AN ABSTRACT OF THE THESIS OF

MAX LEEK for the MASTER OF ARTS

in ENGLISH presented on JULY 20, 1977

Title: EMBEDDED IN NATURE: THE CONTEXTS OF MAN IN THE ESSAYS OF LOREN EISELEY AND LEWIS THOMAS

Abstract approved: John L. Somer

The study of literature is enriched by an understanding of man's changing view of his place in nature. That view has been determined by the Great Chain of Being, Darwinian evolution, and the concept of spaceship earth. The Immense Journey, by Loren Eiseley, and The Lives of a Cell, by Lewis Thomas, are collections of essays by contemporary scientists who share a new view: man is embedded in nature. Their differing scientific disciplines, however, make their ideas of nature differ. Lewis Thomas finds the living world so cooperative and symbiotic that it can best be compared to a single cell.

EMBEDDED IN NATURE: THE CONTEXTS OF MAN IN THE ESSAYS OF LOREN EISELEY AND LEWIS THOMAS

A Thesis

Presented to

the Faculty of the Department of English

Emporia State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

Max Leek

July 1977

Man's function in this unified earth is to use his special skills for manipulating information to serve, unconsciously, as a nervous system for the world. Thomas uses a variety of expository techniques to alter his reader's perspective from the competitive Darwinian view of the world to his own cooperative view. Eiseley sees all living things joined in the dimension of time through evolution, and he sees evolution as an immense journey with a destination beyond man's vision. Man is part of life's journey, but the development of man's brain changes the environment in which evolution takes place to the invisible environment of the socio-cultural world. Eiseley uses the conventions of a religious book to communicate his religious belief in an intelligence beyond nature.

The different perspectives of Eiseley and Thomas are related to the differing concerns of their scientific specialities. They agree, however, on a view of man as an essential part of the living world, but not the only essential part. He is embedded in nature--a step in the journey for Eiseley, one symbiont among millions for Thomas.

Charles S. Walton

Approved for the Major Department

Harold E. Durst

Approved for the Graduate Council

PREFACE

I first read Lewis Thomas's The Lives of a Cell with great interest, not only because of the stimulating ideas Thomas presents, but also because as a teacher of composition I am particularly interested in the short essay form. I decided that a study of contemporary essays would be a rewarding thesis topic, and began to look for other books of essays like Thomas's. I sought essays written by scientists for laymen. My criteria were firmly in mind but not clearly articulated: I could say only that I was looking for essays similar to the ones Thomas writes.

I spent some time looking at essays on the conflict or gap between the humanities and the sciences, of which C. P. Snow's The Two Cultures and J. Bronowski's Science and Human Values are the best known. But I was interested in a confluence of the two cultures, not the conflict between them.

Loren Eiseley's books were among the first I looked at. In addition to being a scientist and essayist, Eiseley has a reputation as a prose stylist. His essays fit my (still unexpressed) criteria. But then I spent

months browsing through libraries, examining bibliographies, and soliciting advice from friends. I found, examined, and rejected dozens of books of essays written by scientists. None seemed appropriate for the kind of study I had in mind. Finally, after hearing me talk about my intentions in vague terms for weeks, Dr. John Somer put my idea into words. "I see," he said. "You want to interpret these books of essays as if they were novels." Much later I read Eiseley's comments about his "concealed essays," and realized that an essential element in the essays of Lewis Thomas and Loren Eiseley, for my purposes, was the concealed intention. Both The Lives of a Cell and The Immense Journey are unified collections of essays skillfully written by scientists. Both are informed by a consistent and contemporary world view. Both provide ideas and expository techniques worth investigating. These rare virtues made the two books the object of my study.

It is unlikely that I would have begun this study had I not experienced the exhilaration of John Somer's class in contemporary fiction; it is certain I would not have finished it without his contagious enthusiasm, steady encouragement, perceptive criticism, and practical advice. Dr. Charles Walton was gracious enough to read and comment on my manuscript. Lydia Walter Leek found the time and

patience to type some of these pages three times, and all of them twice. They deserve, and they have, my thanks.

Great Bend, Kansas M. L.

July, 1977

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION: MAN'S CHANGING PLACE IN THE WORLD AND THE PERSPECTIVES OF LOREN EISELEY AND LEWIS THOMAS

Constantly changing views of man's place in nature influence his art. A student of Elizabethan literature must understand the Great Chain of Being, and a student of Victorian literature must have some knowledge of Darwinian tenets.[1] The contemporary notions of man's relationship to the living world, therefore, are important to the student of contemporary literature.

Man's view of himself and nature is changing rapidly and profoundly. In no century but our own could a governmental agency for the protection of the environment exist. Neither Elizabethans nor Victorians would have been able to comprehend the idea of man as a protector of the environment. In the idea of the Great Chain of Being and the Victorian world-view conditioned by Darwin the environment exists to be exploited by man.

---

[1]See Eustace M. W. Tillyard, The Elizabethan World Picture, or Lionel Stevenson, Darwin Among the Poets.

In the Renaissance, man saw himself as the center of a Great Chain of Being, halfway between the lowest creatures at the bottom and God at the top. He considered himself inferior to the angels, but superior to and master of the entire sublunary world. The Victorians, influenced by the Darwinian theory of evolution, saw man as the perfect form of life, the culmination of a development through eons. Darwinian theory did not eliminate the hierarchical view of the natural world. The theory of evolution, in fact, only modified the Great Chain of Being. The top half of the chain, God and the angels, became less visible, and the details of the hierarchy became less certain. The bottom half, however, came clearly into view. At least in the popular conception of evolution, man was seen as the final product of the chain of life linked in time. Moreover, the Darwinians saw all living things engaged in competition for survival. Man's exploitation of his environment was doubly justified. First, he was the final product, foreshadowed, they thought, by all the creatures who had lived before him. The theory of evolution seemed to give scientific support to the preeminent position of man in the earthly Great Chain of Being. Second, the part played by competition in natural selection seemed to indicate that man's efficiency in consuming his environment

and even his viciousness toward his fellow man were natural, and even valuable, assets in the evolutionary struggle.

Man's view of his relationship to other living things gradually changes, however. The Chain of Being with man as the master gave way to the descent of man, the goal and purpose of evolution. Darwinian ideas still dominate the beliefs of man concerning the place of man in nature, but this competitive, exploitive, Darwinian view shows signs of changing. Now man continues to view himself as the epitome of life, master of the world, but he takes a paternalistic interest in the preservation and protection of the world he has used carelessly for centuries. New discoveries in science have spurred this change, and fuel shortages and photographs of the earth taken from the surface of the moon have also encouraged a new way of looking at the world. The idea of the world as the object of man's exploitation is losing popularity. To an increasing degree, mankind seems one of the names on the passenger manifest of spaceship earth.

Because science has had a great influence on man's changing views of the world, statements on the subject by contemporary scientists are likely to be especially valuable in any inquiry into contemporary world-views. In the essays of Loren Eiseley and Lewis Thomas, two

contemporary scientists, a new view of man's place in the natural world is developing. Man is still a creature with unique specializations and potential, but he is no longer the epitome of life and master of the living world. He is neither the exploiter nor the protector of his environment. Eiseley and Thomas use their considerable literary skills to outline a view in which man is a part of the world of living things--a step in the journey for Eiseley, one symbiont among millions for Thomas.

Eiseley and Thomas, although they have important differences, share several qualities which make them ideal subjects for a study of contemporary world-views and literature. First, they have spent their lives in highly successful careers as scientists. Eiseley is a distinguished anthropologist and student of human evolution, and Thomas is a biologist, Medical Doctor, and President of the Memorial Sloan-Kettering Cancer Institute. Second, both are skillful essayists. Eiseley's essays have appeared in American Scholar, Harper's Magazine, and Scientific American, and have been collected in prize-winning books. The first and best known of these books is The Immense Journey.[2] Thomas's essays first appeared

---

[2]Loren Eiseley, The Immense Journey. Subsequent references to this edition are given in parenthesis within the text and identified by the abbreviation IJ.

in the New England Journal of Medicine. The collection entitled The Lives of a Cell[3] was awarded a National Book Award. Neither author has yet received much attention from literary critics, although Eiseley's essays are the subject of E. Fred Carlisle's study of "The Heretical Science of Loren Eiseley."[4]

The presence of more than popularized science or history of science in the essays of Thomas and Eiseley is a third quality which makes them good prospects for this study. There are a number of scientists who are skilled and successful essayists, but Eiseley and Thomas do not write merely popular science. Isaac Asimov's hundreds of essays on scientific subjects do not attempt to go through the science fact to a concept of man's place in the natural world.[5] Essays by Harlow Shapley[6] and Carl Sagan[7] explain astronomy or speculate about

---

[3]Lewis Thomas, The Lives of a Cell: Notes of a Biology Watcher. Subsequent references to this edition are given in parenthesis within the text and identified by the abbreviation LC.

[4]E. Fred Carlisle, "The Heretical Science of Loren Eiseley," The Centennial Review, XVIII (1973), 354-77.

[5]See Isaac Asimov, Of Matters Great and Small; Isaac Asimov, Of Time and Space and Other Things; and many others.

[6]Harlow Shapley, Beyond the Observatory.

[7]Carl Sagan, The Cosmic Connection: An Extra-terrestrial Perspective.

extraterrestrial life. Jacob Bronowski's The Ascent of Man concerns the development of scientific thought in the western world. Martin Gardner has collected an anthology of scientific essays for a popular audience.[8] Yet none of these works by scientists looks through the science or history of science to comment on man and the world.

Finally, the quality which makes Loren Eiseley and Lewis Thomas ideal for a study of world-views and literature is that both essayists use their backgrounds in science as starting places for essays which are ultimately about humanity, and not just science. Science becomes one of the writer's tools. Through their literary skills, the parochial concerns of their respective disciplines broaden to provide insight into a conception of man.

In his autobiography, Eiseley describes the writing of the first of the essays which are collected in The Immense Journey. He decided, he says, to turn a straightforward essay on human evolution

> . . . into what I now term the concealed essay, in which personal anecdote was allowed gently to bring under observation thought of a more purely scientific nature.[9]

---

[8]Martin Gardner, ed., Great Essays in Science.

[9]Loren Eiseley, All the Strange Hours: The Excavation of a Life, p. 182.

