Cosmology and Curriculum: A Vision for an Ecozoic Age.

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Cosmology and curriculum: A vision for an Ecozoic Age

Lydon, Angela T., Ph.D.
The Louisiana State University and Agricultural and Mechanical Col., 1992

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COSMOLOGY AND CURRICULUM: A VISION FOR AN ECOZOIC AGE

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Curriculum and Instruction

by

Angela T. Lydon
B.A., Blessed Sacrament College, 1962
M.A., Villanova University, 1970
December, 1992
DEDICATION

To MOM AND DAD
who continue to share Spirit and Breath
with me.
ACKNOWLEDGMENTS

This dissertation is a celebration. It embraces in gratitude the many people who travel with me on the eternal Cosmic Journey. It remembers the Cosmic-connectedness of being and honors, what Marion McDonald calls, "the unique Cosmic event when the Un-I-Verse became ever more self-conscious" through us.

The story this dissertation tells is possible because of:

Thomas Berry who shared his vision, time, and energy.

Emma Flaherty and Marion McDonald who gave unsparingly of their wisdom, love, and knowledge; and supported me throughout the entire process.

My chairperson and advisor, William Doll, and my committee members: Mary Doll, Karen Hamblen, John Konapak, Donald Oliver, Beth Paskoff, and Ann Trousdale whose assistance enabled the completion of this work.

Along with other friends, my family: Marie, Bill, John, Greg, and Mark whose dialogue and listening sparked new understandings.

Each of these persons is remembered and named through the story this dissertation tells.

Finally, I acknowledge and thank the unearthed Spirit of Great Time and of all Homecoming Festivals.
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ABSTRACT

The text of this dissertation explores interconnections between cosmology and curriculum. I believe the demands of an Ecozoic Age will initiate a reconceptualizing of curriculum. Further, I believe the particular cosmological perspective I advance can help us with this reconceptualization.

Chapter 1 utilizes the multi-faceted insights of scientific, historical, and speculative thought. The texts used in this chapter incorporate an engagement with past cultures (Ong, Eliade), with contemporary theoretical perspectives (Munitz, Haught, and Stafford), and with a scholarship that envisions alternative futures (Bohm).

Chapter 2 uncovers how modernity's relationship to the earth is rooted in the scientific, political, and social philosophies of the sixteenth and seventeenth centuries. The mechanistic and rationally controlling world views launched in these centuries still govern our destructive attitudes toward the earth. Contemporary societal and educational ecologies are scrutinized. Modernity's dualistic structures, its epistemologies of control, its analytico-referential discourse, and its liberal discursive practices are questioned. Bower's writings are added to those used in Chapter 1.

Chapter 3 enunciates a particular vision of cosmology as story, change, and interpretation. Utilizing
philosophical hermeneutics, the complex and interlocking dynamics of social and cultural phenomena are disclosed, and the effects these occurrences have on a society's cosmology are scrutinized. Cosmology as story is essential to this interpretive endeavor.

Chapter 4 examines contemporary cosmological scholarship, utilizing the works of Berry, Oliver with Gersham, Sagan, Sahtouris, and Toulmin. The significant and divergent contributions of each thinker are explored, especially as these thinkers reenvision human-earth relations.

Chapter 5 establishes the connections between cosmology and curriculum resulting in a new curricular paradigm for an Ecozoic Age. I suggest a cosmic vision that goes beyond survival and critique to creativity. The integrative movement of theory (insight) and praxis (creative action) is contextualized within a vision of human-earth relations.

The Coda marks the finale of the dissertation. Its purpose is twofold: to contextualize the cosmological curricular theory presented in the preceding chapters and to suggest a hermeneutic methodology for earth-centered schools.
INTRODUCTION

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.
Through the unknown, remembered gate
When the last of earth left to discover
Is that which was the beginning;

(Four Quarters
T. S. Eliot)
Always there will be story. Story is primary. It speaks of once upon a time, of beginnings long ago, of advents strange and wondrous. Story's narrative knows no bounds. Human exploration and discovery, beginnings and endings, remembering the unknown through the known, is the stuff of story. The universe, the solar system, and the earth are story. They speak the cosmological story of beginnings and connect all being to the emergent story of the universe. In an inexplicable sense, the cosmic story is the first story and includes all stories.

As a child, I intuitively understood the importance of the cosmic-story even though the significance of the relationship eluded me. I remember insisting that someone "Tell me a story." Even then, I felt the need for story but not just any story. Oh, NO! My stories could not end and so had no "real" beginnings. Each story was an entirety in itself, but its wholeness depended on its connectedness--its being a part of--the past story. I recall the ecstasy I experienced as I became both listener and teller, narrating right along with the narrator.

This interweaving of stories was important for it unfolded patterns, patterns within patterns, and patterns within other patterns. Similar to the vibrant colors of a kaleidoscope that merge and weave, forming and reforming into designs of unbroken wholes, stories fashioned for me a multicolored microcosm. Through story, I began to touch and
be touched by the rich and vital textures that tone the Earth, and I came to sense a larger context, the macrocosm.

A similar connection occurred to me several months ago. I was reading a book which narrated a cosmological story—a narrative recalling origins. This story's mode of contrast and paradox called into question contemporary values and assumptions and challenged modern ways of thinking and acting. By journeying into and between worlds, the narrative interwove text and texture and uncovered a point of view—a state of mind. Its narrative mode unearthed a still point, a starting point for a new ecology of consciousness.

Narrative

A young native American woman ran into my office and cried: "Sister, Sister. You've got to come with me. Come now! You've got to see."

She took my arm and started to pull me out the door. "See what?" I asked. She didn't answer, she just kept telling me I had to "come and see."

So I did. We left my office, went down the corridor and out the back door of the building onto the parking lot. There was construction going on, and the workers had broken up the concrete covering the lot. "See," she said, "look!" I looked, but couldn't see anything out of the ordinary. "The earth," she cried, "the earth is breathing again!"
For modern persons, a vision of the earth as a living, breathing entity is inconceivable. They may "look," and attempt to "see," (as specified in the narrative), but such sensitive awareness eludes the modern mind. The principle mindset of Western cultures is one that decrees control and encourages domination. The modern worldview recognizes power over and validates only human authority. In creating, maintaining, and advancing anthropocentric worldviews, industrialized societies have devastated ecosystems, disrupted the intricately balanced functioning of natural systems, and almost obliterated humanity's conscious awareness of their connection to the universe. The ecology of modernity has created an unprecedented crisis for all Earthlings.

Paradoxically, modernity's pathology has also initiated a movement toward, what many refer to as, a new consciousness— an ecological consciousness. This notion, supported by grassroot ecological groups and insightful scholarship, encourages the reenvisioning of humanity's connectedness to the Earth. What these radical thinkers propose may also be called the new cosmology.

An understanding of story and its relationship to the universe is integral to the new cosmology. Cosmology, if it is to be functional, tells the meaningful story of the universe in its physical dimensions and its inner dynamics. A cosmological story is connected to the emergent universe
in its pervasive manifestations. The form and enactment of story are multifaceted and diverse. Evoking the larger context, the narratives of a functional cosmology contextualize being through the stupendous story of the universe, earth, and human evolution.

Cosmological stories, therefore, embody a past that is 15 billion years old. They weigh contemporary crises as both danger and opportunity. They enunciate futures that unfold the energy and creativity of the universe itself. A functional cosmology, therefore, grounds the human community in the story of the universe from its beginnings, and it connects the individual's story with the narratives of all being.

This dissertation, *Cosmology and Curriculum: A Vision for an Ecozoic Age* is a meaningful narrative based on our present understandings of the emergent universe. It explicates the new cosmology within an interdisciplinary story. Chapter 1 remembers the wisdom of past cultures; acknowledges contemporary scientific, cultural, and speculative understandings; and visualizes the future through the insight of an integrative wholeness. By interweaving textual themes, examining multiple epochs, and engaging different disciplines, this chapter proposes that the narration of a new cosmological story connects many perspectives and evolves new ways of looking at the world, both experientially and intellectually.
Chapter 2 utilizes the understanding of Chapter 1 to explore cosmology through the lenses of contemporary societal and educational ecologies. Interrogating the pathologies of the modern lifeworld, this chapter critiques the crises of current Western institutions as both danger and opportunity. It reconceptualizes a social ecology based on insights gleaned from a perspective that interprets danger as an opportunity. In this way, a new cosmology for human-earth relations is suggested.

If control and domination structure Western understandings of the earth, then a new interpretive paradigm is needed. The primary focus of Chapter 3 is the enunciation of an innovative interpretive vision of cosmology within the framework of story and change. Story, change, and interpretation, then, become an historic and hermeneutic endeavor. The three movements of ancient hermeneutics—to say, to explain, and to translate—are considered. The hermeneutical mode of triangulating analysis, voice, and rhapsody in an historical reinterpretive mode is also probed. Cosmology as story, change, and interpretation in this context embodies understandings of technology that are earth centered, historically cogent, and based on an aesthetic of authentic enactment.

It is not enough, however, to only encourage new ways of looking and seeing. A cosmological hermeneutic of story,
change, and interpretation needs to reinvent and reenvision
our human role in the cosmos by envisioning human
technology in concert with universe functioning. A design
of this magnitude requires the initiation of a biocentric
norm of progress which moves the human species away from
democracy to a more integral biocracy. The qualitative
transformation demanded by a biocentric worldview becomes
the theme of Chapter 4. When the earth story is encountered
by humans as their story, and that story becomes the
meaningfully lived and enacted expression of the
community's story, then an earth age—an Ecozoic Age—can
emerge.

Utilizing the above vision, Chapter 5 proposes to
theorize curriculum through cosmology. It moves the issues
of education and life over into a functional cosmology
where universe, earth, and human education are triangulated
as stages of development in a single unbroken process.
Hence, the curricular paradigm posed by cosmology is one
based on the ongoing emergent creativity of the universe
and humanity's part in this evolutionary process. Story is
essential in developing a cosmology of curriculum as it
evokes a qualitative mode of apprehending that restores
drama, dance, art, poetry—the aesthetic—to primacy, and
validates remembering, imagining, dreaming, and performing.

My presentation of cosmology and curriculum is both a
personal and interpretive vision. I have chosen to engage
specific works and, naturally, such choice excludes others. The breadth and depth of the two fields (cosmology and curriculum) and my own particular worldview were factors in this decision. My choices, however, are representative of a wide and scholarly wisdom— one whose inquiry unveils the textures and tones of cosmological and curricular issues which are relevant for this time and for me personally. I make no apologies for such choices as each enunciates my conviction of the oneness of all being in nature.

Cosmology as curriculum, therefore, resonates with the stupendous, ongoing narrative of cosmogenesis. This story is the foundation of all being. Accessible to contemporary understanding is humanity's part in this story and the insights such a participatory mode enacts. Through a cosmology of curriculum, humanity once again participates— enters into— the original and alluring dance of the UN-I-VERSE.
Notes to Introduction

1. This story is taken from *Food For The Journey* by Juliana Casey, IHM (1991), p. 83.

2. Starhawk (1979) hyphenates universe. I interpret un-I-verse to mean the one song of the universe that is inclusive of each "I."
CHAPTER 1

Beginnings: Cosmological Connections and Perspectives

The music of the spheres
A harmonious universe—like a harp
Its rhythms are the equal, repeated seasons.
The beating of the heart.
Day/Night.
....

Unity behind apparent multiplicity.
That is the music.

(La musica de las esferas
Ernesto Cardenal)
Prologue

The text of this dissertation explores and elaborates the interconnections between cosmology and curriculum. The reconceptualization of curriculum through the functional insights of cosmology constitutes the mode by which this analysis will be conducted. By tracing the history, deconstructing the content, and extrapolating from the implications of multiple and differentiated sources of cosmological thinking, this dissertation will enunciate a curricular vision for an Ecozoic Age.

In our present age of increased global and local tensions, the possibility of a paradigm shift is not without historical precedence. Previously, movement from a geocentric to a heliocentric cosmology demanded revolutionary changes in human thought and worldview. Transforming an interpretive base that perceived the earth as the fixed, motionless center of space to one which empirically specified the orbital movement of the earth and planets around the sun gradually altered humankind's interaction with, and understanding of, the universe as a whole and humanity's place within it.

The discoveries of Kepler, Copernicus, Galileo, and Newton revolutionized the underlying assumptions of Aristotelian physics, Ptolemaic mathematics, Aquinas' intellectual synthesis, and common-sense conjectures about
the world as a whole (Merchant, 1980; Toulmin, 1982; Durham & Purrington 1983; Lovell, 1985). The change from an organic cosmology to a mechanistic cosmology, although gradual, was catastrophic. John Donne's (1611/1912) poetic insight, in his "An Anatomie of the World: The First Anniversary," aptly portrays this occurrence. He writes: "'Tis all in peeces, all cohaerence gone" (1912, p. 237). Carolyn Merchant (1980), in her book The Death Of Nature: Women, Ecology, And The Scientific Revolution, historically contextualizes and analyzes this disruption. She dates the gradual change from an organic to a mechanistic cosmic model between 1500-1700 A.D. Using an ecosystem model, a mode of analysis that allows complex sets of societal and ecological relationships to be scrutinized, Merchant discloses how humanity's relations to the natural world were imperceptibly, yet significantly, altered during these epochs. These changes, in turn, impacted the infrastructures of science, philosophy, art, literature, politics, and culture (pp. 42-43). By the end of the eighteenth century, the mechanistic paradigm became the dominant descriptive metaphor for humankind's interaction with the natural world (Toulmin, 1990).

Today, diverse disciplines question the inadequacies of a solely mechanistic cosmology (Munitz, 1957; Heisenberg, 1958; Bohm, 1980; Capra, 1982; Swimme, 1985; Berry, 1988; Doll, 1988; Oliver with Gershman, 1989;
Sahtouris, 1989; Davies, 1990; Oliver, 1990). Recent scientific discoveries, particularly in biology and physics, are in concert with this scholarship and confirm the inadequacy of the traditional Newtonian picture of the world. The evolutionary processes of the entire universe, begun over 15 billion years ago and mirrored in biological evolutionary patterns, show an organized development from the primeval molecular unfolding through the simplest living organisms to the complexity of human beings.

William Doll, a curriculum theorist, links recent scientific breakthroughs to post-modern curricular changes. In *A Post-Modern Perspective on Curriculum*, Doll (in press) states: "The implications for a post-modern perspective for education and curriculum are enormous but by no means clear." He continues:

> the sweeping changes affecting art, literature, mathematics, philosophy, political theory, science, and theology—changes questioning the basic epistemological and metaphysical assumptions . . . are so great—so megaparadigmatic—that they could well give way to a more complex pluralistic indeterministic system or network. (p. 7)

The magnitude and complexity of these empirical findings, according to Werner Heisenberg (1958) in his book *Physics and Philosophy*, indicate that the correlation between the different planes of language (logistical levels) and an underlying ontology must now be related to scientific understandings (p. 184). He states:

> The most difficult problem concerning the use of language arises in quantum theory. Here we have at
first no simple guide for correlating the mathematical symbols with concepts of ordinary language; and the only thing we know from the start is the fact that our common concepts cannot be applied to the structure of the atoms. (p. 177)

Today, even more than in times past, humanity must seek to enunciate the evocative and creative relationship between the human community and universe processes—an ecological cosmology. Cosmology, as both a speculative and a scientific endeavor, empowers this struggle. As both story and inquiry, cosmology continuously attempts to integrate the experiential and intelligible realities of humanity within the context of the cosmic community. By suggesting functional paradigmatic changes (changes in consciousness, thought, and language), cosmology questions the worldview of liberal curricular discourses which promote individual autonomy, independent rationality, and continuous progress (Bowers, 1987).

The cosmological scholarship of this chapter not only supports the radical reevaluation of such social, cultural, and political assumptions of contemporary educational structures but also initiates a creative and visionary response to the entire earth community—one which allows the meaning and purpose of education to be in concert with universe and earth processes. The insights of both ecological cosmology and curriculum theory are, therefore, central to any meaningful changes in educational praxis—creative action.
The endeavor to integrate curriculum theory and cosmology requires a reconceptualization of contemporary epistemological models. As critique, the reconceptualizing process radically questions unexamined cultural assumptions. As a positive vision, reconceptualizing allows new understandings to emerge through both inquiry and story. Both cosmology and curriculum can incorporate, according to Thomas Berry (1988) in his book *The Dream of the Earth*,

universe education . . . education which identifies with the emergent universe in its variety of manifestations from the beginning until now . . . . [and] earth education . . . the earth as the immediate self-educating community of those living and nonliving beings that constitute the earth. (p. 89)

Speculative and scientific scholarship, utilizing curriculum theory and cosmology, can enunciate a vision of universe, earth, and human education as a "single unbroken process" (Berry, 1988, p. 89). Such education integrates the physical-material and psychic-aesthetic dimensions of the earth community and awakens humanity's sense of awe and wonder at the evolving mystery of universe processes. Reconceptualizing curriculum theory, utilizing the functional insights of cosmology, initiates the gradual unfolding of a profound understanding, both experientially and intellectually, of the human situation within cosmic processes (Berry, 1988 p. 220).

The purpose of this chapter is to engage literature that will support the subsequent interrogation of cosmology
and curriculum in both their inquiry and narrative dimensions. The evocative scholarship utilized will permit connections to be envisioned and perspectives to be enunciated. It will generate ideas that will become functional throughout the dissertation.

Narrative

Beginning societies, in their earliest imaginings and in first recorded stories, wove a cosmology that spoke of a cosmos, a universe, and a world. Since ancient times humans have danced within the curvature of space, moved in concert with the stars, gazed with wonder and awe at the heavens, and speculated as to the universe's meaning. The first narratives, whether mythical or historical, reflected a fascination with the natural world and attempted to elucidate humanity's place in the grand design of the universe as a whole.

Speech, too, imitated the cyclically rhythmic powers of the earth and cosmos. Genesis stories spoke of goddesses and gods who were intimately connected to the lifeworld of the human community. These narratives were as different as the peoples they reflected and as interconnected as the origins of the universe they portended to interpret.

These earliest imaginings continue today. Humankind still evokes a picture of the world that is unique to a
time and place, a people and culture, and that is expressive of the relationship people have to the earth community and the universe. Ancient, indeed, is contemporary inquiry into the universe. Whether a people's story derives from mythical narratives or scientific accounts, the people are still dependent upon their evolution from cosmic processes. The text, whether originating in an oral or a written society, discloses that culture's cosmology—its deepest beliefs expressed through story, dance, art, and ritual.

Textual Etymology

The word "cosmos" originated in oral culture. Its meaning reflects this etymology. According to The Oxford English Dictionary (1989), the Latin and Greek origins of "cosmos" are "order, ornament" (p. 986). To Pythagoras and his disciples, the world or universe, in its perfect order and arrangement, was a cosmos. The OED locates "cosmos" in opposition to "chaos." Elisabet Sahtouris (1989), in her book Gaia: The Human Journey From Chaos To Cosmos, recognizes this etymological opposition, but insightfully links the words "chaos" and "cosmos."

Sahtouris notes that the ancient Greek word "chaos" spoke of the nothingness before there was anything—a time when no-thing had yet been formed. The word "cosmos" voiced
"form and pattern instead of formlessness and patternlessness, things instead of no-things, a world instead of no world" (p. 30). The movement from chaos to cosmos, then, is not oppositional. Rather, it suggests the integrative context of all things continually emerging from no-thing. It becomes, as it were, the dance of Gaia, where the movement of the dancer and the dance cannot be differentiated. Each spirals the other and yet is simultaneously the other. Both are contextually and interiorly one movement.

The etymology of the spoken word "cosmology" demonstrates this single movement. According to the OED (1989), "cosmology," in its Latin and Greek roots, means "world plus discourse" (p. 985). Walter Ong (1982), in his book Orality and Literacy: The Technologizing of the Word, and Beldon Lane (1981), in his work "Story Telling: The Enchantment of Theology," suggest that in ancient oral cultures words embodied events as creative action. There was no separation between word, event, and action. "Cosmology" spoke world. There was no split between world and discourse; one evolved and evoked the other, a spiralling connection.

When cultures developed written codes, however, the importance of the spoken word (breath) was displaced by the written word (sight). As Ong points out, this change gradually altered human consciousness. The written word
referred to a thing as object and linked human consciousness to abstract, analytic structures. Words no longer personified the creative power of the spoken act, nor did they enact the continuous revealment of events. The voice of the spoken word was lost in the silence of the written symbol. The explicitness of the written symbol structured a separation between known and knower, between word and world. The dynamic interactive energy generated by the spoken word was lost in the written symbol.

The written word, distinct from the spoken word, evolved as two epistemological endeavors—science and philosophy. The scientific endeavor systematically analyzed and empirically explained the universe in terms of physical laws or principles. Cosmology, now a branch of metaphysics, attempted through philosophic argumentation to reveal a teleology in the universe. Metaphysical theories elaborated the characteristics of the universe, derived epistemologies, and explained subjective beliefs.

Cosmological Connections Today

Walter Ong (1982) opens a passageway into cosmology. He analyzes the development of oral cultures and explores how knowledge was constructed and managed through verbalization in oral societies. This insightful probing
allows Ong to examine the differences between orality and literacy, and it facilitates a comparative analysis between verbal expression and literate thought (p. 1).

By interrupting, without devaluing, modernity's preoccupation with literacy and symbolic language, Ong communicates the necessity of tracing a word's genesis in order to understand its connection to the lifeworld of its origins. Additionally, Ong's work opens for literate societies a sense of the empowering physical and psychic movement of speech in its genesis moments when it was devoid of symbolic referents. Ong maintains that ongoing inquiry, when it contrasts and relates orality and literacy, reveals not only an understanding of the oral past and the literate present but also facilitates the liberation of "text-bound minds" (p. 156). For Ong, this shift permits humankind to transpose its understanding of human identity and to formulate new perspectives. He asserts:

Many of the features [humanity has] taken for granted in thought and expression in literature, philosophy and science, and even in oral discourse among literates, are not directly native to human existence as such but have come into being because of the resources which the technology of writing makes available to human consciousness. (p. 1)

Ong's scholarship, which penetrates ancient people's management and construction of knowledge, is extended when interrelated with M. Eliade's historical research on myth. In his book The Sacred And The Profane, Eliade (1959)
discusses how humanity in both ancient and modern times related to the cosmos (the world) and found meaning in this relationship.

Eliade identifies two worlds: the sacred (religious) and the profane (non-religious). He draws parallels between the religious and non-religious experiences, analyzing them as two modes of being in the world or two existential situations, and asserts that these postures "depend upon different positions that [humankind] has conquered in the cosmos" (p. 15). According to Eliade, the primordial revelations of ancient peoples were constituted by myth. By narrating stories of gods or culture heroes, myths spoke a sacred history— one charged with mystery and truth. In ancient societies, myths assumed an ontological status connected to religious traditions and rituals. Hence, the sacred was manifested through actual world structures; the particular thing, itself, revealed its true essence. Eliade further elucidates how all life— work, world, nature, life, and death— was touched by this perception of the sacred.

In *Myth and Reality*, Eliade (1964) acknowledges the socio-religious context of myth. Recognizing that myth is an "extremely complex cultural reality which can be approached and interpreted from various and complementary viewpoints" (p. 5), Eliade clearly delineates the functioning of myths in archaic societies and pursues the evolution of the role of mythic consciousness as it became
"demythicized." Mythic insights became an effort of thought, a speculative endeavor of philosophical inquiry, as well as an attempt temporally and spatially to understand creation, the appearance of being, and the exploits of humankind.

Eliade refers to two movements: (a) historiography as "the endeavor to preserve memory of contemporary events and the desire to know the past of humanity as accurately as possible" (p. 135), and (b) historiographic anamnesis as the "desire for a precise and total recollection of the past. In the traditional societies, it is recollection of mythical events; in the modern West, it is recollection of all that took place in historical Time" (p. 138).

Even though it appeared that historical narrative supplanted myth, Eliade concludes that mythic insight on the one hand and contemporary historical, philosophical, and speculative endeavors on the other hand are not inaccessible to each other. His historical outline of the changes that have taken place in the evolution of myth, in both its sacred and profane aspects, are foundational to an understanding of the contemporary scientific, philosophical, and speculative cosmological endeavors as elaborated by Milton K. Munitz.

Munitz (1986), in Cosmic Understanding: Philosophy and Science of the Universe, explores recent scientific discoveries in cosmology and examines the philosophic
implications of these findings. Utilizing empirical data and current cosmological theories, Munitz demonstrates how human beings, in their descriptive and metaphorical narratives about the world, project purpose and meaning onto the world. Language assumes a key role in this endeavor.

According to Munitz, the need to describe, understand, and interpret the world in relational terms is the "characteristic, persistent and irrepressible need [of] the human mind" (p. 4) to evolve a cosmology. Cosmological inquiry, desiring to make the universe intelligible, generates cosmological models. Central to this undertaking is philosophical and scientific inquiry. Both modes of exploration engage humanity's fascination with the physical universe and lead to speculation about the nature of reality and humanity's place in the ultimate scheme of things.

