or near the central plane of the disk, would progressively be looking through greater thicknesses or densities of stars as the line of sight progressed from a to c. When looking at the Milky Way the person was, in truth, looking through the greatest thickness of stars in space (directions c or d). This individual also envisioned the possibility of a ring-shaped distribution of stars, similar to the rings of Saturn, encircling the center. Here the stars would appear packed closer together when looking through the ring.

No longer was humankind necessarily bound to a walled universe. Wright took a major step in breaking out of the
Figure 10. Thomas Wrights' finite collection of stars massed into a disklike shape. As an individual looked from the center of the disk toward c or d, the stars would appear to mass together. In directions a, e, f, and g the stars would not appear as dense as at d and c.
Medieval world, offering a different paradigm for the construction of the heavens—and many other individuals followed his lead by offering other versions of the structure of the stellar system.

Immanuel Kant (1724-1804) amplified Wright's paradigm of a finite disk of stars by suggesting that this disk was subject to a rotary movement, as were the other external nebulae. This truly imaginative insight anticipated the twentieth century discovery of the rotation of our galaxy. It now is recognized that the Milky Way galaxy completes one rotation in space approximately once every 200,000,000 years.

Kant also made a very bold leap when suggesting that some of the nebulae (faint cloudlike shapes in the sky) observed by astronomers were not part of our stellar system but, in reality, were stellar systems themselves. Since Galileo first turned his telescope on the heavens, an increasing number of faint, luminous patches had been observed. Many of these were correctly identified by the early twentieth century as star clusters or clouds of gas and dust which resided in our galaxy. A great many of these objects turned out, however, to be galaxies or extragalactic nebulae which resided outside and far away from the confines of our Milky Way. Munitz (1961) reported:

Their analogy with the stellar system in which we find ourselves, their shape, which is just as it ought to be according to our theory, the feebleness of their light which demands a presupposed infinite distance: all this is in perfect harmony with the view that these
elliptical figures are just universes and, so to speak, Milky Ways, like those whose constitution we have just unfolded. (pp. 236-237)

Kant also envisioned the stellar systems as forming parts of clusters, these clusters forming other clusters, etc. Within the past couple decades, this notion has become truth. Thus, as early as the eighteenth century, several individuals were cognizant of the possibility that humans resided in a stellar system of finite size and that there may exist other stellar systems similar to ours outside our system.

Sir William Herschel (1738-1822) became one of the most highly respected observational astronomers in history. He, according to Munitz (1961, p. 16) "first established the study of the 'universe of stars' upon a sound observational basis". Through the use of his homemade telescopes he observed many of the nebulae and discovered several thousand new ones on his own. Herschel attempted to outline the Milky Way by counting the number of stars in each direction of space. He assumed that all stars in the heavens were a nearly equal brightness. By counting the number of stars seen in any one direction, he assumed that the number and brightness of the stars were an indication of their densities and distances. His diagram of the Milky Way star system placed the sun at the center of this enormous grindstone-shaped structure. This form of galactocentrism was to remain viable until Harlow Shapley's 1918 results
from his study of the distribution of globular star clusters in our galaxy.

Pierre LaPlace (1749-1827), famous for his "nebular hypothesis" on the formation of the solar system, played a critical role in the ensuing debate as to the status of the nebulae, i.e., were these objects members of our stellar system or were they external to it? LaPlace's model of solar system formation was based on the idea of a condensation of the sun and planets from a prior existent swirling cloud of gas and dust. He also suggested that many of the so-called nebulae were further examples of this process of solar and planetary formation occurring within our stellar system (versus Kant and Wright).

Harrison (1981) noted:

These opposing hypotheses ushered in a dramatic era in which astronomers were at loggerheads for more than 100 years. The earlier debate on geocentric versus heliocentric (in which most participants were not scientists) universes had now switched to a higher plane and had become a Great Debate among astronomers on a Milky Way universe versus Milky Ways or "island universes:" a single Milky Way universe, containing nebulous clouds, versus an infinity of island universes, each similar to the Milky Way. (p. 85)

Throughout the nineteenth century a number of views on the structure of the universe were discussed, from the disk-shaped universe to a central cloud of stars surrounded by a ring of stars (with the sun located at the center of the central cloud) (Fig. 11).
Earth and sun located at the center of the central cloud of stars

Figure 11. One of several models used to explain the dense band of stars in the sky known as the Milky Way. Here the band would be seen when looking through the external ring of stars.
The idea was entertained by some that our system was unique to the universe. It was imperative, therefore, that the structure of the stellar system be deciphered to determine if it truly was unique. There was no doubt that the direction in which these theorists headed was a radical departure from the crystalline spheres of the Medieval and Classical minds.

In 1908 two events occurred which were of great importance to settling the Great Debate. First, construction was completed on the 60-inch Wilson telescope and some stars were resolved in some of the nearest nebulae. It then became more probable to consider at least some of the nebulae as stellar systems. If the brightest stars resolved in the nebulae were as bright as the brightest stars in our system, the nebulae had to be located outside our system because of their faintness.

Second, Miss Henrietta Leavitt developed an ingenious key for determining the distances to some of the nebulae. From her study of variable stars—stars which undergo periodic pulsations and regular fluctuations in the amount of light they emit—she was able to derive a relationship between the periodicity of light fluctuation and the intrinsic brightness of a variable star and, thus, determine the distance to the star. The important concept here is that if one knows how bright an object is, one should be able to tell how far away it is by observing its
apparent brightness. An analogy to this situation would be the headlamps of a car. One can gauge how far away a car is when one knows the intrinsic brightness of the car's lamps.

The period-luminosity relationship developed utilizing this technique gives one the intrinsic brightness from merely knowing a star's period of brightness variation. One then computes its distance by measuring its apparent brightness in the sky. Employing this approach, Shapley took the next bold step in 1918 with his revolutionary study of galactic globular star clusters. These compact and large assemblages of stars, so beautiful to behold through a telescope, may contain literally millions of stars. Many of these star clusters were included in the list of nebulae previously mentioned.

Shapley calculated the directions and distances of approximately 70 globular clusters using the period-luminosity relationship just described. When he plotted his data he found that the globular clusters formed a spherically-shaped system in which the position of our sun was peripheral. Here the highest concentration of clusters was seen to be at or near the center of the spheroidal system (see Fig. 12).

Our sun was located approximately 300,000 light-years from the center of the distribution of clusters. Shapley could have assumed that the globular clusters were not centered in our stellar system but that, in reality, our
Figure 12. The Milky Way galaxy indicating the distribution of globular star clusters.

Earth's location on the galactic plane... some 33,000 light-years from the center of the galaxy
solar system resided at the center of the system. Fortunately, Shapley made the right choice; further research has shown that we are located in the galactic suburbs and not in the galactic city center. Shapley originally had overestimated the distance from the sun to the center of the galaxy due to the absorption of the clusters' light by the intervening presence of clouds of gas and dust.

We now know that we reside approximately 30,000 light years from the center of a roughly spherical-shaped mass of stars called the galactic bulge. Along the central plane of the galaxy is a flattened disk which contains most of the gas, dust, and stars of the galaxy. The outer diameter of the disk is approximately 100,000 light years and there are a number of estimates as to the thickness of the central bulge ranging from 15,000-25,000 light-years. In Figure 12 (preceding page) the globular clusters are shown centered on the galaxy.

Shapley assumed that the so-called spiral nebulae were members of our galactic system and were not external galaxies, i.e., the Milky Way galaxy constituted the entire universe. Lord Rosse (1800-1867) first brought to the attention of the scientific community an idea based on his telescopic observations of the nebulae that some of them appeared to demonstrate a spiral nature. With the wedding of photography to telescopes near the turn of this century, a
great deal of progress was made in the classification of the nebulae.

To Edwin Hubble (1889-1953) goes the credit of establishing the distant and external nature of spiral galaxies. In 1923-1924 he resolved some of the outer parts of the Andromeda nebula—the closest spiral type galaxy to us—into stars (including variable stars). He then determined the distance to this nebula based on the light-curves of its variable stars and came up with a value of 800,000 light-years (now calibrated at 2,000,000 light-years).

The spiral nebulae definitely were external systems or "island universes". From continued study, Hubble was able to devise a classificatory scheme to handle the galaxies. He distinguished between normal and barred spirals and elliptical and irregular galaxies. This system still is in use today. The results of his study are detailed in his 1936 classic work, The Realm of the Nebulae.

A question arises as to the total number of observable galaxies of all types in the sky. Abell (1969) referred to a sample by Hubble of 1,283 regions of the sky: based on the number of galaxies found in the sampled regions (44,000), Hubble estimated that 100 million galaxies existed within the range of the 100-inch Mount Wilson telescope, and perhaps 1 billion galaxies existed within the range of the Palomar 200-inch telescope.
Timothy Ferris' beautiful book, *Galaxies* (1982), stated that the question of galactic counts is equivocal. At the same time, a rough estimate "based upon counting galaxies in our galactic neighborhood and extrapolating for the universe as a whole, is one hundred billion" (Ferris, 1982, p. 169). The immensity of all this staggers the imagination. The size of our Milky Way galaxy dwarfs the mind in its attempt to comprehend its estimated 200 billion stars, its 100,000 light-year diameter, its huge clouds of gas and dust, its rotation as a system, taking 200 million years to complete one cycle, etc., etc. The existence of another 100 billion galaxies of various types strung out in space, each perhaps separated from its nearest neighbor by 2-3 million light-years, is the stuff myths are made of!