Both Eiseley and Thomas write this kind of concealed essay. Both men use scientific discoveries in their essays, but neither restricts an essay to describing a scientific discovery. Scientific facts, brought under observation by personal anecdote and other means, are used in turn to examine the broader questions of man and his place in the world. The concealed essay, however, requires explication; careful reading can reveal the matter concealed in the essay. A student of literature will also be interested in rhetorical techniques; that is, how the concealed material is concealed. The essays of Eiseley and Thomas provide rich material for this rhetorical study, as well. There is a significant relationship between the concealed content of these essays and the style used in presenting it. The views of man in nature and the essay styles of these two scientists are both consistent with their respective scientific disciplines. Thomas's literary technique and thought are related to the view of the world of a biologist. Eiseley's ideas and rhetoric are connected with his anthropological studies. Whether or not the relationship between scientific discipline and literary style is a causal one, a relationship can be demonstrated.

Possibly because of their differing disciplines, Loren Eiseley and Lewis Thomas also have widely varying

views of the nature of science. Eiseley works alone. His professional duties have led him to wildernesses and deserts all over the world in search of human remains. He sees science as a lonely quest among scenes of desolation. He describes an experience when he was "young and left alone in a great desert" doing research:

> I had forgotten the world of men and the world had forgotten me. Now and then I found a skull in the canyons, and these justified my remaining there. I took a serene cold interest in these discoveries. . . . I had grown to take pleasure in the divested bone. (IJ, 183)

This romantic view of the processes of science--the lone anthropologist seeking bones in the desert--contrasts sharply with Lewis Thomas's experience of science. He says that scientists at work are "rather like young animals engaged in savage play." It is a long way from Eiseley's solitary bonehunter to Thomas's scientists. Thomas says of science,

> It sometimes looks like a lonely activity, but it is as much the opposite of lonely as human behavior can be. There is nothing so social, so communal, so interdependent. An active field of science is like an immense intellectual anthill; the individual almost vanishes into the mass of minds tumbling over each other, carrying information from place to place, passing it around at the speed of light. (LC, 119)

With ideas as varied as these of the processes of science, it would be surprising to find a consistent "scientific perspective" on man and the world in these two essayists. The anthropologist seeks information

differently than the biologist. Eiseley's scientist contemplates a skull in a vast and desolate landscape. Thomas's scientist almost vanishes in an anthill crowded with tumbling minds. These models of science bear affinities to the visions of man in nature of the two men. The way these visions are presented, the essay style, also shows some relationship to the conception of science held by Eiseley and Thomas. The scientific specializations of Loren Eiseley and Lewis Thomas are related to both their views of man's place in the world and their expository techniques.

CHAPTER II

THE NATURE OF NATURE IN THE LIVES OF A CELL

Lewis Thomas outlines his view of nature in the first essay of The Lives of a Cell. He refutes the idea of man's "special lordship" over nature as well as the idea that life on earth is delicate and endangered by man. The important problem, according to Thomas, is "to cope with the dawning, intensifying realization of just how interlocked we are" (LC, 1-2). Thomas's work in medical research has shown him the extent of man's interdependence with the living world, and his researches also provide him with an appropriate metaphor. Thomas introduces the metaphor of the cell to illustrate the complex and interlocked nature of life on earth. In his words, the biosphere of the earth is "most like a single cell" (LC, 4).

Like the diverse elements which make up the single cell, and like the diverse elements which make up the biosphere, Thomas's essays in The Lives of a Cell interlock. Although they were written at irregular intervals over a period of years, they work together to create something more than a collection of essays. The obvious purpose of the essays is to stimulate and entertain: they are

light, witty, even whimsical. But to understand the view of the world which they present, it is necessary to articulate the argument that underlies and unifies them. Although Thomas presents his ideas indirectly and metaphorically, it is possible to discover the sequence of ideas that creates a framework upon which the essays of The Lives of a Cell may be spread for examination.

Thomas's world view rests on three propositions: 1) there are basic similarities among all forms of life due to their common origin; 2) we cannot be certain what is an individual and what is not; 3) the old, but still prevalent, conception of the battle for survival in nature, the battle that Malthus and Darwin made essential to the twentieth-century way of looking at nature, is no longer tenable because cooperation describes the way of the world more accurately than competition. Each of these three propositions forms a part of a world view concealed in Thomas's essays. Each point is developed in several of the essays of The Lives of a Cell.

The first proposition, that all forms of life share basic similarities, makes less surprising Thomas's startling comparison of the earth to a single cell. As an example of a shared characteristic, Thomas points out that creatures as apparently divergent as termites, whales, birds, and even men, all share a propensity for making

music. Thomas's work in medical research has led him to more profound similarities, however. Because all life probably derives from a single cell, biochemical structures and processes are common to all life on earth. The chemicals and genetic material of living things are remarkably similar. Even though the original cell has developed in many forms, "we still share genes around, and the resemblance of the enzymes of grasses to those of whales is a family resemblance" (LC, 3). Thomas looks at the world from the point of view of a biochemist and finds the uniformity of life on earth more astonishing than its diversity.

One of the characteristics common to all life is described in Thomas's second proposition. Each form of life eludes clear identification as an individual. Any creature, in fact, can be seen as a part of a larger whole, or as a collection of smaller organisms. All creatures are simultaneously elements of colonies and colonies themselves. Even the idea that each human being is an individual, significant in his own right, with an individual destiny over which he has conscious control is merely one way of looking at a man--a limited and limiting perception.

Thomas's second proposition has two parts, since any living thing may be viewed either as a collection of organisms or as a part of a larger whole. The first

essay of The Lives of a Cell begins the presentation of the first of these parts by suggesting that each human is made up of many creatures, some of them with a great deal of autonomy. Individuals, Thomas says, are "eco-systems more complex than Jamaica Bay" (LC, 2). Thomas himself, as he says in another essay,

> . . . could be taken for a very large, motile colony of respiring bacteria, operating a complex system of nuclei, microtubules, and neurons for the pleasure and sustenance of their families, and running, at the moment, a typewriter. (LC, 84-5)

Definitions of individuals and autonomy break down when any one living thing may be a collection of living things.

Green plants, Thomas points out, "are in the same fix": they depend of chloroplasts, which are largely autonomous creatures within the plant--they even have their own genetic material. To insist, then, that a green plant is a separate, single entity is to miss seeing the interrelationship which Thomas believes is the essential fact of nature. An individual plant is really a collection of symbiotic organisms, but it is also a part of a larger organism: earth itself. This is the second part of Thomas's proposition about the difficulty in determining what is a discrete organism: any organism can be viewed as one connected, interdependent part of a larger organism.

The protozoan Myxotricha paradoxa, an inhabitant of the "inner reaches of the digestive tract of Australian

termites" (LC, 31), provides a dramatic illustration of the way individuals may be both members of larger colonies and themselves colonies of smaller members. While the protozoan is essential to the termite and the termite is essential to the ecology of the earth, the protozoan itself is made up of spirochetes, organelles, and bacteria, all contributing to the function of the earth. The classification systems of science, dependent as they are on the idea of discrete individual organisms, blind us to Thomas's "Earnest Proposal": "it is in the nature of things to pool resources, to fuse when possible" (LC, 33).

The best examples of the way apparent individuals may pool resources to form part of a larger organism are the social insects. Although scientists classify organelles as parts of cells, cells as parts of tissues, and tissues as parts of organisms, "bees live lives of organisms, tissues, cells, organelles, all at the same time" (LC, 14). The classification system does not work with social insects. It fails with ants, too, who create an organism by grouping together. One ant is not much of anything. "It is only when you watch the dense mass of thousands of ants, that you begin to see the whole beast" (LC, 13). In order to comprehend ants, the entire hill must be seen as a whole, an intelligence with "crawling bits for wits" (LC, 13)

The formation of an organism through the grouping of individuals is not restricted to social insects. Thomas insists it is a trait common to all living things, even man. Men are, Thomas says, "the most social of all social animals" (LC, 15). Science and language are our social functions, collective activities utterly out of the control of any individual. An institution such as the Marine Biological Laboratory at Woods Hole, Massachusetts, has an existence of its own, a collective existence which is not dependent upon any one individual. Humans, like other living things, can be viewed as both collections of organisms and elements of organisms.

Whether the organism is seen as an individual, a group of individuals, an element of an individual, or all three simultaneously depends on the scale used. On the largest scale, the entire earth can be viewed as a single organism. It is like a cell with the atmosphere as its membrane. Every living thing on earth participates in building the atmosphere. Moreover, the atmosphere is not only constructed collectively, it serves all life on earth collectively. The habit of looking at the differences between forms of life on earth inhibits the vision of the essential interdependence of nature. "One way to put it," Thomas says, "is that the earth is a loosely formed, spherical organism, with all its working parts linked in symbiosis" (LC, 122).

The idea of a symbiotic world organism is not new--Thomas cites Johannes Kepler's vision of the earth as a single spherical being (LC, 48)--but after the writings of Malthus and Darwin, the idea has a surprising ring to it. Thomas's third proposition is that the prevalent view of nature as "red in tooth and claw" is a misperception. Thomas repeatedly insists that this adversary view of nature is wrong.

Such an adversary view is still prevalent, as is illustrated by the following quotation from a book written by another physician and published in 1976:

> From the beginning of life it has been the thousands of single-cell microbes--always there trying to destroy us everywhere along our way--more than any cataclysm of nature, that have been our real opponents in the long struggle for existence. Our survival throughout evolution individually and as a species has rested on the weapons our bodies have developed to meet their relentless, unending attacks.[10]

Compare Thomas's view:

> We still think of human disease as the work of an organized, modernized kind of demonology, in which the bacteria are the most visible and centrally placed of our adversaries. . . . These are paranoid delusions on a societal scale. . . .
>
> Pathogenicity is not the rule. Indeed, it occurs so infrequently and involves such a relatively small number of species, considering the huge population of bacteria on the earth, that it has a freakish aspect. (LC, 88-89)

---

[10]Ronald J. Glasser, The Body is the Hero, p. 4.

In order to discredit the idea of nature as a "struggle for existence" which has dominated man's view of the world for a century and show that his view of a cooperative world is accurate, Thomas shows how two aspects of nature abhorrent to man, disease and death, fit into a world he considers as harmonious as a single organism. That disease and death are real cannot be denied, nor will a physician like Thomas ignore them. He deals with them to strengthen his third proposition about the essentially cooperative nature of nature.

Disease is a fact of life which seems to contradict the tendency of living things to get along. But Thomas points out that good health "is the real lot of most of us, most of the time" (LC, 98). Sickness, when it comes, is not proof of a relentless attack. The odd virus disease "may be looked on as an accident" (LC, 4), and our diseases from bacteria are caused by our own bodies' response to the bacteria (LC, 92). Thomas even turns the existence of disease into an argument for, rather than against, the symbiotic nature of nature: "Disease usually results from inconclusive negotiotions for symbiosis" (LC, 89).