Normally, cosmological models specify an empirical core; that is, a description of an observable universe and the material objects and events that are perceived. To Munitz, these events and objects constitute what humankind refers to as "real" distinguished from what is identified as "fictional" (p. 52). Each "real" model is specific to a place and time, and is, according to Munitz, "an integrated conceptual scheme . . . [that] provides its own picture of the intelligible universe. It does so . . . without
requiring that every element of that scheme . . . be directly correlated with some observable object, process, or phenomenon" (p. 57).

Cosmological inquiry, always limited by its own conceptual boundedness, continuously strives to overcome such limits. In this endeavor, cosmological analysis, based on philosophic arguments, investigates what is not observable and/or capable of being described. Using the term "the Boundless," Munitz states that "the Boundless" does not have to be described "in the form of a maximally comprehensive, intelligible, ordered domain of objects and physical processes. 'The Boundless' is neither observable, intelligible, nor known" (pp. 183-184).

The cosmological investigations of John F. Haught and Harry Coffin Stafford extend the thesis of the aforementioned scholars. While Stafford addresses the complex relationships between cultures and the cosmological models these exhibit, Haught is immersed in arguments concerned with the universe as a purposeful entity.

Haught's (1984) work, *The Cosmic Adventure: Science, Religion and the Quest for Purpose,* recognizes cosmological inquiry as both a speculative and empirical endeavor. He asserts that both modes of inquiry are centered on the issue of "cosmic purpose" (p. 8); that is, "whether nature in its evolution has any purpose or ultimate meaning" (p. 7). For Haught, this is the fundamental question for
both science and religion—whether the evolutionary processes of nature have any purpose or ultimate meaning. His argument supports the view that the "universe is not without purpose and meaning" (p. 1). Haught's position entertains the thesis that cosmic purpose (and hence, meaningfulness) theorizes that nature and mind are interwoven. This integration becomes the prime focus in Haught's book, and from this focus he challenges the dualistic structures of Western metaphysics and science, with its resultant epistemology of control.

Haught recognizes that, historically, speculative and scientific scholarship and analysis have been in conflict. He insists that the disparities that alienate the thinkers of science and philosophy and that interrupt meaningful dialogue exist because a "different order of discourse" (p. 3) is extant. For Haught, the language of one order (speculative) cannot be placed in the same category (class) as the other (scientific). Haught insists that the language of both can be framed within story, as "the 'narrative' interpretation of nature" (p. 24), a non-dualistic context that sees "mental occurrences," to use Whitehead's (1929) term, as intrinsic to nature. Such a view does not fail to recognize, however, that all discourse and communication is culturally specific and that "symbolic and mythic modes of thought and language . . . differ from culture to culture" (Haught, 1984, p. 4).
Stafford (1981), in his book *Culture And Cosmology: Essays on the Birth of World View*, corroborates the relationship between culture and cosmology. He perceives a "dialectical and dialogical interplay between the cosmology and culture: cosmology shapes culture, just as initially culture shapes cosmology" (p. 295). This correlation allows Stafford to analyze the intersections of socialization, language, history, consciousness, and culture, as well as the effects these structures have on the formation of "culturally communicated and historically propagated" (p. 7) worldviews.

Societies construct, then validate the model(s) of their social cosmos. This authentication is later employed to reinforce prescribed norms. Cognizant of these intersections, Stafford examines socialization and language acquisition as multi-faceted phenomena and "as constants in the relationship between culture and cosmology" (p. 6). He considers historical analysis to be a necessary component of the endeavor. Narration explores past societies, the impact their cosmology had on a particular place and time, and the complexity of the differentiated world views each culture enacts.

To Stafford, the analysis of multiple cultural perspectives (from primitive to present societies) suggests the need to search continuously for viable narratives of life processes and the integral relationships they
intimate. Such analysis also generates a new social cosmos. Stafford is convinced that a novel vision of the world—one that imagines a new world order—can subsequently emerge. This cosmology calls for an "attitude or stance towards the world as a whole" (p. 300).

The thesis David Bohm (1980) unfolds in his book *Wholeness and the Implicate Order* integrates the thinking of Ong, Eliade, Munitz, Haught, and Stafford in that it is concerned with the relationship of the whole to the part and the part to the whole. This thinking involves an understanding of the "nature of reality in general and of consciousness in particular" (p. ix). According to Bohm, human perception and consciousness tend to abstract what is relatively stable, viewing such conceptual maps as objective reality. Bohm contends that this bias fragments knowledge. Instead, he asserts, all reality should be seen "as a coherent whole, which is never static or complete, but which is an unending process of movement and unfoldment" (p. ix).

This concept, which Bohm refers to as "relatively autonomous subtotals" (p. 14), does not unite what cannot be combined, nor divide what cannot be separated. Rather, it specifies that authentic wholeness arises between the human and nature, and between humans, "when a form of action that does not attempt to fragment the whole of reality" (p. 16) exists. Bohm proposes a science of
wholeness structured on unbroken inquiry. This approach acknowledges not only the probable existence of a complex order but also the possibility of illusive dimensions that humankind fails to discern. Bohm feels that what appears as chaotic and random can, in reality, represent a higher degree of order than what is actually perceived or conceptually abstracted. The move beyond the linear ordering of reality to a spiral ordering permits, according to Bohm, an unfolding of awareness, attention, and the creative potential of intelligence.

Having analyzed the seminal thoughts of a number of prominent thinkers whose works are relevant to cosmology and a generative curriculum theory, the purpose of the subsequent section will be to interrelate their insights, to discover the old enfolded in the new, and to initiate new relationships. This process enables the forces of creative energy continuously to erupt—a new cosmology.

Cosmology embraces the wholeness of universe relations—its hidden as well as overt aspects, its origins as well as its ongoing processes, its story as well as its actuality. Cosmology and curriculum, then, seen as a dynamic and incorporative movement, form an ongoing event that is the dream of an Ecozoic Age.
Pursuing creative conversations with multiple texts and the varied perspectives they entertain is a reflective and dialogic process. When textual themes are interrelated, fragmentation, oversimplification, and unwarranted relationships can result. Such dialogue, however, can also unfold new visions. This "unconcealment," to use Heidegger's (1962) term, with its concomitant risks, is both the context and the dream of cosmology and curriculum.

Bohm's (1980) work initiates the venture. He refers to theory as insight. "Theoria," derived from the Greek, means "to view or to make a spectacle." Theoretical insight, therefore, implies "a way of looking at the world and not a form of knowledge of how the world is" (pp. 3-4). Bohm maintains that perception, thought, experience, and action, shaped by either the implicit or explicit insights of cultural custom, fragment theory and practice by projecting arbitrary divisionary schemas onto reality. Contemporary society, he feels, fragments academic disciplines, environments, nations, and groups of people without alluding to the inherent limitations of such divisionary mechanisms—the broader contexts suppressed and/or the connections to experience that are devalued or ignored.
Munitz's (1986) observations on cosmological models are apropos here. Each cosmological model proposes an account of the universe as a whole, adopts its own grammar (descriptive and qualifying adjectives: known, observable, intelligible), and bases its description of the universe on meanings derived from the inquiry itself. For Munitz, "the universe cannot be used as a name for an entity that purportedly exists 'as such' or 'in itself'" (p. 176). Any description of the universe as a whole is relative to, and limited by, the linguistically specific cognitive and observational frames of the inquiry. Descriptions, therefore, of a known universe or an intelligible universe are products of human knowledge.

Munitz asserts that any "characterizations of the universe as a whole are the outcome of a creative conceptual process, and the choice of a particular account of the universe as a whole is the result of human inquiry" (pp. 177-178). All models, therefore, are unfinalizable, limited by the conceptual world view they represent. Each model is, however, valuable until the perspectives and/or conceptualizations it represents have been refuted, redefined, or extended.

Like Munitz, Bohm (1980) recognizes that human inquiry separates; he entertains as necessary the division of "practical, technical and functional activities" (p. 2). Problematic, however, are divisionary mechanisms which
ignore or rupture essential connections of self view and world, or fail to question radically taken-for-granted societal infrastructures. Western rational systems are built on the premise that a direct correspondence exists between what humans see and what they think. Such correspondence assumes the status of a description of the world as it really is. This is the fragmentation Bohm insists must be transformed if creative and imaginative responses and meaningful conversations are to be activated. Along this vein, Munitz (1986) observes that in the process of transforming ideas of correspondence, concepts of truth not only have to be redefined, but the notion of objectivity must also be reexamined (p. 179). To Haught (1984), this is the philosophic implication of asking "whether thought itself might not be part of reality as a whole" (p. 36).

Haught (1984) addresses fragmentation as the dualistic tendency to separate humanity from nature, spirit from matter, and mind from body. Dualism emerged when humans, in attempting to explain the incomprehensible, privileged certain "realities." Using the "myth of the exiled soul" (p. 15), which is analyzed by Paul Ricoeur (1967) in his book Symbolism of Evil, Haught clarifies the privileging of soul (world of spirit) over body (world of perishable, evil matter), and asserts that while dualism attempts to preserve the core of our humanness from being lost in matter, ironically it prepares the way for the
materialist interpretation of the world it seeks to avoid in the first place. For by placing the soul or mind in a sphere radically different from that of physical reality, dualism abandons the physical universe to the realm of the spiritless and mindless. And it is fundamentally the mindlessness of nature that renders it incapable of sustaining purpose. (p. 17)

Dualism structures human thought and belief, confirms fragmentary visions, and implements divisionary assumptions that shape social and cultural worldviews (Fiorenza, 1987; Bohm, 1988; Goldenberg, 1989; Kellar, 1989).

To Haught, the bifurcation of reality into discrete regions--inert physical matter (which is mindless and lifeless) and mentality (which is situated in human consciousness)--needs to be negotiated. Such mediation interweaves mind and nature thereby establishing the ground for a meaningful universe. When envisioning the connection of mind/nature and purpose/meaning, Haught (1984) utilizes the "synthetic vision of mind and nature" in terms of aesthetic experience as conceived by Alfred North Whitehead and the "hierarchial structure of nature" based on the thought of Michael Polanyi (pp. 21, 88).

Stafford's (1981) analysis of culture and cosmology also understands nature within an hierarchical design of integrated organization--a system that is "heterogeneously integrated in a dynamic balance where particular structural integrity subsists in open-ended flexibility" (pp. 316–317). Identified as empirical holism, this concept is "a world orientation (incorporating the perspective of, but
not limited to, the scientific enterprise) appropriate and useful to culture in the quest for new world views" (p. 307). Empirical holism acknowledges the incompleteness of humanity's picture of the world. It recognizes that the "real" world is always a mediated reality. Sensitive to the historical and cultural impulses of a people's cosmology, empirical holism encourages ongoing critique, reflection, and change. This attitude, Stafford maintains, is necessary, for when human beings forget that culture is their "own objectification--that it is comprised of a network of artifacts devised by humankind--then culture becomes reified" (p. 317). Then, unchangeable systemic status becomes cultural practice.

According to Stafford, only when humanity remembers the balance of the life systems, the imaginative flexibility and adaptability of nature, and the integrity and creative harmony of the ecosystems, can the reification of destructive cultural practices be re-negotiated in the context of nature as

a nurturing environment out of which [humans] are formed and to which [they] are responsible. As earth's most reflective children, [humans] are given the mandate of its fullest well-being and [they] bear responsibility not solely for [themselves] but for all species (p. 317).

Haught extends Stafford's observations and analysis by utilizing the scholarship of Huston Smith (1982) to identify humankind's structuring of knowledge within a framework of control (epistemology of control) and the
incisiveness of Paul Ricoeur (1967) to analyze the advent of dualistic thinking modeled in the "myth of the exiled soul" (1967, p. 279). Haught (1984) suggests that dualism and control so alienate humankind's understanding that it becomes "difficult to think of mental activity as part of the occurrences that make up nature" (p. 35). Dualism misleads, since humankind assumes that the "real" is subject to intellectual mastery. Such mastery is then projected onto an object, controlling "the other" whether persons, animals, earth, or universe.

Bohm's (1980) engagement with and rejection of direct correspondence advances much of the preceding thought. He calls for an approach that responds to the whole. His idea of wholeness is not a unifying stratagem. Rather, he asserts that "all our different ways of thinking are to be considered as different ways of looking at reality" (pp. 7-8), just as diverse cosmological models are alternate ways of looking at the universe as a whole. Similarly, non-dualistic patterns of thinking frame interrelated contexts.

What Bohm is unfolding is the need to engage disparate and incommensurable ideas so as to gain insight. He views insight as a creative act which engages in ongoing dialogue. Munitz's (1986) assertion of the "need for a cosmology, an acceptable picture of the universe" (p. 5) parallels this observation. This need interweaves intellectual curiosity, a sense of wonder and awe, and the
desire to respond speculatively to questions about the universe as a whole and humanity's place in an intelligible universe.

The analysis offered by Bohm and Munitz facilitates the continuing interrogation of Western literate traditions. Grounded in abstract, symbolic processes, Western society trains its members to read the black strokes on a white page. Elizabeth Beverly (1989), in her essay "A Silence That Is Not Hallow," notes that in Eastern cultures a relational context of white to black establishes meaning. She states:

The meaning of the ideograph lies not in its motion, but in the relation of black to white, of field to ground. The meaning within the black strokes can emerge only because the white space contains it . . . It's not what language looks like that matters, but how it makes us think. If literacy suggests that we respond to black and white together, we can see that all perception is, at least, twofold. (p. 492)

Ong's (1982) inquiry recognizes the above requisite; that is, to connect thought and its verbal articulation in oral cultures to literate thought and expression. He scrutinizes modernity's exclusive valuation of literacy and its fixation on silent, symbolic interaction with the printed text. Ong does not, however, negate literacy nor propose a return to orality. Rather, he contrasts and relates the two modes, engaging the difficulties literate cultures encounter when attempting "to conceive an oral universe of communication" (p. 2).
By examining modernity's historical "discovery" of primary oral cultures as well as of the psychodynamics of oral cultures, Ong activates a sense of what an oral world is like. The oral world is without any visual representations to signify a word—a world where the word and the world exist in sound. "For oral cultures," as Ong observes, "the cosmos is an ongoing event with [humanity] at its center" (p. 73).

Beverly's (1989) work further informs the analysis of Ong. She asserts:

Implicit in our knowledge of speech is the silence that cradles the sound. Implicit in the motion of the dance is the stillness between the steps of the dance. Implicit in the lover's absence is his or her presence. Within the experience of health lies illness.

Nothing is known by itself; all experience is relational. (p. 492)

It is context and the relational that are pivotal in oral cultures. According to Ong (1982), oral communication is grounded in the physicality of the sound, power and action of the spoken word itself, and the community established among the members of the immediate group (formation into close-knit groups). In identifying the characteristics of sound—its evanescence, its relationship to time, its interiority when related to the other senses—Ong clarifies how oral societies organize their thought and expression through mnemonics and formulas (p. 33). In this way, they provide for thought structures that are additive, aggregative, redundant, conservative, agonistically toned,
empathetic and participatory, homeostatic, situational, and close to the human lifeworld (pp. 37-57).

Similarly, Eliade's analysis of the evolvement of myth in oral cultures notes that mythic stories and their re-enactment through ritual were experiential, community orientated, and connected to the natural world. In Eliade's words (1958), primary cultures viewed "[humanity] as the umbilicus mundi, the navel of the world" (p. 231). Humankind was one with "the world." He interprets the mythic story as "an account of a 'creation'; [relating] how something was produced, began to be" (1964, p. 6). Consciousness of primordial and non-temporal origins pervaded every aspect of a primitive person's lifeworld, both the lebenswelt (lived experience) and the umswelt (environment). Mythic or sacred time was qualitatively different from profane time, and, as Eliade notes, primitive societies, by retelling and reactualizing The Story, made present again the sacredness of the event and the timelessness of that past moment.

It was this mythic consciousness that allowed early peoples to transpose profane existence into a dynamic perception of creation within the world as a whole and, thereby, "become 'contemporary' with the events described" (Eliade, 1964, p. 18). Paradoxically, however, this very transposition promoted the advent of dualism.
As Stafford and Haught both assert, dualistic mythologies have subtly influenced cosmological precepts of culture from the advent of primeval myths to modern day scientific hypotheses. For Haught (1984), it is only when mentality itself is seen as "a blossoming forth of nature," and acts of consciousness or subjectivity are seen as part of the "continuum of occurrences that constitutes the world of nature . . . that meaning which requires expression through the narrative mode of consciousness" (p. 24) can transform dualistic thinking.

To Stafford (1981), mythic structures are the creative framework out of which humankind lives and functions, as well as the means by which the "projections of our psychic sensibilities into the cosmos" are actualized (p. 327). Stafford reiterates that it is necessary deliberately to utilize the "psychic and spiritual potency of myths [while recognizing] our agency in their creation" (p. 327). Following Stafford's reasoning, a plurality of mythical constructs and cultural models could evolve.

In summary, the primary emphasis of this chapter has been on the multifaceted dimensions of cosmological thought. This research integrates scientific, historical, philosophic, and speculative wisdom and explores new ways of looking at the world, both experientially and intellectually. Pertinent scholarship is crucial to this endeavor. The multiple texts used in this chapter display
how cosmology incorporates an erudite and balanced engagement with past cultures (Ong, Eliade).

Theoretical probing of past cosmologies facilitates the subsequent elucidation of ancient civilizations, just as the utilization of texts that analyze and advance contemporary theoretical cosmological principles (Munitz, Haught) and their relationship to culture (Stafford) enables contemporary societal structures to be critiqued. Foundational to any reenvisioning of curriculum theory in an Ecozoic Age is cosmological scholarship that espouses a creative wholeness (Bohm) and understands cosmic-earth-human relations (Berry).

The transforming model this chapter advances is not a nostalgic return to the past. Neither is it an idealistic, naive, or romantic belief in a world community existing within a cocoon of universal harmony and peace. Rather, assuming that knowledge of the past can inform the present, cosmological thought asserts, even with the awareness of the power and prevalence of evil and competition,5 the possibility of an evolutionary process that will induce the human community to move into a future of integrative respect.

Thomas Berry (1979), in an essay entitled "The Ecological Age," communicates a dream for the future which is connected to the narratives of the past. He states:

The emergent process of the universe is irreversible and non-repeatable in the existing world order. The
movement from non-life to life on the planet earth is a one-time event. So, too, the movement from life to the human form of consciousness. The movement from the simpler to the more complex cultural forms is also, most likely, irreversible on the larger time scale. (p. 1)
Notes to Chapter 1

1. Berry and Swimme (in press) talk of our emergence into the Ecozoic Age. They state, "A primary aspect of the Ecozoic period is that we recognize the larger community of life as our primary referent in terms of reality and value" (p. 4). In this Ecozoic Age, human activities will become integral with earth functioning.

2. Merchant's focus on this time interval does not preclude her awareness that a gradual transition away from an organic to a mechanistic cosmology did not occur before 1500 A.D. It is necessary to note, however, that some scholars specify the transition as occurring earlier. Elisabet Sahtouris (1989), in Gaia: The Human Journey From Chaos to Cosmos, asserts that the shift is noticeable in early Greek tragedies and philosophy.

3. Gaia hypothesis or Gaia theory evolved through the work of James Lovelock (1979, 1988) and Lynn Margulis (1982). This theory specifies, according to Sahtouris (1989), that "our planet and its creatures constitute a single self-regulating system that is in fact a great living being, or organism" (p. 9).

4. Haught recognizes and critiques the scholarship of various disciplines which argue against a purposeful and meaningful universe. He also acknowledges the cogency of their analysis. Haught (1984) asserts, however, that it is possible to "reconcile the human hope for cosmic purpose with what modern science has told us about nature" (p. 2).

5. I have deliberately linked evil and competition to open discussion and provoke thought for the purpose of transforming educational praxis.
CHAPTER 2

Contemporary Crises in the Ecology of Society and Education

Matter is music. Matter in perpetual movement in space and time Rhythmical hearts and stars. The universe sings and Pythagoras heard it. The music of the spheres, more jazz than classical. The chaotic dance of things.

(La musica de las esferas
Ernesto Cardenal)
Prologue

Chapter 1 suggested that a comprehensive and diverse range of contemporary cosmological scholarship could be used to speculate on a correlation between cosmology and curriculum theory. Chapter 2 extends this conversation. It will use the rich diversity of cosmological thought to critique societal and educational structures.

The main thrust here will be on a cosmology emphasizing an ecological perspective and the paradigm shift such a position envisions. As such, the historical roots of modernity's alienation from the earth will be examined. This analysis will uncover how humanity's contemporary social and cultural practices have emerged and will disclose their relationship to current societal and educational structures. The critique, framed within the context of human-earth relations, will reveal dualistic structures of thought, language, and practice; will question extant epistemologies of control; and will elucidate a discourse of liberalism.

If ever there were a time when the tension of Donne's (1611/1912) poetic insight could serve as a leitmotif, it is now. Contemporary societal structures are "all in peeces, all cohaerence gone" (1912, p. 237). A paradigm shift not unlike the one Donne experienced is presently unfolding (Kuhn, 1962; Fiorenza, 1989). Thomas S. Kuhn
(1959) points out in his book, The Copernican Revolution, that "[Donne] portrayed his discomfort at the impending dissolution of traditional cosmology" (p. 194). Is this same disquiet present today? Perhaps Donne's lament characterizes for contemporary humans a similar alienation and communicates today's malaise. In "An Anatomie of the World: The first Anniversary" (1611/1912), Donne writes:

[And] new Philosophy calls all in doubt,  
The Element of fire is quite put out;  
The Sun is loft, and th'earth, and no mans wit  
Can well direct him where to looke for it.  

'Tis all in peeces, all cohaerance gone;  

Prince, Subject, Father, Sonne, are things forgot,  
For every man alone thinkes he hath got  
To be a Phoenix, and that then can bee  
None of that kinde, of which hee is, but hee.  

(1912, pp. 237-238).

Stephen Toulmin (1982), in The Return to Cosmology: Postmodern Science And The Theology Of Nature, considers Donne's apprehension to be a realistic picture of what was occurring. Toulmin observes that the new philosophers were engaged in dismantling the "traditional astrocosmological image" of the world and in the "breakdown in the sense of 'Relation'—that is, their sense of natural status and relatedness" (pp. 221-222). This dismantling not only altered human-earth relations, it furthered "the ultimate human disjunction . . . the rational separation of human minds from human bodies" (p. 29) as Robert Sidwell (1990) observes in his essay "'Tis All in Peeces, All Cohærance Gone': Educuing an Ecological Consciousness."
The authority this separation exerted on systems of knowledge, ordering, and reference, and the concomitant reorganization of language and discursive practices that resulted is appraised by Timothy J. Reiss. In *The Discourse of Modernism*, Reiss (1982) specifies how changes in cosmological models (Munitz, 1986) and the consequent changes in conceptual infrastructures (Stafford, 1981) are eventually reflected in discourse. Reiss traces the emergence of the analytico-referential discourse of modernity and describes its effect on Western thought and reference. In this way, his analysis reveals the underlying assumptions rational discourse conventionalizes.

Quoting Micea Eliade, Reiss (1982) continues the analysis. He states: "For almost two centuries, the European mind has put forward an unprecedented effort to explain the world, so as to conquer and transform it" (p. 21). This passage frames the repercussions of modern discourse. To Reiss, the development of a single discursive class (a kind of discursive logic), its eventual usurpation of authority, and the purposive epistemology it influenced, explains how Western social and cultural systems theorized then legitimized their desire to dominate the world.

Reiss uses literary sources to trace the discursive authority and functional domination that Western scientific modes of thinking imposed on scholarship and lived reality. Gradually and subtly—Reiss places the transition in
discursive practices as occurring during the Renaissance—empirical methods gained authority and became the only way to describe "objective" knowledge of the world and the "real" order of things. As such, analytico-referential discourse assumed the status of epistemology and ontology.

Reiss' argument, while clearly delineating the consequences of modernity's analytico-referential discourse and the structural influences it exerts on today's social and cultural systems, proposes that a new class of discourse is now accessible. This mode allows for multiple discursive practices. His suggestions for transforming discursive practices are germane to this inquiry. Recognizing the "fallible limits of all discourse" (p. 180), Reiss recommends replacing the "stasis of true/false dichotomy with a continuous process of the production of sense" (p. 381).

Reiss maintains that the new discursive mode will "involve the movement of what one might call a progressive communicational network" (p. 382). The role of deconstruction is useful in this process but, according to Reiss, it should be balanced by movement beyond deconstructive practices. This move requires an understanding of complexity. He maintains:

What is in question . . . is not a specific analysis or a specific proposition, but a particular order of conceptualization, a particular way of ascribing meaningfulness to human relations, and a particular way in which, in turn, those relations produce
meaningfulness. What is also in question, of course, is a new order of society. (p. 385)

Following upon the above, the purpose of this chapter will be to suggest that before the question of a new order of society can be addressed, the pathologies of contemporary societal structures need to be critiqued. The societal dicta that create divisionary mechanisms are the concerns of this chapter. This chapter submits that cosmology and curriculum, understood as inclusive movements, can provide a radical critique of the present and a vision for the future.