Hubble added the final twist to all cosmological speculation with his discovery in the 1920s that the light of all galaxies was red shifted. The notion of red shift in light has an analogous property in sound, e.g., the increase in whistle pitch as a train approaches us and the lower-than-normal pitch as it recedes from us. In the first instance the sound waves pile up and the pitch is increased; in the second instance the distance between the sound waves increases due to the movement of the train away from us, leading to a lower pitch.

An analogous situation arises with light. As an object moves toward us the wavelength decreases and shifts
toward the shorter wavelength, i.e., the blue end of the spectrum. The opposite case occurs with a light source receding from an observer. The wavelength is shifted or spread out to larger wavelengths, i.e., it is shifted toward the red end of the spectrum. The velocity of approach or recession is a function of the wavelength shift.

Hubble analyzed the wavelength shifts of a number of galaxies and noticed two important patterns: (a) all the galaxies were red shifted, i.e., they were moving away from our galaxy, and (b) when the distances of the galaxies were computed (using the period-luminosity relationship of variable stars) and plotted against the red shifts, a linear relationship was seen in which the distance of a galaxy was viewed as being directly proportional to its red shift. The amount of red shift exhibited by the light from a distant galaxy is an indication of the galaxy's distance from us. A galaxy 10 times farther away from us than another would be seen to be moving away with a velocity 10 times greater than the other galaxy.

The only galaxies seen which demonstrated a blue shift were members of our local group--20+ galaxies bound together gravitationally in our local part of the universe. The local group includes our Milky Way, the Andromeda galaxy (which can be seen with the naked eye), the Magellanic Clouds (two irregular galaxies that can be seen in the
southern hemisphere), and others. These galaxies have random movements toward or away from us, thus several of them indicate a blue shift; they are approaching our galaxy. Ferris (1982) wrote:

> Our galaxy and Andromeda, orbiting around a common center of gravity, are drawing closer together. Every second brings us fifty miles closer to Andromeda. In a few billion years, the two galaxies will be only half as far apart as they are today, and Andromeda will loom twice as large in our skies. (p. 76)

The static and self-contained Medieval model had changed into an immense conglomerate of galaxies receding from one another at times, with velocities approaching the speed of light (186,000 miles per second). Initially it seemed that the picture of our galaxy as a focal point in space, from which all other galaxies receded, would offer another instance for the acceptance of a belief in the uniqueness and central location of our galaxy in the universe. It appeared that our galaxy resided at a privileged and stable location in space.

In truth there is no privileged location in space—there is no center from which all galaxies recede. From the vantage point of any galaxy in the universe, all other galaxies appear to recede from it. A good two-dimensional demonstration of this is found in the "spotted balloon analogy." Ink spots are made on the surface of a balloon, representing individual galaxies, and the balloon is inflated. To an observer located on any of the dots,
all the other dots would appear to be moving away. None of the dots would be a center point. None of the dots or galaxies are in a privileged position with respect to the remainder of the universe although it appears that each galaxy is the focal point of the expansion. Here each dot or galaxy is the center of the expansion.

Since all the galaxies are receding from each other, there must have been a time when they all were together. If the universe is run backward in time, a point is reached where all the matter of the universe is located at a point of infinite density. Current estimates for this Hubble time range from 15-20 billion years ago. And it is possible that 15-20 billion years ago this matter exploded and the universe as we know it was created. Gott, Gunn, Schramm, and Tinsley (1976) reported:

Thus it appears that the universe began from a state of infinite density about one Hubble time ago. Space and time were created in that event and so was all the matter in the universe. It is not meaningful to ask what happened before the Big Bang; it is somewhat akin to asking what is north of the North Pole. Similarly, it is not sensible to ask where the Big Bang took place. The point-universe was not an object isolated in space, it was the entire universe, and so the only answer can be that the Big Bang happened everywhere. (p. 65)

A question then arises as to where the matter came from prior to the Big Bang. Aristotle would have said that the matter already existed and that God merely patted it into form. St. Augustine would have been of the opinion that
God created the matter from nothing. As to why God decided to create the universe at a particular time—a seemingly irrational act of a supremely rational being—Augustine would have responded that time was created when the universe was created, so the question "Why at that time?" makes no sense.

Some individuals use the Big Bang notion to buttress their belief in the existence of God; but, there exists a logical method of getting around the existence of a creator God in association with the Big Bang theory. According to present-day cosmological thought, the fortune/fate of the universe is directly related to the total amount of mass or matter in the universe. At the initial Big Bang—15-20 billion years ago—all matter was thrust outward from a point in space as a result of an immense explosion. This matter ultimately formed into the stars and galaxies we now see.

Also, another force plays a major role in the fate of our universe: gravity. The total amount of the gravitational force is a function of the total amount of mass in the universe, i.e., the more mass present the greater the force of gravity exerted upon all the matter in the universe. The presence of a critical amount of mass in the universe guarantees that the gravitational force exerted between bodies in the universe is strong enough to counteract the outward force of the initial explosion of the Big Bang (the expansion of the galaxies), thereby stopping
the expansion of the galaxies. The galaxies, once stopped in their outward expansion, move inward again to the point of an initial explosion. All the matter contained in the universe reassembles into a melting pot or point of infinite density--possibly to be followed by another explosion or Big Bang.

This oscillating model of the universe avoids the idea of an initial creation/creator God because the universe always has existed and will, in all probability, continue to exist. This universe undergoes an infinite series of Big Bangs--alternate expansions and contractions ad infinitum--possibly with the laws of matter and nature changing with each new birth of the cosmos, a totally new assortment with each repetition of the cosmogony.

Another possibility exists in which, subsequent to the initial Big Bang, the amount of mass in the universe is not sufficient to slow and stop the expansion. In this case we have a perpetually expanding universe in which the galaxies continue to increase their distances from each other, and in which the universe ultimately expands to the infinite depths of space.

Cook's (1974) exposition of Eliade's symbolism of the center in relation to cosmological thought demonstrates some interesting parallels to the Big Bang model.

Eliade has shown how all aspects of mankind's "mythical behavior" reflects an intense desire to grasp the essential reality of the world. This is particularly
evident in man's obsession with the origins of things, with which all myths are ultimately concerned. The centre is, first and foremost, the point of "absolute beginning" where the latent energies of the sacred first broke through; where the supernatural beings of myth, or the gods or God of religion first created man and the world. Ultimately all creation takes place at this point, which represents the ultimate source of reality. In the symbolic language of myth and religion it is often referred to as the "navel of the world," "Divine Egg," "Hidden Seed," or "Root of Roots"; and it is also imagined as a vertical axis, the "cosmic axis" or "axis of the world" (Axis Mundi) which stands at the centre of the universe and passes through the middle of the three cosmic zones, sky, earth and underworld. (p. 9)

It is interesting that Abbe Lemaitre, the first proponent of the Big Bang theory, referred to his single primordial atom (in which all the matter of the universe was packed) as the "cosmic egg" or "Lemaitre's egg." Here matter emerged from the cosmic egg and was dissolved in the effort of creation. Initially, Lemaitre conceived this heavy cosmic egg to be a hot nuclear fluid, which fit in quite well with a symbolism directly related to a watery birth.

The concept of creation issuing forth from a central point is common in world mythology. Eliade (1974) said:

There are even instances in which cosmological traditions explain the symbolism of the center in terms which might well have been borrowed from embryology. "The Holy One created the world like an embryo. As the embryo proceeds from the navel onwards, so God began to create the world from its navel onward and from there it was spread out in different directions. In the Rg-Veda, the universe is conceived as spreading from a central point." (p. 16)
Overview

One could write at great lengths about the various current and not-so-current models of the cosmos. At this point, however, it may be best to conclude with a brief summation of the changes wrought in cosmological speculation from the sixteenth to the present twentieth century.

The Copernican formulation was of critical importance to the development of cosmological thought for several reasons. Subsequent to this formulation the earth was no longer seen as being essentially different from the other planets and as being located at the unique location at the center of the cosmos. The age-old dichotomy between the celestial and terrestrial realms of existence began to crumble. It no longer was necessary to posit a solid and crystalline sphere of the stars situated at an invariant distance from the earth. The possibility of extending the stars out into space became a viable option for humankind. The idea of the infinitization of the stars and space became a credible paradigm.

Galileo buttressed the validity of the Copernican system with his telescopic observations of the sun, moon, and planets. He also was the first to train his telescope on the Milky Way and notice that it was a dense assemblage of stars.

Kepler broke out of the predominant mold of explaining celestial motion in terms of a circular pattern with the
substitution of elliptical-shaped planetary paths. And Isaac Newton united the sublunar and celestial realms with his universal law of gravitation which did not operate according to a compartmentalized view of the universe.

The focus shifted from a concern with an explanation of planetary motion to a concern with the structure, sizes, distribution, etc., of the stars. Using the Milky Way as a guide, a number of theorists (Wright, Kant, Herschell) began to alter the overall structural framework of the stars from that of a circular-shaped sphere to that of a flattened disk. Some of these individuals postulated the existence of other stellar systems external to our own. A number of faint and diffuse looking patches of light in the sky were called the nebulae or cloudlike forms. Many of these were eventually resolved into star clusters, clouds of gas and dust, and galaxies.

Harlow Shapley demarcated the overall structure of our galaxy in 1918. He utilized the distribution of globular star clusters to map the location of the solar system within this stellar system. He ascertained that our location within this gigantic disk of stars was peripheral and not central to it.