Like disease, death seems to be an argument against the good nature of nature. It is everywhere; it is inevitable. Yet things are arranged so that men do not constantly dwell on death, even though they are surrounded

by it. And the evidence is that men instinctively know how to die, and cause trouble only when they refuse to recognize the naturalness and the universality of death. Dying is

> . . . the most ancient and fundamental of biologic functions, with its mechanisms worked out with the same attention to detail . . . that we have long since become accustomed to finding in all the crucial acts of living. (LC, 60)

In order to better cope with the idea of death, Thomas says, men should "give up the notion that death is catastrophe, or detestable, or avoidable, or even strange" (LC, 116). The prevalent view of death is part of the view of the world as the adversary of man, but Thomas's third proposition denies that view.

Thomas's three propositions--the similarities among all forms of life, the tendency of all creatures to be both colonies and colonists, and the inaccuracy of the adversary view of nature--point to what Thomas considers the correct view of the nature of nature. That view is that living things tend to get along so well that the world can best be conceived as a single cell.

Man's place is not at all outside this single organism. Man is like all living things: he is embedded in nature. This is the radical departure of Thomas's vision in The Lives of a Cell from the traditional hierarchical views. He disagrees with the idea of

the Great Chain of Being and the Darwinian evolutionary hierarchy which view man as the master of the world for better or for ill. Thomas's biological and medical background allows him to conceive the world organically, with all its parts linked in symbiosis.

It is a mistake to see man as the epitome of life, the victor in a long struggle for survival. He may be an indispensible element of nature, but he is not the ruler of nature. There is no reason to think that man's specializations are any more or any less important than the special skills of Myxotricha paradoxa.

CHAPTER III

THE NATURE OF MAN IN THE LIVES OF A CELL

It makes little sense to ask the meaning, significance, or purpose of single cells in a plant or in the body of a human being. While the cell may very well have a function, even an important function, in the life of the whole organism, such a cell has no significance by itself. It has purpose, or meaning, only in the context of the organism of which it is a part. Lewis Thomas believes that questions concerning man's significance must be approached from a similar perspective. Each individual man is significant only in relation to the entire organism: mankind. By extension, mankind is significant only in that it plays a part in the organism which is the biosphere. For Lewis Thomas, philosophical questions about the nature of man, the purpose for which he exists, and the meaning of his life have limited meaning--they can only be answered in terms of man's place in nature.

One aspect of the nature of man is that he is a member of a "social species" (LC, 68). The value of the individual, then, is in his participation in the functions of the species as a whole. In seeking to discover man's

"specialization," the function he performs in the life of the biosphere, Thomas looks for "the enterprises that we engage in collectively and unconsciously, the things we build like wasp nests, individually unaware of what we are doing" (LC, 68). The behavior of social insects is Thomas's constant guide as he examines the behavior of mankind. Like the termites who participate in the construction of their nest, even though an individual termite can have no conception of the nest as a whole, individual men cannot easily observe the function of mankind in the organism of earth.

This approach to the problem of mankind's specialization contradicts several traditional ideas. The essential qualities of man are usually considered to be related to his value as an individual, his consciousness, and his conquest of the "animal" instincts. To the contrary, Thomas suggests that man's essential quality depends on his collective, instinctive behavior. Thomas sees man as a creature involved in behavior that his consciousness cannot or does not grasp in its entirety, behavior that must be largely instinctive.

Thomas prepares the reader to accept his unorthodox views by showing: 1) that collective activities may transcend the individual's consciousness, at least in ants and termites; 2) that some of man's activities bear close resemblance to the activities of social insects;

3) that man communicates with other men subconsciously. These three points lead Thomas to believe that there are unique, instinctive, collective activities of mankind. These activities are very likely man's "specialization."

Men do not normally consider themselves a social species in the way some insects are social insects. But Thomas's example from the world of insects shows that the individual element of an insect colony is not aware of the nature and function of the whole. This is the beginning of Thomas's evidence to show that mankind may have instinctive and collective activities.

From entomology Thomas borrows the idea of a "Superorganism"--that colonies of social insects possess "a collective intelligence and a gift for adaptation far superior to the sum of the individual inhabitants" (LC, 149). Not only do colonies of insects act in some ways like a single organism, but the individual insects within the colony participate without any knowledge of what the colony as a whole is doing. In a colony of a million ants constructing a hill, for example, each ant works "ceaselessly and compulsively to add perfection to his region of the structure without having the faintest notion of what is being constructed elsewhere" (LC, 151). This idea, that "individual organisms might be self-

transcending in their relation to a dense society" (LC, 150), serves as a model for the kind of instinctive, unconscious, collective activity Thomas seeks in mankind's behavior.

"Nobody wants to think . . . that the mass of mankind . . . bears any meaningful resemblance to the life of an anthill or a hive" (LC, 103), as Thomas says. But Thomas also reminds the reader that there are resemblances between some of the activities of mankind and the activities of the social insects. This is Thomas's second piece of evidence for the existence of instinctive and collective activities of mankind. Thomas notes that conventions of medical scientists, viewed from a height, have "the look of assemblages of social insects" (LC, 11). While admitting that it is "quite bad form in biological circles" to do so, he points out the many activities, from farming to child labor, which ants and humans both do (LC, 11-12).

In spite of the possibility of its being "bad form," the similarities between New Yorkers and social insects are emphasized through parallel descriptions in "Antaeus in Manhattan." Ants communicate by "touching each other continually, by exchanging bits of white stuff" (LC, 63), and people watching the ants are "touching shoulder to shoulder, sometimes touching hands, exchanging bits of information" (LC, 65). Thomas believes

that humans are the most social of all creatures, "more interdependent, more attached to each other, more inseperable in our behavior than bees" (LC, 15). Thomas's second point is that, bad form or not, some activities of humans bear great similarities to the activities of social insects.

Lewis Thomas says that individuals engaged in collective activities may not be aware of it, and that some human activities resemble the activities of social insects. These two points are suggestive, but they do not demonstrate collective, unconscious, and instinctive behavior in man. His third point provides evidence of such behavior. Like the colony of social insects, the minds of mankind are linked together in ways of which the individual is unaware. There is evidence, as Thomas points out in "A Fear of Pheromones" and in "Vibes," that humans, as well as other animals, communicate unconsciously through the sense of smell. Pheromones, odors which transmit information, do not account for all the unconscious communication between humans, but they do illustrate a form of communication which affects man at some level other than consciousness. Even without admitting the existence of human pheromones, however, there is ample evidence that mankind thinks collectively:

> Effortlessly, without giving it a moment's thought, we are capable of changing our language, music, manners,

> morals, entertainment, even the way we dress, all around the earth in a year's turning. (LC, 132)

We communicate with each other so compulsively and with such speed that "the brains of mankind often appear, functionally, to be undergoing fusion" (LC, 166-7). Like other social species, men sometimes communicate with each other unconsciously.

Human beings resemble, in many ways, ants building their hill. Lewis Thomas suggests that "it may be our biological function to build a certain kind of Hill" (LC, 15). The "Hill" he speaks of is the manipulation of information in science and language. "Perhaps," he says, "we are linked in circuits for the storage, processing, and retrieval of information, since this appears to be the most basic and universal of all human enterprises" (LC, 15). Science and language, according to Thomas, are things man does collectively, instinctively, and unconsciously.

Thomas views science as instinctive in man: "There is an almost ungovernable, biologic mechanism at work in scientific behavior at its best" (LC, 117). As in the activities of social insects, the individual scientist is neither capable nor conscious of building the overwhelming structure which is science. In fact,

> . . . an active field of science is like an immense intellectual anthill; the individual almost vanishes into the mass of minds tumbling over each other,

> carrying information from place to place, passing it around at the speed of light. (LC, 119)

The entirety of the structure of modern science, however, complex as it is, may be easier to visualize as one of mankind's "hills" than is language. But language is Thomas's prime example of the way man is specialized for manipulating information. Thomas claims that language is "the most compulsively collective, genetically programmed, species-specific, and autonomic of all things we do" (LC, 152). Language is a structure we build collectively; we all participate in the process, yet no one controls it. Language is instinctive in humans, and restricted to humans: "We have DNA for grammar, neurons for syntax" (LC, 152). Our participation in the construction of language is "autonomic." We control, that is, neither the structure of language as a whole nor our personal participation in the process of language construction. We speak with the same necessity, and with the same conscious attention, as we breathe.

Exchanging information, Thomas says, "seems to be our most urgent biological function; it is what we do with our lives" (LC, 131). This perception of man's specialization leads Thomas to a new conception of man's place in nature:

> We are, in this view, neither owners nor operators; at best, we might see ourselves as motile tissue specialized for receiving information--perhaps, in

> the best of all possible worlds, functioning as a nervous system for the whole being. (LC, 122)

Mankind's special abilities in the manipulation of information give it an essential role to play in the functioning of the biosphere.

Thomas sees the earth as a single, coherent, living thing. In this vision, man is an indispensable part of the world, but he is not the only part or the most important part. He is not the highest sublunary link of the Great Chain of Being, destined to rule and exploit all other life, nor is he the final product of evolution, the fittest of all. Man is no longer seen as master of all the earth, nor is he seen as plunderer and destroyer of the earth's riches. Both views, man as king and man as curse, exaggerate man's control over nature and over himself. Both views are incompatible with the idea of the earth as a cell. Thomas examines man and nature from the perspective of a doctor and biologist, and speculates that

> . . . this might turn out to be a special phase in the morphogenesis of the earth when it is necessary to have something like us, for a time anyway, to fetch and carry energy, look after new symbiotic arrangements, store up information for some future season, do a certain amount of ornamenting, maybe even carry seeds around the solar system. That kind of thing. Handyman for the earth. (LC, 124)

Lewis Thomas believes that man's unique information processing skills do not make him ruler of the earth. His

role must be seen within the context of the organism of the earth as a whole. He is not a king but a "handyman for the earth."

