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SCIENCE, THE SUPERNATURAL, AND THE POSTMODERN IMPULSE IN CONTEMPORARY FICTION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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ABSTRACT

Postmodernism has come to be viewed as monolithically antiscientific. Yet while scholars have focused on criticism and theory, a growing body of postmodernist fiction has gone generally unacknowledged. These texts address science, the supernatural, pseudoscience, and New Age beliefs—often jointly—to explore how science and other knowledge systems relate to one another and to consider what their proper relationship should be. Some commentators view postmodernist fiction's emphasis on ontological plurality as an attack on science, failing to consider the degree to which this fiction takes a provisionally supportive view of science.

Such novels as Don DeLillo's *White Noise* (1985) illustrate that science's disciplinarity precludes nonscientists from fully understanding it—virtually guaranteeing that many options to and supplements of science will continue to attract adherents. In some cases, as John Crowley's *Ægypt* (1987) illustrates, misunderstandings about science can lead people to accept pseudosciences as science equivalents. Nonetheless, science maintains an ontologically privileged status, and in these novels what at first appear to be attacks on science turn out to reflect typical misunderstandings about science and concerns about the manner in which its findings are transmitted. Yet even in validating science, postmodernist fictions are not hostile towards other knowledge systems. Magic realism, for instance, often grants equivalent ontological status to science and the supernatural, allowing for the coexistence of technoscience and a host of magical/supernatural creatures and events. In other works, technoscience is merely one element of a sustainable society. In Ursula Le Guin's *Always Coming Home* (1985), science is no more important to daily life than esthetics or spiritual beliefs. Other fictions treat supernatural knowledge systems
sympathetically in a scientific context. In novels by William Gibson and Lucius Shepard, voodoo is given sustained attention even though it is revealed to be subject to rational explanation.

While validating science, postmodernist fiction recognizes that a variety of nonscientific world views remain current. Science might be represented as the ontological equal of other knowledge systems, but it is rarely depicted as a second-rate option. Thus, although some might view postmodernist thought as inherently antiscientific, such an evaluation cannot fairly be extended to postmodernist fiction, which reflects society’s confusion and anxiety about science, illustrating that our difficulties proceed not from anything inherent to science but from misunderstandings about it.
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INTRODUCTION

POSTMODERNISM, POSTMODERNIST FICTION, AND SCIENCE

Certain gaps have always existed between postmodern theory and the practice of postmodern fiction. While it is not always possible to trace the exact lines of influence between them, they uneasily but inevitably share a cultural ethos and traffic in many of the same ideas. (xix)


No doubt there “is” no such “thing” as postmodernism. Or at least there is no such thing if what one has in mind is some kind of identifiable object “out there” in the world, localizable, bounded by a definite outline, open to inspection, possessing attributes about which we can all agree. But postmodernism’s failure to satisfy the criteria of objecthood is one that it shares with other interesting and valuable cultural artifacts, such as, for example, “the Renaissance” or “American literature” or “pastoral elegy” or “Shakespeare.” Like these other artifacts, postmodernism exists discursively, in the discourses we produce about it and using it. (1)

— Brian McHale, *Constructing Postmodernism* (1992)

Postmodernism is typically seen as an intellectual movement or scholarly position involving a mixture of distrust, skepticism, and dissatisfaction towards Western institutions, intellectual authority, the sociopolitical status quo, and artistic convention. As Paula Geyh, Fred G. Leebron, and Andrew Levy note, for many critics, “the dissolution of intellectual authority . . . represents the core of the postmodern sensibility” (ix). Accordingly, postmodernism itself is “marked by a thoroughgoing skepticism toward the foundations and structures of knowledge” (x). Similarly, Craig Owens views postmodernism as the consequence of a “crisis of cultural authority, specifically the authority vested in Western European culture and its institutions” (57). Simultaneously, however, postmodernism holds out the possibility that the causes for this distrust, skepticism, and dissatisfaction can be transcended. Thus, as John McGowan notes, a
postmodernist position proceeds from "the simultaneous fear that a monolithic social order shapes contemporary life and hope that a strategy for preserving pluralism (difference) can be found" (x).

This interplay of skepticism and hopefulness explains the linkage between science, the supernatural, and postmodernism in the present study. Science is typically seen as the preeminent intellectual achievement of Western society. Over the past three centuries it has become increasingly important in determining how human beings make sense of the universe and their place in it. In some areas of life, science has largely supplanted supernatural or pseudoscientific belief systems that once sought to accomplish the same goals. Yet twentieth-century events suggest a variety of questions and concerns about science and its application. Technoscience has benefited the human species, but it also facilitated the Holocaust, contributed to widespread environmental degradation, and brought our species to the brink of destruction during the Cold War. Given recent events, many have come to view technoscience as just another cog in the machinery of Western sociopolitics, a tool of those in power. Many events in this century have gone wrong, and the whole range of Western institutions and practices—including science—has come under scrutiny in an effort to make sense of events and, if possible, to prevent similar occurrences in the future. The attempt to grapple with such fundamental questions is necessarily reflected in twentieth-century literature, and by examining some portion of that literature I have sought to address some of the concerns that have troubled and inspired contemporary thinkers and artists. It is my thesis that one of the main impulses behind postmodernist fiction is the ongoing attempt to determine how science ought to function in our society as well as how it relates—and how it ought to relate—to pseudoscientific or supernatural knowledge systems.

The phrase "postmodernist fiction" is currently used in reference to a diverse range of texts, from Raymond Carver's minimalistic short stories to such metafictions as Thomas Pynchon's Gravity's Rainbow (1973), in which fundamental dissatisfaction with contemporary Western institutions is a significant concern. The present study will have little to say about most of that fiction, or about the wide variety of experimental techniques on which it relies. The texts under discussion here were not chosen to be representative of
postmodernist fiction in general but rather to provide insights into postmodernist fiction's
depictions of science, pseudoscience, and the supernatural as well as the epistemological
and ontological frameworks that encompass them. Although these various texts will be of
interest in and of themselves, so too will be their representations of science.

In current scholarship, all the fiction discussed in the present study is or can be
grouped under the rubric of postmodernist fiction. Several of the authors whose works I
analyze—including Don DeLillo, Gabriel García Márquez, William Gibson, and Ursula Le
Guin—are typically set forth as representative and particularly important postmodernist
writers. García Márquez and Gibson, for instance, are viewed as the foremost authors in
their respective postmodernist subcategories—magic realism and cyberpunk. Other
authors, such as John Crowley and Ben Okri, have attracted only limited critical attention in
the United States. Although not yet well-known enough to be associated with any
particular genre, movement, or ideology, their published works place them squarely in the
postmodernist mainstream. The fiction of one author under discussion here, Lucius
Shepard, has heretofore been discussed almost exclusively in the context of science fiction.
As I intend to make clear, however, his fiction is as closely related to the postmodernist
project as Crowley's, García Márquez's, Gibson's, and Le Guin's.¹ It is my contention,
in fact, that all of the texts under discussion here, when considered jointly, present a
composite image of one particular aspect of postmodernism's literary landscape. As I will
show, however, that landscape is a contested territory.

I have noted that the perceived collapse of intellectual authority and dissatisfaction
with Western institutions are generally seen as being at the root of postmodernism. In
Higher Superstition (1994), Paul R. Gross and Norman Levitt define those humanities
scholars who take a critical view of the sciences—a view which the authors consider ill-informed—as the academic left. They speculate that while in the short run the academic left
probably poses no danger to the sciences, its analyses threaten "the capability of the larger
culture, which embraces the mass media as well as the more serious processes of
education, to interact fruitfully with the sciences, to draw insight from the sciences, and,

¹ My treatment of Shepard's work in the present study does not represent a significant departure from
current critical practice. A variety of commentators have addressed the relationship between science fiction
and postmodernist fiction, in particular the considerable overlap between them. See, for example, cited
works by Broderick, Bukatman, Donahoo, Ebert, Everman, and McHale.
above all, to evaluate science intelligently" (4). The academic left’s problems with science. Gross and Levitt argue, are largely “informed or inspired by . . . ‘postmodern’ thought and its concomitant value system” which sees Western culture’s ideological system as “bankrupt and on the point of collapse” (4). Despite the forcefulness of their rhetoric, however, Gross and Levitt never come to fully understand the complexities of postmodernism and barely acknowledge postmodernist fiction’s critiques and depictions of science. As I intend to show, although humanities scholarship does suffer from some deficiencies in its treatment of science, there are significant misunderstandings of relevant issues on both sides of the disciplinary aisle.

In particular, I hope to illustrate that although postmodernism has lately been characterized as a monolithically antiscientific movement, such a characterization is inaccurate. In fact, to the extent that postmodernist fiction reflects the broad range of positions grouped under the postmodernist rubric, such a characterization is erroneous. Postmodernist fiction typically presents science in positive terms, as the preeminent mode of understanding the universe and humanity’s place in it—although it at times appears to do so despite its authors’ best efforts. In supporting this position, the present study begins the complicated task of unraveling the interrelationships between postmodernist fiction and science and, to a lesser extent, the relationship between both of these categories and pseudoscience and the supernatural.

Because this study centers on science and postmodernist fiction, my opening chapters address these subjects in considerable detail, providing the foundation for the remainder of my project. At issue here are a variety of interrelated matters of definition, textual interpretation, and cultural criticism. Chapter 1, “Science and the Difficulties of Casual Definition,” offers a working definition of science along with an analysis of the manner in which imprecise use of the term in real-world scholarship parallels the treatment of science by the characters of Crowley’s Ægypt (1987). Here, it is my aim to show that the precision with which the term “science” is applied has significant consequences for both cultural and literary criticism. Imprecise use of the term has led to general misunderstanding about what constitutes science and given rise to a situation in which science is erroneously viewed as one of many equivalent epistemological alternatives.
Closer attention to the details of the scientific enterprise corrects several misconceptions about science that hinder scholarly dialogue, while my analysis of Ægypt illustrates that the scientific errors and misunderstandings of postmodernist fiction’s characters do not necessarily render the works of which they are a part antiscientific.

In Chapter 2, “Critiquing Progress: Postmodernism and the Perils of Technoscience,” I offer further support for my assertion that postmodernism in not monolithically antiscientific. Beginning with an analysis of Ursula Le Guin’s Always Coming Home and the society it depicts, which Gross and Levitt have argued is antiscientific, I illustrate that a closer reading of the text suggests that it does not critique science but, instead, the social practices surrounding the production and distribution of scientific knowledge. My analysis of Don DeLillo’s White Noise, in which issues of knowledge production and distribution are also central, brings me to a similar conclusion. Here I focus on the characters’ views of science and their consequences for the reader’s understanding of science and its place in Western society. In both novels, the manner by which science is apparently marginalized provides insights into Western society’s misunderstandings of science and their primary causes: science’s disciplinary nature and the high volume of information necessitating that disciplinarity. My analysis elaborates on an earlier point: that although scientific errors in postmodernist criticism indicate that the arguments being advanced might be flawed, analogous scientific “errors” in postmodernist fiction can actually be beneficial to the works in question. In White Noise, for instance, characters’ misunderstandings contribute to DeLillo’s exploration of intellectual disenfranchisement by reflecting popular (mis)conceptions of technoscience and highlighting the shortcomings of the transmission of technoscientific knowledge in mass media society. In this manner, DeLillo directs the reader to consider several problematic features of Western society’s relationship to technoscience.

I conclude the main body of my study in Chapter 3, “Science and the Supernatural: Ontologies in Collision and Coexistence,” by analyzing fictions that depict both scientific and supernatural knowledge systems. Here, I examine magic realist fiction by Alejo Carpentier, Gabriel García Márquez, and Ben Okri along with novels at the science fiction-postmodernist fiction interface by William Gibson and Lucius Shepard in which voodoo
figures prominently. I conclude that with one notable exception—Carpentier's *The Kingdom of this World*—magic realist fiction recognizes science's validity and epistemological value. The supernatural, on the other hand, functions mainly to defamiliarize certain aspects of sociopolitical life. Gibson's and Shepard's novels offer an even more positive treatment of science by privileging it and minimizing voodoo's ontological significance. Unlike such works as *Ægypt* in which science is conflated with the supernatural or pseudoscientific knowledge systems or dismissed as ineffective, these fictions implicitly identify the supernatural as an erroneous intellectual category. Events that initially appear to involve the supernatural are revealed to be subject to natural, rational explanation.