Edwin Hubble measured the Doppler shifts of a number of the nebulae and concluded that they were stellar systems in their own right, which were moving away from our stellar system at very high rates of velocity. The overall
universe appeared to be in a state of expansion. A linear relationship between a galaxy's distance and its rate of expansion was derived, called Hubble's Law.

Extrapolating backward, one could arrive at a point in time in which all the galaxies were together, when all the matter in the universe was packed into a small volume of space, thereby contributing to an unimaginable density of matter. The present state of the universe appears to be a remnant of a colossal explosion of this highly packed material and, thus, the Big Bang hypothesis was forged. A number of competing hypotheses have been postulated also to account for the observable universe.

Presently, humans are seen to reside within a gigantic assemblage of stars, gas, and dust called the Milky Way galaxy. The solar system is located some 33,000 light-years from the center of this stellar disk. A number of different types of galaxies have been classified and there appears to exist a large number of galaxies within the observable universe—possibly billions.

The universe we inhabit may be the result of a one-time Big Bang. It also is possible that our universe goes through a continual series of cosmic expansions and contractions, and perhaps with each new Big Bang nature sorts her laws into a totally new set of arrangements. Gravitational force is the final arbiter and midwife of this series of cosmic pulsations.
Chapter 3

METHODOLOGY

Interviews

The belief systems of a number of individuals actively participating in three religious sects is penetrated in this study. The sects studied are Christian Science, Seventh Day Adventist, and individuals following a Pentecostal/Charismatic tradition. Five individuals from each of the groups were interviewed with particular reference to the dimensions of centrality, uniqueness, and locus of control. In addition, another 19 individuals were interviewed who had no formal affiliation with any of the previously mentioned religious sects. This group included an atheist, an agnostic, several Catholics, several Latter-day Saints, a Native American, a Jehovah's Witness, and others with no formal religious affiliations.

The interviews ranged in length from two to four hours depending upon tangential conversation pertaining to theological beliefs and personal experiences. Each interview consisted of three parts: cosmological drawing of a personal universe, the interview proper, and the administration of the locus of control questionnaire. At
times the drawing followed the questionnaire; but, generally, the drawing initiated the interview process with a period of questioning subsequent to the drawing. When possible, the questionnaire was given to each informant prior to the drawing and interview proper. The information generated through the questionnaire served as a baseline for subsequent questioning.

Cosmological Drawing

The drawing phase, which usually initiated the interview process, was quite revealing. Informants were given a sheet of paper and a pen and were asked to draw a picture of how they visualized the universe—no minor task for sure. The only information the informants received prior to the drawing task was a general definition of the universe and a request to minimally include the earth, sun, and stars.

Informants were asked to include all major objects or bodies which were envisioned as being present in their universe. Universe was defined as "all objects visible and invisible which exist and which are known to humankind." The term invisible was included to allow for the possibility of regions being included in the drawings which are traditionally associated with eschatological beliefs such as heaven or hell. Portions of the drawings which included
objects or locations of eschatological import were treated as valid representations of an individual's universe.

The drawings were, in my mind, the primary focus of this study. They proved to be quite interesting and revealing, and they provided a great deal of information which was used as a subsequent guide for further exploration. Besides giving an indication of exactly what objects comprised a particular universe, the drawings presented much information as to the relationships between the objects and additional information as to the classification of semantic domains. For example, in some instances stars were drawn between the earth and moon or between the earth and sun; it thus was obvious that the artists did not include the sun and stars in the same semantic domain, i.e., these objects were viewed as essentially different types of existent entities.

**Interview Proper**

The interview proper consisted of a set number of questions related to the areas of primary concern. These questions are listed in Appendix A (p. 197). They dealt with the origin and destruction of the universe, its spatial limits, the ontological status of animals, the existence of extraterrestrial life, etc.

The questions usually were asked in a set order; but, at times, the order was changed to accommodate the flow of
conversation. Although the list in Appendix A formed the basis of questioning, they were by no means all-inclusive to the interviews.

All the informants were quite open to the questioning. Although the majority of informants felt the questions were difficult to address, they also felt they were important catalysts in the explication and reaffirmation of their systems of belief.

**Locus of Control Questionnaire**

The interview proper was supplemented by a locus of control questionnaire (Appendix A, p. 199) which consisted of an inventory of 29 forced choice items which included six filler items. No information was given to informants as to the function of the scale. Demographic data also were solicited which included age, sex, educational level, and present and past religious affiliations. Attached to the I-E scale was a supplemental questionnaire (Appendix A, p. 204) which was used to gather additional information pertaining to notions on free will, other life forms, astrological beliefs, etc.

**Other Data Gathering Activities**

A number of church services were attended as part of the information gathering process. This enabled me to gain additional insights pertaining to the theological
backgrounds of the individuals interviewed. It also allowed me to relate to some of the informants on a level not dictated by the structure of the interviewing process. Too, a number of films and lectures were attended which dealt with a creationist viewpoint concerning the origin of humankind and the universe.
Chapter 4

RESULTS

The primary aim of this study was the generation of a number of personal universes drawn by a number of informants to scratch the surface of contemporary folk cosmology. Because of the total lack of research done in this area of inquiry, there were no preconceived notions as to what sorts of patterns, if any, would be revealed. With the small number of individuals interviewed, it would be quite premature now to make any claim that the results generated are necessarily representative of American culture in general, neither are they necessarily representative of the three sects investigated. Although the patterns generated should not be extrapolated to the American population as a whole, it is hoped they will prove useful as subsequent guides aimed toward future research in this area.

The Drawings and Artists' Comments

Type of Universe

Before a discussion of the patterns reflected in the data, it may be instructive to consider the utility of the use of the drawings in the attempt to derive cosmographical maps. More specifically, what kinds of information were
reflected in the drawings? To begin to answer this question, please refer to the first drawing (Fig. 13) made by a Native American from Browning, Montana.

**Earthbound universe.** This picture (Fig. 13) is a very concrete and earthbound representation of the universe. Included in the drawing are a number of objects which are of daily importance to the Native American, i.e., water, mountains, trees, animals, and the heavenly bodies. A number of these objects, if not all, are seen as spiritual in nature and, therefore, are of tremendous daily and ritual importance to these people.

**Earth surrounded by infinite number of stars.** After the drawing had been completed, I asked the individual to draw another picture from a vantage point in space, removed from the confines of the earth. The result was Figure 14. Here is seen a circular earth surrounded by a cloud of stars, and there appears to be a bump on the earth. The artist said this bump "was the sun rising in the east."

It is interesting that the sun was drawn not separate from the earth but as an appendage to or extension of it. The tremendous importance of the sun in this person's life thus is reflected in the drawing. One only has to recall the pivotal role that the sun plays in traditional Native American culture to see the tremendous import of this as part of the drawing.
Figure 13. Earthbound universe.
Figure 14. Earth surrounded by an infinite number of stars.
Brown (1973) gave a clear indication of the importance of the sun in his exposition of the rituals of the Oglala Sioux:

The sun enlightens the entire universe; and as the flames of the sun come to us in the morning, so comes the grace of Wakan-tanka, by which all creatures are enlightened. It is because of this that the four-leggeds and the wingeds always rejoice at the coming of the light. We can all see in the day, and the seeing is sacred for it represents the sight of that real world which we may have through the eye of the heart. (pp. 71-72)

The Native American penchant for recognizing all of existence as an interconnected whole is likewise reflected to some degree in this particular drawing. The moon is represented in its crescent-shaped aspect. According to Brown (1973) the moon is the "night sun." In Native American iconography, it is represented in its crescent phase. Here the horn shape "represents a person and, also, all things, for everything created waxes and wanes, lives and dies" (Brown, p. 71)

The artist mentioned that the position of the points of the crescent varied with respect to the earth at different seasons of the year—-the points face the zenith in the wintertime and the horizon in the summertime. Because of the continuous change in the face of the moon over time, in contrast to the sun, it is widely recognized as a symbol of "becoming," of the passage through the stages of life, of the continual death and rebirth of all existence. Here we have
a highly visible symbol of death and rebirth which figures prominently in rites of passage throughout the world.

Another interesting feature of the drawing is the fairly uniform distribution of the stars surrounding the earth. The individual envisioned the stars as extending outward from the earth in all directions to infinity. This pattern was echoed in a large number of the other drawings. The artist explained that the stars are suns composed of different gases and chemicals. He felt that the "sun [is] near while, in actuality, it is 8 million miles away from earth."

The shooting star drawn represents "a remnant of a star that has died." Stars are born and die in a cyclical fashion. When a star dies, its matter turns into a meteorite which we see flashing through the night sky. Shooting stars are propitious signs—if a person is burning sweetgrass and a shooting star passes overhead, it is a sure sign that the individual has been heard.

**Cosmic contest universe.** Figure 15 was drawn by a Pentecostal lady who attends the Foursquare Church. It has a number of points of interest attached to it. The first thing that strikes the eye is the heavily dichotomized nature of the drawing. It represents the cosmic battle between the forces of good/evil, the righteous/unrighteous, the cosmic contest between God and the Devil.
Figure 15. Cosmic contest universe.
The face of Christ is depicted in the upper left-hand corner of the drawing, a face expressing happiness and sadness as He peers down at the "fractured earth." The earth is "torn and is not in harmony." As Christ looks at the forces of good and evil acting through the people on earth--represented by the stick figures with halos or horns on their heads--He simultaneously expresses a happy and sad countenance.