CHAPTER IV

THE NATURE OF THE LIVES OF A CELL

> Tell all the Truth but tell it slant--
> Success in Circuit lies
> --Emily Dickinson

"The Technology of Medicine," one of the essays in The Lives of a Cell, is a straightforward example of the rhetorical technique of classification. Thomas divides present-day medical practices into three categories, defines them, gives clear examples, and concludes that it would be "an act of high prudence to give high priority to a lot more basic research in biologic science" (LC, 41-2). His classification clearly supports this conclusion. It is an effective piece of writing, persuasive even without the concluding reference suggesting the relatively huge amounts spent on the space program: "it seems, as used to be said in the days when the phrase still had some meaning, like asking for the moon" (LC, 42). But the traditional rhetorical form of "The Technology of Medicine" is a rarity in The Lives of a Cell. The majority of Thomas's essays depend for their meaning and their effect on cleverness in concluding sentences, or on word plays and figures of speech, or by contradictions of

the reader's rhetorical expectations.

Thomas can argue logically that more money should be spent on basic research, but the theme of his book is broader than that argument. He is discussing perspectives, points of view, ways of looking at things. The "old, clung-to-notions" about man's special lordship over nature, about the vicious struggle for existence in nature, and about the competition among living things, are cast in a different light. Thomas uses his art to make his readers see things differently.

Thomas seeks a sense of strangeness in order to break down conceptual barriers--the classes, categories, and relationships which men tend to see as immutable, and which Thomas wants to show are the result of "old, clung-to" perspectives on the world. In order to achieve the sense of strangeness, Thomas adopts a light tone about serious subjects, he writes surprise twists in the last paragraph of his essays, he uses military diction to talk about the human body's reaction to disease. He uses ambivalent metaphors, abrupt changes of scale, and paradox. Thomas even plays upon his reader's rhetorical expectations to direct attention away from the main point of the essay, as if crucial information could only be apprehended subconsciously, using peripheral vision. All of these devices serve to present, not factual scientific information, but rather a sense of the possibilities

for ways of looking at the world other than the "old, clung-to" notion of the world as an arrangement of adversary systems.

The capability of human language to create a sense of strangeness is one of its most important characteristics, according to Thomas. In the essay "Information," Thomas expresses his belief in the value of telling the truth slant:

> Ambiguity seems to be an essential, indispensible element for the transfer of information from one place to another by words, where matters of real importance are concerned. It is often necessary, for meaning to come through, that there be an almost vague sense of strangeness and askewness (LC, 111).

According to Thomas, ambiguity is the special value of language, and language is the specialization of mankind.

> If it were not for the capacity for ambiguity, for the sensing of strangeness, that words in all languages provide, we would have no way of recognizing the layers of counterpoint in meaning, and we might be spending all our time sitting on stone fences, staring into the sun. (LC, 111)

Thomas works for a sense of strangeness because strangeness is the way meaning comes through, and also because his meaning is an altered way of looking at the world.

Thomas uses a light, witty style in most of his essays. In the title chapter, "The Lives of a Cell," for example, he describes the mitochondria in his cells as "stable and responsible lodgers" (LC, 2). Viruses "dart . . . from organism to organism . . . passing

around heredity as though at a great party" (LC, 4). In "The Music of This Sphere" he imagines the dilemma of a

> . . . wooly-minded Visitor from Outer Space, interested in human beings, discerning on his spectrograph the click of that golf ball on the surface of the moon, and trying to account for it as a call of warning (unlikely), a signal of mating (out of the question), or an announcement of territory (could be). (LC, 23)

The decision to look at the world differently leads Thomas to whimsy and fantasy. The tone would not be appropriate in a traditional scientific paper, nor would it suit logical argument like the one in "The Technology of Medicine." But for a work intended to alter the reader's point of view or to show that the conventional point of view is only one of many, Thomas's choice of the light tone works perfectly.

Thomas often emphasizes his intention to indulge in fantasy by introducing a part of an essay with a phrase such as "I prefer to think . . ." or "I shall believe otherwise." None of Thomas's whimsies violate known facts; all of them extrapolate, change perspectives, tell the truth "slant." He is aware, for example, that bird song and whale song have been analyzed for their "content of business communication" (LC, 24). But that analysis does not stop Thomas, listening to the thrush sing in his yard, from having the "strongest impression

that he does this for his own pleasure. . . . I cannot believe that he is simply saying 'thrush here'" (LC, 25). Although whale song may be "statements about navigation," Thomas dismisses the theory: "I shall believe otherwise" (LC, 26). The traditional view is not always the best, most useful, or most attractive, and Thomas insists on his freedom to look at things differently.

"The Music of This Sphere" contains one of the most difficult and elaborate of Thomas's whimsies. The way Thomas introduces his whimsy is especially interesting.

> If, as I believe, the urge to make a kind of music is as much a characteristic of biology as our other fundamental functions, there ought to be an explanation for it. Having none at hand, I am free to make one up. (LC, 27)

In two sentences Thomas states his belief (and identifies it as a belief), claims that there should be a reason for it (although the idea that there ought to be a reason behind fundamental functions is another of Thomas's beliefs), and announces his intention to supply the missing explanation, not with a carefully argued hypothesis from scientific data, but with something made up. The avowed intent to "make things up" along with the light, chatty tone is a way Thomas uses to provide alternate perspectives and alter the reader's way of looking at the world.

Thomas also uses the strength of the last paragraph or the last sentences of these essays to provide the "slant"--that strangeness and askewness Thomas feels

may be necessary for meaning to come through. The last sentence of the essay discussed above, "The Music of This Sphere," is an example of this sort of sting in the tail of an essay. Thomas speculates that rhythms and songs of living creatures are "a score for the transformation of . . . random matter . . . into the improbable ordered dance of living forms" (LC, 27). Then, with a verbal shrug, he says this fantasy "would do for what I have in mind" (LC, 28). This is no longer a simple colloquial expression meaning "my idea." In the context of the essay, it suggests that music represents the organization of his brain as well as the organization of life. In addition, what Thomas "has in mind" is an organization of the world: a perspective.

In "Germs," Thomas's consistent use of military diction sets up the "layers of counterpoint in meaning" in the final few sentences. The essay describes the body's reactions to germs in martial terms: we have "arsenals for fighting off bacteria," "we are mined," "we will bomb, defoliate, blockade, seal off, and destroy" in our battle against germs (LC, 92). The reference to the Pentagon in the last sentence is not an abrupt change of metaphor, then, but the last paragraph has developed so that the subject broadens from the body's reactions to germs to war itself:

> Sometimes the mechanisms used for overkill are immunologic, but often . . . they are more primitive kinds of memory. We tear ourselves to pieces because of symbols, and we are more vulnerable to this than to any host of predators. We are, in effect, at the mercy of our own Pentagons, most of the time. (LC, 94)

There is nothing unusual about concluding a short essay with a reference to a broader problem of which the subject of the essay is a part, but the body's defense against germs is related only metaphorically to national defense. The reader of "Germs" is left with a sense of "askewness" because the metaphor has become part of the subject. Thomas describes immunologic reactions in terms of war, then suggests that the metaphor may work equally well in reverse, with war described in terms of immunology. The essay about how misunderstandings cause disease now appears to be about how misunderstandings cause war.

Thomas's analogies, metaphors, and similes are often especially effective because they do point in both directions. What is described as like a cell, for example, may also indicate something about the nature of the cell. When Romeo says "Juliet is the sun," on the contrary, he is describing the girl, not the sun, and there is little chance he will be misunderstood on this point. "All the world's a stage" characterizes the world, not the stage, yet the metaphor makes sense and is still effective when the terms are reversed: "All the stage is

a world." Shakespeare may have intended that meaning, too, in his metaphorical comparison of universes. To varying degrees, then, metaphors may point in two directions. Such Janus-faced metaphors are appropriate to Thomas's style and his intent to involve the reader in the process of experimenting with changing views of the world. Thomas's ambivalent metaphors encourage the intellectual flexibility he seeks.

Another example of the complexity of Thomas's metaphors appears in the first essay, "The Lives of a Cell." The title itself suggests a paradox: a single thing, a cell, is said to have more than one life. Then, in the concluding paragraph of this essay, Thomas admits that the earth is "too big, too complex, with too many working parts lacking visible connections" for him to consider it an organism. Instead he thinks of it as a single cell (LC, 4). By reversing the traditional idea that a single cell is simpler than a multi-celled organism, Thomas provides a conclusion strange and askew enough for meaning to come through. And the meaning is richly complex. A cell, Thomas suggests, is not so simple, so unified, as one might think; it may contain many lives. And the earth, he suggests simultaneously, may be as unified, as interdependent, as a single cell.

The meaning, here, is not that the earth is more like a cell than an organism; in a later essay, after all,

Thomas argues that the earth is like an organism. The point is rather that the mental habits perpetrated and petrified by empirical science--the habit of thinking of cells as simple, for example--are not truth but tools, not facts but viewpoints. When perspectives become dangerous, when men start tearing themselves to pieces because of symbols, the symbols can and should be changed. Thomas implies the flexibility of perspectives when he says that his vision of the earth as a single cell is satisfactory "for that moment" (LC, 4). He does not say that it is eternally true.

The differences among living things, according to Thomas, are often merely a matter of scale. The basic similarities, then, can be revealed by rapid changes in scale and abrupt switches in the position of the observer. In "The World's Biggest Membrane," Thomas describes the function of a membrane in order to show that the atmosphere functions in the same way. But he emphasizes the similarities among all membranes in nature. He reduces the scale twice: "A cell does this [catch, store, and release energy], and so do the organelles inside" (LC, 170). The earth is like a cell, which is like an organelle within the cell: all create and use membranes. The vast differences we perceive among them are merely differences in size.

Removing the observer to the position of an extraterrestrial intelligence is another example of changing the scale in order to change the perspective. Someone out of this world could understand the harmony of the sounds made by life on earth because such a listener could hear it all, according to Thomas in "The Music of This Sphere." A change in scale results in a new way of looking at, or rather hearing, the harmony in nature. Whale song and cricket chirps are always heard individually, and therefore out of context.

> If we could listen to them all at once, fully orchestrated, in their immense ensemble, we might become aware of the counterpoint, the balance of tones and timbres and harmonies, the sonorities. (LC, 26)

The extraterrestrial embryologist described in "Ceti" sees earth "with the beginnings of a nervous system and fair-sized ganglions in the form of cities" (LC, 51), because Thomas wants the reader to deal with the idea that the earth may be viewed as an organism, and finally "that the whole, infinitely huge, spinning, clocklike apparatus around us is itself animate" (LC, 52). The reader is led through increases in scale until he can see the entire universe as a single, animate thing.