Narrative

In the far northern reaches of a Minnesota forest, a tiny, pristine lake, Itasca, marks the beginning of the mighty Mississippi River. As this small, clear stream flows south, its surging water rushes through land touched and scarred by the ancient rhythms of earth and water. Heavy with the earth's sediment, the beginnings of a mighty river meander through rolling hills, high cliffs, and fields verdant with crops. Its path, charted and controlled by the Army Corps of Engineers, covers a distance of 2,344 miles as it loops and curls through locks and dams, towns and wildernesses.

Its story is never the same, always novel; its song resonates with both dissonance and harmony; its beat tatoos
a rhythmic variance as old as its millennium's course. The river sings the music of the land and people, and its waters hold the deep, elusive memories of past ages. The capricious complexities of its course embody the passage of time, the processes of change, and the variations of unbroken progress (unfoldment).

Through the lush land of Louisiana, a smaller, quieter stream, the Atchafalaya, flows. Its river bed is deeper and swifter than the Mississippi, and, at a junction called Old River, water from the mighty Mississippi escapes into this smaller, quieter stream. At this same connection, the waters of the Red River surge into the muddy, swirling waters of the Mississippi. Over a period of years, the smaller, quieter river, the Atchafalaya, lured more and more water from the Mississippi into its swifter running currents. Eventually the waters of the Red River also flowed into its riverbed. Slowly, the power and flow of the Atchafalaya increased. Flowing south and west through the grassy foliage of southern Louisiana's swamp land, the Atchafalaya patiently waited "like a big alligator in a low slough, with time on its side, waiting—waiting" (McPhee, 1989, p. 24) to capture the third largest river in the world. This time its prey was the mighty Mississippi and the rhythms of nature and time were on its side.

Two rivers--the first one, the Mississippi, is millennium's maverick. Its natural history is to jump
channels, move riverbeds, and change courses always searching for the shortest route, the steepest gradient to open waters. Each time it has searched, the river created a shorter outlet to the gulf. By this, its natural cycle, the Mississippi shaped the ever-changing landscape of Louisiana; it channeled the Bayou Teche and spawned the Bayou Lafourche. Today, its pursuit is the steeper, deeper bed of the Atchafalaya's stream. This choice is as natural to its evolution as the passage of time, the unfolding of process, and the dynamics of change.

The other, the Atchafalaya, is classified as humankind's foe. Its natural story is to capture the other river and, in so doing, create again the endless cycle of changing landscapes. That is, after all, nature's way.

Man's way, vis-a-vis, The Army Corps of Engineers, decrees differently. They control nature and pit the technology of human beings against the river, reversing nature's rhythm through a system of locks and gates, dams and walls. The Old River Control, humankind's iron girded sentinel, monitors and governs the flow of water between the Mississippi and the Atchafalaya, thus forcing the Mississippi to remain in its old channel and preventing its synchronized capture by the Atchafalaya. Supervised by the Corps, this control mechanism maintains an ever-vigilant guard over the pounding, swirling waters of the Mississippi on one side of the dam and of the Atchafalaya on the other.
side. These heroes of modern technology safeguard the industrial and mercantile economy built along the Mississippi River from Baton Rouge to New Orleans. They protect people and property against floods and, judiciously and prudently, distribute the waters of the Mississippi into the swamplands of the Atchafalaya. As a system, it appears flawless, a remarkable effort of individuals, a stupendous governmental project—democracy at work, the liberal discourse of public authority in action. Its adversarial role mandates control and propagates dualism. At stake are the beings it proclaims to protect.

Modern society, in attempting to control nature, misuses the commons. In an essay entitled "The Tragedy of the Commons," Garrett Hardin (1968) demonstrates the fact that humanity's failure to acknowledge limits and its concern for the rights of the individual has interfered with the earth's functioning. The mistreatment of the earth is a failure to acknowledge that human beings are a part of nature and that nature will not be dominated by any one of its species. Quoting Hegel, Hardin states, "Freedom is the recognition of necessity" (p. 60). Humankind's freedom must be governed, according to Hardin, by the "freedom of necessity" (p. 60). Such freedom recognizes limits, acknowledges the need for restraints, and nurtures other modes of action. The question for contemporary society is: How can humanity's social and cultural ecology ensure a
sustainable future— one that provides for the survival of human beings?

Societal Ecology: Historical Overview

The ecology of contemporary Western society is rooted in the scientific axioms of Galileo and Newton (Capra, 1975, 1982; Berry, 1980, 1985). These architects of sixteenth and seventeenth century science advanced a mechanistic cosmological model based on the earth as a physical-material entity (Munitz, 1986). Their scientific cosmology sets forth a mechanical system of the universe in convincing terms. Based on ordered, rational processes, this model systematized human activity. Gradually, this world view, utilizing principles of mathematics and instruments of mechanical measurements, gained authority, while the organic view of life was undermined. Similarly, awareness of the connective patterns linking all living and nonliving beings was silenced (Merchant, 1980; Berry, 1987; Berry and Swimme, 1990; Sidwell, 1990). Empiricism began to dominate consciousness and discourse, and its tenets started to function as part of humanity's taken-for-granted cultural assumptions (Bowers, 1984, p. 6).

Correspondingly, the philosophical system that Rene Descartes devised explained nature in mathematical terms. Descartes' belief in the certainty of scientific knowledge
became the foundation of a philosophical system that valued only the cognito. In this system, physical phenomena were reduced to mathematical relationships, and thought was understood as moving from isolated parts to logical wholes. In devaluing the physical-material world, the mental world became the only source of worth. The deleterious effects of Descartes' system were wrought through its method of separating modes of thinking about the world and acting within the world. Descartes' philosophical speculation, while it presented a cohesive, intelligible picture, nevertheless fragmented thought.

Imperceptibly, the primary aim of scientific inquiry became the penetration of nature's secrets, the promotion of objective understanding, and the achievement of purposive control. In a similar vein, philosophical questioning speculated about the cosmos in objective terms. Both philosophy and science theorized about the world independently of history or human experience. The error of this divisionary method lies in what Munitz (1986) observes:

The universe is what the cosmological model says it is. At a given stage of the inquiry, the intelligible universe is that which is described by a particular cosmological model. . . . As a result, the universe as understood is always a conceptually bound universe. Though relative to its origins in the creative power of human imagination, thought, and language, the truth of a cosmological model is a matter of pragmatic justification, not of correspondence with antecedent fact. The testing and evaluation of the relative merits and weaknesses of competing models take place
by appealing to commonly adopted scientific criteria of adequacy. (p. 62)

As new scientific and philosophic spirit gained prominence, it elaborated a vision that influenced cultural world views (Berry, 1988). Francis Bacon evolved a model of society that ordered the social cosmos. Bacon's social ecology, envisioning a "mechanistic utopia" (Merchant, 1980, p. 185), formulated a social philosophy advocating the control of nature for human benefit (p. 164). According to Merchant and Berry, Bacon's historical vision advocated attitudes seeking to control nature, to order earthly concerns, and eventually, with the advent of technology and the Industrial Revolution, to promote doctrines of continual progress.

Political systems also underwent profound changes during this time. John Locke's elaboration of a political philosophy, advancing the establishment of constitutional governments, was central to these changes. Fritjof Capra (1982), in The Turning Point: Science, Society And The Rising Culture, explains how Locke, utilizing the reductionistic principles of science developed an atomistic view of society, describing it in terms of its basic building block, the human being. . . . Thus he proceeded to study first the nature of the individual human being, and then tried to apply the principles of human nature to economic and political problems. (pp. 68-69)

Locke's theory undergirds the basic principles of liberal governments which are instituted on principles of
democratic control, public authority, and the public sector (Chubb and Moe, 1990). Also, Locke's principles paved the way for what C. A. Bowers (1987), in Elements of a Post-Liberal Theory of Education, refers to as the underlying assumptions of liberal practice. Bowers elaborates these as:

Change is inherently progressive, that the individual is the basic social unit within which we locate the source of freedom and rationality, that the nature of the individual is to be understood as either inherently good or amenable to being shaped by the environment, and that rationality is the real basis of authority for regulating the affairs of daily life. (p. 2)

It is apparent that the scientific, philosophic, and political thought of the sixteenth and seventeenth centuries gradually structured a cultural ecology that reified dualism, epistemologies of control, and liberal practices. These world views, fashioned three hundred years ago, still model humanity's response to the micro/macro cosmos.

Today, humanity finds itself in a crisis which threatens the entire global community. This crisis reflects humankind's controlling presence on earth.

Societal Ecology: Contextualized

According to the Worldwatch Institute (1988) report on "Progress Toward a Sustainable Society," human society is not only diminishing the future prospect of planet Earth
but is also causing the deterioration of the earth's life systems. The inability of humankind to achieve a sustainable society is caused by a series of interlocking issues: environmental degradation, global economic decline, and social disintegration. Lester R. Brown and Edward C. Wolf (1988), in an essay entitled "A Sustainable Society: The Challenges for World Leadership," speak of the "crisis of governance," caused by the discontinuities in domestic economic policies, national interests, environmental concerns, and international systems (p. 9). C. A. Bowers (1984), in The Promise Of Theory: Education And The Politics of Cultural Change, refers to the relativizing of traditional forms of culture as the "crisis of authority" (p. vii). Berry (1988) discloses a "crisis of human-earth relations" when the "present story is inadequate to meet the survival demands of a present situation" (p. xi).

These thinkers suggest that such a crisis situation can support a tenable opportunity. Descriptions of contemporary disruptive societal ecologies intimate a move from danger to opportunity. A relational perception validates a non-oppositional frame where the movement of both danger and opportunity spiral each other, contextually and interiorly. Then, dialogue and action can balance and transform events.
The World Commission On Environment And Development (1987), in its document *Our Common Future*, states "The Earth is one but the world is not. We all depend on one biosphere for sustaining our lives. Yet each community, each country, strives for survival and prosperity with little regard for its impact on others" (p. 27). Contemporary problems facing the earth community as delineated by the World Commission On Environment And Development (WCED) are: poverty, economics, growth, and survival (pp. 29-37). These crises occur when the political and economic structures of individual nation-states intervene destructively in nature, considering only territorial survival, security, and progress.

Survival through control and power are myths that dominate governmental structures. This "crisis in governance" exists because nation-states are indifferent to the needs of a sustainable international community, and individual governments promote only the welfare of their country. The devastation of Chernobyl is one such example. This nuclear reactor site sent nuclear fallout across several continents, increasing the risks of future cancers (1987, p. 3). The threat of wars waged for the redistribution of the earth's goods increases as population, poverty, and maldistribution grows steadily worse (Harman, 1988, p. 9).
The massive misuse of the land and people by multinational corporations has become standard management procedure. One such case, as noted by WCED (1987), is the leak from a pesticide factory in Bhopal, India which killed more than 2 thousand people and blinded and injured 200 thousand more (p. 3). This is the inequity of first/third world politics. Business conglomerates manufacture controversial products in less than ideal situations and with little or no accountability.

The opportunity presenting itself, according to the WCED, is for the international community to become responsible to the entire earth community. This requires international cooperation not based on a single blueprint but rather on a complexity of economic, social, and ecological issues within nation-states. When this complexity is understood and nation-states realize that responsible patterns must be implemented, then the contradictory metaphors of liberal discourse can be reenvisioned. What is proposed here is the necessity to deconstruct while simultaneously reenvisioning analytico-referential language structures. The insights of Reiss on discourse are apropos to this context.

Reiss (1982) suggests that an unfamiliar type of discourse is presently emerging. This discourse subverts the accepted order of cause-effect in much the same way as the introduction of quantum mechanics disrupted classical
physics. By introducing complexity into unexamined metaphors, new discursive patterns can be encouraged. Reiss calls this movement a "progressive communicational network where fixity, discrete denoted objects of knowledge, analytical knowledge itself, discursive transparency, objective grasp, absence of the 'subject' would all be strangers" (p. 382).

An example will clarify the preceding ideas. Joan Scott (1988), in an essay "Deconstruction Equality-Versus-Difference: Or, the Uses of Post-structuralist Theory for Feminism," examines equality and difference in their dualistic and liberal contexts. She maintains that equality does not exclude difference. Rather, equality "rests on differences—differences that confound, disrupt, and render ambiguous the meaning of any fixed binary opposition" (p. 48). This is the deconstructive move of which Reiss speaks. But it is, simultaneously, a move toward the unbroken wholeness to which Bohm (1980) refers.

When meaning is made ambiguous, the security of fixed meaning is negotiated and new understandings erupt. Ambivalence explodes the meanings of the symbolic referent and transforms the way a person understands symbolic relationship. This is a significant move—the opportunity. As this process continues, new understandings of difference and equality can be seen. Then, the inclusiveness of differentiation, community, interdependence,
bioregionalism, tradition, and subjectivity (Berry, 1988) within equality can break through as changes in language create (and are created by) cultural change.

To Patricia Mische (1988), in "Toward a New Cosmology for Peace Education: THE EARTH AS PEACE TEACHER," today's crisis concerns humanity's non-peace with its psyche. This problem is reflected not only in the physical disintegration of the earth but also in the war being waged inwardly when individual and collective non-peace creates dualistic relationships between humans-earth, matter-mind, self-other (p. 1). These modes of thinking and acting support separation from, or domination of, one of the terms of the dualism (Swimme, 1983; Haught, 1984; Mische, 1988).

Structural dualism asserts that a person can be an objective observer of reality; that a person can "divorce . . . the scientific subject's mind from the object being examined . . ." (Haught, 1984, p. 35). Is it this estrangement from oneself and other that creates non-peace? Haught asserts that this is an "epistemological dualism of mind over against matter" and this materialistic view of reality "seems to be incoherent" (p. 36).

In the change from crisis to opportunity, seeking peace with the earth becomes a requisite. Mische's recommendation for a sustainable peace, in concert with Haught's analysis, utilizes a cosmology of peace envisioned by Berry (1978a, 1988) and provides the needed vision to
transform danger into opportunity. This cosmology, as outlined by Mische, recognizes: (a) the complexification and differentiation processes present in the earth; (b) the inner, non-material, intelligible dimension of the earth from its beginning; (c) the communion of each component of the universe with every other element of the universe; that is, the process of maintaining one's own identity while being connected and interdependent with the other parts; (d) the vision of the earth as indivisible, so that any sustainable proposal must be inclusive of the entire earth community; (e) the creativity and conflict resolution capacity of earth processes since the earth's first creative impulse; (f) the strategies of discovery, change, and transformation that lie hidden within the earth processes; (g) the paradox of the earth's creativity as expressed in both certitude and surprise; and (h) the increased role of the human in surmounting ideologies of control and domination and transcending national agendas (pp. 10-13).

The common thread linking the perspectives of Haught and Mische is the necessity for reconceptualizing humanity's function in the cosmos. This is the Pax Gaia spoken of by Mische. She says, "In seeking a way out of the present death processes toward peace with the Earth and peace among ourselves, the Earth itself will be our best teacher" (p. 10). This theme is advanced by Berry.
Berry (1988) examines humanity's mode of presence to the earth through the "traditions of Western historical interpretations" (p. xii). His narrative discloses past and present Western traditions which authorize humanity's destructive attitude toward the earth. For Berry, modernity's actions are suspect in that they are governed by the ethos of exploitation. Civilization, dominated by the myth of progress for the last three hundred years, has created an assault on nature that has attained global proportions. It has so escalated human antagonisms that the interests of security have aligned nations into opposing camps--North-South, East-West, poor-wealthy, developed-undeveloped. Such hostility has created an unprecedented devastation of the earth. Structured along economic lines, this exploitation creates macroproblems so complex that human survival itself is in doubt--the crisis of human-earth relations. According to Berry, problems occur when social and cultural systems develop "a nonviable mode of the human . . . [and foster] the industrial plundering of the planet as part of the progress myth" (pp. 160-161).

Both Stafford and Bowers concur with Berry's assessment. Stafford (1981) speaks of how societies validate the models that govern their social cosmos. In this process, the intersections of historical narrative, socialization, language, and cultural organization are crucial. Bowers (1987) examines the metaphors used to frame
liberal thought. These metaphors (equality, emancipation, efficiency, freedom, self-realization, critical consciousness, and predictive control), he asserts "provide the moral vision of social regeneration" (p. 1), but contain unstated assumptions presumed to be on the "side of truth and progress" (p. 8). Liberal principles are immutable in that they emphasize empowerment through individual rationality and emancipation. Never questioned are the inadequacies of "connecting the idea of rationality with the notion of self-direction." Never interrogated are "liberal views of education [that] make morality, commitment to communal goals, and the authority of tradition contingent upon the judgment of the individual" (p. 49). Liberal metaphors tend to silence other worldviews by universalizing "a shared set of liberal assumptions about the nature of reality" (p. 1). Thus, new paradigms are impeded by the "language of liberal ideology which sustains a particular view of the social world (including its possibilities) while impeding alternate ways of understanding" (p. 8).

The modern tendency is to conceptualize issues in dichotomized terms, framed within a liberal discourse. They should, however, be contextualized together. When conceptualized together, the dichotomized relationships (human/earth) are replaced by what Stafford (1981) refers to as a dialectical and dialogical interplay (pp. 295-296).
This integrative interplay creates new relational wholes. It also transforms both the linguistic-cultural structures and the cosmology that informs them.

The radical paradigm Berry (1988) suggests accomplishes the above linguistic-cultural transformation. It restores a balanced interplay in human-earth relations and creates opportunity out of danger through an unbroken wholeness. It proposes industrial management in concert with earth management and earth technologies in place of human technologies. This change requires a reassessment of all societal institutions and a future vision that focuses not simply on questions "of physical survival but of survival in a human mode of being" (p. 37). This mode of harmony with the earth will initiate an age in which human activities will become integral with earth functioning. Then modernity's "grandeur" (p. 159) can transform consciousness and evolve a vision for a sustainable future.

The activities and guiding principles of The Green Political Party model this vision of human-earth harmony and energize the movement of opportunity out of danger. According to Charlene Spretnak (1986a), in The Spiritual Dimensions Of Green Politics, "The core concepts of Green politics are sustainability and interrelatedness" (p. 22). As such, the social and political ideas of the Greens initiate a new perspective in earth relations, in governance structures, and in understanding cultural
authority. These beliefs call for a complete change in modernity's social relations and the world views they reflect--a new discursive patterning. This reenvisioning becomes possible not only through the Green political structure but also in its attempt to re-form the values of modern liberal processes.

Charlene Spretnak and Fritjof Capra (1986b), in Green Politics: The Global Promise, outline the four basic tenets of the Green Party. They are: ecology, social responsibility, grassroots democracy, and nonviolence (pp. 30-49). The deep ecology of the Green Party, defined as "the study of nature's web of interrelated processes and the application of that study to our interactions with nature and among ourselves" (p. 30), is not to be confused with environmentalism which can perpetuate an objectifying (dualistic) stance toward nature as a resource. The Green's emphasis on study and action is central to their deep ecology. This process permits issues to surface, dialogue to occur, and ongoing changes in policy and practice to unfold.

Social justice for the entire earth community describes the social responsibility which is the second tenet of the program of the Greens. This principle has as its primary consideration the restructuring of economic and consumer practices in accordance with sound ecological imperatives. Key to understanding social responsibility is
the tension created by what is considered two opposing concepts—economics and ecology—and the necessity to guarantee ecologically sustainable employment for the working class and the poor.

The third component in Green Politics, grassroots democracy, provides for a participatory, decentralized, direct governance that locates power and control within the local groups.

Personal and structural nonviolence under-girds the fourth principle of the Green Party. Advocating the use of nonviolence in all resistance, the Greens recommend relationships of balance and respect toward all living and nonliving entities.

Let it be said, the Green Party is not Utopian. Debates on policy and differences on practical initiatives are constant. It is this very process, however, that makes the movement hopeful. The Green movement has raised not only "green" consciousness, but also has rendered suspect liberal discourse on equality, autonomy, individual rationality, and unending progress.

Focused solely on the human community, liberal metaphors inhibit an understanding of the relationship of the human community to the entire ecosystem. Green Politics has provided a workable forum and structure for reenvisioning liberal democratic assumptions and the mandates of hierarchial control.
Educational Ecology

The ecology of education should be intertwined with the ecology of societal structures. In the previous section, modernity's exploitation of the earth was delineated through an analysis of societal structures. Schools, as infrastructures of society, reflect society's sense of ecology. Therefore, the crises existing in contemporary societal structures are present in educational institutions.

John E. Chubb and Terry M. Moe (1990), in their book *Politics, Markets, and America's Schools*, address one facet of the crisis in education—the inadequacies of the school as an institution, as a bureaucracy. This recent research shows that representative democratic processes in institutional settings do not work. Chubb and Moe's quantitative study examined five hundred schools and interviewed over twenty thousand parents, teachers, and students. In the sampling, teachers, students, and parents from disparate districts, different parts of the country, and varied socio-economic and racial/ethnic backgrounds were interviewed. The conclusions of the study affirm that America's public schools are not educationally functional.

Both scholars assert that a shift from the institutional paradigm dominating the public school is needed. They state:
The specific kinds of democratic institutions by which American public education has been governed for the last half century appear to be incompatible with effective schooling. . . . The problem of poor performance is just a normal, enduring part of the political landscape as school boards and superintendents are. It is one of the prices Americans pay for choosing to exercise direct democratic control over their schools. (p. 2)

The institutional paradigm, according to Chubb and Moe, remains unquestioned because it is primarily a political and social issue. Politically, the needed reform is never seriously considered because the bureaucracy, the people who have a vested interest in its maintenance, control it. Socially, the school's image is shaped by social scientists who focus on "scientifically legitimated issues" (p. 12). These experts concentrate on the microcosmic issues of scientific and technological societies and never analyze macrocosmic issues.

For the purpose of this chapter, the value of Chubb and Moe's book lies, first, in its critique of the institutional structure of schools and, second, in their recommendations for change. The authors confront the inherent limitations of schools modeled on representative democratic control. The quantitative nature of the study reveals how bureaucracy dominates schools, limiting their effectiveness. The authors state:

Bureaucracy vitiates the most basic requirements of effective organization. It imposes goals, structures, and requirements that tell principals and teachers what to do and how to do it—denying them the discretion they need to exercise their expertise and
professional judgment and denying them the flexibility they need to develop and operate as teams. (p. 187)

The findings of Chubb and Moe analyze the bureaucratic structure of the school. Schools' functional methods isolate learning from the world, from experience, and from context. They control not only access to knowledge but also the validation of particular kinds of knowledge. Knowledge acquisition is mechanical, scientific, and atomized. This divisionary structure has so penetrated Western consciousness that Bowers (1984) refers to it as part of humanity's "recipe knowledge and taken-for-granted cultural beliefs" (p. 6).

Ted Aoki (1988), in "Toward a Dialectic Between the Conceptual World and the Lived World: Transcending Instrumentalism in Curriculum Orientation," refers to this bureaucratic modern experience in terms of "instrumentalism." The exploitation of others, according to Aoki, can become a way of life, separating persons from the world, subjects from objects, and humanity from its lived experience.

Donald W. Oliver with Kathleen Waldron Gershman (1989), in Education, Modernity and Fractured Meaning: Toward a Process Theory of Teaching and Learning, observe that contemporary education is detached from experience. To these scholars, educational institutions have become a separate and specific facet of culture, whose specialized function is to produce a product.
William Doll (1988), in "Curriculum Beyond Stability: Schon, Prigogne, Piaget," identifies the modernist curriculum design as linear, preset, mechanistic, atomistic, and detached. Curriculum is based on universal and unchanging principles and honors only one way of knowing. As such, it does not address multiple learning styles or the complexities inherent in evolving structures.

Indeed, bureaucratic models of education are dominated by curricular strategies based on rational and technical knowledge. The scientific ideas of management and control—the historical heritage of the scientific and social revolutions of the sixteenth and seventeenth centuries—are now the norms. Giroux, Penna, and Pinar (1981), in the introductory essay in Curriculum and Instruction, assert that the curriculum field in the United States "began in administrative convenience: professional responsibility for curricular matters" (p. 2). As such, the field was dominated by administrative perceptions of time and task management. Similar to the efficiency models of industrial and corporate management, the discipline was grounded in principles of efficiency, control, and prediction. Curriculum approaches, too, reflected this intent, in that conceptual structures were theorized around principles that reveal their underlying purpose (Giroux et al., 1981, p. 13).
Giroux, Penna, and Pinar identify the traditional and conceptual-empirical approaches as two perspectives which regulated the rationale of most schools and have well-defined theoretical intent.