It is interesting that the sun (representing goodness, light, life) is situated near Christ in the drawing, whereas hell is pictured in the opposite corner within a dark and amorphous cloudlike form. The individuals in hell are calling for "help"; hell is "totally separated from the stars because it was not part of the original creation." Hell was created by Lucifer after he deceived God. It's a dark lake of fire and brimstone, very deep and totally removed from the earth. It's located beyond the created world because "God cannot look upon evil." Heaven is located in the sky well above the earth and the "mansion of God" is seen radiant in the clouds of heaven.

Here is a universe of earth, planets, sun, moon, and stars. There are nine planets in all and "the planets look like stars in the sky." The stars are suns located at great distances from the earth. When asked if the stars limited out or extended out infinitely, the artist responded that it didn't matter because "the only sphere of action that
really matters is included in the oval-shaped line," i.e.,
the area of existence in which the battle between the forces
of good/evil were being waged. Here the earth plays a
pivotal role in this cosmic drama and is, therefore,
centrally located in the universe. Heaven is "way up in the
sky, as the earth is God's footstool." Heaven is,
therefore, past the sun, moon, and stars.

Circular universe. Figure 16 was drawn by another
Pentecostal lady who also attends the Foursquare Church.
Here the basic cosmography is a circular arrangement of sun,
extearth, moon, and stars surrounded by an all-encompassing
heaven—a sphere of materiality surrounded by an infinite
expanse of spirituality. The earth is located at the exact
center of the sphere of materiality.

A barrier of some sort separates the two spheres of
existence—perhaps a modern-day version of the solid and
crystalline spheres of the ancients? The existence of this
barrier is explained as, "If there were no barrier, there
would be seen a brilliant light emanating from God." The
composition of the barrier is here unknown. In this drawing
one can see the close "fit" between the cosmography and the
individual's theological beliefs. The notion of the
universe being bathed in brilliant light had its counterpart
in the Medieval worldview although that view had its source
in the sun versus God.
Figure 16. Circular universe: solar system with stars out to a limit and heaven beyond.
C. S. Lewis (1964) noted:

Nothing is more deeply ingrained on the cosmic imaginings of a modern than the idea that the heavenly bodies move in a pitch-black and dead-cold vacuity. It was not so in the Medieval model. Nowhere in Medieval literature have I found any suggestion that, if we could enter the translunary world, we would find ourselves in an abyss of darkness. For their system is in one sense more heliocentric than ours. The sun illuminates the whole universe. All the stars, says Isidore, are said to have no light of their own but, like the moon, to be illuminated by Sol. Dante in the Convivio agrees. And as they had, I think, no conception of the part which the air plays in turning physical light into the circumambient colour-realm that we call Day, we must picture all the countless cubic miles within the vast concavity of space as illuminated. Night is merely the conical shadow cast by our earth. (p. 111)

In this personal universe there exists a nonuniform distribution of the stars, i.e., they become more concentrated or "clumped" as they approach heaven. The stars "look like they are painted on a piece of black velvet" and "it feels like we are in a dome--the universe gives the feeling of roundness or circularity."

**Heaven-centered universe.** Another variant, drawn by a Pentecostal man, reverses the relationships seen above between the realm of materiality and heaven. In Figure 17 heaven is located at the center of the universe surrounded by a realm of materiality. The heaven-centered universe is surrounded by an infinite number of stars stretching out nonuniformly to infinity in all directions. Earth is situated "far enough from heaven in space so that heaven cannot be seen from the earth."
Figure 17. Heaven-centered universe surrounded by an infinite number of stars.
Square universe. The next very unusual drawing, Figure 18, was done by a lady raised in the Catholic faith who, later in life, switched to the Seventh Day Adventist church. We now have a very interesting and novel slant on the overall structure of the universe—a square universe. Here, also, God is seen to reside at the exact center of creation. The earth is located at one extreme of the square whereas the stars extend to the opposite extreme.

Directly above the earth is a semicircle—the dome shape of the sky. God, befitting His transcendent qualities, is located at the highest point of the dome, i.e., directly at the zenith point. The dome and God are seen as existent bodies located "trillions of miles away from the earth." The sun is located between the earth's surface and the dome of the sky. Planets and stars exist between the earth and the dome as well as beyond the dome.

Earth is important among the planets because "it is not forgotten and it has a line of influence emanating directly to it from God." Hell is located in a big volcano situated directly at the center of the earth. Purgatory is located between the earth and God. "Purgatory, a place where a borderline case could work off his sins before being allowed into heaven, has now been abolished by the Pope." When asked if anything existed outside the square limits of the universe, the reply was, "Nothing that I can conceive of."
Figure 18. Square universe.
**Geocentric universe.** One individual drew a truly geocentric universe. Figure 19 indicates a central earth surrounded by the sun and the planets, which move around the earth. The respondent was "not sure if the earth displayed a motion of its own." Stars are located between the planets, as well as beyond the planets, and the sun. The sun moves around the earth, planets, and a number of stars. The stars are bodies which shine by "reflected light from the sun." This notion was repeated in a number of the interviews.

The stars extend in all directions to infinity. The lady also stated that she "used to believe that heaven or hell were located at the ends of the universe," but she no longer believed this. She also could imagine her soul, when she died, "out there with the stars." This individual described herself as a "native Philadelphian Catholic who grew up unable to see the sky, polluted by skyscrapers and neon lights."

The lady's comment that she conceived her soul as "mingling with the stars after her death" was quite interesting. This is not a new or novel idea. A great deal of Platonic philosophy rested on a substrata of just such an intense astral mysticism and astral identification. Such Platonic mysticism "recognized the soul as a particle detached from the cosmic fires (Cumont, 1960, p. 79). And again, "the soul of man is kin to the gods which glitter in
Figure 19. Geocentric universe: earth/planets surrounded by an infinite number of stars.
the firmament and thus, contemplation of the heavens becomes a communion" (Cumont, 1960, p. 80).

Man's soul was seen as being directly linked to the eternal realm of heaven and man approached the eternal through a contemplation of the heavens. The order, beauty, and perfection of the heavens offered man a model which was to be emulated. Man the microcosm mimicked the macrocosm and was able to thereby participate in its divinity.

It is very thought provoking that a current-day tenet of astrophysical thought echoes this relationship between mankind and the stars—perhaps a Lévi-Straussian type of transformation? According to current astrophysical thought, all of the heavier elements which comprise the physical bodies of humankind were initially forged in the interiors of massive stars. At a particular point in the evolutionary histories of these stars, termed novae or supernovae, they exploded and spewed forth their human-forming elements into space. The heavier elements do not exist in the natural state; they must be "cooked" in the interior furnaces of stars. Humankind is therefore composed of stellar material and has its ultimate physical source in the stars!

The belief in the soul being assimilated to the sky after death is a fairly common notion that is reflected in the astrogeography of the heavens. For example, many of the present-day constellations such as Hercules, Cepheus,
Perseus, etc., were personnae who had been "castasterized" or translated to the starry realm.

The association of the netherworld with the starry region of space is echoed in a great deal of the world's mythology. Among many cultures the path leading to the underworld was via the Milky Way. To give one example, according to a number of North American Indian groups the Milky Way was the path taken by the souls of the departed to the otherworld. Here, the milky-white light from the stars of the Milky Way was envisioned as the lights from the innumerable campfires of Indian warriors on their arduous journey to the future world.

Hierarchial universe. The next drawing (Fig. 20) was by a female member of the Christian and Missionary Alliance Church. Here we have a universe partitioned into three areas or heavens. A central earth is surrounded by a limited number of stars. At the end of the star field is the third heaven, the place of God. We have a hierarchical arrangement of heavens in which the degree of removal upward is directly associated with a more perfect and more spiritual ontological status.

Beyond the third heaven only blackness exists whereas in the third heaven there is no darkness because all is bathed in the light of God. Heaven is a localized place at the limiting end of the stars. Hell is at the center of the
Figure 20. Hierarchical universe.
earth, the first heaven. The Bible shows that "heaven is up and away from hell." Hell is a "burning lake of fire"; to add corroboration to the location of hell, "scientists have found molten stuff at the center of the earth."

The notion of hell being located at the center of the earth is common. Having been raised as a Catholic, this author still has a difficult time dispensing with the idea that hell is somehow directly beneath his feet. The notion of hell being located at the center of the earth was a conception most perfectly exemplified in Dante's *Inferno*, perhaps the most poetic description of the Medieval cosmos.

According to Wildiers (1982) there is a basic ambiguity inherent in this Medieval picture:

The earth was at the bottom of the hierarchical world order and at the same time it was seen to be the center of the universe. But can the center of a circle be considered the least worthy position? Is it not, in fact, just the reverse? Is the center not the most important position in a circle, no matter what Aristotle had to say about this? For all radii meet in the center, and the circumference only exists by virtue of its relation to the center. How, then, could one explain this contradiction? Why was the least worthy to be found in the place of honour? The difficulty was actually even greater than it seemed at first, when it was pointed out that hell was in the center of the earth and in the center of hell was the throne of Lucifer! This certainly seemed to be blasphemous: The world had become, as Lovejoy explains, diabolocentric. It was not God but the devil who occupied the place of honor in the universe! (p. 86)

This contradiction was resolved, of course, with the replacement of the geocentric universe by a heliocentric universe.
Expanding/contracting universe. Several of the drawings were representative of a viewpoint which is more in line with a modern and scientific presentation of the matter. Figure 21 shows a number of galaxies which are receding from one another in space—a la Big Bang. Here the earth is located on the edge of one of the galaxies—a spiral galaxy.

There is an outer limit to the universe of matter, beyond which nothing exists. The artist stated she wasn't sure if the universe was presently partaking in an expansion or contraction phase. Here the earth and Milky Way galaxy are not at the center of existence; in fact, we "may reside in a cell of a yet larger universe we're not aware of."