Postmodernism and Postmodernist Fiction: Clearing Some Definitional Hurdles

Having delineated the general trajectory of the chapters that follow, a few matters of terminology and one of context deserve attention before I enter into the main body of my discussion. My epigraph anticipates a hurdle that any critic intending to deal with postmodernism in a sustained manner must face. Rhetorical difficulties proceed from the fact that postmodernism is so variable a cultural construct that authors addressing it must "persuade the reader to entertain a particular construction of postmodernism while at the same time preserving a sense of the provisionality, the 'as if' character, of all constructions" (McHale, *Constructing 1*). While particular analyses of postmodernism will necessarily foreground some constructions, they can never completely relegate others to the background—at least not if the subject is to be addressed in any comprehensive manner. Thus, scholars treating postmodernism are faced with the task of situating their constructions in the context of others, some of them similar and others quite different. As we would expect, however, simply because postmodernism is subject to different constructions, it does not necessarily follow that all possible constructions are equally valuable. On the contrary, "we must choose among competing constructions of postmodernism on the basis of various kinds of rightness or fit such as, for instance, validity of inference; internal consistency or coherence; representativeness of sample;
appropriateness of scope; richness of interconnections; fineness of detail; and productivity, . . . [or] capacity to . . . keep the discursive ball rolling” (McHale, *Constructing* 26). In keeping the discursive ball rolling, it is necessary to strike a careful balance between general and specific constructions of postmodernism and postmodernist fiction.

Literary postmodernism is generally seen as a post-World War II reaction to or continuation of modernist approaches. If the events of the war to end all wars dealt Western society’s collective consciousness a heavy blow, the effects of the Second World War more than matched them. Although critics have reached some consensus on the matter of postmodernism’s historical context, however, they disagree about what the term refers to. Rarely are terms in literary and cultural criticism or the popular press so variously employed—a fact that has not gone unremarked. Observations like Linda Hutcheon’s that “Few words are more used and abused in discussions of contemporary culture” than postmodernism (1) are common, as are acknowledgements such as David Harvey’s that “no one exactly agrees as to what is meant by the term, except, perhaps, that ‘postmodernism’ represents some kind of reaction to, or departure from, ‘modernism’” (7). Clearly, then, there is no shortage of available definitions of postmodernism.

Following, among others, Siegfried Schmidt, Helmut Lethen, and Brian McHale, I am inclined to agree that critics and commentators not only conceive of postmodernism differently but that in formulating their opinions actually construct different postmodernisms (Schmidt; Lethen; McHale *Constructing* 1-16). With that in mind, the deciding factor becomes determining which of the available (or hypothetically possible) constructions of postmodernism will be most useful for the present study.

In formulating his definition of postmodernist fiction, McHale relies on the Russian formalist concept of the dominant, what Roman Jakobson calls “the focusing component of a work of art” (qtd. in *Postmodernist* 6). McHale suggests that modernist fiction’s dominant is epistemological. It foregrounds questions relating to the making of meaning

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2 Much the same might be said of selecting other constructed, valuable cultural artifacts to attend to—including, of course, science, which will be the subject of discussion in my next chapter.

3 Generally but not always: James Joyce’s inter-world-war novel *Ulysses* (1922) has come to be seen as having a split modernist-postmodernist personality, roughly the first half of which represents the pinnacle of High Modernism (Beebe 176; Fokkema and Ibsch) and the second half of which has come to be appreciated for its postmodernist approach (Hayman 155-164; Lawrence; MacCabe; McHale, *Constructing* 42-58).
and interpretation of evidence, for instance: "How can I interpret this world of which I am a part? And what am I in it?" (Postmodernist 9). On the other hand, McHale describes postmodernist fiction as having an ontological dominant. It foregrounds questions relating to ultimate issues of reality and being, for example: "What world is this? What is to be done in it? Which of my selves is to do it?" (Postmodernist 10). In simpler terms, while modernist fiction concerns itself with issues of knowledge and the way it is gathered, constructed, and transmitted, postmodernist fiction considers broader questions of reality and ultimate substance, issues bearing on what is real and how people live given the limitations they face in knowing reality. For McHale, postmodernist fiction accomplishes its ontological explorations by intruding one world or universe and its accompanying ontology on another. This juxtaposition goes beyond the modernist presentation of different versions of "the truth" held by different characters. Postmodernist fiction involves the intrusion of one entire world view on another, either directly, as in science fiction, when characters from one world visit another in the course of the narrative or, indirectly, when readers encounter secondary worlds whose ontologies differ from their own. As a tool for keeping the discursive ball rolling, McHale’s construction of postmodernism will prove a fruitful one for the purposes of the present discussion.

As we will see, however, and as McHale points out, the membrane separating modernist and postmodernist fiction is semipermeable. If we push epistemological questions far enough they will tip over into ontological interrogations; similarly, ontological questions can lead into epistemological terrain. Far from being a weakness of McHale’s definitional framework, however, this feature of his constructions of modernism and postmodernism seems to me a strength. Rather than ignoring or seeking to minimize the overlap between modernism and postmodernism, McHale takes that overlap into account, and in so doing implicitly recognizes that if attempts at classifying literature along modernist-postmodernist lines do not involve some tentativeness they are likely to be highly arbitrary. Such a position takes into account Fredric Jameson’s and Harvey’s view of modernism and postmodernism as, to use McHale’s words, “alternative stylistic options between which contemporary writers are free to choose without the choice necessarily identifying them as either ‘avante-garde’ or ‘arrière-garde’” (Constructing 9). As McHale
makes clear, however, such authorial choices are not of the either/or variety; modernist and postmodernist themes, motifs, and poetics necessarily overlap and blend.

I must emphasize, however, that while McHale’s definitional framework is central to the current study, I do not use it restrictively. When necessary, I modify it to reflect my own understanding of postmodernist fiction as well as the requirements of the current project. For instance, McHale’s conception of ontological confrontation seems to me a problematic criterion for identifying some works of fiction as postmodernist. As I will illustrate at some length in Chapter 2, for example, what McHale describes as ontological confrontation seems to me better described as sociopolitical collision. In many postmodernist fictions (e.g., Don DeLillo’s *White Noise*), readers do not observe the collision of worlds radically different from their own. Instead, they encounter their own world defamiliarized as a consequence of the peculiar characters inhabiting it. At times I will also apply McHale’s construction of postmodernist fiction to bring texts under discussion that he does not address. My few minor differences with McHale merely reflect the different sorts of projects with which we are engaged, however. While his interest is in poetics, mine is in science, technology, and their situation within Western society. In regards to another construction of postmodernism—one which has been very much in evidence in recent scholarship dealing with science, society, and literature—I must admit to more serious reservations.

**Cultural Constructivism and Other “Higher Superstitions”: An Alternate Construction of Postmodernism**

My initial concern will be to address the relationship between science and postmodernism before going on to consider how Gross’s and Levitt’s formulation of the term “postmodernism” in their controversial book *Higher Superstition: The Academic Left and Its Quarrels with Science* (1994) bears on the present study. In particular, I will illustrate how *Higher Superstition*, despite some strengths, sets forth an oversimplified view of postmodernism—a perspective which is of central interest to my argument. Gross’s and Levitt’s view of postmodernism as a monolithically antiscientific intellectual movement is one I will argue against both here and in subsequent chapters.
Science is popularly conceived as a rational, objective investigative enterprise that reveals nature's truths bit by bit. This view of science is rooted in popular treatments and philosophical and historical representations of science that have been shown to be inadequate, largely as a result of an intellectual tradition often associated with Thomas S. Kuhn. In his historical studies of the sciences, particularly *The Copernican Revolution* (1957) and *The Structure of Scientific Revolutions* (1962), Kuhn illustrates, first, that scientists cannot be viewed in absolute terms as objective and, second, that at important junctures, scientists departed from established methods to be guided by intuition, esthetics, and metaphysics. Kuhn's argument that a wide range of personal and social factors invariably influence science has been referred to variously as "the social program," "cultural constructivism," or "social constructivism." A variety of commentators in different disciplines have worked within or acknowledged the importance of the cultural constructivist perspective, including virtually every historian, literary and cultural critic, philosopher, scientist, and sociologist whose writings I discuss in this study. While I treat science in considerable detail in later chapters, the importance of cultural constructivism and critiques of cultural constructivism loom so large in some formulations of postmodernism and of science that the subject demands some comment here. Without a basic understanding of cultural constructivism, it is difficult to arrive at even a partial understanding of science or its role in postmodernist fiction. Moreover, it is also difficult to observe the flaw in Gross's and Levitt's equation of cultural constructivism with postmodernism.

The main concern occupying Gross and Levitt bears repeating: that postmodernist-inspired analyses of the sciences undertaken by unqualified humanities scholars threaten "the capability of the larger culture... to interact fruitfully with the sciences, to draw insight from the sciences, and, above all, to evaluate science intelligently" (4). Arguably, however, their well-intentioned analysis falls short, in part because they fail to grasp the complexities of postmodernist thought and literature and in part because they employ an unnecessarily confrontational rhetoric. To begin with, Gross's and Levitt's notion of an academic left is problematic. To the authors' credit, they acknowledge the difficulties inherent in placing such diverse commentators under the same rubric (2-4). Nonetheless,
placed there they are, from feminist theorists to melanin scholars, despite the fact that the views articulated by those in the latter group represent an entirely different order of science critique from those in the former. Having thus yoked incommensurate critiques of the sciences, Gross and Levitt go on to make many of the same sorts of errors that they identify as being unacceptable in the writing of humanities scholars. Although Gross and Levitt fault literary and cultural critics, historians, and sociologists for failing to understand the complexities of the science they discuss, they often replicate that mistake in a different context, assuming that literary criticism and poststructuralist theory are more amenable to analysis by outsiders than is scientific discourse. In fact, both sorts of discursive environments pose problems for visitors. So it is that while Gross and Levitt are sometimes on firm footing in criticizing their colleagues in other disciplines, they also occasionally build their arguments on unstable foundations, as in (but not limited to) their treatment of feminist critiques of science. Here, the writings of Donna Haraway and Evelyn Fox Keller are subjected to especially withering but generally wrongheaded criticism. Largely at issue is the matter of cultural constructivism which, since it typically informs feminist critiques of the sciences, justifies a brief explanatory digression.

Among the classic examples of cultural constructivist arguments is the linkage between the writings of clergyman and political economist Thomas Robert Malthus and Darwin’s theory of evolution through natural selection, an argument often associated with its early proponent R. M. Young. Malthus quantified the relationship between food supply and population growth and determined that, left unchecked, populations increase geometrically. Young linked Malthus’s conclusions, which Darwin is known to have read, to Darwin’s theory, advancing what is known as a “strong constructivist” argument. A weak constructivist position would have noted Malthus’s influence on Darwin’s thinking but would still allow that the theory’s validity (or lack thereof) is independent of whatever

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4 Melanin scholars promulgate an extreme New Age-influenced form of Afrocentrism that credits members of ancient African societies with advanced technoscience and psychic abilities. See Chapter 1 for a fuller discussion of New Age beliefs, their relationship to science, and their role in contemporary fiction. For further details about the melanin scholars, consult Bernard Ortiz de Montellano’s article “Magic Melanin” (1992).

5 For instance, when they point out that Steven Shapin’s and Simon Schaffer’s ignorance of mathematics poses serious, overarching difficulties for their analysis in Leviathan and the Air-Pump (1985) of the debate between Thomas Hobbes and Robert Boyle surrounding the development of experimental method (Gross and Levitt 63-69).
influence Malthus might have had on its formulation. A stronger cultural constructivist reading of the same episode would suggest that Darwin’s theory imposes the tenets of political economics on nature, thereby either rendering the theory suspect or, in the most extreme analyses, altogether invalid. Quite clearly, however, there are limits to the validity of cultural constructivist critiques of the sciences.