The traditionalist perspective evolved from the curriculum ideas of Franklin Bobbitt, Ralph Tyler, Hilda Taba, and others. This curriculum design was structured around practical problems of curriculum development, implementation, and evaluation. According to Giroux, Penna, and Pinar (1981), traditionalist curriculum is problem and solution centered and "in this sense . . . [its] theory guides practice as it anticipates and attempts to control it" (p. 4). The traditionalist design grew out of what Barry M. Franklin (1986), in Building The American Community, refers to as the development of the socially productive individual (p. 86). Its functional aim was to fashion socially proficient workers who were well-prepared to assume their role as citizens in the American society (p. 106).

The conceptual-empirical curriculum model, on the other hand, was a response to societal changes and dissatisfaction with traditional curriculum. With the emergence of scientific technology and the concomitant need for mathematical knowledge, this approach evolved a design that supported scientific modes of inquiry and analysis. Modeling its methodology on empirical processes, its
primary focus was objective, factual knowledge. Prediction, control, and certainty were the desired outcomes. Following a system of analysis that originated three hundred years ago, the conceptual-empirical method operated within law-like propositions that were empirically testable and absolutely certain. The use of natural sciences provided a conceptual and technical framework that could map and evaluate knowledge through objective and logical evidence.

Both the traditionalist and the conceptual-empirical curriculum centered learning on the abstract, rote, and conceptual. Knowledge acquisition was a controlled and ordered amassing of simple data into abstract, complicated "wholes." Students advanced gradually and progressively, guided by an established curriculum and inflexible programs. Successful students accumulated more and more information (simple parts). Parts were abstracted into coherent wholes, and logical rationality was the mode. Individuals who mastered this system were designated academically skilled, gained access to specialized learning, and eventually qualified as experts in their field. Never questioned were the inadequacies of rational knowledge-based systems, devoid of connection, community, and a meaning-context, or the difference between knowledge as content and knowing as act.

A third approach in curriculum, the reconceptualist, is now recognized (Giroux, Penna, Pinar, 1981; Schubert,
According to Giroux, Penna, and Pinar (1981), this mode reconceptualizes "the major issues, concerns, and modes of educational inquiry that [provide] a focus for curriculum theory and practice" (p. 7). Its use of diverse intellectual traditions and its concern with political and social issues, empowers this approach, more than the aforementioned ones, to reenvision human-earth relations.

Pinar and Grumet (1976), in Toward a Poor Curriculum, maintain that the reconceptualist tends "to study not 'change in behavior' or 'decision making in the classroom,' but matters of temporality, transcendence, consciousness, and politics... The reconceptualist attempts to understand the nature of the educational experience" (pp. xii-xiii).

William H. Schubert (1986), in Curriculum: Perspectives, Paradigm, and Possibility, notes the diversity of scholarship this approach represents and the new and pluralistic orientation it characterizes. He acknowledges the mode of inquiry, which questions oppressive social and political structures and promotes alternatives to the natural sciences.

Scholars critical of reconceptualists, namely Ornstein and Hunkins (1988), maintain that reconceptualists "lack a model for developing and designing a curriculum" (p. 5). They also assert that reconceptualists are "generic
theorizers" (p. 293), who focus more on the consequences of curriculum than on its development or its diverse components, and who concentrate on the total educational environment instead of the individual elements of curricular design. They admit, however, that the reconceptualist perspective "rethinks, reconsiders, and reconceptualizes the curriculum" (p. 5).

Rethinking, reconsidering, and reconceptualizing provide a way to reenvision human-earth relations in education. These processes create the opportunity to understand, interpret, and apply out of the crises of dysfunctional education. This stratagem addresses not only external conditioning (as present curriculums do) but inner transformation as well. Hence, the shift integrates past (rethinking, as remembering) and present (reconsidering, as creating) understandings of life within a simultaneous play of new meanings (reconceptualizing), so that what is hidden unfolds through the apparent meaning (MacDonald, 1988a,b).

If this mode of theorizing curriculum can disclose the order and balance present in the imperfect and flexible principles of nature, then education can reflect the stability and resilience present in natural systems as well as the diversity. As a result, an integrative context between human-earth relations can be envisioned. Such a mode recognizes that balancing individual interest with the welfare of the whole is the design of natural systems. It
understands that a cooperative diversity is crucial to survival in natural systems. Cooperation implies working together—communicating; natural systems, in order to evolve, cooperate. Diversity suggests specialization—uniqueness; natural systems, in order to exist and develop, organize creatively around uniqueness.

Reconceptualizing curriculum within human-earth relations not only makes sense, it is one viable alternative humankind possesses for survival. Thomas Berry (1978b), in *The New Story*, notes: "A structure of knowledge can be established with its human significance from the physics of the universe . . . to an understanding of the entire range of human endeavor . . . to all those studies whereby [humanity] fulfills [its] role in the earth process" (p. 13). It is this mode of reconceptualization that cosmology and curriculum address.

In summary, Chapter 2 has revealed how modernity's relationship to the earth is rooted in the scientific, political, and social philosophies of the sixteenth and seventeenth centuries. The mechanistic and rationally controlling worldviews launched in these previous centuries govern humanity's destructive attitudes to the earth in this era. This perspective has so infiltrated humanity's consciousness and so affected our linguistic-cultural milieu that exploitative practices have become an ordinary part of humankind's schema.
Utilizing the scholarship of Chapter 1 (Stafford, 1981; Haught, 1984; Munitz, 1986), Chapter 2 has scrutinized contemporary societal and educational ecologies. Modernity's dualistic structures, its epistemology of control, its analytic-referential discourse, and its liberal discursive practices have been questioned. The method of interrogating modernity's pathology enabled a social ecology, based on human-earth relations, to emerge.

The function of critique in this chapter has centered on contemporary crises as both a danger and an opportunity for reconceptualizing human-earth relations. Thus, a new cosmology based on insights enfolded in the old cosmology is envisioned.
Notes to Chapter 2

1. The Chinese ideograph for crisis has two characters—one means danger and the other, opportunity. It is this related sense of crisis, as both danger and opportunity, that is suggested in the title.

2. The meaning of discourse given by Joan W. Scott (1988) in her essay, "Deconstructing Equality-Versus-Difference: Or, The Uses Of Poststructuralist Theory For Feminism," is applicable. Scott defines discourse as an "historically, socially, and institutionally specific structure of statements, terms, categories, and beliefs" (p. 35).

3. Reiss (1982) identifies the meaning of analytico-referential discourse as a discursive order whose fundamental scheme of functioning is through analysis and reference, and it is through this order that thought and action occur. He further asserts that the syntactic order of this discourse reflects "the logical ordering of 'reason' with the 'structural organization of a world" (p. 31) as external to both thought and action.


5. Lester R. Brown and Edward C. Wolf (1988) define a sustainable society as "one that satisfies its needs without diminishing the prospects of future generations" (p. 4).

6. These insights were facilitated by Bower's (1987) analysis, pages 8-12.

7. Although the focus here is on The Green Political Party, it should be noted that there are over 2,000 ecological groups. The activities and visions of each of these groups is important to the entire movement.

CHAPTER 3

Cosmology: Story, Change, and Interpretation

Rhythm. All is rhythm.
The rhythm of the sun and moon are the rhythms of life....
The cosmos is change.
Its structure is change.
A web of light that always changes.
Meditation is contact with the rhythms of the universe.
Return is the Tao's movement.
To travel far is to return.

(La musica de las esferas
Ernesto Cardenal)
Prologue

Chapter 2 explored the theme that crises in contemporary societal and educational structures are both a danger and an opportunity. Chapter 3 continues this inclusive mode of analysis by rethinking past cosmologies through a new interpretive frame. The purpose of this chapter is not, as Haught (1984) observes, to restore an uncritical, naive consciousness (p. 95)—the nostalgic return to the past. Rather, Chapter 3 proposes a remembering that is part of a creative interpretive process of reconsidering. These two modes of analysis (rethinking/reconsidering) reveal not only the complexity and diversity of cultural traditions but also the pre-rational commonality from which the very awareness of differentiation arises.¹

The reconceptualization initiated, therefore, is a hermeneutical reenvisioning of culture. First, cosmology as story, change, and interpretation is probed theoretically. Then, the aforementioned insights are contextualized by reconsidering the cosmology of mythopoesis (world as organism). Preliterate cultures have been investigated by interdisciplinary scholarship (Eliade, 1959, 1964; Mellaart, 1967, 1975; Ong, 1984; Eisler, 1987; Gimbutas, 1982, 1989). This provocative research provides an interpretive context that reenvisions past cosmologies. By
engaging the cosmologies of past and present cultures (in the theoretical way proposed), a new cosmology can emerge whose patterns embody the multiple enactments of human-earth relations.

Rethinking, reconsidering, and reenvisioning, when perceived as three different yet interrelated moves, affect each other in much the same way as gravity pulls one body towards another and also pulls a body inward on itself. In principle, therefore, as Paul Davies (1983) in The Edge of Infinity states, "Every body has within it the means of self-destruction," (p. 6) not only because of the cumulative effect of gravity but also because the "greater the quantity of matter the larger the inward pull becomes" (p. 7). Conversely, as the separation of the bodies increases, the strength of attraction lessens and the pull within the body itself reduces the net attraction. The cosmic challenge, therefore, is one of maintaining balance.² The interpretive design proposed in this chapter suggests such balanced human-earth relations.

Narrative

A story is told that after a lecture on cosmology and the structure of the solar system, William James was accosted by an old man who said, "Your theory that the sun is the center of the solar system, and that the earth is a
ball which rotates around it, has a very convincing ring to it, Mr. James, but it is wrong. I've got a better theory."

"And what is that, sir?" inquired James politely.

"That we live on a crust of earth which is on the back of a giant turtle," said the old man.

James replied, "If your theory is correct, Sir, what does this turtle stand on?"

Not to be easily dissuaded, the old man said, "You are a very clever man, Mr. James, and that's a very good question, but I have an answer even to that question. And my answer is this: the first turtle stands on the back of a second, far larger, turtle, who directly stands underneath him."

James persisted, "But what does this second turtle stand on?"

To this the little old man triumphantly replied, "It's no use, Mr. James--it's turtles all the way down."3

The issue, of course, is not simply a matter of turtles. Humankind's varied perceptions of the universe and the meanings that give life to these worldviews are part of the fabric of the world. How is it possible to weave the understandings of a world built on turtles with one centering on the sun? How is the process related to story, change, and interpretation? Is it possible that rethinking, reconsidering, and reconceptualizing through cosmology will
permit an interweave of textures that allow old stories to be enfolded within a new interpretative context?

Cosmology as Change and Interpretation

Rethinking, reconsidering, and reenvisioning, when thought of as integrative principles, are reminiscent of what Rosemary Radford Ruether (1990), in "The Message And The Movement," suggests. To Ruether, "All history is part of a hermeneutical circle that looks back and reinterprets the past from the context of one's own questions" (p. 37). Historical inquiry probes not only what is recorded but also what is absent. In the interpretive process, therefore, one enters into the worldview of another culture in order to show the evolution of a culture's cosmology.

This method of interpretation recognizes that change in the worldview of any culture is gradual, relational, and complex. Rarely is it a simple correlation. Rather, change is subtle. It interweaves images, projections, values, and normative restraints and transforms the tensions of multiple and conflicting worldviews under an emerging perspective that gradually assumes dominance. Reiss (1982) analyzed this tendency by tracing the almost imperceptible emergence of analytico-referential discursive practices in correlation with the evolvement of modernity's conceptual schemas.
Merchant (1980), also, describes the gradual and complex processes of social and cultural change by explaining how "historical change becomes ecological change, emphasizing human impact on the systems as a whole. Conversely, ecological change is the history of ecosystem maintenance and disruption" (p. 43). The ecosystem model Merchant outlines brings together the complex webs of relationships that mediate change; that is, humanity's connections to nature, use of technology and commerce, and the social and economic systems constructed. Utilizing these interrelated dynamics, Merchant convincingly demonstrates the change from an organic to a mechanistic worldview. This change was not a linear progression, but rather an interactive meshing of subtle and imperceptible movements in which change in one area impacted other areas, broadening and accelerating, until eventually the dominant assumptions of a culture's worldview were altered.

Nature as disorder (rather than nature as nurturing mother) gained dominance by the path outlined by Merchant. In gradual stages, the need to control nature became the authoritative societal metaphor. As a shift in the descriptive accounts of humankind's relation to the earth altered and advances in technology occurred, cultural values begin to reflect the new metaphor. Normative restraints governing human behavior also altered. If the earth was inanimate, a mechanistic entity, then
exploitation for the needs of humankind was justifiable. Restraints, grounded on a vision of earth as living organism, no longer applied.

Merchant is careful to note that the changes from an organic to a mechanistic worldview were gradual and subtle, but nonetheless, complete. She brings together the diversity of forces that mediate change and reinterprets the past through questions that clearly ground her position.

Such inquiry also reveals the existence of preunderstandings (in Hans-Georg Gadamer's terminology, prejudices) and the limited horizons that always exist in a worldview. Hermeneutic interpretation is imperative in this enterprise. It examines social and historical events (our being-in-the-world) out of which an awareness of difference arises. When such differences and preunderstandings are probed contextually, then the commonalities and the interdependence of all cultural traditions can be encountered.

David C. Hoy (1982) refers to this interpretive endeavor as a hermeneutic circle. In The Critical Circle, he states: "The circle generally describes how, in the process of understanding and interpretation, part and whole are related in a circular way" (p. vii). The empowering aspects of hermeneutical inquiry, as implied by Hoy, are: first, all understanding is governed by presuppositions;
second, understanding cannot exclude subjectivity; third, understanding is interpretive and historical; and fourth, understanding is mediated through language (pp. 4-5).

In the hermeneutic process, the circular way of coming into understanding incorporates personal experience of being-in-the-world. Berry (1988) refers to three principles of universe (hence human) functioning: subjectivity, differentiation, and communion. These three principles embody the essential ways of being-in-the-world. The sense of subjectivity, according to Berry, is not only

the articulation of individual reality so absolute in reference to otherness, this identity carries with it an interior depth, a special quality, a mystery that expresses not only a phenomenal mode, but also an archetypal realization. This enables each articulation of the real to resonate with that numinous mystery that pervades all the world. This quality of things is universal, but its activation in the human order provides the creative dynamics of the thinker, the poet, the writer, the scientist, the farmer, the craftsman, the political leader, the trader, the educator, and whichever other role is fulfilled by human beings in the functioning of the universe. (p. 106)

The awareness of differentiation is also essential. This principle articulates, according to Berry, the "unique, identifiable, intelligible energy constellations, or patterns" (p. 106) observable in the universe; that is, the "overwhelming variety of manifestations" (p. 45) of being-in-the-world.

The communion of all beings-in-the-world is integral to the circle. The intimate presence of every reality in the universe to every other reality and the "fulfillment in
this mutual presence" (p. 106) explain this principle. A positive hermeneutic, as a mode of presence in the world, understands the "art of intimacy and distance, the capacity of all being to be totally present to each other while affirming and enhancing the difference and identities of each" (Berry, 1978b, p. 1).

By way of supplying an historical basis for utilizing the art of hermeneutics, Richard Palmer (1969) in *Hermeneutics: Interpretation Theory in Schleiermacker, Dilthey, Heidegger, and Gadamer* traces the origin of the word hermeneutics to its Greek roots meaning "the process of 'bringing to understanding,' especially as this process involves language, since language is the medium par excellence in the process" (p. 13). To Palmer, hermeneutic interpretation articulates a "human voice" and consequently, must somehow personify this dynamic. Richard J. Bernstein (1988), in *Beyond Objectivism and Relativism: Science, Hermeneutics, And Praxis*, clarifies this idea when he asserts that understanding pertains "to questions concerning what human beings are. . . . so if [humans] are to understand what it is to be human beings, [it is necessary] to understand understanding itself, in its rich, full, complex dimensions" (p. 113).

As a "complex and pervasive phenomenon" (Palmer, 1969, p. 9), hermeneutics, as the "event of understanding . . . and what understanding and interpretation, as such, are,"
(p. 8) suggests more than intellectual analysis. Palmer, addressing the depth of hermeneutic interpretation, considers three aspects of hermeneutic understanding and elaborates three directions for hermeneutical inquiry: to say, to explain, and to translate. While all three movements and their meanings are essential to the hermeneutical process as a whole, each comprises an autonomous and important context for interpretation. According to Palmer,

Interpretation . . . can refer to three different matters: an oral recitation, a reasonable, explanation, and a translation from another language. . . . Yet one may note that the foundational "Hermes process" is at work: in all three cases, something foreign, strange, separated in time, space, or experience is made familiar, present, comprehensible; something requiring representation, explanation, or translation is somehow "brought to understanding"—is "interpreted." (p. 14)

The first direction of hermeneutics is the "saying." This is the "primordial expressiveness" of an oral proclamation which is not present in a written text. Oral interpretation reflects the paradox of understanding. One must understand in advance what is narrated. And yet it is the narration itself that is the process of coming into understanding. "Primordial expressiveness" is an account of an event through an interpretive verbalization. Ong (1982) contends that spoken words engage the body in "natural and even inevitable" (p. 67) activity. As interpretation, "primordial expressiveness" creates, as Palmer (1969)
writes, the "circle of contextual meaning" (p. 17), where meaning and sound interact and create understanding.

Ong (1982) clarifies the interpenetration of personal experience, meaning, and historicity when he notes the dynamics of sound. He states:

Sound exists only when it is going out of existence. It is not simply perishable but essentially evanescent, and it is sensed as evanescent. . . . There is no way to stop sound and have sound. . . . In this sense, all sound, and especially oral utterance, which comes from inside living organisms, is dynamic. (p. 32)

That is why, in the context of literature, every reading should be an oral rendition of the text. Ong states, "oral discourse has commonly been thought of . . . as weaving or stitching . . . to 'rhapsodize,' basically means in Greek 'to stitch things together'" (p. 13). When a work becomes an event, a happening through oral presentation, then the analytical dimensions of understanding are initiated, and a personal response, both rational and speculative, is opened.

When context, the personal, and meaning interact with the horizon of the phenomenon, the hermeneutic of explanation, in its discursive mode, is energized. Explanation permits a creation of being-in-the-world and implies a pre-understanding of both situation and subject. This stance brings to light the presuppositions that constitute each person's historicity. It exhibits, according to Heidegger (1962), in Being and Time, the
nature of being-in-the-world, based on temporality and historicity. In this process, human consciousness in its search for a meaningful reality is addressed, and the quest for truth becomes an historical discernment—a present activity that extends into the past but also opens up to future possibilities.

Hermeneutic understanding mediates between worlds. Recognizing not only the contrasting worlds of time, space, and language but also the history each individual brings to any encounter of understanding and interpretation, hermeneutics attempts to integrate, what Palmer (1969) refers to as translation. Translation makes the human "conscious of the clash of [their] own world of understanding" (p. 30) with the historical and linguistic worlds. As such, the process is always uncertain, interweaving interpretation with a creativity of response to being-in-the-world.

The dialectical and dialogical relationship manifested by Tao's cosmic principles of Yin and Yang, whose perspective of complementarity explains the rhythmic processes constituting the natural world, the workings of self and mutual transformation, and the complexity of space-time, person-thing relationality, is similar to the dialectic of hermeneutic interpretation. According to Bernstein (1988), both modes seek to "convince us by the overall plausibility of the interpretation" (p. 184).
Adrienne Rich (1979), in her essay, "Vesuvius at Home: The Power of Emily Dickinson" and Patrocinio P. Schweickart's (1986) essay "Reading Ourselves: Toward a Feminist Theory of Reading," seek to recover imaginatively, experientially, and historically the reality that framed Emily Dickinson's life. This positive method of discernment actively pursues understanding and interpretation through involvement. Tension exists in this endeavor. Rich must acknowledge her own context, but still enter into Emily Dickinson's life in such a way as, Palmer (1969) states, to "grasp (and be grasped by) the human significance of [her] action" and in such a way that the "metaphysics (definition of reality) and ontology (character of being-in-the-world) . . . are foundational to an interpretation which makes a meaningful understanding possible" (p. 30).

In the very beginning of the essay, Rich describes her journey to reclaim Dickinson. This technique is firmly placed in the now. Rich descriptively portrays the modern world of McDonalds and superhighways, aware that her journey is her attempt to identify, as subject, with the poet. This strategy, according to Schweickart, allows Rich to enter the subjectivity of the absent poet, hear her voice, and attempt to understand her and her past tradition.
Further, Rich aligns herself with Emily Dickinson, overturning the perception that Dickinson is merely an eccentric recluse. Rich is clearly on the poet's side. Schweickart (1986) refers to Rich's affinity with Dickinson as speaking juridically; that is, speaking "as a witness in defense of the woman writer" (p. 46). This is the process of uniting with the voices of past cultures.

Finally, Rich connects to the historical Dickinson, the woman who lived in Amherst, communicated with numerous people, and chose how she was going to live. Schweickart identifies this positive hermeneutic as naming the social, cultural, and historical realities of the person.

Reflecting on the realness of cultural traditions is primary to the hermeneutic undertaking. As an interpretive stratagem, historical and cultural inquiry acknowledge a correlation between, in Berry's (1988) words, "the grandeur and limitations, luminous and dark aspects, successes and failures" of cultural traditions. Similarly, interpretive understanding also recognizes that cultural "traditions must constantly go beyond any existing expression of themselves to new forms of expression" (p. 117). Stafford (1981) speaks to this interpretive move. He contends that cultural models of real persons can remind the human community of its "obviously inherent anthropocentricism; of [its] interdependence with, and creative appropriation of,
natural environs; and, of the comparative richness of cultural dynamics" (p. 3).

Brian Swimme (1988), in the "Foreword" of The Dream of the Earth, recognizes the need to reinvent, remodel, and rework the "visual, aural, intellectual, imaginative, emotional, and spiritual orientation" (p. viii) of humanity. Similar to the rethinking, reconsidering, and reconceptualization explored previously, Swimme's vision connects with Palmer's sense of the ongoing contextual dynamics of the hermeneutic process. To Palmer (1969), in order to enter into the interpretive process, it is necessary to "grasp (and be grasped by) the human significance of the action" (p. 30). For Swimme (1988), the "full reality of the Earth and Universe" and an awareness of "the universe as a developing reality" (p. viii) must create a new relational context of humanity to universe processes. The need for a new interpretive mode where the integration of mind and nature is seen as the formative cultural concept is paramount. In this struggle, cosmology is critical.

Cosmology as Story

Contemporary cosmological understandings need to focus on both the ancient oral origins and contemporary literate frameworks of cosmology. Such awareness (cosmology as a
spoken world and a speaking world) requires the intuitive grasp of similarity in dissimilarity. Accordingly, cosmology defies a solely cognitive interpretation. Its spirit resides in its imaginative capacity to unite what is seemingly incompatible and to create meanings through the processes of novelty and complexity.

To situate cosmology, therefore, as a solely empirical endeavor, examining the world in only its physical-material aspects, is inadequate. It would literalize both the word and the world. To speak of cosmology as descriptive of the world in its physical-material dimensions without including the mysterious and hidden psychic-spiritual reality as well is to dichotomize the world and its discourse. This, too, is inadequate.

What Haught (1984) refers to as the "narrative mode of consciousness" where mind and nature are integrated, and "subjectivity [acts of consciousness]" is seen as part of the "continuum of occurrences that constitute the world of nature" (p. 24), is apropos in this context. A hermeneutic understanding of cosmology, as the "narrative interpretation of nature," views as essential the role of story in both its creator-recipient function and in its cosmic dimension. In this way, story's movement creates meanings and deeply authenticates lived experience.

Berry refers to a functional cosmology, one that provides a larger context for human lives, and Haught sees
it as the meaning and teleological dimension of the universe. As the discourse of the world and a positive interpretive stratagem, cosmology integrates the story of all living and nonliving beings within the story of the universe's emergence, while humanity, as "that being in whom the universe attains reflexive consciousness of itself" (Berry, 1978a, p. 1), provides the narrative framework within its particular cultural system.

If the human is integral to the universe, then implicit in the telling of the human story is the narration of the universe story. An integral culture tells stories from the lived experiences of a people whose home is the cosmos. The story may change from culture to culture, from one millennium to the next, but the narratives display the worldviews each culture enacts and reflect the bonds each culture has to its cosmic origins. When the story, in its social and cultural dimensions, becomes dysfunctional, a "narrative mode of explanation" (Berry, 1988, p. 136), which integrates new ways of understanding being-in-the-world in concert with the earth, must be enacted.

A unifying story empowers the understanding of human existence as being-in-the-world; that is, as "being constituted by and engaged in interpretive understanding" (Bernstein, 1988, p. 137)⁴ This mode of presence, according to Hoy (1982), "opens up new dimensions of
thought and new lines of inquiry" (p. 49). It becomes a way of listening that hears differences, perceives commonalities, and recognizes interdependence, even as it balances response to beings. Cosmology, in its interpretive mode, is flawed if its perspective dichotomizes by an over-identification with either nature or human subjectivity. It is the complementarity of each being that must be envisioned, and the cosmic balance inherent in all entities must be remembered.