This agnostic said, "Anything is probable and I cannot be the PTL Club and have pat answers to these various questions."

Universe of stars and planets out to infinity. Figure 22 is representative of a universe with stars and planets stretching to infinity. This Community Covenant church goer drew a sun and explained that it was for another galaxy. From the drawing it appeared that she equated galaxy with the notion of a solar system, i.e., a star surrounded by a number of planets.

Abstract universe. Figure 23 is an abstract drawing which reflects the Christian Science theological stance.
Figure 21. Expanding/contracting universe.
Figure 22. Universe of stars and planets out to infinity.
Figure 23. Abstract universe.
Here we see a central sun with a number of rays emanating outward and touching a number of smaller circles with centers of different colors. A rainbow forms a backdrop to the above mentioned part of the drawing. This lady explained that the sun represented God while the smaller circles, with central circular cores of varied colors, represented humankind. The colors in the core of the circles representing people were an expression of their individuality. (Note: colors appeared because the drawing was done at home.)

The sun's rays connect God to man and symbolize His love and concern for people. They are connected to God through His love. All are the same in God's eyes because they all partake in one spirit, yet each at the same time is a unique expression of God's infinite creative power.

Humankind is a reflection of God; one can see what God is through people. This notion is represented through the visual imagery of a rainbow. As the light (God) is split into the visible manifestation of the spectrum (rainbow), so humans refract the spirit (God) and present the appearance of something visible and tangible.

The rainbow is a metaphor of spirituality, i.e., the totality of the universe. It has its source in God (the sun)--a source outside itself. In a sense, the rainbow (universe) is immaterial just as the universe is immaterial (spirit).
Universe Patterns

From the drawings it is apparent that there is a great deal of variety in how individuals represent the universe. Drawings ranged from the concrete to the abstract and carried, at times, a great deal of eschatological and theological information. From the relatively small number of drawings generated through this study, several eschatological patterns emerged. Two represented a heaven-centered pattern (see example in Figure 24) with a sphere of materiality beyond the heavenly realm. A reverse pattern was expressed in two drawings (see example in Figure 25) in which the heavenly realm begins at the immediate periphery of the sphere of materiality, containing the earth, humans, sun, planets, and stars. Another variant occurred (Fig. 26) in which heaven was located beyond the sphere of materiality, but in this instance heaven was identified as a localized area adjacent to and immediately beyond the sphere of materiality.

Hell was visualized in a number of ways. It was situated at the exact center of the earth, at a distance removed from the earth but within the world of materiality, or completely removed from the world of materiality.

A number of fairly well-defined patterns emerged as to the overall structure of the universe proper. The most frequently occurring paradigm (21 of 34) was a universe in which the earth, sun, moon (and, at times, the planets) were
Figure 24. Heaven-centered pattern.
Figure 25. Heavenly realm begins at immediate pheriphery of the sphere of materiality.
Figure 26. Heaven located beyond the sphere of materiality.
represented as a core of objects surrounded by a uniform distribution of stars which extended out to infinity in all directions. Another pattern in three drawings indicated an infinite number of galaxies stretching to infinity in all directions. A variant of this pattern had an infinite number of galaxies interspersed with stars. Four additional drawings had a uniform distribution of stars extending to an indeterminable limit with an infinite void beyond. Two drawings were a subspecies of the latter with the stars extending to a limit and heaven beyond. These various patterns are represented in Figures 27 through 30.

One individual interviewed referred to the existence of galaxies in the universe, but this person's drawing did not include galaxies, and the solar system (sun, moon, and planets) was not drawn within the context of a galactic structure. A conjecture is that the notion of galaxy was somehow confused with the idea of the solar system.

The most revealing aspect of this study was, I feel, the nearly total lack of reference and emphasis paid to the existence of galactic structures. This is all the more significant when one recalls that galaxies are the major structural feature of the universe. Galaxies generally are assembled into clusters, and the clusters are clustered into larger clusters, but the basic unit remains the galaxy.

The notion that we are embedded within a stellar system has been postulated and discussed repeatedly since the
Figure 27. Solar system surrounded by a uniform distribution of stars stretching out to infinity.
Figure 28. An infinite number of galaxies stretching out to infinity.
Figure 29. An infinite number of galaxies interspersed with stars.
Figure 30. Stars out to a limit with a void beyond.
mid-1700s; our placement within a galactic structure and the external nature of other galactic systems was verified in the early decades of this century. One would, therefore, think that the knowledge of our presence within a galactic form, as well as the existence of a multitude of other external galaxies, would be fairly common knowledge in present-day worldviews. This would seem to be the case based not only on the 60+ years that have elapsed since the verification of these facts, but also because of the wide dissemination of this knowledge throughout this period in the various media forms available to humankind.

This study indicated the opposite to be the case. The major structural features in the minds of the individuals interviewed were the solar system and stars. These components seemed to reflect the Medieval mind--a universe composed of the solar system and the stars without the crystalline spheres. But there is a major difference in the present data in that the stars are not all located at an invariant distance from the earth; they are located at variant distances from the earth and, in the majority of instances, extend to infinity. Humans are placed within the context of an infinite or minimally indeterminate context of stars.

The worldviews demonstrated here are not consistent with a twentieth century viewpoint promulgated by a popular scientism but, rather, reflect a pretwentieth century
viewpoint which, in a number of respects, echoes the line of thought on this matter in the eighteenth and nineteenth centuries. One can recall a number of similarities seen between the data of this study and the early theoretical notions of Digges, Bruno, Newton, and others. For example, Isaac Newton was of the opinion that the universe consisted of an infinite number of stars—surrounding the central solar system—which extended out to infinity in all directions. There thus appears to be a definite cultural lag or knowledge lag in relation to current scientific views on the subject.

Wildiers (1982) had a number of pertinent comments here in his discussion of the aftermath of the Copernican formulation. Not only did Christianity make headway in the calculated retention of the Medieval conception of the world, there also occurred a natural aversion toward the dismantling of the geocentric, geostatic, and anthropocentric worldview which had offered people an exaggerated sense of cosmic importance and security for such an extended time:

Initially the cultural climate continued to be governed by the old world picture, even though certain isolated thinkers soon began to explore the far-reaching implications of the new picture. It is a well known sociological phenomenon that new ideas permeate a society only slowly, gradually disclosing all the consequences that are involved. Throughout the sixteenth century the old world picture was still maintained as an intellectual framework, in spite of the fact that scholasticism had fallen into decay and had become an object of ridicule. In Erasmus's
In Praise of Folly the scholastics are accused of captious hairsplitting. Luther (1483-1546) denounced them in the name of the pure gospel, while Rabelais (1490-1553) regarded them as a laughingstock, bluntly casting them aside, and Montaigne (1533-1592) withdrew into a skeptical consideration of the nature of man. (p. 107)

Edward Burnett Tylor (1913) spoke of the existence of survivals in his grand synthesis of culture. He defined survivals as (Mair, 1974)

processes, customs, opinions, and so forth, which have been carried on by force of habit into a new state of society different from that in which they had their original home, and they thus remain as proofs and examples of an older condition of culture out of which a newer has been evolved. (p. 24)

Perhaps the worldview of the solar system surrounded by an infinite or indeterminable web of stars is a survival from post-Copernican and pretwentieth century thought on the subject which has been carried forward by dint of cultural inertia?

Again, to appeal to a common sense impression of the sky and its constituents as an explanation, it becomes a relatively easy task to align oneself with such a cosmic model. When one gazes at the sky one sees the stars scattered seemingly at random in all directions. One does not have a vision of galaxies splattered against the firmament. Throw in the possibility of the stars extending to infinity and one then has the basic ingredients of the folk model just described, a model based on immediate perception rather than abstract generalizations.
Uniqueness and Centrality

Sect Results

It initially was postulated that individuals with a Pentecostal/Charismatic tradition would display the most marked propensity toward centrality. The data indicated a disposition in this direction (3); it also indicated an equal and opposite tendency (3) away from centrality (see Table 2).

Of the three sects studied, the Christian Science group expressed the greatest trend away from the notion of centrality. Here all five individuals were unanimous on this point. The idea of centrality does not appear to be consistent with a theology in which all is Spirit. If all is Mind/Spirit/God, the notion of centrality loses meaning. To the Christian Science individual, matter is not a solid existent entity physically located at a particular point in time and space.

This common conception of matter is an expression of "mortal mind." The "spiritual mind" opens the individual to a belief that reality is not material in essence but, in actuality, is all-good, all-eternal, and all-spiritual. Since everything is Spirit, all slices of existence are equally spiritual and, therefore, of equal importance. There is no privileged location or privileged entity—whether humankind, the earth, or any other existent being--
Table 2

Sect Data: Uniqueness and Centrality

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Uniqueness

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**Qualified.
within the realm of spiritual existence. To emphasize this point, one individual interviewed said she could not perform the drawing of the material universe because "it did not really exist," i.e., only Spirit truly exists.

The Seventh Day Adventist data demonstrated the most marked tendency toward centrality. Three of four individuals expressed a geocentric universe and one perceived the universe as a God-centered construct. It is possible that the Seventh Day Adventist data is based, at least in part, on a belief that the great cosmic battle between the forces of good and evil are to be waged on the planet earth, thereby attaching tremendous importance to the backdrop of this all-important cosmic drama.