First of all, as many commentators have noted, science “delivers the goods” (Sagan, *Demon-Haunted* 30). If science merely reflected social preferences and prejudices, it is difficult to imagine how its hypothesis-testing mechanisms would generate such impressive and accurate accounts of the behavior of organisms and physical systems. It has been argued persuasively that in doing so it must rely on more than whatever social or intellectual predispositions happen to be in circulation. So it is that in many cases, arguments for the cultural constructivism of scientific theories are found on closer examination to have relied on oversimplified accounts of the theories under consideration. In the case of Malthus’s influence on Darwin, for instance, selecting one book as the primary inspiration for natural selection is problematic given the complex nature of the theory, the variety of Darwin’s field observations, and the wide range of reading he did on subjects not related directly to biology during the period he was formulating his theory (Kohn 1981; Schweber 1977). As Ernst Mayr points out, in fact, Darwin scholars have come to agree that his theory “evolved slowly and piecemeal” (478). This is not to say that Malthus’s influence on Darwin was insignificant; on the contrary, Malthus helped Darwin recognize the importance of competition for resources between members of the same species (478). But, as Mayr observes, the complex interplay of the various elements of Darwin’s theory precludes any single influence from having inspired the theory or any of its components in their entirety (491-493). So it is that while Malthus is typically

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*Analyses such as those that have been offered by Mayr have not prevented analogous constructivist arguments from having been advanced in relation to Darwin’s theory, however. See, for instance, Joyce Appleby et al., *Telling the Truth About History* (1994), which argues that Darwin’s theory imposes on nature his atheist and materialistic beliefs. Although this position was articulated long after the publication *The Growth of Biological Thought* (1982), Mayr’s treatment of the Malthus-Darwinian connection speaks eloquently to the shortcomings of Appleby’s position. For a brief but more direct rejoinder to Appleby and her coauthors, see also Carl Sagan’s *The Demon-Haunted World* (1995) (258-259).*
mentioned in discussions of the development of Darwinian theory, he is not presented as anywhere near so important a figure in that process as a cultural constructivist analysis might suggest.

The broader issue, of course, is the extent to which cultural constructivist arguments can convincingly identify the social tenor of the times as a centrally relevant issue in theory formation. While Darwin’s engagement with his society and its intellectual debates no doubt predisposed him to accept some ideas over others, a difficulty with the cultural constructivist argument remains. If, as Mayr writes, “the theory of natural selection were the logical and necessary consequence of the zeitgeist of the industrial revolution, it should have been widely and enthusiastically adopted by Darwin’s contemporaries. Actually, just the opposite is true: [initially] Darwin’s theory was almost universally rejected, indicating that it did not reflect the zeitgeist” (Growth 492). If evolution through natural selection—or, for that matter, Newtonian physics or general relativity—are somehow determined by the prevailing socioeconomic tide, why would they have faced such stiff resistance? Moreover, of all of these cases in only one did multiple theorists identify the same principles, and that is in the case of evolution. Here, however, it would appear that the same factors influenced the thinking of Alfred Russel Wallace and Darwin: extended time in different regions of the world observing animals and collecting specimens.

A second and more serious consideration is relevant to the cultural constructivist position: namely, that for scientists the sources of insights that lead to the tendering of hypotheses are to a considerable extent irrelevant. Whether or not Darwin’s theory of evolution through natural selection was in part inspired by Malthus might be a matter of interest to many, but it is not especially significant to evolutionary biologists in their roles as scientists. For them, far more important than what inspires a theory is the matter of how well that theory holds up to testing. In repeatedly returning to the cultural constructivist foundations underlying various arguments, Gross and Levitt attempt to suggest that the shortcomings of cultural constructivism I have outlined above are lost on a wide range of humanities scholars—but such an argument is at best an oversimplification.
In *Secrets of Life, Secrets of Death* (1992), for instance, Evelyn Fox Keller explicitly states that although science has long been too much a masculine project, she recognizes the importance of its achievements and aligns herself with like-minded scholars who support it (2-5). Far from representing some nihilistic, postmodern vanguard intent on dismantling science as an institution, by her own account she is sympathetic to its broader project. In discussing the reception of her work she also notes, "[T]he confidence and respect I continued to have for 'science' was lost on those critics—mostly from the ranks of 'working scientists,' but sometimes also from the history and philosophy of science—who read in my work only an attack on both science and objectivity" (2, italics in original). In identifying her work and that of many of her colleagues as a product of a moderate rather than radical feminist position (3), Keller briefly but effectively addresses the current situation of feminist scholarship on science, suggesting, first, that her views and conclusions have been misread and, second, that although others might have advanced more extreme conclusions, she and many of her colleagues neither agree with nor endorse them. Keller concedes the existence of weak cultural constructivist influences in the sciences but is justifiably cautious about arguments for strong constructivism, which is the same position Gross and Levitt themselves take (*Higher* 44-50).

Gross's and Levitt's treatment of Keller is not unique. Haraway, another feminist critic whose work Gross and Levitt find objectionable, is not criticized on the basis of her published writings, but on the basis of an interview (132-134). Rather than taking the logical step of examining Haraway's writing in some detail, however, Gross and Levitt allow this text to represent her entire position, in effect criticizing the subject of the interview for the context in which the interview was published. Even for those who are willing to limit their examination of Haraway's writing to her most approachable analysis of science, however, a variety of important considerations that elude Gross and Levitt become apparent. For one, like Keller, Haraway takes care to differentiate her position from misreadings and caricatures of it. She thus points out well in advance of Gross and Levitt many shortcomings of feminist and cultural constructivist critiques of science. In *Primate Visions* (1989), for instance, she enumerates the flawed extremes into which such
critiques can lapse—which she refers to as "The Four Temptations" (6-8)—beginning with a brief treatment of the problems inherent in strong constructivist arguments (6).

It is not my intention to critique the strong cultural constructivist position. The limitations of such analyses have been discussed elsewhere. I would, however, like to make clear that the phrases "cultural constructivism" and "postmodernism" are not interchangeable. Scientists and scholars prioritize potential threats to the sciences differently. Some, like philosopher Philip Kitcher, view self-styled "scientific" creationists as posing the greatest threat to science, while Carl Sagan viewed New Age pseudoscience with greater concern. Gross and Levitt focus on the damage they fear will result from the activities of a wide range of humanities scholars whose various perspectives and approaches they group under the rubric of postmodernism. In drawing that term into the discussion, unfortunately, Gross and Levitt tend to confuse rather than clarify matters. Not only is their use of the term "postmodernism" problematic, but those scholars who have been affected by its allegedly anti-intellectual influence are far less antiscientific than Gross and Levitt maintain. Even Sandra Harding, an advocate of radical feminist critiques of science, prefaced one of her books with the comment: "I am not proposing that humankind would benefit from renouncing attempts to describe, explain, and understand the regularities, underlying causal tendencies, and meanings of the natural and social worlds just because the sciences we have are androcentric. I am seeking an end to androcentrism, not to systematic inquiry" (10).

The tone of Higher Superstition has also tended to make dialogue between scientists and humanity scholars difficult. Many readers inside—and, in some instances, outside—the humanities found the work offensive both for its dismissive treatment of humanities scholarship and its tendency towards ad hominem attacks. Coupled with those instances in which Gross and Levitt assume but fail to demonstrate a command of postmodernist criticism and poststructuralist theory, this tone risks widening the rift between those in the humanities and those in the sciences. To whatever extent Higher Superstition emphasizes for humanities scholars the importance of understanding the

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8 For instance, Johns Hopkins University anatomist and vertebrate paleontologist David Weishampel has stated that the book's snide tone kept him from finishing it.
science they discuss, however, the book is a success despite its problems. As I have pointed out, at times the critiques Gross and Levitt offer on these grounds are both accurate and relevant. Too often, however, their strategy of seizing on errors of detail in an effort to suggest gross, across-the-board ignorance on the part of humanities scholars is flawed. They present the basic scientific errors of humanities scholars as remarkable, failing to acknowledge that similar cross disciplinary glitches show when scientists try to work within unfamiliar disciplinary terrain. Similarly, they present such errors as evidence of global incompetence in an effort to refute arguments that the scholars in question have not actually advanced.

Perhaps, then, the lesson to be learned from Higher Superstition and the attending fallout is that cross-disciplinary collaboration is as necessary for those scientists writing about the humanities as it is for humanities scholars discussing science. Gross and Levitt have certainly foregrounded a variety of concerns and confusions that clarify the terms of my own discussion. In particular, while Gross's and Levitt's foray into cultural criticism generated more heat than light, it provided a point of reference for my own analyses. My finding, however, was that while scientists and humanities scholars alike showed a less-than-admirable grasp of scientific method, the sorts of factual and interpretive errors that undermine postmodernist or postmodernist-inspired cultural criticism often have an entirely different effect in postmodernist fiction.

For example, biologist Rudolph Raff notes that “in a 1994 review, a prominent developmental geneticist . . . lamented that it is unfortunate that invertebrates make poor fossils” (32). Raff then goes on to correct the geneticist’s mistake, observing, “In reality, all the phyla but one are invertebrates, and the vast bulk of fossils are of invertebrates” (32). Less fundamental errors are far more frequent. Physicist Alan Cromer, for example, writes in Uncommon Sense (1993) that dinosaurs are currently viewed as “quick, warm-blooded animals that—in some cases, anyway—cared for their young and evolved social organizations” (41). Although some fossils offer evidence of herding and parental care, the question of dinosaur warm-bloodedness remained very much open, as Cromer would likely have found had his research on the subject led him beyond his one source, an article in the popular science magazine Discover. Of course, while these unfortunate errors certainly do not add to the works in which they occur, they do not render them fatally flawed either.

A good, brief introduction to this dynamic of misrepresentation can be found in a 1996 exchange between Norman Levitt and science historian Richard Olson. Levitt’s rebuttal of an article by Olson (Levitt, “More Higher Superstitions: Knowledge, Knowingness, and Reality”) elicited a response (Olson, “Where is Knowingness to be Found?”) which briefly details Levitt’s misrepresentation of Olson’s position and Gross’s and Levitt’s broader misrepresentation of the arguments of the so-called academic left, although Olson’s main focus is on their treatment of Sandra Harding’s work.
CHAPTER 1

SCIENCE AND THE DIFFICULTIES OF CASUAL DEFINITION

"The history of science is crosshatched with lines of additive and corrective thought. This is how we arrive at the truth. Truth accumulates. It can be borrowed and paid back. We correct our predecessors, an effete form of assassination, and then we wait either in this life or the next for the corrective dagger to be slipped twixt our own meatless ribs. Here it comes, zip, the end of an entire cosmology." (193)

—Don DeLillo, Ramer's Star (1976)

We must surrender our skepticism only in the face of rock-solid evidence. Science demands a tolerance for ambiguity. Where we are ignorant, we withhold belief. Whatever annoyance the uncertainty engenders serves a higher purpose: It drives us to accumulate better data. This attitude is the difference between science and so much else. Science offers little in the way of cheap thrills. The standards of evidence are strict. But when followed they allow us to see far, illuminating even a great darkness. (365)


The imprecise use of the term "science" in humanities and science scholarship reflects general misconceptions about science which have analogs in postmodernist fiction. By analyzing these oversimplified constructions of science, I will argue against one representative, particularly prevalent position: that, since science is a cross-cultural phenomenon, many varieties of so-called primitive science exist. The more precise usage of the term "science" that I derive from this analysis then serves to illustrate that hostility toward and/or misunderstanding of science on the part of a fiction's characters do not necessarily render that fiction antiscientific. Here, my focus will be on John Crowley's Ægypt (1987), which privileges nonscientific knowledge systems over science as part of a mimetic depiction of the manner in which confusion about and hostility toward science result from fundamental misunderstandings about it.

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Science: A Working Definition

Rarely do discussions of science and scientific method begin from equivalent starting points or use terms equivalently. In writing for a popular audience, for instance, Carl Sagan equates science with skepticism (*Demon-Haunted*), while Stephen J. Gould views it as a specific sort of hypothesis testing. Others see science as trial-and-error learning or, indeed, any coherent system of knowledge. For Sagan, however, while skepticism defines a genuinely scientific attitude (in contrast to less rigorous thinking associated with one or another New Age creed), that skepticism does not extend to current programs of scientific research. Thus, while he privileges the reductionist ontology underlying such diverse fields as particle physics and molecular biology—which analyze complex systems by studying their component parts—he does not advocate that skepticism be applied to the reductionist research program itself, for example by advocating a Marxist dialectical approach to the sciences in general or to biology in particular, as do Richard Levins and Richard Lewontin in *The Dialectical Biologist* (1985). My quarrel is not with reductionism, nor am I particularly interested in championing Marxist dialectics in the sciences: both programs have merit. I mean merely to make explicit that commentators approach science for various purposes, attending to their subject at different discursive levels. For instance, while Sagan wrote for a lay audience with the intention of differentiating between science and pseudoscience, Levins and Lewontin address a politically sophisticated audience with a background in the methodology and philosophy of science. Neither body of commentary is necessarily superior, and both have a great deal to offer the present discussion. But they are different, and their differences must be taken into account. Often, however, they are not.