Thomas uses still another method of telling the truth slant: he intentionally directs the reader's attention away from important, and sometimes central, points of his essays. In "The MBL," for example, Thomas

decides that the Marine Biological Laboratory at Woods Hole is a good example of a joint activity of man. He discards the best example of collective activity, language, because it is "so overwhelming a structure and grows so slowly that none of us can feel a personal sense of participating in the work" (LC, 68). Thomas then says that the MBL is "touched all around by human meddle" (LC, 68) and is "seasonally raddled" by committees (LC, 69). The beach there "is so crowded that one must pick one's way on tiptoe to find a hunching place" (LC, 73) [my italics]. The words Thomas invents are richly ambiguous, the way he believes language should be. "Hunching," for example, describes both the crouching and the guessing on the beach near the MBL. Thomas gives examples of coined words in this essay to show how language grows, even though he says he is not going to discuss language. The essay, in fact, concerns two of man's collective activities, science and language.

"Antaeus in Manhattan" provides another example of Thomas's use of misdirection. The "parable," as Thomas calls it, is the story of a colony of army ants exhibited in an art museum. They die mysteriously, and Thomas suggests they may have died because they were out of touch with the earth. The parable applies to mankind, Thomas continues, because "Manhattan itself is suspended

on a kind of concrete platform" (LC, 66). To this point the essay is built on the familiar change of scale--there are similarities between army ants and people--and the message should be that New Yorkers should get back to the earth. This is not, however, the way Thomas concludes the essay. The meaning lies in the analogy, the similarity of army ants to "the crowds of winter-carapaced people who lined up in neat rows to gaze down at them" (LC, 65). After the parallel descriptions which show the similarities between ants and people, Thomas quotes a paragraph from an author who insists that analogies between social insects and humans are meaningless. Then he adds:

> It is, of course, an incomplete comfort to read this sort of thing to one's self. For full effect, it needs reading aloud by several people at once, moving the lips in synchrony. (LC, 67)

This ironic conclusion makes it clear that it is the similarities between the two forms of life, not the distance between New Yorkers and the earth, that is the more important theme to Thomas. Even the title of the essay is part of the misdirection. The classical myth of Antaeus is suggested by the weakening of creatures suspended above the earth, but the important thing about Antaeus is that it contains "ant" and "us." Thomas's subject, concealed in the title, is the similarities between ants and people in large groups.

Something is askew about the conclusion of "An Earnest Proposal," as well. The proposal is this: "I suggest we defer further action [on beginning a nuclear war] until we have acquired a really complete set of information concerning at least one living thing" (LC, 30). He proposes a protozoan as a subject which will be "easily solved within ten years" (LC, 31). At the end of the essay, however, Thomas appears to have changed his mind about the ease of solving the protozoan. It seems, in fact, that Thomas's proposal is a trick. The computer will reply, at the end of ten years, "'Request more data. . . . Do not fire'" (LC, 34). The proposal turns out to be a way to make scientists and their computers play Scheherazade by insisting that a never-ending story be completed before the execution takes place. That proposal does not seem earnest at all.

The real earnest proposal, the idea which lies at the heart of this essay as it does at the heart of the book, is a revised view of nature. We are threatened with nuclear annihilation because

> . . . the men who run the affairs of nations today . . . have been taught that the world is an arrangement of adversary systems, that force is what counts, aggression is what drives us at the core, only the fittest can survive, and only might can make more might. (LC, 30)

The composition of the protozoan contradicts that view because it is made up of many interdependent organisms

existing harmoniously and symbiotically together. Thomas extrapolates from this information until he has arrived at nothing less than a new understanding of aggression, including war:

> If this is, in fact, the drift of things, the way of the world, we may come to view immune reactions, genes for the chemical marking of self, and perhaps all reflexive responses of aggression and defense as secondary developments in evolution, necessary for the regulation and modulation of symbiosis, not designed to break into the process, only to keep it from getting out of hand. (LC, 33)

The essential information which the proposed study of the protozoan would produce is that living things tend to get along.

Empirical knowledge is a useful tool for Thomas, but this book is not about human pheromones and termites' nests; it is about ways of conceiving the world: perspectives. The tendency to look only for empirical data from biological research can be misleading, since the most essential contribution of modern biology may be an altered perspective. It is such a perspective which Thomas is trying to show and explain in The Lives of a Cell. He is telling the truth; but, more importantly, he tells it slant.

CHAPTER V

THE NATURE OF NATURE IN THE IMMENSE JOURNEY

The title of Loren Eiseley's first book of essays, The Immense Journey, refers to more than one journey, but all his journeys span the dimension of time, not space. The essays, he says, have "grown out of the seasonal jottings of a man preoccupied with time" (IJ, 12-3). Eiseley is preoccupied with his own personal history, of course, and many of his experiences serve to illustrate or symbolize some idea he wishes to present. As an anthropologist and evolutionist, Eiseley is professionally preoccupied with the history of mankind and even life itself. This history has been his life's study: "Forward and backward I have gone, and for me it has been an immense journey" (IJ, 13). His personal experiences, as a man and as a scientist, provide a medium for discussing a longer journey: the development of man from the moment a primate became self-conscious. "Perhaps he knew," Eiseley writes, "there in the grass by the chill waters, that he had before him an immense journey" (IJ, 125-6). Ultimately, the immense journey refers to the journey being made by all life, by the whole of nature. Sometimes Eiseley has doubts about the "destination" of that journey:

"perhaps there is no meaning in it [evolution] at all, the thought went on inside me, save that of the journey itself, so far as men can see" (IJ, 6). Eiseley comments repeatedly upon the limits to man's vision, especially his vision through the "dimension denied to man, the dimension of time" (IJ, 11). But finally Eiseley does have some ideas about the meaning of life, about the direction of the journey being taken by life.

As Eiseley develops his view of the natural world as seen through the dimension of time, the appropriateness of the journey metaphor becomes apparent. The idea of a journey encompasses or suggests the important points in Eiseley's view of nature. One of life's "strangest qualities," Eiseley believes, is its "habit of reaching out into new environments" (IJ, 37). This "reaching out," which moves life along its travels, results in a constant appearance of change and movement when viewed through evolutionary time. Reaching out and its resulting continuous change are important qualities in the nature of life as Eiseley views it. More important, however, is Eiseley's belief that the change and reaching out have direction. Like a journey, there is an end to the immense journey in which life is involved. There are "final secrets" (IJ, 12) in a world beyond nature, a world which seems to resemble the ideal world of the Platonists.

One of the most important characteristics of all life is its tendency to "reach out." Eiseley finds this tendency so universal that he considers it an important difference between life and non-life. It is "that magnificent and agelong groping that only life--blindly and persistently among stones and the indifference of the entire inanimate universe--can continue to endure and prolong" (IJ, 43). This reaching out is the aspect of life which propels it along its immense journey. Eiseley notes several examples of life's "eternal dissatisfaction with what is, its persistent habit of reaching out into new environments and, by degrees, adapting itself to the most fantastic circumstances" (IJ, 37). The "floating heads with their starveling bodies" (IJ, 37) in the ocean depths are evidence of this characteristic of life. So, too, is the "spidery thing of hair and many legs" seen by Eiseley as a boy when he lifted the cover from a well (IJ, 38). Man himself is ultimately a result of the reaching out of the prehistoric fish which began to breathe air instead of water. Man's attempts to penetrate outer space are merely other manifestations of the urge of all living things to reach out (IJ, 44). Eiseley sees life constantly reaching out and adapting to new environments.

Because Eiseley looks at living things in the dimension of time, he sees the changes and adaptations

brought about by life's reaching out as changes wrought in a single thing. He sees, that is, not individuals and species, but one thing--life--which continuously changes shape in its passage through time. The best illustration of this vision is Eiseley's description of a part of life's journey seen in reverse:

> You and the cat are related. . . . But somewhere there must be an original pattern; somewhere cat and man and weasel must leap into a single shape. That shape lies inconceivably remote from us now, far back along the time stream. (IJ, 160)

It is this way of looking at things which allows Eiseley to say that man was driven out of a prairie dog town when he means a Paleocene rat (a distant relative to man) was driven out, or to say about the face of a strange prehistoric fish which began to come ashore, "in three hundred million years it would be our own" (IJ, 51). The cat, man, and weasel, the rat and the fish, all are forms of the same thing. All are shapes taken by life on its journey.

Eiseley is talking about evolution, of course, but his view of evolution emphasizes the unity of living things. When he says that "living creatures flow with little more consistency than clouds from age to age" (IJ, 5-6), he does not intend the lack of consistency in shape to obscure or weaken the concept of the "flow" of living things. In the perspective of an evolutionist like Eiseley, living things are not only related, they are

unified through time. All living things share characteristics such as reaching out; all are part of the same immense journey.

That reaching out leads to a continuous flow of life through changing shapes in the dimension of time is one important part of Loren Eiseley's view of nature in The Immense Journey. The most significant aspect of Eiseley's view, however, is that the flow of life has order, direction, and purpose. The journey has a destination. There is some sort of directing intelligence behind the scenes.

Eiseley's belief in the directing force behind or within nature is illustrated by his reaction when a seed attaches itself to his socks or shoestrings: "It is obvious that nature, or some part of it in the shape of these seeds, has intentions beyond this field and has made plans to travel with me" (IJ, 196). Nature, here and elsewhere in The Immense Journey, is personified. Nature can make plans; in another place Eiseley describes nature as having "inscrutable wisdom" (IJ, 75). This personification of nature is an indication of Eiseley's belief that there is some sort of intelligence behind the scenes (or behind the masks, as Eiseley says,) which gives to life its order and purpose.

Eiseley finds "organization" to be the sine qua

non of life. It is "that mysterious principle known as 'organization,' which leaves all other mysteries concerned with life stale and insignificant by comparison. . . . Without organization life does not persist . . ." (IJ, 26). Organization is evidence of the intelligence behind nature; it is another manifestation of nature's wisdom.

For Eiseley, tracing the living world through the dimension of time, a primary illustration of the organization of life is the order and pattern which results in the continuity of evolution. This persistent pattern, Eiseley says, is so common that men do not see the miraculous in it:

> All their experience tells them that their children will precisely resemble themselves; that kittens will become cats and cats will have kittens, and that even caterpillars, though the pattern seems a little odd, will become butterflies and butterflies will produce caterpillars. (IJ, 147)

Man recognizes this continuity without recognizing the implications. Eiseley points out that "this amazing precision in results implies a strange ordering of life in a world we often think is chanceful and meaningless" (IJ, 147). The continuity of patterns, Eiseley believes, is further evidence that a mysterious principle moves in nature. At one point in his description of the "wisdom of nature" in directing the course of evolution, Eiseley identifies this principle as "the careful finger of God" (IJ, 52).