Caroline Richards (1990), in her essay "The Nature-Culture Dilemma: Deep Ecology Meets Liberation Theory," confronts the balancing of issues by analyzing the problems of social and ecological concerns. Her analysis of the theoretical construction of Arne Naess and Paulo Freire is pertinent to the present discussion in that her inquiry addresses the endless controversy of ecologist vs. liberationists. Both stances are accusational. The first accuses the second of non-concern for the earth, while the second asserts the lack of concern of the first for oppressed peoples of the earth. Richards notes the validity of both concerns. Utilizing the insights of Fredric Jameson, she moves the issues to an interpretive mode where the questions center on the possibility of creating diverse cultural codes.

According to Richards, contemporary cultural practices which cause "the objectification through commodification of
human and other being" (p. 12) can then be transformed into a new cultural vision. Richards' quoting of Fredric
Jameson provides further insight: "What is wanted, therefore, is a new relationship between global cultural style and the specificity and demands of a concrete local or national situation" (p. 11).

Berry (1988) frames the dilemma of contemporary society in terms of story. Cultures, he maintains, are between stories; they lack a functional narrative (p. 130) which provides "a context in which life could function in a meaningful manner" (p. 123). The question becomes: how can story, as a new mode of understanding, contextualize an ethos for all beings, including even the technological world? As such, it would recognize limits, appropriate traditions, and construct languages that mediate the existing tradition.

Martin Heidegger (1971), in Poetry, Language and Thought, speaks of ethos as an authentic openness for the Being of beings. In Heidegger's view, the alienation of contemporary peoples (their failure to experience Being authentically) results from their valuation of only some human pursuits and their exclusive concern with rationality as the foundation of all reality and truth (pp. 3-35).

of Being. Zimmerman contextualizes Heidegger's understanding as an ethos which experiences Being authentically (p. 108). Hence, an authentic ethos creates a profound respect and understanding for the Being of beings and initiates a novel attitude toward techne—the root word for technology (p. 108). To Zimmerman, an appropriate techne discloses physis (nature or Being) not as a "human product or possession, but instead . . . human life is an instance of physis, as such" (p. 109). Authentic techne, therefore, allows Being to become manifested in ways that are meaningful to the being itself, and, likewise, human techne empowers the emergence of being with the "least interference and the most cooperation" (p. 108).

According to Zimmerman, in its revelation of nature (physis), techne requires:

appropriate language, understood broadly as art, religion, myth, philosophy, and so on. The true work of art . . . cannot be defined merely as a human invention. Instead, the true work of art is what physis calls on us to make so that physis can reveal itself. True "technology," then, would not be machines to dominate nature, but instead ritual, poetry, religion, and art required to disclose most appropriately what beings are. (p. 109)

Consequently, when humanity "as the earth's consciousness of itself" (Berry, 1978b, p. 1) lives within the limits of being and recognizes human life as an "instance of nature" (Zimmerman, 1983, p. 104), then the development of techne can be in concert with the reality of being-in-the-world. Humanity can then function in harmony
with its responsibility as members of being-in-the-world and articulate this presence through appropriate techne.

The inquiries of the previous scholarship address the practical problems facing humankind today; that is, the movement of understanding not as the activity of a subject but rather as a happening, an event, a pathos contextualized within a larger framework of relations. Such a perception immerses cosmology in the changing world of cosmic and linguistic-cultural history.

An interpretive understanding of cosmology, therefore, needs to examine past cultures and their relationship to present ones so that futures may be envisioned. Such understanding can then create a techne that connects being-in-the-world through an awareness of the three principles of universe functioning which are applicable to being-in-the-world: singularity (individuality), differentiation (variation), and interdependence (communion). No-thing is itself alone; yet all things reflect a complex individual interiority while still manifesting diversity. It is this appreciation that connects the cosmology of past, present, and future.

Cosmology of Mythopoesis or World as Organism

Thousands of years ago, primitive peoples gazed at the sky, speculated about the cosmos and their place in the
universe, and narrated stories. These narratives reveal, according to the Frankforts (1946b) in "Myth and Reality," a complex and inventive cognitive orientation, a speculative wisdom unhampered by the scientific search for universal truth, as well as a sensed awareness of the complementarity of universe and human relations (p. 4).

Stafford (1981) refers to this cognitive orientation as Mythopoesis the myth-making cognitive structures of prehistoric cultures. He identifies this age as manifesting: a qualitative apprehension of space and time, a tribal-centered identity, a unity between subject-object, a personified and personalized understanding of cause-effect, and a relational context for signifier and signified (p. 28).

The cosmologies of organic peoples linked the cultural community with individual experience and within a cosmic, organic image. In Merchant's (1980) words, "The world we have lost was organic" (p. 1). To Berry (1988), this coupling is "the ancient awareness that we live in a universe—a single, if multiform energy event" (pp. 45-46).

For primitive societies, the cosmos was an organic unity, vital and alive, all parts held and bound together and people's presence to the universe disclosed as a non-dualistic mode of imminence. Merchant (1980) notes that sixteenth century peoples advanced, through metaphor and projection, an "organismic theory." This mode of "binding
together self, society, and the cosmos" was an attempt to reinstate an organic society. It "emphasized interdependence among the parts of the body, subordination of individual to communal purposes . . . and vital life permeating the cosmos to the lowliest stone" (p. 1). The organic world that sixteenth century people attempted to grasp hold of was, however, a thing of the past. Merchant suggests that societies where "human beings lived in daily, immediate, organic relation with the natural order for their sustenance" (p. 1) gradually disappeared as the mechanistic domination of nature gained ascendance.

What Merchant formalizes was, for primitive peoples, a reality. No conceptual or experiential separation existed between what the Frankfort's (1946b) refer to "as the realm of nature and the realm of [humans]" (p. 4). Neither was it possible to imagine or speak of a social and a cosmic world. The cosmic and social order were one. Thinking and acting existed within an ethos that disclosed the Being of all beings.

Primitive societies experienced this ethos as a mode of apprehending being. According to Merchant, the organic vision of primitive societies prevented the exploitation of the earth, for Earth was as much a living organism as was humanity. Ancient societies communicated this intimate relationship through the enactment of myths. Eliade rightly speaks of myth as a mode of being in the world, and his
assertion that mythic structures exhibit patterns, repetition, and a context wherein sacred events were enacted is also valid. Myths spoke a sacred history of true occurrences. The narratives coupled belief, provided guidance, and conferred wisdom. They also told, according to Eliade (1964) who quotes Malinowski, of a

primeval, greater, and more relevant reality, by which the present life, fates, and activities of [humankind] are determined, the knowledge of which supplies [the human] with the motive for ritual and moral actions, as well as with indications as to how to perform them. (p. 120)

Myth, as event, framed every aspect of life. Myth was, as Stafford (1981) observes, the "legitimating framework" for both the culture and the individual (p. 59). Through mythic reenactment, the sacred order of the cosmos became the sacred order of human relationships. Accordingly, primeval cosmologies were religious in the root sense of the term. Sahtouris (1989) grounds this understanding when she identifies the Latin root of re-ligio as meaning to reconnect. Hence, religion is a way of reconnecting "to our origins in nature or cosmos, within which [humans] were created and within which [they] continue their creation" (p. 11).

To Stafford and Eliade, mythic understanding was a reconnection in that a correspondence existed between every facet of life (experience, belief, and ritual) as part of an integral cosmos. The sacredness of life revealed the sacredness of the world order. The "eventness" of mythic
narratives provided an interpretive context for individual experience through the reenactment of sacred time distinct from profane time. To Eliade (1964), "Myths ... narrate not only the origin of the World, of animals, of plants, and of [humans], but also all the primordial events in consequence of which [humans] became what [they are] today" (p. 11). Events that took place in the beginning, in a primordial and non-temporal setting, were viewed as sacred time. Hence, mythic or sacred time was qualitatively different from profane time. In Eliade's (1961) words, this time was "the continuous and irreversible time of . . . everyday, de-sacralised existence" (p. 57). The retelling of the myth reactualized the sacred event. Through the narration, humanity recovered sacred mythic time. But even further, the mythic structure communicated culturally authorized values, purposes, and meanings.

According to the Frankforts (1946b), ancient peoples saw the human "always as part of society, and society as imbedded in nature and dependent upon cosmic forces" (p. 4). This ethos of the social cosmos used speculative thought to address the problems of origins and purpose, while it also provided an integrated organic schema through the "language of myth" (p. 9). Through the drama of dance, ritual, or oral presentation, myth portrayed a reciprocity based on humanity's very existence in the events of nature. The whole person (emotionally, imaginatively,
intellectually) experienced the event individually over and over again in its reenactment. The authority of the myth resided in its ability to transmit its imagery, as the Frankforts state, in "a carefully chosen cloak for abstract thought. The imagery is inseparable from thought. It represents the form in which experience has become conscious" (p. 7).

Oral expression and thought were reciprocal, dependent on the community of listeners whose presence and interaction not only contextualized but also stimulated thought. Languages in oral cultures were spoken, contextual, and communal and, as Ong (1982) suggests, connections between "rhythmic patterns, breathing, gesture, and bilateral symmetry of the body and thought itself" (p. 67) were essential to the oral communication. Ong, utilizing the scholarship of Malinowski, states: "Among 'primitive' (oral) peoples generally language is a mode of action and simply a countersign of thought" (p. 32).

Since a totally integrative relationship existed in primitive societies, cognitive modes modeled an "I-Thou" relationality. Thus, understanding any phenomenon was not an objectified "it," but rather, a "Thou." The Frankforts (1946b) summarize the primitive's relational views to the cosmos and to the community of which they were a part, when they state:

"Thou" reveals its individuality, its qualities, its will. "Thou" is not contemplated with intellectual
detachment; it is experienced as life confronting life, involving every faculty of [the human] in a reciprocal relationship. Thoughts, no less than acts and feelings, are subordinated to this experience. (p. 6)

The cosmology of early peoples portrays the world of nature and human beings as interactive. Ancient stories enacted this relational mode and provided a meaningful context for Being-in-the-world. According to the Frankforts, "To people in ancient times the phenomenal world was teeming with life; the thunderclap, the sudden shadow, the unknown and eerie clearing in the wood, all were living things" (p. 6). This view is in concert with Eliade (1964) who maintains that, in societies where myth is a living entity, "The World . . . is a living Cosmos, articulate and meaningful. In the last analysis, the world reveals itself as language. It speaks to [humankind] through its own mode of being, through its structures and its rhythms" (p. 141).

Heidegger (1971) speaks of the connection between physis, as self-blossoming emergence similar to the blossom bursting into bloom, and language (pp. 10-11). He asserts that "The ground of beings is Nature. The ground for [the human] is not only of a kind identical with that of plant or beast. The ground is the same for both" (p. 256).

Through language, humans encounter beings. According to Zimmerman (1983),

Human works—poets, religious, ritualistic, artists, philosophical, political—open up a world or clearing
as the overpowering order of physis. Only in such a clearing can beings appear and disappear as beings. Without rituals, myths, poetry, and art—that is, without language—there can be no human encounter with being as such. . . . Language as logos opens up a world in which physis manifests itself. And physis itself is governed by logos when logos is understood in its root sense as what gathers and assembles. (pp. 110-111)

Reinterpreting the Cosmology of Mythopoesis

Seeing history not as a definitive or universal statement of truth but as the ongoing story of human existence in the cosmos is necessary if the rethinking, reconsidering, and reconceptualizing of hermeneutic interpretation is to be actualized. Until recently, historical interpretation was limited to an analysis of literate societies. Contemporary archaeological and cultural historical scholarship, however, has traced the roots of organic modes of apprehending being as originating in preliterate paleolithic and neolithic societies. These are the primary oral communities Ong speaks of, where cosmology, as world plus discourse, spoke an unbroken wholeness which literate societies are only now beginning to acknowledge.

Riane Eisler (1987), in her book The Chalice & The Blade (1987), examines the cultures of paleolithic and neolithic peoples. These societies existed over twenty thousand years ago and were modeled, according to Eisler,
on equalitarian social relationships, where women and men revered the life-giving powers of the universe.

Eisler also explores "the STORY [emphasis added] of how the original partnership direction of Western culture veered off into a bloody five-thousand-year dominator detour" (p. xxiii). This historical narrative traces "the logical consequences of a dominator model of social organization at our level of technological development" (p. xxiii). Eisler's reinterpretable mode of analysis based on the recent scholarship of Mellaart (1967, 1975), Stone, (1976), Nash (1978), and Gimbutas (1982, 1989) clearly shows the inadequacies of understandings that view primitive cultures as bloodthirsty hunters, male-dominated, and warlike. These thinkers provide a diverse and fertile scholarship which necessitates the reevaluation and reconstruction of humanity's most distant past.

James Mellaart (1967, 1975), in Catal Huyuk and The Neolithic of the Near East, substantiates the need to reconstruct the past. According to Mellaart, Catal Huyuk, an ancient settlement, flourished in Anatolia (modern-day Turkey) during the Neolithic era; that is, 6000 BCE. Mellaart (1967) refers to Catal Huyuk descriptively. He states:

Catal Huyuk's numerous sanctuaries testify to an advanced religion, complete with symbolism and mythology; its buildings to the birth of architecture and conscious planning; its economy to advanced practices in agriculture and stockbreeding; and its
numerous imports to a flourishing trade in raw materials. (p. 11)

The goal of Mellaart's excavations in Catal Huyuk was to reconstruct, as much as possible, the social and cultural life of the people. Although Mellaart observed some social inequalities (differences in the sizes of the buildings, equipment, and burial gifts), these differences were outweighed by the apparent communal aspects of social and religious organization. The artifacts uncovered attest to the obvious matrilineal and matrilocal social organization; that is, a social order based on, what Eisler (1987) refers to as an equalitarian mode of life (p. 25).

Marija Gimbutas (1982) documents hundreds of archaeological excavations in her work, The Goddesses and Gods of Old Europe, 7000-3500 BC. Gimbutas' archaeological findings clearly show how the ancient societies of Old Europe manifested agricultural stability by efficiently using fertile river valleys, cultivated a wide variety of crops, domesticated and bred many animals, produced pottery, used bone and stone for artifacts, and traded and communicated with other cultures. Gimbutas designates the civilizations of Old Europe as an area extending north of the Adriatic and Aegean Seas, and inclusive of Czechoslovakia, southern Poland, and western Ukraine. Gimbutas' study of these ancient cultures reveals social relationships modeled on a relational paradigm. In her words,
In Old Europe the world of myth was not polarized into female and male as it was among the Indo-Europeans and many other nomadic and pastoral peoples of the steppes. Both principles were manifest side by side. The male divinity in the shape of a young man or male animal appears to affirm and strengthen the forces of the creative and active female. Neither is subordinated to the other: by complementing one another, their power is doubled. (p. 237)

Both scholars (Mellaart and Gimbutas) working in close conjunction with other disciplines and using sophisticated dating techniques inferred that the artifacts uncovered at their sites revealed a sophisticated civilization. In Gimbutas words, "If one defines civilization as the ability of a given people to adjust to its environment and to develop adequate arts, technology, script, and social relationships it is evident that Old Europe achieved a marked degree of success" (p. 17). Mellaart and Gimbutas also acknowledge the peaceful character of the peoples. The notable absence of any warlike artifacts attests to peaceful societies. According to Eisler (1987), the social and cultural systems of ancient civilizations were structured on "unity of all life in nature" (p. 19).

By reinterpreting the cosmology of mythopoesis or world as organism, two essential points are made. First, history reflects the world view of a particular culture. As such, the hierarchical interpretations of Western historiography saw all of reality framed within a dominator model and viewed civilization as beginning with literate societies. Historical narratives, therefore, require
continuous interrogation. Contemporary insights are always subject to linguistic-cultural limitations, and ongoing changes create new interpretations and understandings. These perceptions, in turn, require new modes of creative action (praxis). Second, reinterpretive processes reveal the existence of societies where a partnership mode of existence was exhibited. Once pictured as violent, blood-thirsty, male-dominated societies, these cultures now provide an integrative context for reenvisioning human-earth relations.

In summary, the primary focus of Chapter 3 has been to enunciate a vision of cosmology as story, change, and interpretation. This mode of presentation facilitates the examination of change and interpretation as both an historic and hermeneutic venture. Such analysis reveals the complex and interlocking dynamics of social and cultural phenomena, and the effect these occurrences have on a society's cosmology. Important to this endeavor is the realization that historic change and hermeneutic interpretation are never definitive. Processes of historical reinterpretation must be ongoing.

When reenvisioning is contextualized, the new insights generated provide novel interpretive frames for a culture's cosmology. Cosmology as story is integral to this interpretive process. A functional cosmology, as a speculative and descriptive narrative, tells the story of a
people's presence to the universe and reveals the relational mode a culture has to the cosmos.
Notes to Chapter 3

1. Western society places primary emphasis on reasoning, whereas Tao (and the Chinese culture) inquires about what an individual does before reasoning. This questioning looks at the deep layers of reality that lie hidden in the unconscious and in pre-rational modes of consciousness.

2. Elisabet Sahtouris'(1989) insight on the balance in nature is apropos to our context. She states:
   Nature was never perfectly balanced or harmonious, but always struggling toward balance and harmony. Whenever it was won, it was soon followed by new imbalance that drove the dance forward in search of harmony. If nature reached perfection, its evolution would come to a stop. If things fell back into complete chaos, creation would also cease. Nature's balance is always somewhere between the two—away from chaos and toward harmonious balance. (p. 165)


4. According to Zimmerman (1983), Being of beings means "the self-revealing or self-manifesting of beings" (p. 103).

5. According to Capra (1982),
   The notion of complementarity is used by Niels Bohr to explain the particle and wave picture as two complementary descriptions of the same reality. Both are needed to render an adequate description of atomic phenomenon, and both are to be applied within the limitations set by the uncertainty principle. (p. 79)

6. According to Richards (1990), praxis is "critical reflection and action upon the world" (p. 11). The vision of praxis that this dissertation proposes is creative action. This view implies reflection, critique, and action. It also envisions the need for an awareness of creative action as an event modeled on the creative energy of universe processes. Each being, therefore, evokes and communicates energy as part of the "functional role within the creative intentions of the universe" (Berry, 1988, p. 25).

7. Commodification as defined by Richards (1990), implies "the breakdown of the individual as subject, a 'flattening' of the ego, the destruction of depth in human personality,
and in art and architecture, the abandonment of an historical perspective" (p. 11).

8. Heidegger (1977b) elaborates this point in The Question Concerning Technology.

9. Heidegger attempted to overcome subjectivism by eliminating dualistic and objectifying perceptions of human consciousness. This endeavor attempts to situate being as an openness for Being. The difficulty, however, is that this perception still positions humankind as the establisher of the world.

10. To Eisler (1987), equalitarian societies model a partnership society "where women and men (and 'masculine' and 'feminine') are accorded equal value." Eisler does not consider egalitarian, the more conventional term, adequate as it defines "equal relationships between men and men (as the works of Locke, Rousseau, and other 'rights of men' philosophers, as well as modern history, evidence)" (p. 206).
CHAPTER 4

Toward A New Cosmology: Reenvisioning Human-Earth Relations

The symphony of the Universe
Creation is a song
A song that has not yet ended.
In giant lenses the past of the
Universe is still gloriously present.
And although our lives are brief, we
live in days of creation.
With all their tragic entropy.

(La musica de las esferas
Ernesto Cardenal)
Twenty-first century humankind sits on the cusp of an emerging twenty-first century. The critical challenge facing humanity at this present time is visualized by the World Commission On Environment And Development (1987). The beginning of their document, Our Common Future, focuses on human-earth relations and the meanings implied by this perspective. They state:

In the middle of the 20th century, we saw our planet from space for the first time. Historians may eventually find that this vision had a greater impact on thought than did the Copernican revolution. . . . From space, we see a small and fragile ball dominated not by human activity and edifice but a pattern of clouds, oceans, greenery, and soil. (p. 1)

The functional vision the World Commission On Environment And Development (WCED) emphasizes is the Earth as a whole and humanity as part of the cosmic entirety. Such understanding decenters the human, centers awareness on cosmic unity and multiplicity, and surfaces the need for a new consciousness. Stafford (1981) speaks of this earthrise perspective in terms of the "inextricable interlinking of destinies [whereby] all human beings are indeed [companion] adventurers on the global spaceship . . . . This simple and incontestable fact is a presupposition for all future global planning" (p. 279).

If the above position is relevant, then the 2,100 year record recounting the solitary journey of literate human
societies, independent of earth context, is derelict. In their contemporary form, Western historical narratives are flawed. They isolate the human story from the cosmic story.¹ What is lacking is a narrative that gives voice to an emergent universe from its beginnings and in its continuing evolvement throughout 15 billion years of creative change. The evolutionary process of the cosmic genesis, in both its physical-material and psychic-aesthetic dimensions, is equivocated. The erupting exuberance of the galaxies, protogalaxies, and subatomic particles and the formation of the glorious radiance that gave birth to the planet Earth and the species that inhabit that sphere are narrated only in their physical-material aspects.

Western cosmological scholarship is presently addressing the foregoing concern and attests that meaning-filled narratives are needed if humankind is to remember its continual evolution from cosmic energy. Current cosmological thought critiques not only the inadequacies of contemporary social and cultural ecologies but also asserts that the very survival of the human community requires the creative articulation of a new mode of human presence within universe processes.

What is needed is a meaning-filled story that sees humankind as part of cosmic processes. Such stories, as narrated in ancient cultures, overflow in enactment and in
celebration (Frankforts, 1946a,b; Eliade, 1964, '60).
Dance, song, art, drama, and spoken narratives can make explicit the bondedness and interdependence of all species. Only with enactment and celebration can descriptive narratives interrogate the valuing of merely literate historicity and recognize literate tradition as just one of many discourses. Then humanity's social and cultural structures can authenticate an aesthetic narrative of the universe.

Themes proposed in this chapter argue for a radical vision of human-earth relations. For this reason, the chapter is organized into three parts. Each segment is vital in that it helps to fashion the vision of the whole. The first section examines five cosmologists. The intellectuals selected for study (Berry, 1988; Oliver and Gershman, 1989; Sagan, 1977; Sahtouris, 1989; Toulmin, 1982) challenge modernity's paradigm, recommend rethinking contemporary cosmologies, and articulate a dream for a new cosmology—one which speaks to the root of the word by speaking to the interconnectedness of all reality. They raise questions that are basic for cosmology and curriculum.

Utilizing both the thought and questions raised by the new cosmologists, the next section interweaves the textures of human-earth relations and thereby contextualizes the essential elements of a cosmological curriculum. The
resultant suggestion is that a cosmological curriculum retrieves the inclusive movement of the word, event, and action, while simultaneously providing a transformative and integrative view of human-earth relations.

The chapter's last part spirals this vision into a cosmological curricular vista of enactment; that is, a qualitative understanding of human-earth relations. Suggesting a novel vision for human-earth relatedness, Chapter 4 proposes movement beyond modernity's penchant for survival and critique toward that which energizes a generative creativity. The cosmological thought suggested initiates what Bohm and Peat (1987), in *Science, Order, and Creativity*, characterize as "a new kind of creative surge . . . a new kind of consciousness" (p. 207) or, what Berry (1988) describes as the "new cultural coding" (p. 194).

Narrative

Once upon a time, when time was not as time is now, there appeared to be no-thing, and yet all-things were emerging. This beginning is a silence of fire and light. A primeval cycle, the circle of extravagant elemental unfolding; a bursting of galactic exuberance in a gravitational dance, creating whorls of worlds, the galaxies and stars, the planets and their moons. This energy is an explosive force and heat (hydrogen into
helium), then the star dust that formed the solar system and the earth. Such mystery, a multiplicity and complexity of being emerging from simplicity; a creative differentiation of form, of emerging life, yet a communion revealing even now an emergence of the potentiality to come.

The un-i-verse, both in its living and nonliving forms, throbbed with this emergence. Complex systems leapt into existence effortlessly and the earth was forged and formed--its water and its life and land. Process, transformation, each being bonded, bounded; a totality of presence each to each and to that deeper mystery out of which all things Be-Come. Complete unto itself, and yet unconscious of itself in both its physical and numinous aspects, until, as the universe's reflexive consciousness of itself, the human emerged.

And even now, until this very moment, in the simplicity of complexity, within a stillness and a silence, the exuberance of the cosmic dance radiates Un-I-Verse.

The New Cosmologists

Thomas Berry

A cosmology is functional when the new story of the universe's emergence is narrated in both its physical dimension and its numinous and consciousness aspect. According to Berry, stories reveal, at a deep level, the unique and irreplaceable qualities of all being, as well as the identity, relatedness, and bonding to all entities in the universe. The story Berry envisions connects the human to the integral functioning of the earth. For Berry, the human is the earth's consciousness of itself. In this context, the earth is the primary norm for measuring the value of human activity.