Philosophy of science, sociology of science, and science and literature scholarship rely on a range of different types of argumentative and evidentiary support without (1) offering a complete synthesis of the different modes and methods of those constituent supports, (2) evidencing a thorough understanding of the specifics of either their own supports or of the claims offered that are to be based on them, and/or (3) exhibiting a thorough understanding of the claims offered by opposing scholarship or the sometimes important consequences of those counterclaims. By attending to all of these matters, it is
possible to come to a fuller understanding of science, of postmodernist fiction's various treatments of science, and, finally, of the thematic significance of postmodernist fiction's representations of the relationship between science and other sorts of knowledge systems.

Notions of what science is or should be are numerous and variable. Then, too, many people know little about science and what they do “know” often amounts to bits of isolated, oversimplified information. By defining science with some care, I hope to head off confusion in later chapters, address some of the oversimplifications which have posed problems for philosophy of science scholarship and cultural criticism, and provide the framework for a discussion of the problems these oversimplifications pose for postmodernist fiction's treatments of science. The place to begin is with the fundamental question, “What is science?” As a first step in addressing that question, I will consider the uses to which our society puts this artifact, answering the corollary question, “What is science used for?”

There is considerable agreement about the purpose of science, which is, in biologist and evolutionary theorist Ernst Mayr’s words, “to increase our understanding of the world in which we live, and of ourselves” (23). Francisco J. Ayala describes science and its objectives more specifically as being: (1) the systematic organization of knowledge, where possible by discovering patterns in the relationship between phenomena and processes, (2) the explanation of events through (3) the use of explanatory hypotheses that are testable and subject to rejection. “More broadly,” as Mayr writes in synopsizing Ayala, “science attempts to subsume the vast diversity of phenomena and processes of nature under a much smaller number of explanatory principles” (23). Albert Einstein’s observation that scientists aim “to secure a logically consistent transcript of nature” (qtd. in Planck 211) shows an understanding of scientific purpose similar to Ayala’s and Mayr’s. Regardless of the particular discipline or subdiscipline in which they work, scientists endeavor to better understand the physical and biological phenomena surrounding them. A theoretical physicist might investigate the formative mechanisms of white dwarfs while a paleoanthropologist seeks to reconstruct the human family tree, yet both endeavors intend
to increase our understanding of the universe. Although the goals of science are
generally straightforward and uniform, its methods are an altogether more complicated
matter.

Paul Feyerabend argues persuasively, for instance, that "the events, procedures and
results that constitute the sciences have no common structure" (1) and that
the wide divergence of individuals, schools, historical periods, [and]
entire sciences makes it extremely difficult to identify comprehensive
principles either of method, or of fact. The word 'science' may be a
single word—but there is no single entity that corresponds to that
word. (238)

Feyerabend is not alone in observing that different scientific disciplines rely on different
procedures (Glen 76; Bauer; Mayr 24; et al.). Still, if we seek a general enough account of
scientific method, we can locate some shared principles. Feyerabend implicitly recognizes
such a possibility when he notes that the rules of scientific method might "function like
rules of thumb" (242). Mayr also accepts that the sciences rely on general guiding
principles (25-32), and we can identify some of these by considering a few specific
scientific endeavors.

Although Western society describes both theoretical physicists and paleontologists
as scientists, they rely on different procedures. Despite their differences, like all other
scientists they formulate and test hypotheses. The success or failure of these hypotheses in
passing experimental and explanatory tests leads them to be modified or discarded.
Hypotheses that successfully predict and/or explain phenomena are designated by members
of relevant scientific communities as theories. As such, successful theories must have
explanatory efficacy. They may not be objectively true accounts of the way the universe
functions, but they approximate objective truth by predicting the behavior of physical
systems or explaining phenomena. Success is no guarantee of permanence, however.
Even successful theories can be replaced by more successful alternatives. Gould, for
instance, recognizes that all scientific knowledge is subject to revision when he notes that
"Science is a procedure for testing and rejecting hypotheses, not a compendium of certain
knowledge" (Flamingo's 111). While scientists cannot promise certain knowledge, they
implicitly promise that with each successive theory or refinement of an existing theory, they
better understand the universe and its phenomena. Science proceeds on the assumption that
as theories succeed one another, they more accurately describe reality. Thus evolution through natural selection offers a better explanation of the diversity and distribution of species than does biblical creationism, while relativity theory offers improved insights over Newtonian mechanics. Matters such as these have a direct bearing on both cultural and literary criticism, since they figure so prominently into broadly held conceptions of science. Perhaps in part because science is a cumulative enterprise integral to Western life, some have wondered whether or not it played a similarly important role in nonwestern societies, many of which persisted for as long or longer than their Western counterparts.

Fiction and the Philosophy of Science, Part I: Considering the Possibility of Primitive Science

In Don De Lillo's *Ratner's Star* (1976), a minor character named Cyril—one of many quirky geniuses in a novel full of eccentric scientists and mathematicians—suggests that science might involve more than most people realize. "There's never been a satisfactory definition of science," he says, in beginning to set forth the difficulties he faces in formulating his own:

"I'm trying to apply rules of valid argument to the defining procedure. A noteworthy boondoggle thus far . . . . Our current problem seems to be whether or not the definition of science should include such manifestations as herb concoctions, venerated emblems, sand-painting, legend-telling, ceremonial chants and so on. There's a distinct methodology to each of these pursuits. Experimentation, observation, identification. Nature is systematically investigated, its data analyzed and applied." (30)

The dilemma Cyril faces in trying to distinguish between science and other procedures is one very much in evidence not only in historical, sociological, and philosophical treatments of science but in the popular press and consciousness as well. Much of the difficulty proceeds from the fact that many nonwestern societies developed highly successful subsistence strategies with long-term sustainability. Scholars in both the sciences and the humanities have tended to focus on these successes and then gone on to mistakenly conflate these cultures' various knowledge systems with science. Here, I will grapple with the same questions confronting Cyril and contemporary scholars. Did nonwestern societies,
including those that were once termed "primitive," possess intellectual traditions that can be legitimately described as scientific, as the fictional Cyril suggests and such real-world scholars as anthropologists Claude Lévi-Strauss and Jack Weatherford or philosopher Paul Feyerabend maintain, or does a significant divide exist between scientific and nonwestern knowledge and belief systems, as biologist Lewis Wolpert and physicist Alan Cromer argue?

Following Wolpert and Cromer, I will argue that nonwestern knowledge systems are equated with science for three related reasons. A confusion between scientific and nonscientific belief systems occurs in areas of knowledge that relate to biology—particularly botany, zoology, and ecology—because the existence of environmentally sustainable societal traditions is mistakenly seen as resulting from or leading to a scientific understanding of the natural world. Often, scholars draw parallels between nonwestern traditions and science only in passing, but the conflation of the two sorts of knowledge remains clear nonetheless. Thus, an entomologist and an ethnobotanist write about the "ecological insights" of Mayan bee keepers (Buchman and Nabhan 155-156), an ethnobotanist comments on the "botanical ingenuity" of South American Indians (Plotkin 108), and an anthropologist comments on the "wealth and accuracy" of the "zoological and botanical knowledge" of the Indians who lived in the northeastern United States and southeastern Canada (Lévi-Strauss 8). As I will discuss in more detail shortly, in scholarship going back decades, archaeologists, ethnologists, economists, historians, and naturalists have characterized members of many aboriginal societies as natural conservationists (Coutts; Best; Firth; Parsonson; and Murphy, respectively). Although indirect arguments for aboriginal sciences are most common, direct arguments are not unknown. For instance, Claude Lévi-Strauss sees Native American plant breeding as evidence of a "genuinely scientific attitude" (14) and anthropologist Jack Weatherford subscribes to the same view. In a different context, Carl Sagan interprets the practices of some hunter-gatherer societies as evidence of scientific thought (Demon-Haunted 309-317). All of these interpretations result from an erroneous conflation of science and
technology and a tendency on the part of scholars to define science in terms so lacking in rigor that virtually any evidence of intelligent action qualifies the actor as engaging in scientific thinking.

Western scholars have traditionally seen science as a peculiarly Western endeavor rooted in a variety of historical contingencies ranging from the ancient Greek penchant for debate and observation to late medieval European agricultural advances and the subsequent rise of capitalism and a middle class. By contrast, in what has been referred to as the "modern view" (Cromer vii), more recent scholarship views science as a feature of many nonwestern societies. Although the modern view developed in the wake of discoveries about ancient Babylonian mathematics and Chinese technology,¹ it has come to be applied to a variety of societies and, indeed, species. Some argue that many so-called primitive cultures possess scientific knowledge systems (Lévi-Strauss; Weatherford; et al.) because daily problem solving necessarily leads to the development of scientific thought (Sarton 3). As Wolpert explains, "For some historians, science began whenever and wherever humans tried to solve the innumerable problems of dealing with the environment. For them, technology, starting with toolmaking, is problem-solving, and hence science" (25). As Wolpert and Cromer argue, though, considerable differences exist between science and both nonwestern and pre-nineteenth-century Western technology. These technologies are based on common sense, while science is not.² This distinction is lost on those who go so far as to see scientific thinking as an attribute of many higher animals, including nonhuman primates (Dunbar 58-67; Sagan, Demon-Haunted 315-316).

An analysis of the available evidence suggests that while some societies engaged in activities that are among those central to science (e.g., trial-and-error learning, the cultivation of careful observational skills, systematic application of acquired knowledge in explaining phenomena without resort to supernatural agencies), they did not possess

¹ These discoveries do not provide evidence of nonwestern science either, of course. For an explanation, see Alan Cromer’s Uncommon Sense: The Heretical Nature of Science (1993), particularly 81-120.
² Science is often counterintuitive, particularly physics (consider, for example, quantum mechanics). In addition, common sense is a highly pliable construct. Many of contemporary science’s givens were long opposed because they disagreed with common sense: Darwin’s theory of evolution contradicted Judeo-Christian common sense; similarly, heliocentrism contradicted the commonsense observational evidence of heavenly bodies rising and setting as they “revolved” around the Earth. See Cromer’s Uncommon Sense and Lewis Wolpert’s The Unnatural Nature of Science (1992) for a fuller consideration of these matters.
science. To a considerable extent, in discussions of what is alleged to be nonwestern science the specifics of the societies under consideration are less at issue than the commentators' definitions of science. If, as some have suggested, trial-and-error learning is a sufficient condition for categorizing a society or species as possessing science, not only are chimpanzees and vervet monkeys scientists, so too is a rat learning to run a maze. Commentators arguing against the existence of nonwestern science base their cases on more stringent use of the term. Taking a cue from them, a persuasive case can be made that nonwestern societies were not and are not scientific.

Some qualifications are in order, however. Traditionalists do not argue that nonwestern societies could be described as scientific only if they availed themselves of contemporary technologies and techniques. By such a rigorous standard, European science as it existed during the seventeenth and eighteenth centuries would not make the cut. Instead, scholars arguing for the existence of nonwestern science have focused on societies whose investigations into nature place them in the initial phases of a tradition involving observation and/or experimentation that could have led to the identification of guiding principles and/or the formulation of laws describing the universe and its behavior. Nonwestern sciences would fit the circumstances of the societies in which they developed. For instance, hunter-gatherers could not be expected to support a segment of their society whose sole responsibility was basic research. They would necessarily lack large-scale science for the same reason they lack institutionalized religions supporting professional priesthods; unlike societies with agricultural economies, hunter-gatherers simply can't afford to support a segment of the population that does not contribute to the society's material success on a daily basis (Dunbar 162).

Considering the Evidence

In determining whether or not nonwestern societies possessed science, we can first consider what sorts of scientific disciplines they might have developed. Certainly, "traditional peoples' knowledge of the environment is often closely related to their needs" (Dunbar 54). Sciences developing in such societies would probably relate to knowledge with day-to-day importance. Thus, observational astronomy might arise amongst seafarers
who rely on celestial navigation or in societies where the motion of heavenly bodies is used as a natural clock that indicates when the time has arrived to hunt particular game animals or gather ripening fruit. In such contexts, naked eye astronomy would be sufficient and there would be little need for cosmological knowledge to reflect the actual nature of the solar system, galaxy, or universe. If people only need to know when to relocate to a different region so they can gather berries, it makes no practical difference whether they perceive the solar system as geocentric or heliocentric or, indeed, whether they conceive of the planets and stars as physical bodies, demons imprisoned in a dark void, or benign spirits.