Eiseley believes that this recognition of an organizing principle is as far as man's understanding can go in the search for the meaning in life's journey. Man's limitations in time prevent him from seeing the end of the journey, the final shape of life. In this sense, time is "a dimension denied to man" (IJ, 11). Man dimly sees the past and is blind to the future, and cannot, therefore, see the entirety of the creature called life.

The limits of man's vision apply also to man's institutions, such as science. He denies that science can answer essential questions, because their answers lie in "that mysterious shadow world beyond nature" (IJ, 27). He repeatedly mocks materialists, as when he imagines his reactions to the future announcement that life has been created in a laboratory through a combination of particles. He will examine the skeleton of a hare, he says:

> I will marvel, as I marvel now, at the wonderful correlation of parts, the perfect adaptation to purpose, the individually vanished and yet persisting pattern which is now hopping on some other hill. I will wonder, as always, in what manner "particles" pursue such devious plans and symmetries. (IJ, 209)

Eiseley doubts that empirical science's search for more and more basic forms of living things, "this long descent down the ladder of life" (IJ, 209), will lead to the "final secret" of life. "Even if the secret is contained in these

things . . . I do not think it will yield to the kind of analysis our science is capable of making" (IJ, 202). Eiseley's suggestion, here, that materialistic science is not the road to final answers is repeated near the end of this essay on "The Secret of Life." If the secrets of life are found in matter, he says, then "it must be plain even to the most devoted materialist that the matter of which he speaks contains amazing, if not dreadful, powers" (IJ, 210).

Eiseley has learned through his studies in evolution and his preoccupation with time that life continually changes and reaches out, but his science cannot tell him life's purpose. His science leads him to believe in some organizing force beyond nature. But science deals with the material world; it cannot define the ideal world beyond. Eiseley mocks materialism and the more grandiose expectations of modern microbiology because his science has convinced him that there is a reality, a final truth, beyond science.

Eiseley is idealistic when he writes about final truths and a world beyond nature. Eiseley's idea of some organizing force in nature often takes on a Platonic tone, such as when he says the principle of organization in life, like Platonic pure forms, was "there before the living in the deeps of water" (IJ, 26). Or, again, he sounds Platonic when he argues against the "utilitarian

philosophy," the "doctrine of use or disuse" which characterizes much of evolutionary theory:

> There is no logical reason for the existence of a snowflake any more than there is for evolution. It is an apparition from that mysterious shadow world beyond nature, that final world which contains--if anything contains--the explanation of men and catfish and green leaves. (IJ, 27)

The "shadow world beyond nature" is also beyond the grasp of man's science. Eiseley agrees with Hardy, whom he quotes as saying that the material world which scientists investigate may be "but one mask of many worn by the Great Face behind" (IJ, 210).

For Loren Eiseley, nature is in the midst of a journey through time. The journey has direction and purpose; it has an order given it by "the wisdom of nature" or a "mysterious shadow world" or "the careful finger of God." Man's limited vision in the time dimension prevents him from seeing the entirety of the journey and its destination, although the order and organization found everywhere in life suggest that some ultimate purpose does exist. Modern man is not as limited as those nineteenth century scientists who saw history as a story of steady progress towards man. Scientific advances have taught us only to see ". . . that eternal flickering of forms which we are now too worldly wise to label progress, and whose meaning forever escapes us" (IJ, 138).

CHAPTER VI

THE NATURE OF MAN IN THE IMMENSE JOURNEY

Loren Eiseley's study of evolution gives him no reason to believe that man is the perfect and final form of life. Eiseley says that the world view in which man is the end of the development of life through evolution is Ptolemaic" (IJ, 57): "We see ourselves as the culmination and the end, and if we do indeed consider our passing, we think that sunlight will go with us and the earth be dark" (IJ, 57). But man does have some unique specializations that have profoundly changed the evolutionary process from the classic "survival of the fittest" which produced life before man. Man is a social animal, a self-conscious animal, and the first animal on earth with the ability to exert some control over his own evolution. Eiseley is acutely aware of man's literal kinship with the rest of nature, but he is equally aware of the differences created by man's brain development.

Eiseley describes his experiences to show man's kinship with nature and his differences. A catfish frozen in ice, a skull embedded deep in the earth--these are images Eiseley uses to illustrate man's position. Man

is a part of an ongoing evolution. The short lifetime of each man and even of the entire species limits him in the dimension of time. These temporal limits prevent him from understanding or transcending the entirety of the process in which he is a part. He is locked in time as the fish is locked in ice. Like the skull Eiseley finds in "The Slit," man will not live to see his successors. Unlike the creature of the fossil skull, man can know that successors will come.

Man is one of the products of evolution which is still continuing. Eiseley's essay on "The Snout" in The Immense Journey describes two creatures which emerged from swampy waters in two different times and learned to breathe the air with lungs instead of gills. One, the Snout, was the prehistoric fish that was ancestral to man. The other is the mudskipper, a present-day fish that "climbs trees and pursues insects" (IJ, 58). The mudskipper is a living answer to those who believe man to be the end of life. It demonstrates that the processes which produced the Snout and his descendant, man, have not stopped. It is clear that

> . . . nature [is] still busy with experiments, still dynamic, and not through or satisfied because a Devonian fish managed to end as a two-legged character with a straw hat. There are other things brewing and growing in the oceanic vat. (IJ, 47-8)

The immense journey does not terminate in man.

Man's position as the perfect conclusion to the development of life is undermined not only by the continuous nature of evolution, but also by the fact that man has no reason to believe that he is superior to other creatures at this point in the evolutionary journey. Those early evolutionists who saw a progression in time leading inevitably to man were mistaken. Eiseley is contending against such "Ptolemaic" writing when he says that man

> . . . was merely one of many descendants of the early vertebrate line. A moose or a mongoose would have had equally good reason to contend that as a modern vertebrate he had been 'prefigured from the beginning' and that the universe had been organized with him in mind. (IJ, 159)

Man is not necessarily the last or the best of the forms of life.

But if man is not the culminating, perfect image of life, he does have unique specializations which distinctly set him off from the rest of nature. The three essays at the center of The Immense Journey concern the development of the human brain. These chapters are central both to the book and to Eiseley's thought because it is this specialized organ which gives man his "lonely, magnificent power" (IJ, 46). It is the brain which allows man to far surpass other forms of life in "reaching out." It is the brain which both creates and is created by the new "invisible environment" of man's social world. It is the brain which gives man his unique ability to make choices about evolution.

Eiseley believes that all life reaches out, but man excells other creatures in reaching out because his brain development has given him imagination. Eiseley suddenly understands mankind's unique ability when he stands quite still to avoid frightening a frog he is observing. He has imagined what the frog might see, and "this is the most enormous extension of vision of which life is capable: the projection of itself into other lives. . . . It is . . . the supreme epitome of the reaching out" (IJ, 46). This tremendous extension of vision is one of the results of man's brain development. The imagination is one of those abilities which result in the creation of what Eiseley calls an "invisible environment."

Another effect of man's unique brain development which alters man's environment is man's consciousness of time. The awareness of time is prerequisite to a conception of history and, therefore, necessary to understanding evolution. Man's consciousness of time allows him to be aware of the evolutionary processes in which he is involved so that he can influence his own evolution through altering his environment.

The development of man's brain allowed him to begin to make choices. No longer a creature governed solely by instincts, he began to face decisions about good and evil. The Biblical metaphor in Eiseley's description

of the beginning of human consciousness shows that Eiseley is aware of the religious overtones of men beginning to choose between right and wrong. When man's brain evolved,

> The Eden of the eternal present that the animal world had known for ages was shattered at last. Through the human mind, time and darkness, good and evil, would enter and possess the world. (IJ, 121)

The knowledge of time and history and the capacity for imagination are both chacteristics resulting from man's brain, and together they give man the ability to conceive of and influence his own evolution.

Man's brain has created an environment other than the natural world in which the laws of natural selection work. With the addition of the "invisible environment" created by consciousness, survival might depend as much on wit as on strength and size. The selection of mates, a crucial process, of course, in evolution, may be controlled in part by mental qualities, since wisdom (or even the opposite) may be a desirable trait in a mate. The laws of evolution, "survival of the fittest" and "natural selection," still work, but they must operate in a second, invisible environment where man's evolution is concerned. The selection which is resulting in "brain enhancement" is the "product of unceasing struggle, not by ax and spear in the war of nature, but in the world of streaming shadows forever hidden behind the forehead of man" (IJ, 121).

Eiseley says that "it is man's ideas that have evolved and changed the world about him. . . . All that sustains him is that small globe of gray matter through which spin his ever-changing conceptions of the universe" (IJ, 89-90). Man is evolving, but the mechanics of evolution no longer operate solely in the natural world. Man's "ever-changing conceptions of the universe" have become more important than the universe itself in the process of man's evolution. Eiseley argues that

> . . . it is likely that the selective forces working upon the humanization of man lay essentially in the nature of the socio-cultural world itself. Man, . . . once he had "crossed over" into the new invisible environment, was being as rigorously selected for survival within it as the first fish that waddled up the shore on its fins. (IJ, 120)

The comparison is a good one because the evolutionary result of a creature entering a new environment, whether it is a fish reaching the shore or a man dreaming dreams, is dramatic and unpredictable. One of the consequences, so far, of the beached fish is man. The consequences of man's entrance into a new environment may be equally remarkable and profound.

Man's developed brain has made the social world an integral, essential part of the nature of man. Such a brain cannot exist without a stable family to provide care through an extended childhood, nor can it function

well without the cultural heritage provided by a society. As Eiseley says, "man is totally dependent on society. Creature of dream, he has created an invisible world of ideas, beliefs, habits, and customs . . ." (IJ, 92). Man lacks the "precise instincts" of the other creatures, and has instead his culture to provide a sort of extra-corporeal set of instincts. The loss of instincts, Eiseley speculates, may have precipitated brain growth. The loss most certainly, however, meant that man's competition for survival was "less with his own kind than with the dire necessity of building about him a world of ideas to replace his lost animal environment" (IJ, 92-3). Eiseley suggests that theories concerning the viciousness and savagery of early man cannot be true.[11] The human brain requires stability of family and culture to properly develop, and man in groups had to create and maintain the culture.