A functional cosmology enables humankind to stand with, and act from, a position that acknowledges the interdependence of all species. It promotes principles of harmony revealed through cosmic order and reflects the inner organic bond that unites all species. According to Berry, insightful human-earth relations reflect, "the art of intimacy and distance and the capacity of all being to be totally present to each other, while affirming and enhancing the differences and identities of each" (p. 1). This mode of presence, and the consciousness it initiates, allows human beings to envision and energize a new techne devoid of arrogance and the desire to control.

For Berry, the narration of a new story is essential. He asserts that contemporary stories are inadequate. They no longer speak meaningfully to people or search for
humanity's place in earth activities. The narratives we need to internalize, if we are to remain a viable part of the earth community, must utilize new scientific understandings and evoke the psychic-aesthetic realities of universe. Meaning-filled stories, Berry maintains, transform and energize; they elicit new understandings and generate creative patterns of thinking and acting.

Berry's vision is radical for it decenters humans, replacing them in the universe. Through his critique of the meaning-systems, the myths of modernity, and those activities of humankind that are dysfunctional, Berry reconceptualizes a cultural coding based on the human's role as an integral member of the earth community.

It is this universe/earth/human integration that constitutes Berry's dream of the earth. His hope for an ecological age is contingent upon people relearning their connectedness to all entities. This requires envisioning the genetic codings that connect all species, and evolving new cultural codings from this recognition. Berry feels that, flowing from the awareness of cosmic connectedness, human communities can reimagine education, peace, justice, global economics, world spirituality, and bioregionalism.

The implications of Berry's cosmology are probed by asking the following question: What is the nature of a new cosmology that would provide the ground for reenvisioning
Donald W. Oliver with Kathleen Waldron Gershman

The cosmology elaborated by Oliver and Gershman (1989), in Education, Modernity, and Fractured Meaning Toward a Process Theory of Teaching and Learning, is a metaphysical cosmology of process. According to Oliver and Gershman, metaphysics speculates about the meaning and nature of the universe. Metaphysics interrogates the incomprehensible by asking generative questions. Cosmology, the story side of philosophy's metaphysics, grapples with metaphysical questions through the telling of stories.

Process views all creation as a be-coming, or as Oliver and Gershman state, creation is perceived "as a flow, the dissolution of one occasion in the becoming of another" (p. 115). Process initiates a continuous evolvement of "occasions, events, things" (p. 136). For Oliver and Gershman, the metaphysical cosmology of process inaugurates a "radical revision in how we imagine ourselves to be--how we apprehend and perceive the world, the way we feel, and dream, and think--as a prelude to how we might act within communities" (p. 4).

The question-posing storytelling elaborated by Oliver and Gershman facilitates both the critiquing and rethinking of existing cosmologies and, thus, provides for a
reconceptualization of how we come to know. Both thinkers specify this knowing as rational technical knowing and grounded ontological knowing. Rational technical knowing is identified as a controlled, delineated, defined, predictable, and quantifiable knowing; whereas grounded ontological knowing is understood as an evolving, becoming, emerging, experiential, and qualitative knowing (p. 14). The integration of both of these ways of knowing, the rational and ontological, is Oliver and Gershman's major thesis.

Oliver and Gershman extend the concepts of knowing by contextualizing them within what they characterize as a positive and balanced culture. They assert that by integrating rational technical knowing and grounded ontological knowing, a culture will emerge that balances three complementary metaphors: the dance, the living organism, and the machine. They reason that an integrated paradigm of knowing will generate a theory of "deep knowing" and being and will initiate new ways of understanding. This "new cultural paradigm" will then "inform a broadened conception of education" (p. 30).

Oliver and Gershman's cosmology articulates a radical revisioning of what it means to educate humans. The value of their work lies in four areas: (1) critique as an ongoing, generative work that transforms, (2) knowing as rational and ontological, (3) integrated knowledge that
recognizes the creative and transformative aspects of the universe, and (4) a community of storytellers as the basis for curriculum theory and practice.

The implications of Oliver and Gershman's cosmology emerge from the aforementioned foci and center around a response to the question: How can we enact a cosmology that values and utilizes multiple ways of knowing?

Carl Sagan

Carl Sagan (1977), in his book *The Dragons of Eden: Speculations On The Evolution of Human Intelligence*, narrates a scientific and speculative cosmology. Sagan utilizes recent scientific data and dating techniques to describe the origins of the universe, to portray the complexity of biological evolutionary process, and to delineate the gradual evolution of the brain. His scientific inquiry contemplates new understandings of human evolution and history and advances, as reasonable, the existence of extraterrestrial intelligence.

Gregory Bateson's (1972) concept of a "pattern that connects" is analogous to Sagan's interfacing of humanity's historical evolution with that of other species. Sagan traces the evolution of intelligence and consciousness through the gradual increase of information in the genes and brain. Sagan explains that, at one point in evolutionary history, a reptilian species evolved which had
more information stored in its brain than in its genes (R-complex). Further evolution made possible the development of strong, vivid emotions (limbic brain system). The vast area of abstracted, symbolic, and linguistic transactions (neocortex region) of which the brain is now capable, represents the most recent stage of brain evolution.

Sagan's description of the anatomical and physiological evolution of the body and mind displays his rejection of mind-body dualisms. His focus on the different functions of the brain is also integrative, and it enables him to trace the evolution of the brain as an organ of feelings, experience, and intelligence. He expresses a fascination for the enduring influence of the deeper, older parts of our brain (R-complex and limbic system) which coerce the neocortex, and yet, are dependent on the monitoring complexity of the newest brain part.

Sagan is convinced this evolution is still active today and will affect what occurs in the future. He reasons that other intelligence, different from human intelligence, most certainly evolved throughout the billions of years of the universe's evolutionary processes. The search for extraterrestrial intelligence, employing the capabilities of artificial intelligence (machines), is a natural outgrowth of scientific and speculative inquiry. The existence of such intelligence, "biochemically different
from earth species" (p. 242) is, Sagan believes, almost certain.

Sagan's cosmology encourages the question: How can humans continue to explore the evolutionary complexification of intelligence and imagination in all species?

Elisabet Sahtouris

Elisabet Sahtouris (1989), in her cosmological approach, situates a poetic-imaginative mode of presentation within a scientifically explicit narrative of universe evolution. She asserts that Gaia: The Human Journey from Chaos to Cosmos, is:

a work of philosophy in the original sense of a search for wisdom, for practical guidance in human affairs through understanding the natural order of the cosmos to which we belong. It bears little resemblance to what we have come to call philosophy since that effort was separated from natural science and became more an intellectual exercise than a practical guide for living. (p. 9)

In her search to discover a wisdom in concert with living in a natural environment, Sahtouris dialogically engaged the "research and debates" (p. 9) of scientists and philosophers, wrote a scientific text that traces the evolution of cosmic processes, and then tested the clarity of her presentation by reading her manuscript to the village people among whom she lived. She then incorporated the wisdom of the villagers, in the ancient style of the storyteller, and reworked her narrative achieving a
simplicity and coherence of story that allowed the interweaving of the scientific with the speculative.

This melding of the scientific and speculative enabled Sahtouris to narrate scientific data metaphorically. The poetic metaphor of Gaia, the dance of the living planet, is interwoven throughout her entire scientific account. The Greek myth of Gaia, the ancient Earth goddess (Spretnak, 1978; Downing, 1981), clothed in delicate, white veils, spinning throughout the vast reaches of dark space and dancing the universe into existence, is central to the narrative. The image of Gaia's body and dance, moving in rhythmic patterns, shaping the universe in its simplicity and complexity and in its varying moods of competition and cooperation (p. 81), enhances Sahtouris' scientifically astute presentation.

A vision of the Earth as a living planet (not just a planet with life on it) forms the basis of Sahtouris' narrative. The term autopoiesis (self-generating) describes this concept. The earth's evolutionary unfolding occurs within the autopoietic unity or holon which "produces the very parts of which it is made and keeps them in working order by constant renewal" (p. 40). The earth is a self-creating, living organism and cosmic life-processes are, therefore, self-renewing and self-regulating (p. 65). According to Sahtouris, an autopoietic holon originates "its own rules and creates a boundary that distinguishes it
from its environment and through which it exchanges materials with its environment" (p. 40).

Sahtouris' understanding of life as a processive event embodies a view of earth as more than a fixed mechanistic entity or cybernetic machine operating on determined systems of mechanistic equilibrium. Understanding the Earth as a living organism whose intricate dance cavorts in evolving patterns of creative exuberance, disequilibrium/equilibrium, conflict/harmony, and adaptation creates an interweave of mutuality exhibiting the principles of subjectivity, differentiation, and communion.

Through her cogent scholarship and her narrative style, Sahtouris raises a profound question: How can a vision of the Earth as a living organism affect the human community's valuation of the earth aesthetically and act as a guide for practical creative action (praxis)?

Stephen Toulmin

According to Stephen Toulmin, cosmology is an attempt to understand "the Universe as a Whole" and humanity's place within the universe. To Toulmin, cosmology is the human attempt to address the totality of what is knowable and experientially rational. This desire to know incorporates the scientific, metaphysical, and theological. In his book, The Return to Cosmology: Postmodern Science And The Theology of Nature, Toulmin (1982) recognizes
cosmology as the struggle to connect natural science (as a postmodern science) and natural religion (as a Theology of Nature). Toulmin calls for the integration of the wisdom of these disciplines, thereby opening a continuous dialogue between science, metaphysics, and theology. He feels that it is only through balancing multiple perspectives that cosmology can premise what is more congenial to nature; that is, the overall interrelatedness of things.

This balance of emphasis promotes what Toulmin refers to as "the middle way between credulity and skepticism" (p. 12). The first position, unquestioning belief or credulity, uncritically accepts scientific theories and hypotheses and defends them beyond their limits or intended range. The second, cynicism or skepticism, rejects scientific reasoning, denying the validity of the scientific worldview. Toulmin's "middle way," which is interdisciplinary and integrative, will extend scientific horizons beyond the measurable, will reconnect transcendental theology with the concrete world of experience, and will encourage philosophic argumentation to move beyond endless rational inquiry.

Toulmin's balanced approach to cosmology recommends: (1) a cosmic knowing that is both empirical and relational (science), (2) the critical and intuitive questioning of human perceptions (philosophy), and (3) an enterprise which understands mystery (theology).
The interdisciplinary cosmic vision Toulmin projects, and the reality of the emerging ecological movements he recognizes, facilitate the participatory and dialogic context needed for the cosmological endeavor. To isolate the cosmos from the human or the human from the cosmos, according to Toulmin, would continue the imbalance that has dominated most disciplinary activities of the nineteenth and twentieth century.

Toulmin's cosmology asks: What are the implications of a positive hermeneutic of connection for praxis (creative action)?

Texture of Human-Earth Relations

The texture of the human-earth relations erupted billions of years ago. The cosmic creation of protogalaxies, galaxies, stars, and planets began as a differentiated, yet connected, energy explosion. Subatomic particles, pure energy, and electrical forces repelling and alluring, collapsing and smashing, generative and generated, whirled into patterns of energy creating a cosmos where the dynamics of relationship (communion), the articulation of variety (differentiation), and the spontaneity of creativity (subjectivity) burst forth in an ethos of being. Gradually, "life" evolved as an unfoldment of cosmic novelty and interdependence.
In this, the first unconcealment, the authentic and meaning-filled narratives of emerging "life" dawnc. Sahtouris (1989) perceives "'life' as the essential process of the cosmos as a whole and not just something happening at a special point [humans] hunt for in vain" (p. 41). This understanding interprets each cosmic occasion as a creation, which then becomes "a significant part of a cosmic life process" (p. 41), not in terms of gradation—a hierarchical pyramid from lowest to highest, but rather, as an evolvement where novel events spiral from previous occurrences and create new contexts.

Hence, the drama of the universe's birth, whether bathed in beauty, majesty, disruption, or violence, evokes a vision of primal creativity whose eloquence speaks meaningfully, even today, of the Being-of-beings. Being whispers through the shimmering luminescence of the night sky; it dances in the immensity of the whirling galaxies; and it sings in the enactment of the Paleozoic, the Mesozoic, and the Cenozoic Ages as living systems continue to unfold.

As Berry and Swimme (in press) note, "Neither earth-history nor human history is yet concluded. There is a future that is taking shape. A movement toward the healing of the earth..." (p. 4). This is the future age envisioned by the new cosmologists. Berry and Swimme refer to this epoch as the Ecozoic period of earth-history. Other

The new cosmology (Sagan, 1977; Toulmin, 1982; Berry, 1988; Oliver and Gershman, 1989; Sahtouris, 1989), however, is distinctive in that it is grounded in the earth (cosmos), asks radical questions emerging from a cosmological context, and visualizes the future in terms of the entire "life" community. Cosmological speculation, recognizing the impasse of modern malaise, submits that a transitional phase between the Cenozoic and Ecozoic Age needs to creatively articulate a new mode of human presence within universe (earth) processes.

Toward this goal, this chapter proposes a renewed sense: (1) of story, as the explication of the universe's narrative through the reflexive consciousness of the human species, (2) of change, as the evolutionary dynamism of cosmic creativity in its movement toward complexification, and (3) of interpretation, as a generative and evocative occasion for reenvisioning physis, techne, and ethos. This threefold perspective (story, change, and interpretation)
empowers thinking to move beyond attitudes of survival and critique to a creativity articulated by what Charlene Spretnak (1991), in *States of Grace: The Recovery of Meaning in the Postmodern Age*, identifies as the articulation of variety (differentiation), the uniqueness of inferiority, depth, and spontaneity (subjectivity), and the dynamics of relationship and community (communion) (pp. 29-30).

The cosmogenic story is never complete. In its very evolvement, its evocative and mysterious creativity is continuously revitalized and its erupting exuberance creates new aesthetic horizons. According to Berry (1988), it is imperative when reenvisioning human-earth relations to construct a story that incorporates the ever changing "larger community of life," who then become the "primary referent in terms of reality and value" (p. 126).

An entirely new way of seeing is suggested by this vision— one best exemplified in the wisdom of primary cultures. Primordial people's connectedness to cosmic processes implied a way of understanding that was descriptive and evocative. Primary societies responded to natural cyclical rhythms and the physical and psychic dimensions contained in all life (Frankforts, 1946a, 1946b; Eliade, 1959, 1964).

The first cultures, as noted in Chapters 1 and 3, had a mode of presence to the universe harmonious with their
lifeworld. No divisionary frameworks existed in the worldviews of the first peoples, and their responses to cosmic happenings enveloped both its sacred and profane aspects. Stories told, dances performed, art created, and dramas enacted, embodied a cosmic context and reflected awe at the revealment of natural phenomena/processes. All life was an enactment (a commemoration and celebration) of natural events, and the image of a meaning-filled universe guided the human community in its harmonious relationship to the cosmos as a whole. Thus, the mythic reenactment of origins, as Eliade (1964) states, recovered "... a reality [coming] into existence, be it the whole of reality, the Cosmos, or only a fragment..." (p. 6).

Ancient people's narration was a functional story—a story of lived reality framed within cyclical cosmic processes. Permeated with an awareness of both the physical/material and psychic/spiritual realities of the universe, these stories presented the universe in its eventness as an ever-changing and mystery-filled cosmos.

This mode of presence so characteristic of early cultures is similar to what Stafford (1981) calls holistic empiricism (pp. 296-303). Bohm (1980) identifies it as unbroken wholeness. Bohm's science of unbroken wholeness, referred to in Chapter 1, provides the common thread that connects the cosmological thought of Berry, Oliver and Gershman, Sagan, Sahtouris, and Toulmin. Bohm's example of
two vortices in a stream illustrates the unbroken wholeness concept. It also concretizes what was natural (spontaneous) in primitive people's understandings. In this example, two vortices exist as separate and entire entities in one stream. The stream, where the vortices occur, is also an unbroken entity. Each is a whole in itself and in its relationship to the entirety. However, neither the stream nor the vortices exist independently of each other. Therefore, to analyze the vortices separately from the stream or the stream isolated from the vortices is to fragment the reality of the whole.

Although fragmented analysis is necessary and important, the methodology of modern science, based solely on this rationale, is incomplete. According to Bohm and Peat (1987), "True unity . . . between [persons] and nature, as well as between [humans and humans], can arise only in a form of action that does not attempt to fragment the whole of reality" (p. 16). Inclusive analysis requires that the vortices be analyzed in conjunction with the stream. Primitive societies actuated this kind of connection. Their stories narrated the cyclical dynamics of cosmic processes and their lives reflected an indwelling ethos and a responsible techne. Scholarship attests that the wisdom of ancient peoples admitted no other worldview. The tendency to isolate and then abstract relatively unchanging qualities (mental mapping) is, according to Bohm
(1980), a problem created by the Newtonian/Cartesian worldview where values are placed only on what is recognizable, categorizable, or abstracted.

Bohm's call for change designates two orders: the explicate order and the implicate order. He characterizes Matter as explicate order, a level that orders mental mapping and temporality. This analytic influences what a person sees and how a person understands. Theoretical formulations and the interpretations they propose are influenced through explicate ordering. Hence, the explicate order, in many instances, eliminates more inclusive perspectives and thus fails to acknowledge the existence of a more complex and elusive order.

Bohm calls this less tangible order the implicate order. Identified as chaotic and random, this order is nonlinear, continuous, and infinitely divisible (pp. 107-108). Bohm associates the Mind (consciousness) with the implicate order. For Bohm, the multidimensional layers of intuition, imagination, and timelessness allow one to see and experience the "four-dimensional space-time world" (p. 115). It is this multidimensional order that links consciousness and matter and can be perceived as a continuum of explicate/implicate unfolding.

The explicate/implicate approach, if correlated with the notion of holons (a concept utilized by Bohm, Koestler, and Sahtouris), helps in reenvisioning the textures of
human-earth relatedness. It also elucidates the processes of ordering perception in that it empowers new ways of seeing.5

Sahtouris (1989) describes a holon as the "concept of dependence-in-independence" (p. 52). Every living creature is a holon. It receives, uses, and returns material and energy provided by its environment (which is also a holon). Absolute autonomy (independence), therefore, is neither possible nor viable in the larger schema of universe processes. The autonomy of each holon exists, but its existence is stabilized by the holonomy surrounding it. She observes:

Any individual human . . . must transcend simple self-rule and integrate him- or herself with the rules of society, while human society must transcend its autonomy and integrate itself with the holonomy imposed by the autonomy of the planet. The balance between any holon's autonomy and holonomy must be worked out as mutual consistency if the holon is to survive as part of the holarchy--and it cannot survive in any other way. (pp. 52-53)

Linking the notions of holonomy and explicate/implicate orders, gives rise to some provocative considerations. First, distinctions are functional, but ultimately they are inaccurate abstractions. Second, what seems to be essential is the relational (interdependent) mode of prehending; that is, an understanding where, according to Bohm and Peat (1987), "All consciousness is [seen as] enfolded in matter and matter is [seen as] the unfolding of consciousness. Thus, individual consciousness,
like an individual electron, is an abstraction. A useful one at times; at others, destructive and confusing" (p. 130). Third, as in the holonomy, parts (holons) are not separate from other parts. Separateness (independence) is the ultimate illusion. Rather, the autonomy of each part (holon) generates and is generated by the other—"parts within parts, wholes within wholes" (Sahtouris, 1989, p. 35). Fourth, since its beginnings, the universe as a whole has been caught up in time-developmental creativity. This ongoing surge of self-emergence, according to Brian Swimme (1990), in an essay entitled "Science: A Partner in Creating the Vision," empowers all existence to participate in the dynamic processes of creativity inherent in the universe since its genesis (pp. 86-87). Finally, the creative potential of being emerges from the preceding context of cosmic spontaneity and continues to reveal itself through the reflexive conscious awareness of human beings (Berry and Swimme, 1990).

Bohm and Peat (1987) clarify the notion of holons and explicate/implicate ordering. Their analogy of the "part" holding the code of the entire organism is pertinent. They state:

The pattern of the whole [includes] all the past . . . with implications for all the future. Each region carries the encoding of the whole somewhat differently . . . [therefore] each region is a distinct perspective, yet each contains all. (p. 111-112)
The previous modes of understanding (explicite/implicite order and holonomy) need to be actuated (retrieved) in human-earth relations as humankind dreams an Ecozoic Age. During this passage, both the marvels and the limitations of the Cenozoic age must become substantiated. The cosmologists examined previously address this issue and recognize that an integrated and balanced perspective must present not only the pathos but the ethos of the Earth. Berry's recommendation emphasizes the importance of understanding the story of Earth history and the evolving wonder and mystery of its beauty without negating humankind's destructive tendencies.

Berry and Swimme (in press) allude to the Cenozoic era as "the lyric period of evolutionary process, the period of the flowers, the birds, the mammals." They also assert that:

before a full description of the Ecozoic period and the historical role that it is called upon to fulfill, [humanity] must first appreciate the Cenozoic period in the full grandeur of its creativity, in its role in bringing the human species into being, and providing the context for unfolding of human life until the present. (p. 1)

In treating the pathos of the earth, cosmological scholars critique the systems of control which sanctioned the domination of "so-called" subordinate species in the name of progress and human development. Each cosmologist
studied replaces modernity's objectives (control and domination) with a praxis attentive to the primacy of the larger life community in its integral earth functioning.

The new cosmology sees the earth and the community of species as interrelated with, not emanating from, the human. In Berry and Swimme's (in press) words, "The human in its every aspect is derivative from the community of life species; derivative in its being, its functioning, and its fulfillment" (p. 4). Sagan's (1977) "cosmic chronology" (pp. 13-17) clearly evidences this derivative mode, and Sahtouris' (1989) Gaian dance of cosmic evolution corroborates what Berry and Swimme state--the emergence of all being is an outgrowth of cosmic complexification, and all life processes depend upon cosmic creativity.

If the florescence of the Ecozoic epoch is to occur, however, the enactment of a new cultural coding is imperative. Since this coding "provides the basic psychic and physical structure of our being" (Berry, 1988, p. 194), patterns our basic identity, and guides our continued existence, humankind needs to listen to the spontaneities hidden within the very structure and functioning of its being. It is in this way that humanity will sense and touch the creative energies of the earth and the universe. What is needed, according to Berry, "is not transcendence but 'inscendence,' not the brain but the gene" (p. 208).
Emanating from the cosmic context, human beings share the original and alluring capacities of the primordial fireball. Their story is the cosmic story, and its guidance still illuminates not only humankind's physical existence but also awakens an awareness of the numinous spontaneities inherent in all being. In Berry's (1988) words:

The supreme need of our times is to bring about the healing of the earth through this mutually enhancing human presence to the earth community. To achieve this mode, . . . a new type of sensitivity is needed, . . . a sensitivity that comprehends the larger patterns of nature, its severe demands as well as its delightful aspects, and is willing to see the human diminish so that other lifeforms might flourish. (p. 212)

Bowers (1984) confronts the same issue by an analytic inquiry of cultures. He speaks of modern culture's inability to visualize and activate "conceptual elements as an alternative to the modernizing process . . . at least in credible form" (p. 9). He insists that human beings need to develop the ability to "negotiate meanings and purposes instead of passively accepting the social realities defined by others" (p. 2). Using the term "communicative competency" to identify this proficiency, Bowers contends that the liberal tenets of democracy vitiate contemporary Western understandings especially in areas of autonomy and individualism. He maintains that unexamined prescriptive practices (both social and cultural) must be interrogated in order to change language construction, human consciousness, and belief systems.
Bowers insists that ecological understandings can radically alter liberal frameworks since they reject social systems constructed solely on homocentric abstractions. Bohm and Peat (1987) speak to the same issue (new cultural coding) in terms of "a creative surge for a new order" (p. 256). Both thinkers emphasize creativity, dialogue, and a planetary culture.

Humans need to return to the source from whence they come and dwell within (indwelling) the dream of the earth. The journey begins with chaos and cosmos, the creative emptiness from which the world emerged. Then, nothingness (chaos) becomes a positive energy, a meaningful context for a functional creation (cosmos). Palmer's reference to understanding differently is pertinent here. Penetrating deeply the thing itself as it comes into appearance is, according to Palmer (1969), the ability to see the "creative emptiness and nonbeing behind positive emergence" (p. 166). A positive hermeneutic, as the creative impulse of being, steps away from the conceptual thinking to a kind of thinking that Heidegger (1971) calls "a meditative (andenkende) thinking" (p. 180). Meditation describes the world qualitatively, as subject rather than object or plaything. An awareness of a mysterious order of reality is entwined with qualitative discernment of being.

In The Universe Is A Green Dragon, Brian Swimme (1985) utilizes the qualitative language and imagery called for by
the new science; namely, the concept of creative emptiness, when he refers to human creative impulses as emerging "from the same place out of which the primeval fireball comes: an empty realm, a mysterious order of reality, a no-thing-ness that is simultaneously the ultimate source of all things" (p. 34). Such an admission acknowledges the inadequacies of human consciousness and language. There is no way, at this present juncture, that human beings can explain the leapt out of no-thing-ness (chaos) into be-ing-ness (cosmos).