On the other hand, we might expect hunter-gatherer societies to have developed some form of biological science since their members would require considerable knowledge of local plants and animals. Such societies might lack evolutionary-biogeographical accounts of these various species, but they would have knowledge—some of it rudimentary and some comprehensive—about the habits and behavior of many species. Just as the actual composition of stars and planets makes no difference to a society so long as they can be used as signposts, a more detailed tradition of investigation involving hypothesis testing, observation, and/or experimentation need not necessarily result simply because a society possesses such valuable knowledge. So far as we know, in fact, no aboriginal society ever took the leap from gathering useful information about plants and animals to using that knowledge in developing such disciplines as botany or zoology. This is not to say that societal knowledge of nature might not have been detailed, important, or useful to the society as a whole—only that such knowledge does not constitute a scientific discipline. Consider, for example, traditional plains Indians' knowledge about the American bison.

The relationship between some Indian tribes and the bison centers on a story about a man's marriage to a woman who turns out to be a bison in human form. Although the marriage is happy, the man's wife is a source of considerable concern for his family. Not wanting to be a cause of trouble, the woman slips away with her son. The two transform themselves into bison and rejoin her old herd. Because of the man's great love for his wife and child, he seeks them out and allows himself to be changed into a bison so he can rejoin them (Crum 38). Obviously, this is not a scientific narrative. It neither makes nor
suggests any testable hypotheses that would allow a society to come to better understand the bison on its own terms. Although the Native American account of human-bison relationship does not suggest the possibility of an incipient scientific discipline, it helped foster a way of life that allowed a society to utilize bison on a renewable basis as a key resource. Thus, the Native American account has important consequences for its source society, results that have been mistaken by some contemporary Westerners for evidence of Native American ecology. Subsistence patterns with long-term sustainability, however, need not result from or lead to the development of biology or related sciences. The traditions and beliefs held by such societies, however, are not therefore rendered trivial.

Historically, Indian societies that depended heavily on the bison viewed the animal as a relative. In plains tribes, this is a cross cultural belief, as such tales as the Brule Sioux story of the White Buffalo Woman illustrate (Erdoes and Ortiz 47-52). Although evolutionary theory posits a relationship between all organisms, Native Americans frequently understood this relationship as being considerably more immediate than contemporary Westerners. As a consequence, while the plains Indians relied on bison for food, shelter, and fuel, they used the animal respectfully, in accordance with their belief that it was both a resource and an honored relative. Prayers are not the province of scientific investigation, whether they're offered in the context of grace being said before a meal or a blessing pronounced over a slain bison. It is worth noting, however, that Lakota prayers offered during the processing of a buffalo and the return of its unused remains to the Earth serve to reinforce human respect for the nonhuman world, particularly in regard to an awareness of human dependence on the nonhuman. Whether Native Americans conceive of their kinship with bison literally or metaphorically is to a considerable extent unimportant in terms of the belief’s effect. In either case, Native American tradition recognizes the interdependence of the human and nonhuman world. In this case as in

3 Similar beliefs persist in many Native American societies. As Peter Vecsey observes, “Ojibways still speak of bears and other animals as ‘relatives,’ ‘grandfathers,’ ‘brothers,’ and the like” (20).
others, however, the existence of customs that led to societal practices we would refer to as ecologically sound doesn’t prove the existence of a science akin to ecology or conservation.  

That Native American beliefs fostered a relationship between humans and animals with long-term sustainability is not surprising. If local custom had promoted the hunting of bison as an end in and of itself, a bison population crash could have ensued, leaving plains Indians with insufficient resources and potentially dooming the bison, the tribes, or both. At the very least, as bison became increasingly scarce, plains Indians would have been forced to earn a living by different means which, in turn, would have led to the institution of different traditions and customs. If these new customs proved to be unsustainable, they would presumably have been abandoned as well. Traditions providing a sustainable way of life would have been selected for, and those that did not would have been selected against. Given sufficient time, the end result would be a society in tune with the local environment. Such a state of affairs neither results from nor necessarily leads to the institution of a tradition of biology. Numerous early societies failed, and their failures did not relate to the fact that they lacked biologists. As a series of examples illustrates, far more important for societies’ long-term success would have been time in which to adapt to their environments.

The Thule people, ancestors of the Inuit, lived on Greenland between 1100 and 1500 A.D. by hunting ringed seals under the ice during the winter when few other sources of meat and fat were available (Pringle 926). During the same period, Norse colonists on Greenland failed miserably and either fled the island or starved. While most commentators have focused on the inflexibility of Scandinavian colonists, few have considered how the Thule achieved their notable successes. Their skills at harpoon-making and seal hunting
were not the results of a few days' work. During the many generations that the Thule inhabited extreme northern latitudes, they developed these and a variety of other skills through trial and error. Yet as Robin Dunbar observes of these skills, they “were surely not acquired without cost: buried beneath the tundras of the Siberian peninsula must be the remains of more than one Eskimo version of the Greenland Viking community” (188).

That we know nothing about failed pre-Thule societies or their traditions does not mean that they did not exist. It means only that they left no easily locatable traces. Parallel examples do exist, however.

The failure of Anasazi society in present day Arizona’s Chaco Canyon has been linked to erosion, which, though it might have been exacerbated by drought, is associated with unsustainable slash-and-burn agricultural practices. This particular instance provides a clear example of trial-and-error learning. After the abandonment of Anasazi cities in the thirteenth century, Hopi society became regionally significant—in part because the Hopi learned from the example of the society that preceded them. As Peter Vecsey observes, “Hopi myths recall the earlier Anasazi errors at Chaco Canyon and warn against their repetition. Hopis recall past ecological upsets and espouse a land ethic which will better guard against such events” (27-28). Archaeological and paleontological finds reveal evidence of failed aboriginal societal practices elsewhere.

While we lack specific knowledge about the traditions of such societies, we do know that their hunting, gathering, and agricultural practices were not ecologically sound. If one school of thought about the end-Pleistocene megafaunal extinctions is correct, human hunters were the key causal agent in some or most instances of species loss (Greene 278; Martin and Klein). Prehistoric New Zealanders were instrumental in extinguishing the large flightless birds known as moas, in part by hunting them for meat and gathering their eggs (Trotter and McCulloch 717). Early Maoris also practiced slash-and-burn agriculture and introduced dogs and rats to New Zealand, placing still further pressure on ground nesting moas (Trotter and McCulloch 717). A combination of factors including hunting by humans, forest-burning for agriculture, and the introduction of alien species had

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5 The Pleistocene Epoch ended between 10,000 and 12,000 years ago, roughly coincident with the conclusion of the last major ice age. Affected North American species most familiar to American readers include the Shasta ground sloth (*Notrotheriops*), American mastodon (*Mammuth*), camel (*Camelops*), and the sabre-toothed “tiger” (*Smilodon*) (Benton 356-357). Other continents experienced analogous losses.
a similar effect on Madagascar's flightless birds (Battistini and Verin; Dewar; Mahe). Available evidence suggests that the original human inhabitants of New Zealand and Madagascar lacked any sort of proto-ecological tradition.

Taboos rather than a tradition of ecology or conservation helped preserve some species in Madagascar. The island's largest surviving lemur, *Indri indri*, remains in a small section of northeastern coastal rain forest partly because of a local *fady*, or taboo, against killing it (Quammen 506). In areas that have experienced a recent influx of migrant workers who do not share the taboo, the species is "rare or nonexistent" (Dewar 587) and its prospects for long-term survival bleak (Quammen 505-511). Similar local taboos appear to have played a significant role in protecting some populations of tortoise (Juvik et al.; Preston-Mafham 84) and crocodile (Glaw and Vences 230). Apparently, then, societies either abandon flawed traditions or fail when the net negative effect of those traditions become too great. E. C. Pielou describes one North American archaeological find suggesting this possibility (309).

During a prolonged period of cold winters commonly referred to as the Little Ice Age (about 1350 to 1870 A.D.), the northern limit of the corn-growing belt shifted southward. Archaeological finds near present-day Winnipeg show that corn growing was abandoned there about 400 years ago, probably as a result of this cooling trend. The Native Americans who lived in the region, ancestors of the modern Cree, returned to a diet of native plants and animals. This site offers the only direct archaeological evidence of the temporary shift toward a colder climate during the Little Ice Age. "As to how daily life was affected [by the Little Ice Age]," Pielou writes, "we can only speculate" (309). Be that as it may, available evidence reveals that a proto-Cree agricultural tradition relying on corn faltered. Any system of legends or beliefs in which corn was viewed as a nurturing crop, gift of the gods, or kindred organism would have fallen into decline or been forgotten. As this example suggests, aboriginal traditions that have evolved to suit local conditions leave contemporary observers with the mistaken impression that these societies must have either relied on or developed sciences from botany and conservation to ecology and zoology. A more specific case study emphasizes this point.
The Example of the Maya

The Mayan phrase *xunan kab* refers to four species of stingless bees that are important pollinators in the Mexican states of Yucatan, Campeche, Quintana Roo, Tabasco, and Vera Cruz (Buchman and Nabhan 156). Traditional Mayan belief holds that these stingless bees must be regenerated by performing a complex, 24-hour-long rite known as the *Hanli Kol* which involves more than 100 hours of preparation and the use of dozens of local plant and animal products. Although the ceremony is rarely practiced now, the difficulty involved in its observance suggests its importance in traditional Mayan society. Yet the degree to which Mayan beekeeping represents a scientific discipline is less than clear, despite the assertion of entomologist Stephen Buchanan and ethnobotanist Gary Paul Nabhan that “The Mayan tending of stingless bees—and the symbolism associated with this tradition of native husbandry—is a remarkable testament to their ecological insights into the often hidden or forgotten relationships between crops and pollinators” (Buchman and Nabhan 155-156). Here we see a conflation of science and technology where what initially passes for an ecological sensibility on closer examination turns out to be something quite different.

That Mayans realized the importance of bees as a potential food source and put their knowledge to material use is noteworthy. What remains unclear is to what extent, if any, the Mayans attempted to investigate pollination and beekeeping in order to better understand the principles underlying pollination and honey production. Strong circumstantial evidence suggests that investigation was not an important part of Mayan beekeeping: pollination was seen as a process mainly under the control of animals and insects. Local folklore tells that when French-introduced methods of hand pollination were applied to vanilla farming in southern Mexico, the subsequent agricultural successes of French colonists initially led a local tribe, the Totonacas, to accuse them of stealing from the Indians’ plantations (Buchman and Nabhan 155). Once colonists taught the Mayans hand-pollination techniques, their yields increased and trouble was avoided. Based on this incident, it appears that Mayan beekeeping relied on an undeniably successful but generally unanalyzed tradition. The Mayans never built on their knowledge of natural pollination to take a direct part in the process themselves. Although such a step is considerable, it is one
that a civilization as long-lived as the Maya would have been likely to make had they actively investigated either the activities of the bees they managed or the pollination process.

It might be true, as Buchman and Nabhan assert, that the Mayans realized the benefits of crop pollination but "simply encouraged animals to provide this service rather than do the work themselves" (155). Such inactivity, however, doesn't argue for "ecological insight" nor, to be more to the point, a science akin to ecology. Available evidence suggests that the Mayan's trial-and-error approach had reached a plateau. They might have further refined their beekeeping techniques, but by and large their methods had become settled. Techniques, if they improved at all, were left to do so through accidental discoveries in the context of a tradition of trial and error that placed considerable weight on divine intervention. Research was apparently not a part of the program.

What Mayan bee keepers know is certainly of scientific interest, but the knowledge system on which they rely in keeping bees is not itself a science. Consider, for instance, that some Mayan farmers blame recent droughts and subsequent decreases in honey production on their failure to perform rain-bringing ceremonies which require that honey be left in the fields (Buchman and Nabhan 159). That they locate the failure of their endeavor here, rather than with one or another of the factors identified as significant by entomologists, ecologists, or biologists, points out that Mayan bee keeping, despite its successes, is not a scientific endeavor undertaken in the context of an ecological tradition. At issue is not the fact that the farmers consider supernatural intervention to be a factor in their troubles—supernatural considerations have figured into several scientific disciplines early in their development. Instead, what argues against a tradition of ecology here is that the Mayan world view precludes them from advancing any number of other hypotheses involving natural causes for the drop in honey production. Once a method of bee keeping was found that worked, matters were left to tradition. Mayan bee keepers were technologists, relying on the structures, tools, and techniques they devised to house and maintain bees and harvest honey. As Wolpert explains, however, "The motivations behind science and technology are very different. The final product of science is an idea, or information . . . [while] the final product of technology is an artifact" (31). Mayans
produced honey rather than hypotheses and information. It should be stressed, however, that the Mayan knowledge system is not unscientific because it involves supernatural agency via the actions of a god.