But man has not completely escaped the effects of his descent through the old, natural environment, where the struggle for existence was primarily a physical one: "The hand that hefted the ax, out of some old blind allegiance to the past fondles the machine gun as lovingly" (IJ, 140). The process of adapting to the new kind of environment is

---

[11]See Robert Ardrey, African Genesis.

still going on. Eiseley believes that man must recognize both his animal ancestry and the new invisible environment in order to break the old, savage habits and acquire new ones more appropriate to man's social nature. "The need is now for a gentler, more tolerant people than those who won for us against the ice, the tiger, and the bear" (IJ, 140).

Eiseley's plea for a gentler people only makes sense because man, unique among living things, can do something about his own evolution. Because man is being "rigorously selected for survival" in an environment of his own creation, the socio-cultural world, man can affect his own evolution as he alters the invisible environment. To change that environment in order to allow a gentler people to evolve is beyond the ability of an individual, of course, but not beyond the abilities of mankind.

Although man's limitations in the dimension of time prevent him from knowing what the future development of life will be, there is one of man's characteristics that seems to point to a possible future. Man's social nature, the result of his ability to "reach out" imaginitively and his skills in communication, points to ever-increasing communications and connections of man with man. It is this characteristic which encourages the

development of a "gentler, more tolerant people," a people adapted to cooperation. "Even now," Eiseley says,

> . . . the brain of man, with all its individual never-to-be-abandoned richness, is becoming merely a unit in the vast social brain which is potentially immortal, and whose memory is the heaped wisdom of the world's great thinkers. (IJ, 125)

The future of life may lie in the development of the social brain.

Whatever the future, Eiseley reminds his readers that "there is just as much future as there is past" (IJ, 48). Man is "one of many appearances of the thing called life; we are not its perfect image" (IJ, 59). Man's consciousness and his tremendously developed brain have separated him from the world of animals. A consequence of that brain, language and culture, now seems to be moving man in the direction of a "vast social brain." Like the change from fish to land creature, or the change from animal to man, the change from individual to social brain may change the environment in which life evolves. But life will reach out, adapt, and continue its journey.

CHAPTER VII

THE NATURE OF THE IMMENSE JOURNEY

In his autobiography, All the Strange Hours, Eiseley indicates his interest in writing essays whose points are not explicitly stated. He describes, in fact, the composition of the first of the essays which are collected as The Immense Journey. He had written a straightforward account of human evolution for a magazine which rejected the article. He decided to "attempt a more literary venture":

> Why not turn it . . . into what I now term the concealed essay, in which personal anecdote was allowed gently to bring under observation thought of a more purely scientific nature?[12]

Eiseley began to write these essays with the idea of concealing serious science within personal anecdote.

Except for the three central chapters, which deal with the evolution of man's brain and the development of knowledge of human evolution, each of the chapters of The Immense Journey contains personal anecdotes. Yet Loren Eiseley's book is not autobiographical any

---

[12]Loren Eiseley, All the Strange Hours, p. 182.

more than it is a history of science or a textbook on human evolution. These three subjects--three journeys, as Eiseley sees them--provide symbols and illustrations for the intentions Eiseley reveals only indirectly and only near the end of the book.

In chapter eleven, he gives an indication of his concealed intentions:

> It is a commonplace of all religious thought . . . that the man seeking visions and insight must go apart from his fellows and live for a time in the wilderness. (IJ, 163)

In Eiseley's book, the wilderness can be both external and internal. He has certainly spent enough time in the natural wildernesses of the world to expect visions and insight. But in his first chapter he writes, "I can at best report only from my own wilderness" (IJ, 13). In the descriptions of events in both wildernesses the religious intent of the book is unmistakable. Moreover, The Immense Journey can be viewed as a religious work because Eiseley uses his experiences and knowledge, professional and personal, to get at the meaning he believes lies behind the material world. Like Emerson, Eiseley sees the natural world as "the organ through which the universal spirit speaks to the individual, and strives to lead back the individual to it."[13]

---

[13]Ralph Waldo Emerson, "Nature," in The American Tradition in Literature, I, 807.

The answer to the mystery of the secret meaning of life lies in the realm of religion. As E. Fred Carlisle says in his appreciation of Eiseley, "From . . . natural facts, or scientific speculation, Eiseley tries to grasp the meaning for man."[14] This search for meaning makes the crux of Eiseley's work religious, and not autobiographical or scientific except as illustration and symbol. Like other religious books, the book of Eiseley contains history, law, and parable; but the history is history of science, the law is evolution, and the parables are the personal experiences of Loren Eiseley. History, evolution, and Eiseley's personal experiences with miracles are all tools to be used in excavating the secret meanings in the world.

The history of science teaches the limits of empiricism. "It is really a matter," Eiseley says, "of the kind of questions one asks oneself" (IJ, 207). Modern science, as Eiseley sees it, answers more and more "how" questions, but gets no closer to the "why." Materialistic questions produce materialistic answers, and such answers do not satisfy man's search for meaning.

Much of the history of science in The Immense Journey is the history of mistakes. Eiseley describes an episode

---

[14]"The Heretical Science of Loren Eiseley," The Centennial Review, XVII (1973), 367.

in the search for the origins of life when some Victorian scientists believed that they had found a link between living and non-living matter in some slime dredged up from the ocean floor. The slime proved to be the product of the addition of strong alcohol to sea water--the method of preservation used on a sample. Even twentieth-century scientists do not have final answers. Eiseley remarks that twentieth-century scientists were taken in by the hoax of Piltdown Man. The success of this hoax shows that man's conception of evolution is still uncertain, still evolving. The scientists enthralled by the idea of the basic protoplasm covering the ocean floor were victims of "an overconfident materialism, a vainglorious assumption that the secrets of life were about to be revealed" (IJ, 35). The same overconfident materialism exists today among both scientists and laymen, and Eiseley believes it does not lead to any secrets of life. The history of science in The Immense Journey reveals the limits of science. But science is useful within these limits.

While science, in Eiseley's view, is not likely to discover the secrets of life, it is a valuable tool. Science shows Eiseley, for example, that those secrets do exist. The existence of organization in nature, natural laws, cannot be explained in materialistic terms, but

the description and analysis which science performs on the material world reveals the elaborate organization. Science discovers and describes natural law. Moreover, science can provide paradigms, models, perspectives for use in examining what Eiseley considers the more important questions, the why questions. E. Fred Carlisle points out that the theory of evolution is especially important for Eiseley and is "a major structure for perceiving and comprehending experience. He dwells in it, and through it makes contact with reality."[15] Evolution is one of the laws science discovers and describes. Eiseley uses evolution, conceived as an immense journey, as a model for understanding his own life, the development of science, and the natural world. All are journeys, as Eiseley sees them; all have beginnings, and, more importantly, ends. The organization in nature described by the theory of evolution suggests to Eiseley that there is meaning and purpose in the world.

Eiseley's adoption of the theory of evolution as a way of "perceiving and comprehending experience" leads him inevitably towards a concept of God. A journey so rigidly ordered must have an end, and the end is not visible to man. Therefore, there is a controlling

---

[15]Carlisle, p. 365.

intelligence at the beginning and the end--a God. Eiseley's scientific perspective leads him through the theory of evolution to religious theories.

Thought of a religious nature is brought under observation through personal anecdotes in The Immense Journey, as Eiseley says science was to be introduced through personal anecdote in his first "concealed essay." He approaches the task of writing a religious book by seeing "the miraculous in the common."[16] These are the parables of the book of Eiseley. He hopes that his readers can discern "in the flow of ordinary events the point at which the mundane world gives way to quite another dimension" (IJ, 164). Eiseley's experiences, because of the way Eiseley describes them, border on that other dimension. The dimension of miracles and symbols intersects both the internal and the external wildernesses.

Eiseley tells, for example, of the way he once floated down a river and felt himself actually to be the river: "I felt the cold needles of the alpine springs at my fingertips, and the warmth of the Gulf pulling me southward" (IJ, 19). The miracle in this experience is internal. It lies in Eiseley's mystical sense of unity with nature. But Eiseley sees miracles in the

---

[16]Emerson, p. 813.

external wilderness, too. He describes waking in a forest to witness a drama in which a raven eats a small bird while other birds seem to protest. Then, the birds "forgot the violence." They begin to sing, because "life is sweet and sunlight beautiful" (IJ, 175). Eiseley sees symbols in this experience. He describes the raven as "a bird of death" and as "the black bird at the heart of life" (IJ, 175).

Eiseley finds miracles and symbols in less dramatic events, too. He discovers a spider spinning a web across a street lamp in Autumn and immediately thinks of the spider as "a great black and yellow embodiment of the life force," and examines the symbolic implications of her actions:

> Maybe man himself will fight like this in the end, I thought, slowly realizing that the web and its threatening yellow occupant had been added to some luminous store of experience, shining for a moment in the fogbound reaches of my brain. (IJ, 177-8)

Eiseley seeks and discovers meaning everywhere in the natural world.

The experiences Eiseley describes are often personal, imaginative, and solitary, but his subject is the miraculous in nature, not in himself. He is, therefore, careful to describe the setting of each of his unusual experiences to show that many people, given the same circumstances, would have the same experiences and the

same insights. He claims special skills neither in vision nor in interpreting those visions. It is better, he says, for those "emissaries returning from the wilderness . . . to record their marvel, not to define its meaning" (IJ, 178). Eiseley insists from the beginning of the book that his writings are "a confession of ignorance" (IJ, 13).

Eiseley takes care to define his role in this religious book. He does not consider himself a prophet: "Let it be understood that I am not the sort of man to whom is entrusted direct knowledge of great events or prophecies" (IJ, 164). He does feel that he bears a message, however, so he considers himself an emissary from the wilderness. The difference between such an emissary and a prophet is that the prophet sees things other men may not see, while Eiseley sees miracles because he is in the right place at the right time and has looked from some unlikely perspectives.

Any man suffering from insomnia on the twentieth floor of a New York hotel might look out the window to find that the city belongs to birds in the pre-dawn hours, not to men. Such a man might feel the urge that Eiseley feels to enter the city on wings, or feel the other sensation Eiseley describes, "a sense of things passing away" (IJ, 167). The unusual time and place affects the

perception of a natural event so that it seems miraculous. The place may be the wilderness of the city before dawn or the wilderness of the desert at sunset. A flock of birds passing over Eiseley's head as he wanders on the Badlands seems a miracle, as it would to anyone, he says, who "stood in the middle of a dead world at sunset" and contrasted the dead chemicals of the earth with the racing birds in the sky (IJ, 171-3). Each of Eiseley's wonderful experiences is introduced by an explanation of the unique circumstances which makes the common seem miraculous. Thus, even though he claims to be reporting only from his own wilderness, the emphasis remains on the miracles of nature, not the miracle of Eiseley.