A number of comments by several Seventh Day Adventist informants seemed to lead some credence to this possibility. One stated that "the earth was created to show that man can use his free will to choose to follow God versus Lucifer--in a way, to prove a point." Another said that people have cosmic importance attached to them because we are the only ones who know sin. Angels never know sin, they only see its effects. Therefore when we die we will be closer to God--above the angels--and will be higher up in the governing community of heaven because we know both good and evil.

A third individual summed it up by stating, "We are unique in that the only contest between good and evil is being waged on earth."
The Christian Science data related to the matter of uniqueness fit in well with the sect's attitude toward centrality. All Christian Science informants accepted the idea of animal spirituality as well as the possibility of other existent beings in the universe similar to humans. Here no cosmic drama takes place between the opposing forces of good and evil; all is good in the Christian Science universe. Humans are not central to a cosmic existence. God could very well have created a universe replete with other life forms akin to them—a good and spiritual universe is a full universe.

The Seventh Day Adventist data on uniqueness is reflective of a fundamentalist interpretation on the creation of humankind a la Genesis and a spiritual separation between people and animals. This appears to be consistent with the idea of man being the main actor in the cosmic drama between the forces of good and evil. At the same time, the Seventh Day Adventist data demonstrated a unanimous belief in other life forms akin to human beings. How can one resolve this apparent inconsistency in the various data?

There may be a way of resolving this contradiction. One Seventh Day Adventist stressed "that the people on other planets are sinless; they have passed the test already of not eating the forbidden fruit. The only place in the universe where evil now exists is on earth." Here the notion of the uniqueness of people and a belief in other
life forms may be made compatible to a degree. Other life forms exist; but, in a sense, they are irrelevant to the unfolding of the great cosmic drama which presently occurs on earth. Humans remain unique in that they are to be the final arbitrators in this pressing battle. By humankind's God given use of a free will, a choice is to be made whether to align oneself with the forces of good or evil.

The Pentecostal/Charismatic data exhibited an equal split between a belief in centrality and noncentrality. This is accompanied by a strong nonevolutionary viewpoint of humankind and an equally strong belief in a spiritual separation of people and animals. When compared with the Seventh Day Adventist group, the Pentecostal/Charismatic members expressed less of a concern with centrality and more of a tendency toward uniqueness.

My initial hypothesis that the Pentecostal/Charismatic group would demonstrate the most marked tendency toward centrality is not suggested by the data. It is quite possible that these results could be very different with a larger random sample. Again, the results of this inquiry are meant as guides for further research and not necessarily a statistically based representation of reality.

The Christian Science data indicated an open and liberal attitude with respect to the two dimensions of centrality and uniqueness; they are highly noncentral and nonunique. The Christian Science universes drawn also
reflected a fullness and unlimited sense of existence, i.e., all the cosmographies drawn were the same type of universe—a full universe of stars and planets extending out to infinity.

The Seventh Day Adventist data appeared to lie at the opposite extreme of the continuum. Here we have a fairly high developed sense of uniqueness and a well developed notion of centrality. All Seventh Day Adventist individuals saw the universe as human, heaven, or God centered. A plausible reason for the Seventh Day Adventist belief in other life forms has already been suggested which may not necessarily detract from the presence of a well developed sense of uniqueness within this group. The Pentecostal/Charismatic group fit somewhere in the middle of this continuum. Here was seen more of a mixture of beliefs pertaining to the dimensions of uniqueness and centrality.

The sects' positions on a uniqueness/centrality continuum may be reflected on another level of abstraction, i.e., on a liberal versus fundamentalist continuum. The Christian Science group follows a liberal and nonstrict interpretation of scripture whereas the Seventh Day Adventist group appears to exhibit the opposite disposition. These two groups thus form the end points of a continuum. The Pentecostal/Charismatic group again fits somewhere in between.
The Pentecostal/Charismatic emphasis is not necessarily placed on the adherence to a strict theological system but, rather, on a highly charged and emotional contact with supernatural powers and an individual exegesis of scripture as a subsequent manifestation of this contact. Schwartz (1970) discussed this freedom of interpretation:

In fact, Pentecostals do not subscribe to a definitive creedal statement, partly because each member always has recourse to the Spirit in matters of scriptural interpretation. In addition, every Pentecostal minister likes to develop his own unique style in the pulpit and therefore adds his own embellishments to the generally accepted core of Pentecostal theology. A student of Pentecostalism goes so far as to declare that "Pentecostal movement has no common creed and no real theological literature." (p. 144)

Because of this freedom in creedal interpretation, it's possible that the Pentecostal/Charismatic data could exhibit a greater amount of variability with respect to the dimensions of centrality and uniqueness than the other two sects. Although it's true that this freedom of interpretation also is present among Christian Science members, the core of Christian Science theology dictates a noncentral and nonunique viewpoint.

Nonsect Results

The following results are reflective of those who were not members of the Christian Science, Seventh Day Adventist, or Pentecostal/Charismatic groups, a total of 18 individuals. These people were members of various religious groups and some had no formal affiliation with any religious
organization (see Table 3). Thirty-nine percent of these individuals saw the earth/humankind as central to the universe. Eleven percent envisioned the sun as the center point of the universe. I suspect that there may have been some confusion here discriminating between the universe and solar system. Fifty percent of the subjects did not see the earth/humankind as being located at a privileged position in space.

The tendency toward centrality was less than the values generated by the Pentecostal/Charismatic and Seventh Day Adventist groups (50% and 60%, respectively) and higher than the Christian Science group (0%). Nonsect individuals favored an evolutionary viewpoint of humankind by a two-to-one ratio. This result was diametrically at odds with those gleaned from the Pentecostal/Charismatic (17%) and Seventh Day Adventist (0%) groups. Thirty-eight percent of these people were of the opinion that human beings are not the only living entities which partake in a spiritual nature. This value was higher than the Pentecostal/Charismatic (16%) and Seventh Day Adventist (0%) groups but less than the Christian Science group (100%).

Eighty-nine percent believed that there are other life forms akin to humans in existence. This value was higher than the Pentecostal/Charismatic group (50%) and less than the Christian Science and Seventh Day Adventist groups (100%).
Table 3
Nonsect Data: Uniqueness and Centrality

<table>
<thead>
<tr>
<th>Response</th>
<th>Animal spirituality</th>
<th>Other life exists</th>
<th>Evolutionary viewpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uniqueness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Totals</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td><strong>Centrality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humankind not central</td>
<td>9</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Humankind central</td>
<td>7</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Sun is central</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>God is central</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heaven is central</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What strikes one immediately in this data is the disparity seen between the nonsect group and the Pentecostal/Charismatic and Seventh Day Adventist groups, and the disparity between the Pentecostal/Charismatic, Seventh Day Adventist, and nonsect groups, and the Christian Science group. The Christian Science group appears to be quite unique in comparison with the other groups. This is particularly evident with respect to the issue of centrality and the spirituality of the animal world. It is obvious that the Christian Science individuals have a very selective and highly unique mode of accommodating themselves to the sacred and to the world around them.

At the same time, the Pentecostal/Charismatic and Seventh Day Adventist groups see themselves as more central and generally more unique than the nonsect group. The unanimous belief by the Seventh Day Adventist group in the existence of extraterrestrial life may not be necessarily incompatible with the notion of uniqueness. These trends may be indicative of an actual difference in world views when compared with the nonsect individuals.

Summary

The following discussion summarizes the data related to centrality and uniqueness for all 34 individuals interviewed (see Table 4). In response to the question originally posed, "Is the notion of centrality a product of the past,
Table 4
Total Data, Sect Plus Nonsect: Uniqueness and Centrality

<table>
<thead>
<tr>
<th>Response</th>
<th>Animal spirituality</th>
<th>Other life exists</th>
<th>Evolutionary viewpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uniqueness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>11</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>23</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Other planets, but no life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualified (Christian Science)</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Humankind not central</th>
<th>Humankind central</th>
<th>Sun is central</th>
<th>God is central</th>
<th>Heaven is central</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Centrality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>16</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>34</td>
</tr>
</tbody>
</table>
an idea which is no longer pertinent to present-day folk cosmologies?" the answer was "No." Thirty-four percent of all individuals questioned saw themselves as located at the central point of existence. I must admit that this value was higher than anticipated.

The central factors for the retention of this idea are difficult to decipher. The prevalence of this notion throughout the past couple millenia has already been discussed. Perhaps centrality is a notion all individuals develop during early childhood—which is not easily dispensed with. Perhaps it is an integral part of the human psyche, enabling people to demarcate themselves from the rest of the world. The presence of this idea also may be of some evolutionary significance as a survival mechanism.

One cannot, however, neglect a common sense perception of the world as an explanation for this idea. When one looks at the night sky, for example, one does get the visual impression of being at the center of the gigantic sphere of the universe. It well may be that the present existence of this idea is a "survival" from the historical past. Too, the existence of this notion well may be due to a combination of all or several of the above factors.

Eighty-five percent of the individuals interviewed believed in the existence of extraterrestrial life forms. It was easy to see a relationship between this relatively high value and the massive doses of exposure received daily
via the media concerning imaginative contacts between the human species and extraterrestrial life forms.

Spuhler (1985) spoke of a Gallup poll performed in 1982 which indicated that 47% of the people in the United States accepted an evolutionary origin for the human species whereas 44% did not. In this study, 38% of the individuals adhered to an evolutionary genesis of humankind and 45% did not. The results of this study were surprisingly consistent with those of the Gallup poll.

Thirty-two percent of all the respondents felt that the other animals participated in a spiritual nature akin to human beings. It would be interesting to correlate such a belief with the presence/absence of animals within the homes of the respondents.