Identifying elements of supernatural belief in a nonwestern society and then settling on them as compelling evidence that the society in question is nonscientific is a dead-end strategy. Sciences frequently involve supernatural beliefs. For instance, early geology relied on the Bible as a source of evidence and a standard against which observations and hypotheses might be tested. Attempts to label supernatural beliefs and scientific traditions as mutually exclusive is equally flawed. Societies are far too complicated for such simplistic one-to-one correspondences to yield valid conclusions about their epistemologies. The presence of supernatural beliefs in one sphere of a society’s activities is not sufficient to establish that all its other activities are nonscientific. After all, scientists are certainly not exempt from religious faith or superstitions, and such beliefs do not preclude them from undertaking scientific inquiry when not visiting a church or synagogue or looking around for a lucky set of golf clubs in other areas of their lives. A 1997 poll conducted by The University of Georgia’s Edward Larson, for instance, found that “about 40% of working physicists and biologists hold strong spiritual beliefs” (Easterbrook 890). Moreover, scientists’ beliefs about the supernatural might influence their work. Christians might pray for inspiration and guidance in their work or be guided toward or away from some avenues of investigation by religious convictions. To say this, however, is no more than to say that scientists are human. All manner of extrascientific factors can affect the work of scientists, from indigestion and illness to family responsibilities and power failures. A better indicator of whether or not a society possesses a knowledge system that can be called a science is to determine whether its people’s supernatural beliefs are sufficiently separate from their investigations into the natural world to allow those investigations to proceed without undo hindrance. Thus, geologist Walter Alvarez is correct in noting that “Geology could not become a real science until the stranglehold of

*Nobel-laureate physicist Charles Townes, for instance, notes that his belief in God was a source of strength that allowed him to overcome self-doubt during his research into spectroscopy, microwaves, and light—work that led to his co-invention of the laser (Easterbrook 891).
Biblical chronology was broken” (43)—provided that we understand that by a “real science” he is referring to what most historians and philosophers of science would call a mature science. 

**Hunter-Scientists**

Carl Sagan notes that

> Certain kinds of folk knowledge are valid and priceless. Others are at best metaphors and codifiers. Ethnomedicine, yes; astrophysics, no. It is certainly true that all beliefs and myths are worthy of a respectful hearing. It is not true that all folk beliefs are equally valid—if we’re talking not about an internal mind set, but about understanding . . . external reality. (*Demon-Haunted* 252)

From this promising beginning, Sagan goes on to define science in exceedingly broad terms. Sagan draws on the writings of anthropologist Richard Lee, who observes that a hunter’s examination of an animal’s footprints reveals a number of things: the type and number of animals involved, whether or not they are injured, how fast they are moving, and how long ago they passed. Various features of the tracks reveal this information: a fast-moving animal’s footprints exhibit a pronounced elongated symmetry; a slightly lame animal puts less weight on an injured foot, leaving shallower imprints; over time, footprints erode and windblown particles collect in them, so the less distinct a footprint is, the older it is.

“This method,” Sagan writes of the hunter’s approach, “is essentially identical to what planetary astronomers use in analyzing craters . . . . [O]ther things being equal, the shallower the crater, the older it is. Craters with slumped walls, with modest depth-to-diameter ratios, with fine particles accumulated in their interiors tend to be more ancient—because they had to be around long enough for these erosive processes to come

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7 By way of comparison to the Bible’s influence on nineteenth-century paleontology and geology, consider traditional Sioux Indian beliefs about the fossils that occurred on their lands. The Sioux who lived in what are now South Dakota’s Badlands were well aware of the existence of fossils there—although their definition of that term would not have coincided with ours. They viewed fossil bones as the remains of giant serpents that the Great Spirit had killed with lightning bolts; these bones were thought to be mystically powerful objects that ordinary people should avoid (Costa 118). Most of the fossil bones that the Sioux believed belonged to giant serpents have proven to have been those of a variety of mammals that roamed the area 23-37 million years ago (Costa 118). The Sioux belief that these bones were mystically powerful objects that should be avoided would certainly have been a significant barrier to the development of a tradition of geology or paleontology.
into play" (Demon-Haunted 313). Sagan argues that a !Kung hunter’s systematic attention to animal tracks amounts to science. “To me,” he writes, “all of these formidable forensic tracking skills are science in action” (Demon-Haunted 314). Sagan’s discussion of hunting as science takes a different, slightly more detailed approach than Thomas Henry Huxley’s treatment of the same matter. In fact, the following quotation from Huxley serves as one of Sagan’s two epigraphs for the chapter in which he discusses !Kung “science”:

> Every time a savage tracks his game he employs a minuteness of observation, and an accuracy of inductive and deductive reasoning which, applied to other matters, would assure some reputation as a man of science . . . . The intellectual labors of a “good hunter or warrior” considerably exceeds that of the ordinary Englishman. (175-176)

At issue, of course, are not only the matters to which the hunter applies his intellectual skills but also the context within which he applies them.

Science is undertaken in the context of an intellectual community which shares a matrix of ideas, beliefs, customs, and procedures. Although a !Kung hunter might possess skills that would be of use in a scientific context, those skills don’t make the hunter a scientist, although they might suggest he could have been one under different circumstances. As Wolpert notes, technology often relies on a series of ad hoc hypotheses directed toward practical ends rather than the general understanding of overarching principles science seeks (30). The process by which a !Kung hunter analyzes animal tracks might resemble the approach of planetary astronomers examining craters, but the context and the goals of the two activities differ dramatically. The hunter needs to eat, and his understanding and application of principles is strictly practical. His analysis of data is one component of a broader hunting technology. The principles he applies to reading a track are every bit as important as the weapon he uses to kill a game animal, but the principles do not constitute science. The scientific matrix and its relationship to crater analysis—as well as its nonrelationship to hunting—clarify the distinction between the exercise of human intelligence in general and the exercise of human intelligence in a scientific context.

There is a multidisciplinary dimension to science that is lacking in any and every instance of alleged nonwestern science. Each branch of mathematics and science serves to define a broader macromatrix. In so doing, these disciplines offer independent checks on
one another. For instance, contemporary geology serves as a check for evolutionary biology by explaining some of the mechanisms (e.g. sea floor spreading, continental drift, and glaciation) which isolate populations, allowing speciation to occur. Just as importantly, one branch of scientific inquiry can provide the methods, techniques, and/or technologies that will allow another discipline to advance. The dramatic success of astronomy in this century results largely from the importation of mathematically rigorous physics (Dunbar 105). Mathematics has had a similar effect on molecular biology and ethology (Cromer 102-104).

The disciplines of molecular biology and ethology, the study of animal behavior, are roughly equivalent in age. Ethology got its start in the 1930s and molecular biology in the mid-1940s. By drawing on advances in chemistry, molecular biology experienced remarkable success and by 1970 was the best-funded, best-staffed of the biological disciplines. Ethology, by contrast, made steady but unspectacular progress until the late 1970s when it became clear that the mathematical techniques of population genetics could be applied to animal behavior. Afterwards, ethology’s progress also accelerated. History suggests that scientific disciplines can only go so far on observations undertaken in the absence of rigorous quantification. Although biology received a boost when Darwinian theory gave scientists the ability to organize disparate observations and formulate testable hypotheses, the quantification and mathematical analysis of data eventually became crucial for the discipline’s continued success. Sooner or later, a mathematical understanding of phenomena is crucial for any science.

For science’s multidisciplinarity to have a significant affect on any one discipline, a society must place at least minimal emphasis on the investigation of phenomena for the sake of knowledge gained rather than for the sake of whatever practical benefits such investigations might offer. If a society remains content to know only what is required to maintain a tradition relating to such activities as analyzing animal tracks or keeping bees, those traditions have stalled. An understanding of phenomena that is “just good enough” is an achievement, but attempts to better understand phenomena and to quantify that understanding are hallmarks of scientific investigation.
Native Americans and Science: Practical Knowledge vs. Knowledge for its Own Sake

European contact with the Indians of the Americas provides numerous examples of Western technoscience’s dependence on apparently nonscientific cultures as well as several instances where Europeans failed to recognize the full scope of Indian knowledge. It is possible to make more of those facts than they can support, however. In one of the more ill-considered nods toward the notion of a Native American science—and one I will discuss in more detail shortly—Jack Weatherford relies on this data to suggest that an archaeological site might be the remains of a Native American research station (60-63). Weatherford does not offer his assessment of Native American achievements in an intellectual vacuum. Claude Lévi-Strauss presents a similar appreciation in The Savage Mind (1966), although Lévi-Strauss’s focus is more cross cultural, addressing a range of so-called primitive cultures throughout the world. Weatherford’s observations generally complement Lévi-Strauss’s. Drawing on the work of D. P. Barrows, for instance, Lévi-Strauss notes that

Several thousand Coahuila Indians never exhausted the natural resources of a desert region in South California, in which today only a handful of white families manage to subsist. They lived in a land of plenty, for in this apparently completely barren territory, they were familiar with no less than sixty kinds of edible plants and twenty-eight others of narcotic, stimulant or medicinal properties. (5)

Other Native American achievements are equally noteworthy. A host of globally important crops trace their ancestry to the Americas. Also significant was the manner in which Native Americans raised their crops. Indian fields consisted of small mounds on which corn was planted—a practice called hilling—in order to minimize the loss of soil to runoff (Sauer 6; Weatherford 82). Traditionally, Indians grew multiple crops in the same plots. Perhaps the most well known such arrangement involved the hilling of corns, beans, and squash so that the leaves of corn plants shaded the relatively delicate beans from the sun. Squash—which are vine plants—covered the ground between and around these other plants and protected the soil from erosion while shading the ground and discouraging the

* American farmers adopted hilling, using the technique into the 1930s (Sauer 6). Since its abandonment, soil erosion has become a significant problem (Weatherford 82).
growth of weeds. Beans fixed atmospheric nitrogen in the soil and so fertilized the plot, which kept the soil from being too rapidly depleted of nutrients (Weatherford 83).

In the context of an appreciation of Native American agriculture similar to Weatherford’s, ethnobotanist Mark J. Plotkin praises the “botanical ingenuity” of South American Indians in cultivating and preparing the cassava so as to make a poisonous plant a staple and notes that the Indian practice of growing multiple varieties of the same food plants discourages blights (108). Plotkin also accepts that Indians have a keen understanding of agricultural techniques, a fact made evident from an exchange between the author and a few Indians who critiqued a white settler’s garden (194). The Indians observed that because the settler planted only one variety of manioc, his garden invited a potentially damaging insect infestation. In addition, his excessive weeding left insufficient plants to properly anchor the poor soil.

In all these instances, Lévi-Strauss, Weatherford, and Plotkin suggest that Native American societies not only possess effective agricultural traditions but science as well. Plotkin, for instance, lauds the “botanical ingenuity” of Indian farmers, drawing an explicit parallel between Native American agriculture and botany. Biology requires that its practitioner understand more of the relationship between organisms and their environment than would be necessary for day-to-day needs; consequently, an argument for aboriginal sciences akin to biology would require that the relevant knowledge systems value knowledge for its own sake rather than for its utility.