What humans can do is express being in its qualitative modes. Such enactment embodies the dynamic (active), the quiescent (nonactive), the illusive (non-observable), and the non-controllable (non-real) allurement of a mysterious universe. Haught (1984) identifies beauty, value, and importance as primary qualitative modes of apprehending and asserts that modern persons have relegated qualitative dimensions of experience to secondary status. Hence, they have excluded "the sensitivity of evaluators, the sense of importance of things, events, persons, and the universe itself" (p. 32). In a similar vein, modernity relegates valuations to the sphere of secondary classifications.

According to Heidegger (1977a), in Basic Writings, when values are created for and by humanity, no intrinsic value is allocated to other species. His concept of "radical killing" which "strikes down Being-in-itself" and "does away utterly with Being" (p. 242) makes sense in this
context. For it is humankind's disregard of other species, their refusal to place limits (boundaries) on human activities, and their repudiation of mystery (as qualitative dynamic) that create and sustain alienation of being.

Paradoxically, modern persons actually believe that an authentic techne and an ethos of being can evolve (exist) within systems where the valuation of all being is directly negated by social and cultural practices which legislate for only one species. By way of regaining perspective, Joseph W. Meeker (1988), in Minding the Earth, states: "The story of life is a cosmic tale" (p. 100). The entire living earth is enmeshed in the cosmic narrative, and cosmic tales spun through language convey a sensing of the earth as a living, vibrant event. This discursive mode introduces relational complexity, sponsors new ways of seeing and knowing, and communicates the earth's story.

Scholarship shows that the cosmic qualities existent in primitive languages can complement and inform discursive practices. Oliver, Gershman, and Stafford use the seminal study of Benjamin Lee Whorf to speak of the Hopi people's sense of being as well as their understandings of time, eventness, and substance. In the Hopi language, these notions are dynamic and active, processive and becoming. They express the actuation of being. The Hopi people communicate experience as a ongoing dynamic process.
Reality is not objectified. The structure of the language is non-divisionary. Hence, eventness rather than abstractive categories frame relational contexts. Stafford (1981) clarifies how the Hopi sense of time and space is coherent not only with contemporary scientific evidence but with the cosmologies of oral and mythic societies. To Hopi peoples, time is a continuing entity, unfolding and enfolding—a continuum enclosing, yet not separating, past, present, and future. Hopi notions of time, according to Stafford, can impact physics in an evocative way. He states: "Time and velocity would have to be replaced by intensity. Acceleration would perhaps be replaced by variation" (p. 51).

Meeker's (1988) descriptive narrative proposes similar transpositions not only in naming and vocabulary but also within the language structures themselves. He states:

- Syntax will have to rethink the meanings of subject, predicate. . . . Rhythms need to observe the pulse of fluids and the subtleties of daily and seasonal time. Imagery can be used to conjure anew the sense and the sensations of life. And . . . metaphor is just waiting for the inventive mind that will renew the meaning of a living Earth in the human imagination [emphasis added]. (p. 5)

Meeker encourages a mode of silent presence to the living Earth, one that is attentive to its sensual components: smell, color, dance, surface texture, and music. Reminiscent of Heidegger's meditative thinking, these elements unveil Earth's fecundity and fluency and recall the notion of complexity that Reiss (1982) speaks
of; that is, the creation of "a new order of society" (p. 385), where multiple and eclectic discursive practices enunciate the many modes and moods of literacy.

The silent presence of meditative thought, for Haught (1984), requires the wisdom of Tao and the transformative energy of wu-wei, "an untranslatable term for 'active inaction' or . . . 'effective non-interference' or 'non-interfering effectiveness'" (pp. 70-71). Such practices allow one to be formed through awareness and silence, through paradox and certainty. This insight is similar to Heidegger's perception of ethos and techne; that is, authentic techne allows Being to become manifested in ways that are suitable and meaningful to the being itself. In this manner, the earth's story can be heard, listened to, and narrated. In this way, the earth's story is known as the human story.

Wisdom gained energizes change, creates new interpretative modes, and initiates an aesthetic through qualitative awareness. Praxis (creative action) can then follow. Six thousand years ago, Lao Tsu Te Ching, in Tao, expressed these mystical ideas when he wrote:

Look, it cannot be seen--it is beyond form.
Listen, it cannot be heard--it is beyond sound.
Grasp, it cannot be held--it is intangible
These three are indefinable;
Therefore they are joined in one.
(1972, p. 14)
In summary, the preceding descriptions incorporate the dream of the Ecozoic period which is to reinvent and reenvision the human's role in the cosmos. This transformation requires the reformation of humanity's social and cultural modes of presence to the earth. Berry and Swimme (in press) reiterate:

A new role exists for both science and technology in the Ecozoic period. Science must provide a more integral understanding of the functioning of the earth and how human activity and earth activity can be mutually enhancing. Our biological science especially needs to develop a "feel for the organism," a greater sense of the ultimate subjectivities present in the various living beings of the earth. Our human technologies must become more coherent with the technologies of the natural world. (p. 2)

Envisioning human technē in concert with universe functioning requires a biocentric norm of progress and demands movement away from democracy to biocracy (Berry, 1988, p. 165). This manner of thinking and acting integrates the functioning of all species as participating members of the earth community. Recognizing the integrity and value of all surrounding life systems, the biocentric/biocracy mode of prehending incarnates a praxis where the self-nourishment, self-propagation, self-education, self-governance, self-healing, and self-fulfillment of the entire community of species is fulfilled (pp. 166-168).

When the Earth story is encountered by humans as their story, and the entire song of un-i-verse emergence in its mutuality and complexity Be-Comes the meaningful expression
of a lived enactment of the community's story, then the diversity, self-articulation, and interrelatedness of cosmic processes can function within a story that grasps the incredible magnitude of the promise and possibility of futures.

The earth community is in a transitional phase between the Cenozoic and Ecozoic Ages. As participants in the ongoing complexification patterns of the universe, humanity participates in the intricate play of being that began its emergence 15 billion years ago in primeval mystery.

As the self-reflexive manifestation of the universe, humankind must include the narrative of its emergence within the story of the universe. In this way, humans will begin to live within an ethos and techne that creatively articulates the subjectivity, differentiation, and communion of all being.
Notes to Chapter 4

1. Oliver and Gershman (1989) and Haught (1984), observe that the alienation of human beings results, in many instances, from failure to acknowledge that humans are in nature.

2. The scholarship and thought developed in Chapters 1, 2, and 3 educate to these observations and statements.

3. The author's process cosmology comes from the work of Alfred North Whitehead (1929).

4. The division of nonliving and living world is a controversial issue—the separation of life from nonlife. It seems questionable that life can suddenly and spontaneously emerge out of nonlife. Sahtouris (1989) maintains that this perception needs to be clarified within an understanding of life as process rather than as a kind of matter (p. 40).

5. A new way of seeing is an important analogy as it infers the insight proposed by Bohm, the awareness suggested by Tao, the nondvisionary presence primitive peoples had to the cosmos, the two kinds of knowing advanced by Oliver and Gershman, and Berry's suggestion for reinventing the human within the context of a functional and meaningful story.

6. Sagan (1977) and Sahtouris (1989) also address the emergence of this age (Cenozoic) and trace in great detail the evolution of all species.

7. Destructive and controlling modes of presence to the earth were examined in Chapter 2. It is important to note that the cosmologists cited in this chapter detail the disastrous environmental practices of humankind.
We are the star that is seen; that sees itself.
Born in its fire
and cooled down in order to think and see.
Protons, neutrons and electrons
are the human body, the planets, and the stars.
Consciousness emerged from unconsciousness.
In us, then, the planet loves, dreams.
It is the Earth who sings in me this
Cosmic Canticle.

(La musica de las esferas
Ernesto Cardenal)
Prologue

There has existed throughout recorded history a tenacious and apparently irrepressible need for the human intellect to evolve a cosmology. That hope, according to Munitz (1986), is to "describe and understand the structure of the universe" (p. 5), to comprehend and grasp the universe in its unique singularity with nothing excluded, and then construct and delineate a theoretical frame around an observable universe (pp. 53-60). This aspiration is unending as humankind meets horizons or limits that can never be overcome. Using philosophical argumentation, Munitz clarifies how "the known universe points beyond itself ... [and] stimulates the drive to ever find a still more adequate picture of the universe as a whole" (p. 228).

Toulmin's (1982) methodology of historical inquiry alludes to humanity's desire to comprehend the universe as a whole and its place within the cosmos. Using Kant's (1781/1965) Critique of Pure Reason, Toulmin delineates the conceptual limitations of cosmological speculation and states that humanity, in valuing only analytic approaches, has fragmented cosmological study. Toulmin insists, however, that contemporary shifts in intellectual and cultural attitudes have begun to mediate between "a single-minded preoccupation with intellectual purity and abstract
theory to a more complex concern for human relevance and concrete historicity" (p. 12). Understanding the overall scheme of things, a cosmology necessitates the interrelationship of scientific, philosophic, and theological ways of coming to know (p. 13).

The story of the universe, as presented by Berry and Swimme (in press), is the convergence of history, culture, and science. Narrative, in this instance, functions as the historical account of the universe's evolution as a whole with the story of humanity's evolution as a part of this larger context. Berry and Swimme share with Toulmin the feeling of "at homeness," and describe this as the human community's connection to the aesthetic of story, dance, song, and art.

If humankind desires to be at home on the Earth, then a functional cosmology is foundational not only for continued existence but for the very feeling of "at homeness" that humankind craves. Reexamining the functional activities of humanity's interaction with cosmic-earth processes is crucial to cosmological understandings. Reenvisioning humanity's infrastructures which specify what constitutes knowledge and how knowledge is acquired is critical for theorizing curriculum.

When cosmology as the discourse of the world, integrates, as viable, the qualitative processes of the universe, then curriculum theorizing, as insight, can
address the complex and comprehensive ways of knowing demanded by contemporary education. Education, as Berry (1988) notes, can then be considered a continuation, at the human level, of the self-education processes of the earth itself: universe education, earth education, and human education are stages of development in a single unbroken process. We cannot adequately discuss any stage of the development without seeing it within this comprehensive view [emphasis added]. (p. 89)

When the 15 billion year old self-education processes of the Earth (from which humankind evolved) are correlated with human curricular designs, the Earth, itself, becomes the informer and transformer of anthropocentric discourses which legitimate social and cultural practices of domination and control.

The descriptive and analytic inquiry of cosmology, when it engages cosmic complexification in its physical and psychic dimensions, provides a vision for humanity that evokes an ethos of being in concert with the cosmic community. Cosmology as curriculum, Toulmin implies, is a complex endeavor that embraces an understanding of techne as the aesthetic praxis of the universe.

The integrative movement of cosmology and curriculum speaks to contemporary paradigmatic change.

Narrative

We are the star that is seen; that sees itself.
Born in its fire
and cooled down in order to think and see. (Cardenal, 1989)

As a city-girl-child, I was an apartment-dwelling "Bronx-ite" by birth and a "Brooklyn-ite" by adoption. I remember the Bronx as a place of many friends and lots of people; a place of gatherings and parties; a community of people rich in gifts of laughter and tears, stories and sharings, song and musings. It was a neighborhood we visited frequently after we moved, for it nourished and sustained each of us in a variety of ways.

My recollections of Brooklyn are framed in terms of a growing place; a place where my story emerged unselfconsciously. Brooklyn is the space/place/time where the rhythms of my narrative unfolded the mystery of subjectivity, my amazing differentiation, and the deep bondedness of my relatedness.

Our move to Brooklyn, a borough located on The Narrows (the entrance to New York harbor), was a day marked by change. Our apartment was located on one of the many steep embankments which rise out of the bay, and this location provided a panoramic view of the harbor. From the apartment window, the blue-green waters of the bay rippled in the sparkling sunlight, and hues of blue and white danced across the textures of the sky. As my gaze connected with the totality of the scene, I felt the sky enfold me as surely as it enveloped the tree-covered hills and as certainly as it caressed the tranquil waters of the ocean.
An awareness of affinity gently touched me, while the
wisdom of synthesis bestirred in me an immediate knowing of
silence, spontaneity, and exuberance—the creative tension
that beauties the microcosm and originates in the novelty
of the universe.

I remember with clarity the awe I experienced as I was
enfolded into the vista of sky and water, and if I but
close my eyes, the feel, the sight, and the sounds become
present; and great time is enacted once again.

This, my first explicit recollections of my
connectedness to Earth, generated an evocative and
imaginative response. From that day on, my imagination
dreamt a world in and beyond the sky, and the allurement of
the macrocosm permeated my fantasies. I imaged and imagined
a universe vast and mysterious, timeless and unique. Within
this vastness, however, a place/space was always accessible
to me. In my child-play, the rhythms of the sky danced
through me, and its colors were my rainbowed aura. Its
pictures, painted in silence, curved in and towards,
embracing and reciprocating the noisy exuberance of the
girl-child whose beauty was a reflection of all.

Protons, neutrons and electrons
are the human body, the planets, and the stars.
[emphasis added] (Cardenal, 1989)
I recall the play my older sister invented out of my "childish" ruminations and fantasies. As the older, wiser sister, she wanted to be free of the tag-along, questioning younger sibling. So she manipulated my childish dreams and created a wonder-world just out of reach. This sphere's accessibility, of course, was reserved for those whose age and maturity enabled them to make the long and arduous evening-sky-journey.

Not to be put off—for dreamers do not wish their dreams deferred—I asked questions replete with wisdom's lure.

Where are you going? Can I go with you? No, why not? Well then tell me, just how . . . how will you get there? I want to know the way, so that someday I, too, can go. And what, oh tell me, what is it like? Is it as beautifully wonderful as I imagine it to be? Do all the inhabitants of the creative-sky-world get along so that no one hurts the other? And will I be welcomed, even though I'm so young and don't know too much? Most of all, though, will I be free to discover all that is spectacular and unknown, all that is secret and held within its mysterious depths?

Anxious to be with her friends, my sister, with both humor and consternation, said over and over again, "YES, Yes, yes, . . . but you're still way too young. So you've just got to learn to wait. Now I've got to go. Remember when you're old enough, you can come with us."
As I watched her go each evening, my dream of skies and worlds soared, and I continued to prepare for the day of my journey. There was not one single doubt in my mind about the accessibility of the world beyond—a world I sensed as being strongly linked and mysteriously present to all space and time. In my musings, I rhapsodized a world vast and mythic, filled-full with possibilities. I danced endlessly within the potentiality my vision nourished. My youthful enthusiasm envisioned a cosmos of endless exploration and continuous play and discovery. I created panoramas of cooperative, intergalactic journeys—voyages that spiraled and encircled the universe. This world was rich in expectation and diverse in enactment. Little did my sister realize how my sky-love and her economics of necessity initiated an authenticity that would later problematize the "real" world of everyday affairs.

As the girl-child grew, the "real" world of human affairs intruded. School and friends and all sorts of necessary and practical affairs predominated. After all, there was so much for the growing child to learn, numerous objects to captivate her, myriad things to accomplish, and an exciting career to pursue. The world of school and the school of "life" became The Real World, a world dominated by rational knowledge and competitive motivation.

Thus, the seduction of acceptance, the mirage of advancement, and the myth of progress forced the world of
skies and cosmic possibilities to recede and the dreamings of intergalactic journeys to disappear.

But sometimes, when a quietness happened, the girl-child looked up at the night sky and once again was captivated by its beauty. She remembered her musings of long ago and sensed the unspoken inadequacies of modernity's myths and their fragmented knowledge. But the necessities of "real life" gripped her ever so tightly. So, she shrugged her shoulders and forgot that the silences of the night sky speak a knowing more profound than human words can articulate. She got on with her "life."

Consciousness emerged from unconsciousness. (Cardenal, 1989)

My Re-Connection to the Earth was also generated by a place, a night place. This specific night marked a reexperiencing of beginnings and became, paradoxically, an ending that originates continuous beginnings. I had taken part in a unique educative approach that incorporated art and meditation within the dynamics of enactment. This process allowed individuals time and space for reflection, dialogue, and participatory application.

On the last night of this integrative educational experience, all were invited to participate in an ancient ritual, the Spiral Dance, led by Starhawk. As the time for assembling approached, we slowly moved toward the meeting
place, and even as the setting sun awakened another part of the world, this same earth process enabled the night sky to glow with the luminescent lights of past eons. Our voices clear, yet hesitant and expectant, rose and fell within the soft black velvet of the earth and sky. As a drum beat sounded and gently fanned the night air, a strong rhythmic voice awakened memory; and we responded to the ancient call of symbol; and a circle formed—a sacred space within time, yet encompassing all times and flowing outside of time.

As the dancers and dance merged and wove a spiral, the realization of the elemental and psychic relationship with space and time created an interrelationality that mandated both interdependence and dependence within the awareness of differentiation. "The circle is cast by taking hands; power is raised, shared, and earthed" (Starhawk, 1979, p. 45).

Within the continuous process of circling and spiraling, cosmic interrelationships seemed possible; holistic entirety became plausible; connections to Life were forged; and commitment of self to life was renewed.

In us, then, the planet loves, dreams.
It is the Earth who sings in me this Cosmic Canticle [emphasis added] (Cardenal, 1989)
Paradigmatic Reflection

Thomas Kuhn (1962), in The Structure of Scientific Revolutions, refers to change in terms of a paradigm shift. Kuhn identifies a paradigm as a comprehensive and definitive scientific research tradition instituted and preserved by the scientific community. Paradigms support "acceptable examples of scientific practice--examples that include law, theory, application and instrumentation together--[and] provide models from which spring particular coherent traditions of scientific research" (p. 10). A paradigm, in other words, reifies a system already in place and authenticates suppositions already inferred.

Kuhn's analysis subverted understandings that imputed universality and truth to scientific "facts." In an essay entitled "How Fields Change: A Critique of the 'Kuhnian' View," Theodore Brown (1988) states that Kuhn's analysis questioned science's ability to "slice through superstition, error, and impression" (p. 18). Scientific theoretical formulation reinforces a particular model of how things are ordered (sequential explicate order) rather than searching for novel relational orders (generative/implicate order). The scientific endeavor by reifying its analytic and detached methodology excludes, and in many instances, devalues understandings reached by way of artistic and phenomenological endeavor.
Dialogue between and across methodologies is thus cut off. As Kuhn (1962) observes:

The proponents of competing paradigms [or methodologies] are always at least slightly at cross-purposes. Neither side will grant all the nonempirical assumptions that the other needs in order to make its case . . . they are bound partly to talk through each other. Though each may hope to convert the other to his [sic] way of seeing his [sic] science and its programs, neither may hope to prove his [sic] case. The competition between paradigms [methodologies and/or epistemologies] is not the sort of battle that can be resolved by proofs. (p. 148)

This time of paradigm shift signals the breakdown of one coherent paradigm with the simultaneous (although gradual) emergence of incommensurable paradigms. The intellectual metamorphosis created by paradigmatic change requires, according to Fiorenza (1989), "a completely new perspective" (p. 36), which informs and reforms prior understandings. Consequently, "the world" is experienced differently, and thought is extended (diffused). In her essay entitled "In Search Of Women's Heritage," Fiorenza (1989) maintains that paradigm shifts transform the imagination and allow for an "intellectual conversion that cannot be logically deduced" [emphasis added] (p. 36).

A New Paradigm

The purpose of this final chapter is to theorize curriculum through cosmology. This intent requires a paradigmatic change from anthropocentric modes of analysis
to a biocentric elan (spirit) of understanding. This change signifies a transformation of the imagination and demands an intellectual metamorphosis that defies (hence is simultaneously outside/inside) contemporary Western models of logic and reason. In other words, to theorize curriculum through cosmology, Insight is a prerequisite and is integral. Such understanding discerns the qualitative mode of presence inherent in the earth. It elaborates an interpretive mode that calls for a new consciousness, one that radicalizes contemporary modes of thought and rejects solely analytic models and rationales.

The ongoing story of the universe's creativity and humanity, as a part in this creative process, ground this new curricular vision. A cosmological curriculum theory contextualizes what Berry (1988) refers to as "emergent universe in its variety of manifestations from the beginning until now" (p. 89), with humanity as part of this activity. Its praxis personifies subjective experience as an ethos of being-in-the-world and educates toward a mode of being as both "communion and community" (p. 91).

As integrative movements, cosmology and curriculum reflect a complex unity. This wholeness triangulates universe, earth, and human education as stages of development in a single unbroken process. It encounters all aspects of being in their subjectivity, differentiation, and communion. Finally, it experiences story interactively,
embedded in the personal (as subjectivity), the cultural (as differentiation), and the cosmic (as communion).

The wisdom that sustains a cosmological curriculum also provides its rationale. Practically speaking, the insight natural to a cosmological curricular design is one that reveals all Being as meaningful and worthy of respect. It provides a vision for an authentic techne, which is grounded in understandings that grant things their being and empower the presencing of being as an indwelling which "lets the earth be as earth" (Heidegger, 1971, p. 227).

When techne is experienced in this way, as the revealment of being (ethos) and as the aesthetic enactment of nature (physis), then a cosmology of curriculum will resonate with a praxis (creative action) inherent in the universe itself. In this context, education is one—universe, earth, and human educare (as a course to run). Berry (1988) states: "It is especially important . . . to recognize the unity of the total process, from that first unimaginable moment of cosmic emergence through all its subsequent forms of expression until the present . . . . Nothing is completely itself without everything else" (p. 91).

Cosmology as curriculum empowers the emergence of an Ecozoic Age.
When envisioning a curriculum based on cosmic creativity, the function of story is primary. Story, consciously or unconsciously, juxtaposes past events and present happenings (Benjamin, 1968). As an individual's story unfolds, it creates relational contexts that enfold ever-widening patterns of connections. It encompasses the person, community, all being, and the universe. Story evokes new structures and is empowered to generate novel categories of meaning.

Story's mode taps the collective wisdom of the ages and interjects the mythical into curricular insight. Hidden within the oral narrative is the spark of enchantment, the dream of creating, and a sensed-knowing of the human's relationship to mystery and meaning. The fact that stories have to be told is the narrative quality absent (or devalued) in modernity. Charles Winquist (1978), in his book *Homecoming: Interpretation, Transformation And Individuation*, identifies the tendency of modernists to negate story with their inability to connect feeling to the reality of self. What is missing in contemporary modes of curriculum theorizing is the narration of stories that link inner/outer realities.

Joseph Campbell's (1984) scholarship, in *Myths To Live By*, is apropos to the above considerations. By telling
stories (both contemporary and past), Campbell demonstrates how humans need to integrate outward-orientated consciousness and inner-subjective forces. Myths, "as the picture language of the powers of the psyche" (p. 13), reveal the wisdom and spirit of all being. Contemporary understandings combined with mythic insights can engage evolving futures already present within the human psyche and genetic codes.

Mainstream modes of theorizing curriculum value an objectified episteme (knowledge), while the subjective, inner world (intuitive knowing) often is suspect. What is missing and what stories, in a unique way, provide is the linking of the two modes—an interdependence of inner/outer realities.

James Hillman (1979), a depth psychologist, adds to the preceding insights and further clarifies the need for storytelling when theorizing curriculum. He shows how stories support a meaning-filled integration of knowing, learning, and feeling—a qualitative mode of apprehending. Hillman asserts that story opens "a way in which the soul finds itself." Narratives present "archetypal modes of experiencing" and generate wonder, response, and creativity, restoring the "imagination to its primary place in consciousness" (p. 45).

Familiarity and involvement with story grounds the theoretical insight of a cosmology of curriculum.
Narratives create anew with each retelling, with each rethinking. Stories, like constellations, uncover an authenticity of revealment similar to the ongoing processes of cosmic creativity.

Story enacts the creative energy of the participatory endeavor—the drama of response through voice, song, movement, dance, and silence. Ong (1982) contends that "spoken words engage the body . . . bodily activity in oral communication is natural and even inevitable" (p. 67). There is no distinction, therefore, between "how" a story is narrated and the "what" of the narration (how/what). Rather, there is an interpenetration of both.

Bakhtin's (1986) concept of dialogue is relevant in this context. The stories dramatized are rooted in the concept of dialogue as a "live entering" or a "living into." This understanding suggests, according to Morson and Emerson (1989), the entering of "another's place while still maintaining one's own place, one's own 'outsideness,' with respect to the other" (p. 11). The movement projected by Bakhtin's idea of dialogue balances the interaction between story and person, between me and the other, between the cosmos and being.

Storytelling, as a mode of dialogue, is an empowering dynamic that initiates a balance between grounded ontological knowing and technical rational knowing. Stories, in oral cultures, are remembered not memorized.
They are created anew with each remembering. When a listener is caught up in a tale, the story recreates. It has a life of its own. Only later does analytical thinking integrate the experience, encounter truth, attach meaning, and become the knowledge that is remembered. Maria Chona (1979), Papago, in "Hear/Say," remembers how her father told stories in a low, quiet voice. She felt as if the story was a dream. But the dream has remained never forgotten. The how/what of the story are long remembered.