Universe Types

Sect Results

A question was posed: "Are there any discernible patterns present in the drawings which tend to associate a particular type of universe with a particular group?" The major type of universe expressed by the three sects was composed of a sun, moon, and planets surrounded by an infinite number of stars (and possibly planets extending to infinity). The proportion of this type of universe for each sect was 100%, 60%, and 50% for the Christian Science, Seventh Day Adventist, and Pentecostal/Charismatic,
respectively (Figures 5, 6, 7). Note that only four of the five Christian Science individuals completed a cosmographical drawing.

Nonsect Results

The nonsect group drew this type of universe 61% of the time whereas the total group of 34 respondents drew this universe 62% of the time. It appeared that this conception of our cosmos is a fairly common phenomenon because its presence is well represented in all the data groups.

Summary

The Christian Science data for this universe type exceeds the frequency of occurrence in any of the other groups. It would be quite premature at this point, with the small Christian Science sample, to state that this type of universe is reflective of this particular sect in larger samples. At the same time, it appears to be a plausible hypothesis due to such a universe's compatibility with Christian Science theology where a full and bountiful universe is a good universe, and where all is God. If all is God and all is expressive of an infinite creative potential, then a universe composed of an infinite number of stars and planets (without limits) fits in quite well.
<table>
<thead>
<tr>
<th>Sect</th>
<th>Type of universe</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christian Science</td>
<td>Solar system surrounded by stars and planets which go out to infinity</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>No drawing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pentecostal/Charismatic</td>
<td>Solar system surrounded by an infinite number of stars and planets which go out to infinity</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Solar system surrounded by stars which go out to a limit with a void beyond</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Solar system embedded in a galaxy; an infinite number of galaxies stretch out to infinity</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Solar system surrounded by a large number of stars which go out to a limit with heaven beyond</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Seventh Day Adventist</td>
<td>Solar system surrounded by an infinite number of stars and planets which go out to infinity</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Square universe which is God centered</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Solar system surrounded by stars which go out to a limit with heaven beyond</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>
### Table 6

Nonsect Data: Universe Types

<table>
<thead>
<tr>
<th>Type of universe</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar system surrounded by planets and stars which go out to infinity</td>
<td>11</td>
<td>61</td>
</tr>
<tr>
<td>Solar system surrounded by stars and planets out to a limit with a void beyond</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Solar system with an infinite number of galaxies; solar system included in a galaxy but some confusion present as to what constitutes a galaxy</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Galaxies out to a limit and then a void; confusion regarding what constitutes a galaxy</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>

### Table 7

Total Data, Sect Plus Nonsect: Universe Types

<table>
<thead>
<tr>
<th>Type of universe</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar system surrounded by an infinite number of planets and stars which go out to infinity</td>
<td>21</td>
<td>62</td>
</tr>
<tr>
<td>Solar system with stars and planets out to a limit and a void beyond</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Solar system with stars and planets out to a limit with heaven beyond</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Solar system with galaxies out to infinity; some confusion with respect to our placement within a galaxy</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Solar system with a large number of galaxies out to a limit with a void beyond; some confusion with respect to our placement within a galactic structure</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>God centered square universe</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>No drawing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>34</td>
<td>100</td>
</tr>
</tbody>
</table>
Locus of Control

The data related to locus of control are listed below. The average locus of control value for each sect/group reflects the number of external responses out of a total possible number of 26.

- Christian Science: 1.40 average
- Pentecostal/Charismatic: 7.00 average
- Seventh Day Adventist: 6.60 average
- Nonsect: 7.875 average

The above values all fit within a fairly small range except for the Christian Science sect. These subjects had a very low number of externally oriented responses to the questionnaire. Two of the five Christian Science individuals tested with no external responses at all! Subjects therefore appear to be highly internally oriented. This fits in with the Christian Science theological system which emphasizes humankind as an idea of God, which expresses the unbounded creative potential of individuals as well as the perfect, external, and unlimited nature of human beings.

Wilson (1961) said:

Man is understood to be made in the image and likeness of God, and because God is spiritual, so man must be. Man is an idea of Mind, God; he is perfect, eternal, unlimited, and reflects the divine. He is immortal, has all intelligence, is incapable of suffering sin, disease, or death. The material, bodily, mortal man is not the real man, but a counterfeit, an apparition, man's distorted view of himself--a false belief about
man, which binds man to exactly those limitations which it suggests. If man were but to elevate his consciousness above the seeming mortal man, all these limitations would fall away. Likewise the whole material world is a counterfeit, since God is all-in-all and is spiritual. (pp. 122-123)

All the other groups appeared to be more externally oriented than the Christian Science group. There did not appear to be any sizable difference between the locus of control scores for these groups. It appeared that the initial hypothesis that the Christian Science group would demonstrate the most internally oriented locus of control scores was borne out by the data generated in this study.

One may look at the Christian Science data in several ways. Silvestri's (1979) research on the relationship between God-dependence and locus of control indicated that individuals who identified themselves as God-dependent ("all the credit goes to God, I can no nothing of myself"), scored significantly lower, i.e., more internally oriented on the I-E scale than those individuals who identified themselves as non-God dependent ("God creates us and leaves us free"). It appeared that the God-dependent individuals felt they were in control of what happened to them in life, but here the sense of control was not a sense of self-control or self-direction. Rather, control over reinforcements in life was expected because of the relationship the individuals felt they had with the sacred. The sense of relationship dictated that the sacred power(s) would guarantee a
beneficial influence over the lives of the individuals concerned—a healthy, wealthy, spiritual, and genuinely happy life was assumed.

With the Christian Scientists this line of reasoning can be taken one step further. The Christian Science stance dictates that All is Spirit—God. All is perfect, beautiful, spiritual, and Godlike. Sickness, evil, sin, and death are subjective illusions of the mortal mind. Whatever is possible to God is possible to humans as God's reflection.

The Christian Scientist individual begins with the basic premise that the attainment of a proper disposition of mind will, out of necessity, lead one to an awareness of a Godlike state of being. One can only be heir to the full potentiality of existence. In effect, one does not have to do anything to be in control of one's reinforcements in life except make oneself truly aware of the existence of the totally beneficent reality in which one is immersed.

There is an implicit belief that only good will impinge upon an individual's life because only the good, the perfect, the beautiful exists. Perhaps it may rightly be stated that there is no utility in talking of a distinction here between external versus internal control because this distinction cannot possibly refer to reality, i.e., All is one and All is God. The individual must break the shackles of ignorance and is, thereby, able to totally "participate" in and totally embrace the world. The sacred is not thrust
upon the individual, but it's up to the individual to restructure one's thoughts on the nature of reality in order to be able to fully participate in that reality. One is not dependent upon an external power, but one must take the necessary steps to regain one's ordained ontological status.

It may be that another type of response altogether, with respect to the Christian Science data, should be based not on an internal/external polarity but on an identification, in which the individual is the universe.
Chapter 5

CONCLUSION

Discussion

Although this study barely scratched the surface of contemporary cosmological beliefs, several interesting patterns seem to have emerged. First, the cosmographies drawn appeared to have been influenced very little by the popular scientism of present-day society. This was reflected in the drawings in which only 15% of the individuals indicated an awareness of the pervasive galactic structure of the universe—the dominant pattern drawn being a universe composed of the solar system surrounded by an infinite expanse of stars.

Second, there appeared to be a cultural lag expressed in the drawings. There was but minimal awareness demonstrated in the drawings of the major shift in the cosmological paradigm which occurred early in the present century. This shift concerned the demonstration of the solar system's placement within the galactic structure of the Milky Way and the determination of the existence of an innumerable number of other galactic systems external to our own.
The drawings also did not reflect an awareness of the nonstatic nature of the observable universe, i.e., the expansion of the galaxies. Perhaps the number of elapsed years subsequent to the shift in paradigms is but a night when talking about the amount of time it takes for a new paradigm to enter the consciousness of humankind.

The idea of centrality still is a fairly common belief in present-day society. Nearly 40% of the individuals in the study held this notion. The retention of this belief may be a "survival" from earlier cosmological conceptions as explicited in the discussion on the history of cosmological thought. This notion also may be due to an inherent tendency which develops in the psyche of humankind as part of the individualization process—a notion which is not easily dispensed with. At the same time, it may be the result of the impression human beings get when they view the universe around them, i.e., when one looks out at the night sky and feels one is at the center of a gigantic sphere.

The drawings also indicated a fairly common belief that the stars do not belong to the same semantic domain as the sun. These two objects are seen as being essentially different types of objects. In truth, of course, the stars are the same type of object as the sun; the great distances of the stars force a different appearance than our sun, a relatively near neighbor to us in space.
A comparison of the Christian Science, Seventh Day Adventist, and Pentecostal/Charismatic sects with respect to the dimensions of centrality and uniqueness indicated that the Christian Science group has a unique and atypical (to this study) worldview. The Christian Science group appears to be composed of highly noncentral and nonunique-oriented individuals. At the same time, members appear to express a highly internally-oriented locus of control pattern.

The Christian Science data with respect to centrality, locus of control, and uniqueness seemed to fit in well with the Christian Science theology based on the belief that humans are perfect and eternally existent beings which are a reflection or an idea of God—which knows of no sickness, sin, or death. There is nothing over which the individual does not have potential control. This fit in well with the highly internally-oriented locus of control data for this group.

The Seventh Day Adventist sect appeared to be the most highly central and unique group in the study. This statement assumes that the Seventh Day Adventist's unanimous belief in other life forms akin to humankind has not detracted from the sense of uniqueness of human beings as the principal arbitrators waging the final battle between the cosmic forces of good and evil.