In order to support exactly that assertion, Lévi-Strauss quotes F. G. Speck, an ethnologist whose study of the Indians of the north-eastern United States and Canada (the Montagnais, Naskapi, Micmac, Malecite, Penobscot), in Lévi-Strauss’s words, “emphasizes the wealth and accuracy of their zoological and botanical knowledge” (Lévi-Strauss 8):  

Such [extensive] knowledge... [of animals] is to be expected with respect to the habits of the larger animals which furnish food and the materials of industry to primitive man. We expect, for instance, that the Penobscot hunter of Maine will have a somewhat more practical knowledge of the habits and character of the moose than even the expert zoologist. But when we realize how the Indians have taken pains to observe and systematize facts of science in the realm of lower animal life, we may perhaps be pardoned a little surprise.
The whole class of reptiles... affords no economic benefit to these Indians; they do not eat the flesh of any snakes or batrachians, nor do they make use of other parts except in a very few cases where they serve in the preparation of charms against sickness and sorcery. (Speck 273)

Lévi-Strauss suggests that the existence of herpetology among north-eastern Indians supports his thesis that primitive cultures possess scientific traditions. Yet what Lévi-Strauss refers to as herpetology is actually the possession of “distinct terms for each genus of reptile and other terms applying to particular species and varieties” (8). What Lévi-Strauss apparently has in mind is taxonomy rather than herpetology. Inasmuch as his concern in this context is with Native American knowledge of animal habits, however, we can return to the matter of taxonomy shortly. In the meantime, we can note that there is no clear reason why religious uses for a species should necessarily provide less incentive than others in leading Native Americans to learn animals’ habits. While Speck and Lévi-Strauss might dismiss the importance of “charms against sickness and sorcery,” the Montagnais, Naskapi, Micmac, Malecite, and Penobscot almost certainly did not. A parallel example sheds some light on the matter.

Native American tribes in what is now New York eliminated the eastern box turtle, *Terrapene carolina*, from much of its original range (Behler and King 469). Their main uses for the species appear to have been religious: turtles were sometimes buried with the dead and their shells were used in making ceremonial rattles. Although the turtle was sometimes eaten, its potential toxicity suggests that it wasn’t a routine food item: the eastern box turtle’s diet includes mushrooms poisonous to humans whose toxins persist in the animal’s flesh, occasionally killing those who eat it (Behler and King 469). In this instance at least, some tribes had reason to learn the habits of a species that was used neither for food nor economic purposes. For Lévi-Strauss the acquisition of such knowledge represents part of a tradition like that of natural history, which informed both evolutionary theory and ecology. Native Americans could locate this and a variety of other animals, but they didn’t use the diverse data they collected to develop a science. Their interest in the species related to their day-to-day spiritual needs. However, they had either misjudged the reproductive rate of the species or were either unaware or unconcerned that over-collection of the animal could eradicate local populations. Lévi-Strauss’s assertion that aboriginal
peoples developed a scientific understanding of species is undermined by other lines of
evidence as well, including one that relates to his incipient discussion of Native American
taxonomy.

Gould and E. O. Wilson note that nonwestern native peoples tend to classify
animals along species lines in much the same way as scientists. In 1928, when Ernst
Mayr visited the Arfak region of western New Guinea to survey its avian fauna, the native
hunters who captured specimens for him distinguished types of birds in much the same
way that scientists defined species. The Arfak people recognized 137 varieties of birds,
which "matched almost perfectly those distinguished by the European museum biologists.
The only exception was a single pair of closely related species that Mayr . . . was able to
separate but that Arfak mountain people . . . lumped together" (Wilson 43).

So far so good for the cause of nonwestern science, but there is trouble ahead.
When Wilson surveyed the ant species in the Saruwaget Mountains of northeastern New
Guinea, he attempted to determine whether these insects would be defined along species
lines cross-culturally too. He found that the Saruwaget people could not tell one ant from
another. To them, "[a]n ant was an ant was an ant" (Wilson 43). Wilson, who did not
suppose that the Saruwaget would be scientists, was not surprised. As he writes:

> It was not that Saruwaget ants and natives failed the test, only
> that Papuans have no practical need to classify ants. The
> Arfak people are hunters who use their knowledge of bird
> diversity to make a living, just as European ornithologists do.
> In Mayr's time . . . wild birds were their principal source of
> meat. (43)

Again, available evidence suggests that aboriginal people's knowledge of plant and animal
life is pragmatic.

Nonetheless, the leap from appreciating native people's knowledge to equating that
knowledge with science has often turned out to be a short one, as is suggested by
philosopher Paul Feyerabend's willingness to assert, "First-world science is one science
among many" (3). Weatherford argues that Indians had a good understanding of practical
genetics and developed hybridization techniques through trial and error, although, like their
European counterparts, they had no genetic theory (85). Lévi-Strauss similarly concludes

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*While Wilson treats the subject briefly, Gould's essay "A Quahog Is a Quahog" (Panda's Thumb 204-
213) addresses it in considerable detail and offers a historical overview of the topic.*
that due to the impressive achievements of primitive cultures in the area of plant breeding that "there is no doubt that all these achievements required a genuinely scientific attitude, sustained and watchful interest and a desire for knowledge for its own sake" (14). Within this context Weatherford speculates that the Incan archeological site of Machu Picchu—located in what is today south central Peru—might be best explained as a station for experimenting with cultivars (60-63).

As Dewar notes, despite the fact that "the Nobel Savage concept has taken a battering in recent decades, it lives on strongly enough to color our reasoning" (723) in investigating extinctions and, I would add, in assessing whether or not nonwestern social traditions represent sciences. The prehistoric Maoris, in marked contrast to European settlers the world over, continue to enjoy a conservationist reputation (Dewar 723), a trend that traces at least to 1920s scholarship by ethnologist Elsdon Best and economist Raymond Firth. In a statement from the 1950s that can be seen as prefiguring many of Weatherford's comment on Native Americans, naturalist Robert Cushman Murphy observed that "like most primitive folk the Maori were effective conservationists" (qtd. in Dewar 723). Citing works published during a 40-year period, Dewar illustrates the pervasiveness of the notion that the Maori were "natural conservationists." Of course, while technology can readily develop through trial and error and/or common sense both in animals and humans and can thus be described to some extent as "natural," there is little about science that would lead us to describe it as a natural activity. Because science often contradicts common sense and requires reasoning that is not necessary in day-to-day life, people are not scientists "naturally"; people learn science and learn to do science.

That Indians should have had a practical understanding of genetics—by which Weatherford appears to mean an understanding of plant breeding—is not surprising, but only if we take care to clarify that what Weatherford means is not quite what he says.

Despite his talk of a "practical understanding of genetics" in Native American society, there are parallel bodies of scholarship dealing with Native Americans also exists. Wilbur Jacobs, for example, calls Native Americans "America's first ecologists" (49). Much of this scholarship is markedly naive on matters of scientific method. Chris Vecsey, for instance, locates the thesis that Indians were ecologists of a "mystical sort" (5) with the writing of John Collier, and observes that the "image of Indian as spiritual ecologist filters down" through mainstream media and education (7). See, for instance, Collier's 1947 study, Indians of the Americas (11) and Albert J. Snow's American Biology Teacher article "The American Indian Knew a Better Way." For an early refutation of the notion of Native Americans as conservationists, see Daniel A. Guthrie's "Primitive Man's Relationship to Nature."
never was such a thing. Although it is possible to select for traits by intentionally crossing plant or animal varieties, any breeding that occurred in the absence of an understanding of the basic principles of genetics represents merely another instance of a tradition or technology that was good enough. The underlying principles by which traits were inherited remained unknown and unquantified. Native American plant breeding might be a matter of scientific interest but it was not itself a science. Despite what might be some apparently significant parallels between plant breeding and genetics, a significant gulf separates this trial-and-error enterprise from even Mendel's earliest experiments. Mendel's discovery that offspring inherit their parents' traits with statistical regularity involves a quantitative measurement of a phenomenon which we have no evidence American Indian agriculturists undertook.

The cautious historian or philosopher of science can be excused some skepticism in the face of claims that various societies—whether Native American in particular or more generally aboriginal—were scientific. The fact that the Coahuila Indians used 90 desert plants for medicine or food—which Lévi-Strauss raises in support of his thesis and Feyerabend echoes (Lévi-Strauss 5; Feyerabend 3)—while impressive, does not necessarily make traditional Coahuila society scientific. Chimpanzee populations in Gombe recognize and eat a minimum of 201 plant species, while those in the Mahale Mountains about 100 miles to the south eat roughly 328 different plant species and subspecies (Peterson and Goodall 37). The work of some primatologists suggests that some of these plants may be medicinal (Newton and Nishida; Wrangham and Goodall). Given the growing interest in and respect for the herbal lore of traditional cultures, such an assertion may appear farfetched, but so too was Jane Goodall's original assertion that chimpanzees constructed and used simple tools, a fact which has been repeatedly verified through field observations. Certainly, impressive agricultural achievements do not prove in and of themselves that the societies which accomplished them were scientific.

Leafcutter ants of the genus *Atta* and *Acromyrmex* grow fungus crops on harvested sections of leaves and, so far as is known, rely only on this fungus for food. In nature, it has been found only in their underground nests (Dawkins, "Blind" 107), which suggests that the fungus species evolved symbiotically with the ants. Arguably, the achievement of
the leafcutter ants in cultivating their one fungus is as impressive as Incan crop diversity. A nest of *Atta sexdens* excavated in Brazil contained over five million ants and over 1,000 chambers. To construct it the ants had to move 22.7 cubic meters (800 cubic feet) of soil with a weight of about 40,000 kilograms (44 tons) (Hölldobler and Wilson 115). "The construction of one such nest is easily the equivalent, in human terms, of building the Great Wall of China" (Hölldobler and Wilson 115). "They are," as Bert Hölldobler and E. O. Wilson note, "true agriculturists" (111). Aside from the engineering necessary for this ant agriculture, there is also the matter of the crop itself: it is so perfectly suited to the ants' nutritional needs that they require no other food. Still, no one would suggest that the leafcutter ants rely on a scientific knowledge system.

Complex behaviors such as those exhibited by leafcutter ants are not generally seen as constituting scientific thinking because they are instinctual. Complex, learned behaviors are generally seen as representing an entirely different order of intelligence. Even here, though, if we accept trial-and-error learning as the key requirement for an organism to qualify as a scientific thinker, we would be far too liberal in our use of the term "scientific." While trial-and-error learning is a feature of all sciences, it certainly isn't the only one. Nor does it constitute a sufficient condition to qualify an organism as a scientist. If it did, not only would chimpanzees qualify as scientists, so would dozens of other species.

Coevolution occurs in nature as a result of linked natural selection. As Darwin illustrated at great length, evolution in the wild is not altogether different from the processes that occur during artificial selection by human plant and animal breeders. Incan and Mayan food crops are every bit as much the result of coevolutionary processes as the crops of leafcutter ants. That one process involves conscious decisions on the part of human farmers does not, in itself, make the human agriculturists scientists, although it does qualify them as skilled craftspeople or technologists.

Closing Thoughts on the Possibility of Primitive Science

Could Mayan beekeeping or other aboriginal knowledge systems relating to plant or animal life have led to the development of sciences? Perhaps. In many instances, the raw materials of observational data were present. When hunter-gatherer societies saw a need to
differentiate animals from one another, they were able to do so almost as well as contemporary taxonomists. What was needed, however, was a more far-reaching interest in species along with a theoretical framework to accommodate both observed data and the sort of hypothesis testing that could verify, extend, modify, or refute existing theories. Eventually, too, some sort of quantification of phenomena would have been necessary. The various systems of non-western knowledge and belief that have been studied all appear to have been frozen at a far earlier stage than what even a minimal definition of science would require. Certainly, many of these traditions were effective in fostering societies that exhibited long-term success, but in and of itself, that does not qualify those traditions as sciences.

For some decades now, scholars have offered a subtextual refrain that could be summarized: “So-called primitive societies are actually quite knowledgeable about a great many things.” However well-intentioned such a subtext might be, its effects have been problematic. Through repetition, it has given rise to incidental overstatements that have complicated discussions of science with snarls of half-considered data and anecdotes. However impressive ancient cultures’ technological achievements might be, “[t]here is no evidence of any theorizing about the processes involved in the technology nor about the reasons why it worked” (Wolpert 27). I say again, then, that any society that can persist over the course of centuries is certain to have gotten a few things right. They will also have achieved some things that are worth admiring, and some of these will be of interest to scientists. In offering the rightful admiration that these achievements deserve, however, we should take care not to exaggerate, misrepresent, or confuse them with science.