The miracles in nature are Eiseley's subject because his concealed essay is about his religious belief in an organizing force behind nature. His visions of the miraculous in the mundane, described but not interpreted, "go echoing on through the minds of men, each grasping at that beyond out of which miracles emerge" (IJ, 178). Towards that beyond Eiseley's essays are always directed. When he finds and descends into a deep crack in the prairie ("The Slit"), he feels the transitory nature of mankind as he stares at a prehistoric skull embedded in the earth. In "The Flow of the River"

he describes being on the high plains in winter, where he sees a fish embedded in the ice, and feels enough kinship to imagine a conversation with it. Yet his point, even in this confrontation with a frozen catfish, is the beyond: "We were both projections out of that timeless ferment and locked as well in some greater unity that lay incalculably beyond us" (IJ, 24).

The Immense Journey is a "concealed essay" the rhetorical purpose of which is to lead the reader to an understanding and perhaps acceptance of Loren Eiseley's religious perceptions. Three conventional aspects of religious books, history, law, and parable, appear in Eiseley's book in the forms of history of science, evolutionary law, and the author's personal experiences with "miracles." The three aspects serve to express Eiseley's religious thought indirectly, in the manner of the concealed essay. The idea of the journey is related to his studies in empirical science, but Eiseley describes the immense journey in such a way that he constantly leads his readers to seek and see the beyond out of which miracles emerge.

CHAPTER VIII

THE CONTEXTS OF MAN

A study of the essays of Lewis Thomas and Loren Eiseley reveals that their respective scientific disciplines color and perhaps even determine their views of man and nature. Both use scientific fact, often recent scientific discoveries, in their essays on mankind and its environment. The differences between these two scientists do not lie with disagreements about facts. The differences lie in the interpretation--interpretation which is influenced by the professional perspectives of the men.

These differences are apparent in at least three areas: 1) the two scientists differ in their feelings about the nature of science. They disagree about the way to find facts about the natural world; 2) they disagree in some significant ways about the nature of nature and the nature of man. Consequently they differ in their opinions of how man ought to behave; 3) Eiseley and Thomas differ markedly in their essay styles. The differing methods of seeking truth, the differing views of man and nature, and the differing methods of presenting ideas in

the essay form are all related to the scientific specializations of the two men.

The development of the ideas expressed in The Immense Journey took place in the deserts and plains where Eiseley, alone, sought the bones of early man. A student of human paleontology, Eiseley spent years in the field. Many of his experiences in solitude are described in his essays. Eiseley has always sought knowledge individually, and that method of seeking wisdom is the one he knows best. The Immense Journey, therefore, is a "record of the prowlings of one mind" (IJ, 12), a "record of what one man thought" (IJ, 13), a bit of Eiseley's "personal universe" (IJ, 13). Eiseley seeks wisdom in a manner consistent with his professional experience--alone in the wilderness.

Lewis Thomas is familiar with scientific research done in laboratories by teams of scientists. He sees the Marine Biological Laboratory at Woods Hole, Massachusetts, or the Memorial Sloan-Kettering Cancer Institute as models for seeking truth. Thomas describes the process of science this way:

> In the midst of what seems a collective derangement of minds in total disorder, with bits of information being scattered about, torn to shreds, disintegrated, deconstituted, engulfed, . . . there suddenly emerges, with the purity of a slow phrase of music, a single new piece of truth about nature. (LC, 119)

Thomas views science primarily as a cooperative endeavor

because modern medical research is conducted that way.

Lewis Thomas, in fact, sees the entire world as cooperative. In this case, science can serve as a model for the world, a world that Thomas believes is so intensely cooperative that it can best be compared to a single cell. Thomas's studies in microbiology, physiology, and pathology have shown him microcosms in which living things exist through symbiosis, and that is the way Thomas believes things operate in the entire biosphere. "There is a tendency for living things to . . . get along whenever possible" (LC, 147). In Thomas's view, all creatures in the world naturally cooperate and help each other.

Thomas's view of cooperation in the natural world seems at first to contrast sharply with Eiseley's evolutionist world-view of competition and survival of the fittest. But Eiseley takes care to show that the picture of man struggling against man and nature for survival is a simplistic and false picture. Man's unique brain development has altered the environment in which adaptation and competition take place to the world of dreams and imagination. Eiseley, like Thomas, sees man as one element of nature, not the final fulfillment of life.

Both Eiseley and Thomas agree that man has the unique ability to control his instinctive behavior and to control,

to some degree, his own evolution. They differ markedly, however, in their views of what course man should take. If there is a "moral" in the essays of these two scientists it concerns this point. Eiseley believes that man must recognize and channel his abilities to surmount instincts. Speaking of the skills in violence which served man well in the struggle against "the ice, the tiger, and the bear" in the animal world of instinct from which man emerged, Eiseley warns that "it is a habit man will have to break to survive, but the roots go very deep" (IJ, 140). Lewis Thomas, on the other hand, sees only good in instinctive behavior. He suggests that man should not exercise the ability he has to overrule his instincts and alter his evolution: "Stand back and give it room is my advice" (LC, 169).

Thomas's view of the value of instinctive behavior comes directly from his science. Living things work best, he finds, when their natural processes are not interfered with. As a doctor he has found, in the case of disease, that "most things get better by themselves" (LC, 100). Eiseley's view of the necessity for human intervention in human evolution also develops from his scientific discipline. He has seen how one specialization or another can mean the difference between survival or extinction in animals, and believes man must use his

specialization, his brain, to insure his own survival and evolution.

The styles used in writing the essays also bear a relationship to the scientific studies of the essayists. Eiseley deals with bones and artifacts in his professional life; he introduces personal memories into his essays. Eiseley deals with evolution, a theory with the force of law in his study of man's origins; his essays have the tone of a religious book, as if they presented revealed truth. Eiseley's science has led him to believe in "final secrets"; his essays use the conventions of religious books to search for those ultimate answers. Eiseley's style is conclusive; the reader is invited to examine a finished product.

Thomas attempts to make the reader look at the world from an altered perspective, as discoveries in modern biology have altered the perspectives of biologists. He uses stylistic devices to involve his reader in the process of making discoveries about the world: he changes the scale from molecules to solar systems as quickly as a scientist changes the power of his microscope; his essays begin to prove one thing and conclude by showing something else, with all the serendipity of Fleming discovering penicillin; he uses a tone as light and excited as the conversations and speculations of scientists on a beach explaining things to each other. Thomas's

essay style is inconclusive; the reader is required to participate in discovery.

Eiseley describes himself as "a man preoccupied with time" (IJ, 12), and time controls his perspective. He examines mankind and the world in the context of time. He sees the story of life as a journey and development, and life has an end, as a journey has a destination and development a goal. This perspective is consistent with the point of view suggested by his scientific studies, and the perspective permeates his thought and his essay style in The Immense Journey. Consistent with the perspective of a biologist, Lewis Thomas examines the nature of man by placing him in the context of the biosphere. Without the perspective of time which influences Eiseley, ideas of progress and the evolutionary "ascent" of man become meaningless. The importance of competition, then, is minimized, while the cooperation which produces ecological balance is emphasized. There are no "final secrets" in Thomas's vision, and no destinations. Man is significant only as a part of the planet he participates in. The participation is the important thing in nature, and Thomas invites participation through the style and speculations of his essays in The Lives of a Cell.

Loren Eiseley and Lewis Thomas reveal the importance of perspectives and points of view in the essays collected

in The Immense Journey and The Lives of a Cell. The information presented, the world-views and philosophy expressed, even the style in which the essays are written bear significant similarities and interrelationships among themselves and with the respective scientific disciplines of the authors. In spite of real differences between the perspective of the biologist and the perspective of the anthropologist, there is general agreement on man and his place in nature. The hierarchical patterns which have dominated man's view of his place in the natural world from the idea of the Great Chain of Being through Darwinian evolution and even including the modern view of man as the fatherly protector of the environment may be giving way to a new, more egalitarian view. Both Thomas and Eiseley believe that man is one of the many forms of life. His unique specializations give him an essential part to play in the functions of the biosphere and the development of life, but he is neither the perfect and final form of life nor the master of the world. He plays a role in the world exactly as important as that of a catfish, a termite, or a protozoan.

BIBLIOGRAPHY

BIBLIOGRAPHY

Ardrey, Robert. African Genesis. New York: Atheneum, 1968.

Asimov, Isaac. Of Matters Great and Small. Garden City, New York: Doubleday, 1975.

_____. Of Time and Space and Other Things. Garden City, New York: Doubleday, 1965.

Bronowski, J. The Ascent of Man. Boston: Little, Brown, 1973.

_____. Science and Human Values. New York: Harper & Row, 1975.

Carlisle, E. Fred. "The Heretical Science of Loren Eiseley." The Centennial Review, XVIII (1973), 354-77.

Eiseley, Loren. All the Strange Hours: the Excavation of a Life. New York: Scribners, 1975.

_____. Darwin's Century: Evolution and the Men Who Discovered It. Garden City, New York: Doubleday, 1958.

_____. The Firmament of Time. New York: Atheneum, 1975.

_____. The Immense Journey. New York: Vintage, 1959.

_____. The Invisible Pyramid. New York: Scribners, 1970.

_____. The Man Who Saw Through Time. New York: Scribners, 1973.

_____. The Night Country. New York: Scribners, 1971.

_____. The Unexpected Universe. New York: Harcourt, Brace, Jovanovich, 1969.

Emerson, Ralph Waldo. "Nature." In The American Tradition in Literature. Ed. Sculley Bradley, Richard Croom Beatty, and E. Hudson Long. New York: Norton, 1956, I, 780-814.

Gardner, Martin, ed. Great Essays in Science. New York: Washington Square Press, 1970.

Glasser, Ronald J. The Body is the Hero. New York: Random House, 1976.

Ramsey, Roger. "Eiseley's Art: A Note." Notes on Contemporary Literature, III (1973), 9-11.

Sagan, Carl. The Cosmic Connection: An Extraterrestrial Perspective. Garden City, New York: Doubleday, 1973.

Shapley, Harlow. Beyond the Observatory. New York: Scribners, 1967.

Snow, C. P. The Two Cultures and a Second Look. London: Cambridge University Press, 1969.

Stevenson, Lionel. Darwin Among the Poets. New York: Russell & Russell, 1967.

Thomas, Lewis. The Lives of a Cell: Notes of a Biology Watcher. New York: Bantam, 1975.

Tillyard, Eustace M. W. The Elizabethan World Picture. New York: Macmillan, 1944.