The Pentecostal/Charismatic group fell in between the other two on a centrality and uniqueness continuum. This
variability may be due to the Pentecostal/Charismatic tendency of not following a strict scriptural exegesis. Matters of interpretation are subjective in nature, subject only to the dictates of a personal spiritual contact which is highly individualistic and emotional in content.

The data with respect to uniqueness and centrality appeared to be reflected on a continuum based on a liberal/literal scriptural exegesis. The Christian Science group (liberal) was placed at one end of the continuum and the Seventh Day Adventist group at the other (literal) end. The Pentecostal/Charismatic group was located somewhere in between.

All the Christian Science drawings reflected the openness and unlimited creative potential of God/humankind. The other groups reflected a variability in the types of universes drawn. Except for the Christian Science drawings, there were no apparent patterns between the types of drawings and the particular groups--at least to the degree demonstrated by the Christian Science group. Considering the small sizes of the individual groups studied, these results are tentative at best.

There appeared to be somewhat of a pattern between centrality and uniqueness. The highly noncentral Christian Science group was also highly nonunique, whereas the highly central (humankind, sun, and God) Seventh Day Adventist group was also highly unique. The Pentecostal/Charismatic
group which demonstrated a medium tendency toward centrality also showed somewhat of a restrained tendency toward a sense of uniqueness.

A large amount of information related to other areas of inquiry was collected in this study; issues related to the genesis of the universe, the end of the universe, free will, and astrological beliefs were but a few of the areas also researched. Because of the time limits imposed on completing this study, the author is not able to include these results at this time.

Recommendations for Future Research

This study was initiated to scratch the surface of contemporary American cosmological beliefs. The possibilities for expansion of this research are nearly endless. Even with the small number of informants in this study, some interesting patterns emerged. The author felt that the most tantalizing results were those in regard to centrality—and the drawings which indicated a dominant universe as essentially a pretwentieth century version.

It would be desirable to extend this study to other groups conforming to the additional types of responses to the world explicated by Wilson (1973). It also would be interesting to see if there is a continued presence of the dominant universe type reflected in this study, across the other response types. Of course, any future work should
utilize reliable sampling methods and a statistical analysis.

With more precise and statistically valid data, the relationship between beliefs in centrality and uniqueness might be addressed more properly. Also, is there a statistical justification for assuming an apparent correlation between beliefs in centrality/uniqueness and a liberal/literal scriptural exegesis continuum?

This study did not, in most instances, delve into the minutiae of "near space," i.e., the volume of space containing our solar system. A number of aspects of this cosmography could be researched: the structures present, and their sizes, relationships, and motions. A semantic analysis here would be quite useful, particularly in view of the semantic confusion demonstrated in this study between the stars and our sun and the apparent mixing of the domains of the solar system and our galaxy.

This study did not put a great deal of stress or focus upon eschatological beliefs, yet some interesting patterns cropped up. An expansion of this area of inquiry would be interesting and, I feel, quite fertile.
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**Literature Not Cited**


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INTERVIEW PROPER

Structured (at times unstructured) interview questions

1. What objects do you envision in your universe?
2. How are these objects organized?
3. What are the relative sizes of the objects?
4. What are the relative distances of the objects in miles?
5. Does the universe have limits?
6. What is the overall shape of the universe?
7. When and how did the universe begin?
8. If the universe began at some finite time in the past, how was it created?
9. Was the universe created in stages over time or was it created instantaneously?
10. When did man appear on the earth?
11. What was the order of creation?
12. Did man evolve through natural evolutionary processes?
13. Did man evolve through an ape stage?
14. Will the universe end?
15. How will it end?
16. Are there any overall movements of the universe?
17. What are the stars?
18. What are the planets?
19. What are meteors?

20. How high does the sky appear to you?

21. Does man have free will?

22. Do animals have a spiritual nature akin to man?

23. Do you believe in astrology?

24. Where is man/earth located with respect to the rest of universe?

25. Do other rational life forms exist in the universe?
LOCUS OF CONTROL QUESTIONNAIRE

Name ___________________________ Age __________

Educational level ____________________________

PLEASE GIVE A BRIEF STATEMENT ON PRESENT AND PAST RELIGIOUS AFFILIATION.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered A or B. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you are concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief—obviously, there are no right or wrong answers.

Be sure to find an answer for every choice. In some instances you may discover that you believe both statements or neither one. In such instances be sure to select the one you more strongly believe to be the case as far as you are concerned. Also try to respond to each item independently when making your choice; do not be influenced by your previous choices.

I MORE STRONGLY BELIEVE THAT:

1.  ___A Children get into trouble because their parents punish them too much.

       ___B The trouble with children nowadays is that their parents are too easy with them.
2.  __A  Many of the unhappy things in people's lives are partly due to bad luck.
    __B  People's misfortunes result from the mistakes they make.

3.  __A  One of the major reasons we have wars is because people don't take enough interest in politics.
    __B  There will always be wars no matter how hard people try to prevent them.

4.  __A  In the long run people get the respect they deserve in this world.
    __B  Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5.  __A  The idea that teachers are unfair to students is nonsense.
    __B  Most students don't realize the extent to which their grades are influenced by accidental happenings.

6.  __A  Without the right breaks one cannot be an effective leader.
    __B  Capable people who fail to become leaders have not taken advantage of their opportunities.

7.  __A  No matter how hard you try, some people just don't like you.
    __B  People who can't get others to like them don't understand how to get along with others.

8.  __A  Heredity plays a major role in determining one's personality.
    __B  It is one's experiences in life which determine what they're like.

9.  __A  I have often found that what is going to happen will happen.
    __B  Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10. **A** In the case of the well prepared student there is rarely, if ever, such a thing as an unfair test.

**B** Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. **A** Becoming a success is a matter of hard work; luck has little or nothing to do with it.

**B** Getting a job depends mainly on being in the right place at the right time.

12. **A** The average citizen can have an influence in governmental decisions.

**B** This world is run by the few people in power, and there is not much the little guy can do about it.

13. **A** When I make plans, I am almost certain that I can make them work.

**B** It is not always wise to plan too far ahead because too many things turn out to be a matter of good or bad fortune anyhow.

14. **A** There are certain people who are just no good.

**B** There is some good in everybody.

15. **A** In my case, getting what I want has little or nothing to do with luck.

**B** Many times we might just as well decide what to do by flipping a coin.

16. **A** Who gets to be the boss often depends on who was lucky enough to be in the right place first.

**B** Getting people to do the right thing depends upon ability; luck has little or nothing to do with it.

17. **A** As far as world affairs are concerned, most of us are the victims of forces we can neither understand or control.

**B** By taking an active part in political and social affairs, people can control world events.
18. **A** Most people can't realize the extent to which their lives are controlled by accidental happenings.

**B** There really is no such thing as luck.

19. **A** One should always be willing to admit one's mistakes.

**B** It is usually best to cover up one's mistakes.

20. **A** It is hard to know whether or not a person really likes you.

**B** How many friends you have depends upon how nice a person you are.

21. **A** In the long run the bad things that happen to us are balanced by the good ones.

**B** Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. **A** With enough effort we can wipe out political corruption.

**B** It is difficult for people to have much control over the things politicians do in office.

23. **A** Sometimes I can't understand how teachers arrive at the grades they give.

**B** There is a great connection between how hard I study and the grades I get.

24. **A** A good leader expects people to decide for themselves what they should do.

**B** A good leader makes it clear to everybody what their jobs are.

25. **A** Many times I feel that I have little influence over the things that happen to me.

**B** It is impossible for me to believe that chance or luck plays an important role in my life.
26. **A** People are lonely because they don't try to be friendly.

**B** There's not much use in trying too hard to please people; if they like you, they like you.

27. **A** There is too much emphasis on athletics in high school.

**B** Team sports are an excellent way to build character.

28. **A** What happens to me is my doing.

**B** Sometimes I feel I don't have enough control over the direction my life is taking.

29. **A** Most of the time I can't understand why politicians behave the way they do.

**B** In the long run, the people are responsible for bad government on a national as well as on a local level.
SUPPLEMENTAL QUESTIONNAIRE

Please answer yes or no to the following questions. Space is left under each one to allow you to express additional insights or opinions.

1. I believe that U.F.O.s exist and that they are controlled by extraterrestrial life forms.
   ___Yes  ___No

2. I believe that man is the only human life form existing in the universe.
   ___Yes  ___No

3. Observing nature can teach man about God and is, therefore, of great theological and spiritual interest.
   ___Yes  ___No

4. The universe is an orderly place, working according to laws which have been set down by God.
   ___Yes  ___No

5. The universe was created out of nothing by God.
   ___Yes  ___No

6. Man has total free will in determining his decisions in life.
   ___Yes  ___No

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7. The universe works according to chance; it has little rhyme or reason to it.  
   ___Yes   ___No

8. The fate of the world and man was sealed at the time of the creation of the universe. Ultimately, man cannot change his fate.  
   ___Yes   ___No

9. Since the world had a beginning, it must have an end.  
   ___Yes   ___No

10. The universe was not created by a supernatural being.  
    ___Yes   ___No

11. The universe has always existed and it will always continue to exist.  
    ___Yes   ___No

12. The universe was created instantaneously.  
    ___Yes   ___No

13. The universe was created in stages over a period of time.  
    ___Yes   ___No
14. The stars and planets present in the sky at a person's birth play a part in the fate of the individual.
   ___Yes   ___No

15. I believe in a heaven and a hell.
   ___Yes   ___No