Narrative story balances how the body senses with how the mind reasons. Lane (1981) asserts that this perception is rooted in orality where words possessed a power that accomplished the tasks they were meant to enact. Stories engage mind and body by the very texture of the words used; they enact new languages. Stories reach beyond the restraints of rationality; they connect word, event, and action, and search for multiple and complex meanings and understandings. This is the hermeneutic of connection which exists in the dialogic unfolding of story.

The three directions of hermeneutics (to say, to explain, and to translate) are inherent in storytelling. There is a hermeneutic of "primordial expressiveness" in oral stories, one that is missing in a written text. The hermeneutic of explanation implies a pre-understanding of the situation and subject. The hermeneutic of translation
mediates between worlds; that is, it translates the conflict of horizons.

A cosmological curricular theory, as a positive hermeneutic of connection, awakens consciousness to the novel possibilities inherent in many words and worlds. Such theory can then change anthropocentric words and worlds and leap into an understanding of humankind's rootedness in the cosmos—a biocentric appreciation of connectedness.

In addition to story's hermeneutical connection and its capacity to balance the knowing of mind and spirit, narrative when extended to its "far reaches [is] an art form" (Bruner, 1986, p. 15). The subjunctifying potential of the narrative enables the listener/teller to reach into the world of the story, interrogate that world, relate it to the present, and then realize meanings that extend beyond the immediacy of the story and one's own life. This is the aesthetic aspect that the new cosmological curriculum theorizing will incorporate.

Story and Inquiry: Its Cosmic and Curricular Context

If we are the star—if we are born in its fire and cooled down to think and see—if protons, neutrons and electrons are the human body, the planets, and the stars—if consciousness emerged from unconsciousness—if in us, the planet loves and dreams, then, curriculum theorizing and
praxis, as a functional cosmology, should facilitate the singing of the Earth's cosmic canticle through the "being in whom the universe attains reflexive consciousness of itself" (Berry, 1988, p. 95).

The cosmic story of origins, as the ongoing event of historical change, becomes the interpretive underpinning for a cosmological curriculum based on the three basic laws of the universe and a biocentric norm of existence. Berry (1988) depicts education in a manner that is coherent with the aforementioned. He states:

Human education is primarily the activation of the possibilities of the planet in a way that could not be achieved apart from human intelligence and the entire range of human activities. In this sense human education is part of the larger evolutionary process. (p. 92)

When theorizing curriculum, therefore, an Ecozoic cosmology begins its inquiry with the Earth narrative and the dynamic and creative changes natural to its story of complexification. This approach exemplifies the radical paradigm shift referred to previously. It advances understandings of creativity rooted in the largess and wisdom of the universe itself and grounded in its evocative creativity.

Each chapter of this dissertation utilizes the narrative mode, and each prologue is prefaced with poetry. These two, the narrative and the lyric, are basic to the textual fabric of a cosmological curriculum. They
interweave the experiential, the imaginative, the creative, the historical, and the scholarly within a vision of the physical-psychic dynamics of the universe. This interweave becomes the cosmology of curriculum.

Swimme (1985) quotes from a conversation with Berry. As Swimme was working his way through a Greek salad, Berry suddenly announced:

You scientists have this stupendous story of the universe. It breaks outside all previous cosmologies. But so long as you persist in understanding it solely from a quantitative mode you fail to appreciate its significance. You fail to hear its music. That's what the spiritual traditions can provide. Tell the story, but tell it with a feel for its music. (p. 19)

If curriculum theory is to narrate the music of the universe and dance within the rhythms of cosmic exuberance, than educare (as a course to be run) needs to be conversant with the earth community as a whole and reverberate with the aesthetic natural to the Un-i-verse. Then, a renewed understanding of technological activity (as techne) will enhance the total life of the planet and enrich the whole reality of the Earth community (Swimme, 1983: Berry and Swimme, 1990).

Curriculum theoría utilizes cosmology as a practical guide for attaining wisdom and begins with the universe as the primary referent. This worldview acknowledges the universe as a singularity. No comparison to any existent thing is possible. Hence, the reality of the universe does
not admit a separation into neat, organized, and component parts.

Bohm's concept of wholeness and the notions of interrelationality elaborated by contemporary thinkers are vital to this view. Just as the dancer cannot be separated from the dance, the stream from the vortex, or winds from their surrounding turbulence, neither can curriculum theorizing isolate the processes of educating from the reality of a larger context; that is, humankind's emergence from, and existence in, the self-education processes of the cosmos.

In this way, the universe as a whole and humanity's place within the cosmic scheme become the ground for theorizing curriculum. This vision obliges humankind to acknowledge limits. This admission alters ways of thinking and functioning and modifies stances of control and domination. When this occurs, attitudes respecting the primordial and pervasive creativity of cosmic processes (Swimme, 1985, pp. 23-40) can emerge, and notions of a dynamically alive universe can become an epistemological understanding of the universe as a psychic-physical event. In this way, a cosmology of curriculum enables an Encounter with the Universe through a dialectic of interrelationality which experiences the nuances of distance and intimacy, passion and passivity, question and response.
The aesthetic narrative of the universe connects and energizes. It becomes an image of a cosmos formed on dancing particles, weaving and moving as vibrant energy patterns and one staged within a time-space continuum. A cosmology of curriculum aims to awaken in humankind deep feelings of intimacy and a primordial sense of presence to the larger Earth community. Just as mythic reenactment, orality, and the aesthetics of extant tribal communities were grounded in the experiential, orientated toward the community, and connected to the natural world so, too, must be the basis of a functional cosmology of curriculum. Lived experience (lebenswelt) and the environment (umswelt) pervade its every aspect and the creative and intelligible realities of humanity within the context of the cosmic community are its domain.

Creativity, Intelligence, and Generativity

Creativity, being a way of looking at the world and not a form of knowledge of how the world is, subverts inflexible and linear methodologies. Consequently, old perceptions (notions) are altered in a conscious effort to engage in "free play" (Bohm and Peat, 1987). The "free play" of thought Bohm and Peat depict belongs to the generative order. Generative ways of thinking and acting are essential to a cosmological curriculum theory since
they empower intuitive and intelligible modes of perceiving and facilitate the evolvement of new relational categories.

Generative thinking focuses on how each individual part enfolds the entire universe and how the universe as a whole enfolds each part. The insights generated by quantum physics and the image of holographs provide an excellent analogy for the "global property of enfoldment" (1987, p. 175).

A theorizing of curriculum based upon generative ordering introduces the notion of complexity. Complexity bridges individualism and extends curricular insight to the entirety of experience and nature; that is, it enhances a multiplicity of forms, processes, events, structures, and qualities without becoming relativistic. In other words, it re-creates worlds. It awakens a sense (feel) for new ways of seeing, new orders of creativity.

The creative action of intelligence is, by definition, generative. Bohm and Peat use the Latin root "intelligere" meaning "to gather in-between" to explain intelligence as the "mind's ability to perceive what lies 'in-between' and to create new categories" (p. 114). It is just such movement that is suggested by a provocative approach to curriculum and cosmology, wherein creativity is seen within a matrix of order that elicits the in-betweenness of understandings and perceptions.
The generative thinking a cosmology of curriculum initiates resides within the continuing story of a living universe. Cosmological curriculum theoria recognizes that creativity and intelligence originate in and emanate from cosmic singularity. All beings share individually, albeit differently, in the creative impulses encoded within the cosmos from its beginnings. Theorizing curriculum through cosmology grounds reality in this understanding: all being participates in the generative story of the cosmos, and the cosmic story is evocative of all being.

Theorizing Through Story: Primal Creativity

In a very real sense, the universe story as a whole and the emergent cosmos were the primary referents for ancient peoples. Today, similar cosmological grounding is necessary based on current understandings and an awareness of contemporary practices. When theorizing curriculum for an Ecozoic Age, in which a feel for all life is enacted and applied, the universe story as a whole and the emergent cosmos become "the fundamental context for all discussion of value, meaning, purpose, or ultimacy of any sort" (Swimme, 1985, p. 27).

Both knowledge and knowing, perceived as one movement in the cosmic dance of creativity, reestablish, as Berry (1988) says, "toward the earth and its inhabitants [a]
sense of courtesy, [a] willingness to recognize the sacred character of habitat, [a] capacity for the awesome, for the numinous quality of every earthly reality" (p. 2) that is neither controlling nor trivializing of the living community.

Curriculum, in its theorizing mode, therefore, is an experiential praxis that enhances "a sense of presence, a realization that the earth community is a wilderness community" (Berry, 1988, p. 2), and thus empowers narrative (as story, dance, ritual, song, art) to continuously integrate and celebrate the stories of all being within the spontaneous and awesome story of Universe Creativity and Exuberance (Swimme, 1988a).

Sahtouris (1989) probes the creative impulses present in the universe. She retells the new scientific story of cosmic evolution as the dance of life where cosmic experiences and experiments resolved competitive situations through cooperative strategies. To Sahtouris, the "intricate web of cooperative mutual dependence . . . [and the] patterns of evolution show . . . the creative maintenance of life in all its complexity" (p. 25).

A cosmology of curriculum must theorize modes of education that encompass an appreciation for and a knowledge of the creative beauty of the earth in all its complexity. Such an understanding is grounded in the Earth as a numinous and physical reality, raises questions that
emerge from the Earth and challenges present realities. It is an aesthetic, historical endeavor that discloses (uncovers) earth-centered values.

Swimme (1985) maintains that "to learn about creativity, [humanity] must begin to understand the creativity of the earth" (p. 30)—its lands, its waters, its mountains—and experience the depth of its beauty and allurement. Without allurement, there would be no cosmos, for it is attraction that holds the universe together. In human beings, the mystery of allurement creates passionate interests that are uniquely personal (subjectivity and differentiation), but the relational context of allurement itself generates the need for involvement in ever-more profound relationships (communion). Allurement ignites an awareness of and response to the complexity inherent in the universe and in all being.

Curriculum theorized around a functional cosmology of allurement traces the evolutionary story of the universe from its beginnings until its present development in human cultural systems. It is an evocative, historical, and scientific/speculative endeavor (Berry, 1988, p. 99).

In the cycles of nature, Swimme (1985) finds a power of sensitive awareness present everywhere. As water absorbs salt, it becomes something new and enters into a new relation (pp. 88-89). The interrelations and interactions formed through awareness are not overly concerned with
already organized and structured knowledge. There is an openness which is generative--creative; it is the "free play" that energizes a new world visage.

Theorizing curriculum under the impulse of the Cosmos may well be the ultimate breakthrough of the Ecozoic Age.

In summary, the theorizing of curriculum through the insights and wisdom of cosmology has been a transformative endeavor. In order to remain faithful to the call of the new paradigm, a cosmological curriculum theory must separate itself from past curricular designs which emphasize static programs and rational procedures. The very notion of cosmology as curriculum precludes such organizational structuring.

What a curriculum theoria of cosmology envisions is the transformation of tacit cultural infrastructures that inhibit the telling of the cosmic story from which humankind's deepest meaning and creativity emerge. A cosmology of curriculum anticipates the interpretive changes a new cosmic order requires and provides the avenue for change as a new integral mode of human presence and living in the cosmic community.

The purpose of this dissertation is to outline what this author believes to be the foundation of a cosmological curriculum theory. Since story is central to the unfolding and balancing of ways of knowing, the following contributions of narrative to educare are recognized:
1. Story juxtaposes past and future.
2. Story is located within time, but is timeless.
3. Story connects feelings with reality.
4. Story integrates outward-oriented and inner-subjective forces.
5. Story is a qualitative mode of knowing.
6. Story is a participatory endeavor.
7. Story is rooted in dialogue.
8. Story balances ontological knowing and rational-technical knowing.
10. Story joins body-sensing and mind-reasoning.
11. Story reaches beyond the restraints of rationality.
12. Story is hermeneutical.
13. Story is art form.

Story contributes to a cosmological curriculum theoria in that it is a qualitative mode of creatively imaging world. Story expresses allurement and fascination, probes the mythical and mysterious, and interweaves through the "free play" of thinking the aesthetic and intellectually creative impulses of the universe. Story acknowledges the three basic laws of the universe: subjectivity, differentiation, and communion.

The enactment of a cosmology of curriculum can occur only within the Dream Vision and the Creativity associated with the Dream Experience. A Cosmology of Curriculum is the Dream Vision/Experience. It is the capacity to imagine, to sense the mystery and magic, to continuously envision and revision, and to live into and out of a cosmic vision.

With the Dreaming, praxis (the creative action of the cosmos itself) follows, bringing into consciousness an Ecozoic Age, an era where the larger community of life is
recognized as our primary referent in terms of reality and value.

Berry and Swimme (in press) affirm:

As the Ecozoic Age comes into its full expression, the healing of the past and the shaping of the future are becoming more effective. The possibilities and the promise of the future become clear. As we finally become familiar with the language and the wisdom of the winds and the sea and the land and all the unnumbered forms of life that form the great community of Earth, we finally realize that we are Earthlings, that we are born out of the Earth, that we have no future except within the larger earth community [emphasis added]. (p. 7)
A coda by its very definition finalizes. In so doing, it fashions a definitive and acceptable finale where separate variations of musical themes or the *pas de deux* of the dance come together in an effusive and energetic climax. Introduced at the end of a composition, a coda delineates its boundaries and is defined by its distinctiveness. By integrating thematic parts charismatically, the coda fashions a satisfactory conclusion while maintaining its own singularity (Oxford English Dictionary, 1989; Webster's International Dictionary, 1961).

Similarly, the coda a work on cosmology and curriculum proposes is a finale. Its purpose is to contextualize themes that have danced throughout the work and to articulate a vision of education as the discourse of the world. As such, my cosmological coda integrates and advances concrete ways of enacting an Ecozoic rationale, while synchronously providing a vision for earth-centered schools.

Earth-centered education transforms the imagination and extends rational thinking beyond logical deduction. Centered on a biocentric elan (spirit) of understanding, earth-centered schools educate toward a mode of human presence in the cosmos that affirms and confirms the
unfolding universe in its diversity of revelations from its
genesis until now. Biocentric understandings personify
subjective experience as an ethos of being-in-the-world,
both as community and communion, and enact an interactive
and experiential interpretation of story. Narrative, in an
earth-centered school, is, therefore, embedded in the
personal (as subjectivity), the cultural (as
differentiation), and the cosmic (as communion). The
subsequent scenario exemplifies how a cosmological
perspective influences classroom teaching and elucidates a
cosmology of curriculum.

The curricular design I am about to describe evolved
quite spontaneously. I was teaching fifth grade and read
Mildred Taylor's (1975) *Song of the Trees* to the class. The
power, depth, and beauty of this story soared through the
students as they became captured by the tale's magic. One
reading wasn't enough. So I read it a second and third
time. The plot of the *Song of the Trees* confronts and
exposes the harsh reality of "man's inhumanity to man" and
to nature. By skillful revealment (unconcealment) of a
family's courage, wisdom, and unity, Taylor unfolds a story
that interrelates themes of loving, caring, sadness,
cruelty, prejudice, poverty, strength, and gentleness.
Taylor's artistic interweaving of the preceding motifs
contextualizes family strength and unity during difficult
times when a family not only grapples with economic
hardship but also confronts cruelty and prejudice, domination and control. The family's refusal to succumb to oppression as well as its power to remain true to its vision creates a story whose texture touches and transforms, energizes and repositions the reader.

"Good morning, Mr. Trees," I shouted. They answered me with a soft, swooshing sound. "Hear 'em, Stacey? Hear 'em singing?" (1975, p. 11)

"One thing you can't seem to understand, Anderson," Papa said, "is that a black man's always got to be ready to die. And it don't make me any difference if I die today or tomorrow. Just as long as I die rightly" (p. 49).

"Dear, dear old trees," I heard him call softly, "will you ever sing again?"

I waited. But the trees gave no answer (p. 52).

By the third reading, the students lived in the story's aura and felt at home with the family and the forest. The students identified with the family's courage, love, and integrity and became incensed at the injustice, cruelty, and racial prejudice. I decided to use their engagement and interest to develop a thematic unit.¹
I planned a section entitled: "Response to Theme," and developed predictable subheadings (character, plot, story, etc.). Suddenly, I realized that such minute planning for every expediency was deadening—boring.²

Detailed and precise strategies structured within explicit methodologies tend to become inflexible in that outcomes are already perceived and planned. When this occurs, student spontaneity and interest are subordinated to the already defined plan which is consciously or unconsciously imposed on the theme. It also takes away from the student's engagement with the text. I immediately decided to list only major headings: (a) Response to Theme; (b) Nature, Earth, Land; (c) You; (d) Dream; (e) People. The students would generate subdivisions. My task was to wait and see what evolved through student responsive understandings.

What happened next was not a new technique but rather a transformed context for educing education through story, inquiry, and an active, caring participation with the natural world. The students generated all the activities for the main ideas and began investigating their world (personal ecology), others' world (ecosystem of learners), and the natural world (their bioregion). What evolved was not an external methodology developed and used by the teacher to facilitate the acquisition of knowledge, but rather a dynamism of inner student motivation that spiraled
into new ways of seeing and looking, a qualitative mode of insight, a wisdom that hears the languages of all being.

Caution should be exercised in using the preceding example as an absolute model/methodology for enacting a cosmological curriculum. What a cosmological curricular perspective suggests is a generativity and creativity that is modeled through the universe itself and the evolving story of its genesis. Its praxis, therefore, is interpretive, and its vision is hermeneutical. The theory-practice a cosmological attitude counsels is structured on teacher artistry, the art of inquiry, and a practical knowing of the natural world. The hermeneutic a cosmological curriculum proposes is a new way of looking that opens up the interactive and dialogic processes of awareness which empower students and teachers to see the world directly in its richness and not simply on what others have told them.

Hence, the methodology a cosmological curriculum unfolds is, at its core, hermeneutical.3 It challenges the preconceptions (prejudices) that both teacher and students bring to every encounter. Even further, however, grounded in a creativity as vast as the universe itself and in the ongoing story of cosmic genesis, a cosmological curricular perspective is shaped through dialogue and interaction. When narrative, dialogue, and interaction are viewed as integral to a methodology, then the circular dynamics of
hermeneutic understanding, interpretation, and application can unfold and enfold contextual meanings.⁴

Another illustration of an earth-centered methodology may be useful at this juncture for it, too, exemplifies the genesis needed if a cosmological curricular mode is to be initiated.

Cheryl Slattery, a primary teacher, read the cosmic story I narrate in Chapter 4 to her first grade students. After a second reading, she asked the students to create their own story through picture and words. Unencumbered by titles, explanations, or directions on how to do the activity, the students originated word-images and picture-portraits filled with cadences and movement, primordial splendor and dynamic energy.

Look, so as to see, and listen, so as to hear, the synergy of their creations in both their artistic and narrative voices.⁵
FIRE IS LIGHT.
THE EARTH AND THE STARS STARTED IT WAS LIKE NOTHING IT JUST HAPPENED AND ANIMALS WERE MADE IT WAS AMAZING. THE SIGHT LISTENING TOO THE BREEZ BLOW A GOOD SOUND.
I DID FIRE.
THE FIRE BLAZZING
HOTI COLE COME TOGATER
These drawings reflect what Slattery feels is usual for her students. Scholarship attests to Slattery's observation. The work of Karen Hamblen (1984, 1989, 1990, 1991) in art education and Ann Trousdale (1989, 1990) in literature and whole language derive corresponding conclusions. Trousdale has researched story (children's literature) as an interactive event and has documented how oral narration and/or the reading of stories out loud enables collaborative teaching strategies to evolve and cooperative learning to unfold. Even further, Trousdale's strategies enable students to gain confidence in their own voice when narrating stories.

In art education, Hamblen's research integrates the exploratory experiences of art education with higher level thinking skills. Hamblen explicates how viable artistic expression and the alterable endpoints of children's art interface with adult artistic expression. Such intersections suggest that universal factors of selection as well as cross-cultural similarities and differences are operative in both adult and children's works of art. Hamblen's work indicates that when art and literature are comprehended through a cross-cultural, international perspective and an open and receptive attitude toward student artistic and literary creativity is initiated, then Wolfgang Iser's (1978, 1989) ideas of dialogue, discourse, communication, and textuality become important in their
pedagogical implications. The research of both Trousdale and Hamblen interface with what Iser identifies as central to literacy—the dialogic process which examines the use of metaphor and the reality of different cultural viewpoints in all literary/artistic works. Iser sees the communicative (dialogic) processes as initiating movement toward collaborative learning processes. Hence, when teaching strategies utilize the vision of the aforementioned scholars, then a conscious awareness of the creative dynamics of active intelligence, the importance of reflexive processes, and the necessity of interactive communication can be realized. Such processes are hermeneutic and initiate the continuous quest for new understandings.

An earth-centered school, using a cosmological curriculum praxis, extends the previous rationales. Embodying a vision of human-earth relatedness in concert with an ethos of the earth and an authentic techne of enactment, the cosmology of curriculum an earth-centered school implicitly seeks is insight; that is, deeper understandings which reside in the untapped generativity and creativity of the universe itself.

Hence, an earth-centered school interprets Slattery's concept of usual in an earth-centered WAY (TAO) and in the context of the total generativity and creativity of the Un-I-Verse which is open to all being. The uniqueness of the
student word-pictures presented above, when related to a human-earth context, lies in the very issue of their being usual--their usualness. What is usual for Slattery's students is what, in itself, makes these works unique. By engaging students through story, the narrative mode of enactment, the teacher tapped into the generativity and creativity that is present in ALL being. It is a creativity that is in us as beings who are part of the creative processes of the universe. What a cosmology of curriculum empowers is the evolution (emergence) of the Un-i-verse's creativity through the dialogic, interactive, and hermeneutic processes which the narrative mode encourages. It allows the very creative processes of the universe from its emergence to be-come apparent through the students. This process of unconcealment, if nurtured, acknowledges the subjectivity, differentiation, and communion actualized through all being and enables students to enact (portray) the USUAL creativity present in the universe--an originality that is awesome and mysterious, constant and participative. It is a creativity accessible to humankind as the earth's consciousness of itself.

This very approach facilitates what Doll (in press) in his final chapter, refers to as the 4 R's--richness, recursion, relations, and rigor. According to Doll, richness refers to a "curriculum's depth, to its layers of meaning, to its multiple possibilities or interpretations"
Recursion derives its importance from the need to consciously and continuously make meaning of our world. Through a reflexivity that orders, links, and questions, recursion allows persons to interrogate their perceptions of what is (pp. 36-37). Relations, in both a pedagogical and cultural sense, imply connectedness. Pedagogical relations connect to the curriculum. Pedagogical relations inform and are informed by the larger reality of both cultural and cosmic relatedness (p. 37). The last of Doll's 4 R's is rigor. He defines rigor "in terms of mixing--indeterminacy with interpretation. The quality of interpretation, its own richness, depends on how fully and well we develop the various alternatives indeterminacy presents" (p. 46). Doll's 4 R's support what Bruner (1986) sees as the need for the analytic to combine with the narrative, the representational with the interpretative, and the scientific with the hermeneutic.

Cosmology and curriculum confirm and affirm the creativity and generativity of the Un-I-Verse and allow all being to evolve and emerge through this vision/dream.
Notes to Coda


2. There are numerous thematic units on environment, ecosystems, and habitat which utilize many interdisciplinary approaches and techniques. Most of these units, however, do not develop the functional idea of a cosmological curricular mode which is the development of integral human-earth relations.

3. Currently, hermeneutics is perceived as a persuasive way to revolutionize research methodology. Jonas Soltis (1990), in an address to the American Educational Research Association, considers a hermeneutic methodology necessary for inquiry into contemporary affairs. Addressing Division D of AERA, Soltis presented a philosophical, ontological, and epistemological rationale for a hermeneutic/interpretive methodology.

4. The unfolding and enfolding of contextual meanings through narrative and dialogue is what hermeneutics is all about. As Richard Rorty (1982) points out, since the time of Galileo and Newton the sciences and human sciences have believed in a "distinctive" analytic method, one which leads to an understanding of nature in "cold," "inhuman," "mathematical terms." The notion of such a distinctive, non-human method is, he says, seriously "misguided." Narrative serves a "useful purpose . . . [as] a protest against this fetish." Hermeneutics goes too far if it separates itself entirely from the scientific and analytical and "begins to draw a principled distinction between [humans] and nature" (pp. 191-210). Narrative and analysis are both needed to help us unfold and enfold contextual meanings.

5. Both the artwork and unedited text are the original work of the first grade students.

6. It is worth noting that some scientists with a cosmological interest are beginning to posit the universe as being inherently creative. See Swimme (1985) and Davies (1988, 1992).
BIBLIOGRAPHY


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