Science is not a catchall phrase applying equally to every area of human intellectual endeavor. The fact that it is so often treated as such by scholars has led to criticism by scientists as well as lampooning by writers. The Jesuit priest Armand Verbene, a minor character in Don DeLillo’s Ratner’s Star working beyond the fringe of scientific respectability, makes a comic comment on attempting to subsume too much under the rubric of science. “For years I’ve been trying to convince the scientific power structure that red ant metaphysics is a hard science” (157), Verbene says of his project: “There’s nothing soft here. This isn’t long-range weather forecasting. I study my ants rigorously. I use
rigorous methods” (157). For Verbene, though, ant metaphysics (whatever it might be) merely provides another method of formulating a uniquely personal and subjective human metaphysics. While entomologists like Hölldobler and Wilson might find some of Verbene’s observational data interesting if they actually existed, Verbene’s field of interest does not qualify as a science, regardless of the scientific-sounding rhetoric he deploys in attempting to prove otherwise. Verbene emphasizes a point which has been implicit in my discussion for some time: if we cannot be clear about what science is, we run the risk of legitimizing science impostors and deligitimizing actual sciences—a matter of some importance to literary and cultural criticism.

Fiction and The Philosophy of Science and Fiction, Part II: The Difficulties of Casual Definition and John Crowley’s Ægypt

In *Higher Superstition* (1994), Gross and Levitt repeatedly express their concern that, in the bland relativism represented by postmodernism, anything goes. Some feminist critics dismiss physics because of its association with patriarchal tradition, accepting on faith that theorists from Newton to Einstein were fundamentally mistaken because of the patriarchal biases of their societies. Since the theories’ failures are preordained, critics need not learn much about them (126-132). Similarly, Gross and Levitt demonstrate that critics and philosophers appropriate chaos, relativity, and evolutionary theory as well as quantum mechanics to discuss literature and society, often without exhibiting the most basic understanding of the science they discuss. Some have criticized Gross and Levitt for focusing their attention on the so-called academic left rather than on other groups who pose a greater threat to the sciences, among them creationists and the pseudoscientific authors published under the marketing category “New Age.” To the best of my knowledge Gross and Levitt have never been chided for saying so little about fiction, even though some postmodernist fiction deals directly with nonscientists’ failed treatments of science and with the influence of New Age beliefs on such treatments.

Within just this sort of fictional context, hostility towards and misunderstanding of science is rarely so apparent as in the characters of John Crowley’s Ægypt (1987),

11 In fairness, however, I should remind readers that moderate, pro-science feminist critics raised these very same points, well in advance of Gross and Levitt. See the Introduction of the current study for details (13-15).
particularly its protagonist, the historian Pierce Moffet. As I will show, despite the fact that Crowley's novel is one in which science is marginalized and other knowledge systems foregrounded, it is not, in the final analysis, antiscientific. Pierce finds himself pushed away from academics toward an independent project, a work he conceives of as "a kind of archaeology of everyday life" (192). His focus is on systems of belief and knowledge, including the relationship between magic and science, and in this interest he has real world counterparts. Some have suggested that magical thought had an instrumental formative influence on the sciences, a position often associated with Frances Yates—who is prominently mentioned in the acknowledgements to Ægypt—although other historians have occasionally argued similarly, including Allen G. Debus and P. M. Rattansi.

In depicting the world of Ægypt, which is so similar to our own as to be almost identical to it, Crowley focuses particular attention on the popularity of New Age beliefs in American society. Compared to the novel's other characters, Pierce is skeptical of New Age beliefs and critical of others for accepting them. He considers that college students "had come to college not, as... [those in his generation had], to be disabused of their superstitions, but to find new and different ones to adopt; they seemed not to understand the nature of evidence" (84). In particular, he sees that his students "believe the stories they were told" (90). Pierce's job is made more difficult by the fact that New Age thinking permeates his workplace, Barnabas College. The administrator Earl Sacrobosco is also an astronomy teacher whose class is, "at his students' insistence, coming to include practical training in judicial astrology" (83). Nor is Sacrobosco's class an anomaly. The college also employs a New Age journalism teacher (84). New Age and pseudoscientific critiques of science coupled with naive acceptance of controversial claims and unreasonable analyses

12 It is perhaps no coincidence that this planned project has parallels both of title and content with Michel Foucault's The Archaeology of Knowledge (1971).

13 Many scholars—particularly historians—have challenged both Yates's evidence and her conclusions, among them Edward Rosen, Paolo Rossi, and Robert S. Westman. As Brian Vickers argues, despite the problems with the argumentation and evidence of the Yates school, the relationship between the sciences and the supernatural remains a significant question which has come to be addressed in slightly different terms by examining the occult and science as two traditions involving different thought processes and mental categories for understanding the world (6).
of evidence are a constant feature of New York City’s and Barnabas College’s intellectual and media landscapes. Crowley’s narrator observes:

"[T]he Age of Reason was a shuttered mansion; what Pierce heard constantly now was how the real world that had seemed so clinker-built was beginning to come apart under investigation. Relativity. Synchronicity. Uncertainty. Telepathy, clairvoyance, gymnosophists of the East levitating, turning their skins to gold by thought alone. Wishing maybe made it so, for the skilled wisher trained long enough in the right arts, arts so long suppressed by the Holy Office of imperial Reason that they had atrophied, languishing in prison. Strong acid, though, might dissolve those bonds, cleanse the doors of the senses, let the light of far real heavens in. That’s what Pierce heard. (92)"

Pierce finds the situation similar elsewhere. After he leaves New York to work on his book in the small town of Blackbury Jambs, he is struck by the prevalence of New Age thinking in the country. He observes that Val, the town’s astrologer, is as important a local figure as an astrological doctor or cunning woman would have been in an Elizabethan village (299).\(^4\) In addition, a very early passage whose significance is revealed only retroactively lends still further support to astrology’s local importance. The first time the reader sees Rosie Mucho, one of the novel’s focal characters, she is carrying the astrological chart Val cast for her (34)—a detail which proves to be significant in defining both Val’s and Rosie’s New Age leanings.\(^5\) Indeed, nearly every one of the novel’s characters has a similar predisposition.

The semi-mystical (or, perhaps, pseudo-mystical) Beau Brachman, comments early on that Rosie’s estranged husband is a “young soul,” which is what causes so many problems in his relationship with Rosie, since she’s an older soul—a detail that coincides exactly with Rosie’s own thoughts on the matter (37). This knowledge about Rosie’s life which initially makes Beau appear extraordinary is explained more conventionally when it

\(^4\) A conclusion which coincides with earlier comments by the narrator that establish Val’s local importance (214-215).

\(^5\) It is worth noting that Val, despite being aware of the elements of math and astronomy important to her discipline, shows very clearly why astrology isn’t a science. Astrology does not propose and test hypotheses; in modern practice, it requires that practitioners select which existing “rules” to follow in order to reach a point where hunches and intuition can come into play. Thus, Val observes, “[W]hat mattered always more than accuracy, more than math, was apprehension: the growing conviction that you had it right, that it made sense” (215, italics in the original). Astrology, then, consists of hunches but, unlike science—which requires that hypotheses be tested and conclusions quantified—it requires neither verification nor quantification.
becomes clear that Beau has very likely talked to Val about Rosie. Apparently, then, Val is responsible for having introduced both Rosie and Beau to notions of old and young souls. Finally, though, Beau’s belief in astral projection (258-261), his conviction that souls come from outer space (290), and his youthful adventure on a Colorado mountaintop where he waited for the arrival of starships (97) mark him as an advocate of one or a combination of several New Age belief systems.

Living within social strata that give primacy to New Age beliefs while dismissing science, Pierce is gradually drawn from working on the project he initially envisions to one that partakes of those antiscientific beliefs. Although it becomes apparent that some of Pierce’s antiscientific leanings are rooted in the same impulse underlying the rage for New Age thinking that surrounds him, part of his aversion derives from his earlier education as well as from the zeitgeist. Crowley writes of Pierce, for instance, that:

> Almost with disdain, a shrinking as from the touch of something loathly, he had always avoided all systematic knowledge of the physical universe; he had carefully just-barely-not failed every science course he had been made to take ... and had forgotten their boring and ghastly contents as soon as he closed the last lab door behind him .... What he knew of how the investigation into the nature of things was going was confined to what he read in the papers or saw on television; only that, and the notions he was receiving as though through the charged air ... rumors of terrific revelations about to break that never quite did. Starships from Elsewhere were landing as the moon drew closer to the earth; powerful mages hidden till now in Tibet were about to announce themselves the true governors of the planet; scientists had fallen through self-made gaps in the fabric of space and time and the matter was being hushed up: Pierce would hear, with a shiver of wonder, at news that if true would transform the whole account of time and life forever more—and in the next moment, laughing with relief, would recognize in the news an old story, a story that had been old at the turn of the last millennium, had perhaps been one of those told around the old original campfire where stories had first been heard in the world. (93-94)

For Pierce, while New Age stories are attractive even if fraudulent, science is unrelievably unpleasant, even if genuine. But science is also necessary to his project. Underpinning Pierce’s planned archaeology of daily life and human knowledge is an assumption about belief and knowledge systems, namely that “even though magic, and science, and religion
did not all mean the same thing, they all meant in the same way" (97, italics in the original). Despite his earlier aversion to the systematic study of science, Pierce develops an interest in various scientific subjects, adding to his reading list "books on celestial mechanics and the workings of the senses and the insides of the atom" (97). Significantly, however, Pierce’s exploration of the sciences does not necessarily contradict his distaste for "systematic knowledge of the physical universe." In particular, what Pierce arguably finds distasteful about science is the fact that systematic knowledge of the subject is a prerequisite to understanding it in any reasonably complete manner. Not surprisingly, then, although Pierce occasionally shows a grasp of scientific subjects that is atypical for a humanities scholar, he sometimes proceeds on fundamentally mistaken assumptions. In particular, Pierce imperfectly understands some of the specifics of philosophy of science, especially scientific method. As with many real-world scholars, he confuses any systematic attempt to understand the universe with science. He believes that because a "Renaissance magician’s power wasn’t used to enrich himself, or curse people... [but] was used simply to know. It was a system of science, with the same goals as the other kind of science, the kind [of knowledge systems] we call science" (194, italics in the original). He concludes similarly of Egyptian mythologies that, “[T]hey weren’t art, they were science. The Egyptians just thought the world worked this way, operated by these characters, acting out this grotesque dream” (106). Although Egyptian mythology might have been an attempt at understanding the way the world worked, it was no more a science than Renaissance magic. Hypotheses were not formulated and tested, nor were naturalistic explanatory principles proposed to account for the variety of observed phenomena.

Despite his misunderstandings, Pierce intends to do his subject justice, and it initially appears as though he will be able to do so. Rather than subscribing to any New Age beliefs, he remains focused on his intended project, realizing of readers that

What they needed—what he was coming to need himself, for that matter—was not more stories so much as an account: an... explanation of why these world-tales, exactly these and not others, should be now abroad again, after a long sleep, ...some means by which those who fed on notions as on bread might be able to tell which ones were really news and which were the old dreams still being dreamed.” (91)
Moreover, in a characteristically skeptical move—one which some commentators would identify as a characteristically postmodernist skepticism of metanarratives—Pierce realizes that the very range of beliefs and knowledge systems he seeks to analyze will prevent him from taking sides amongst them. As he recognizes, to begin assenting to one of them requires that other equally sweeping and compelling narratives be abandoned (91). Yet after he tells his agent Julie Rosengarten about his proposed “archaeology of everyday life” (192), she reduces it to just the sort of New Age tract he doesn’t want to write. Dismayed at her caricature of his project, he observes that hearing his ideas “fitted to a different kind of consciousness, made them sound at once loony and banal, too much and not enough” (199).

Since Rosengarten believes that Renaissance magic actually worked (194), a New-Age-inspired misreading of Pierce’s intentions is consistent with her character. As a result of her unfamiliarity with science, she unknowingly harbors a variety of misconceptions about it. Her difficulties range from overarching misconceptions about what science involves to serious misunderstandings of specific theories—difficulties with science that are far more significant than Pierce’s. In addition to equating the beliefs of the Christian mystic Giordano Bruno with science, she thinks that “regular science” has “sort of run itself into the ground” and that a different, mystical brand of Renaissance science actually seems more modern. When Pierce asks her to explain, she replies:

“I mean it just took in more, didn’t it. things that the regular kind of science leaves out. Telepathy. Intuition. Other ways of perceiving. Didn’t you say that Bruno and so on believed the earth was alive? Well it is.” (196, italics in the original)

Rather than noting that “Renaissance” and “regular” are not viable scientific categories, Pierce is nudged into Rosengarten’s world view and draws parallels between her comments and some current and outdated scientific concepts that seem to be their rough equivalent. He begins by mentioning the term “ecology” and equating Bruno’s idea that the world was “one big animal” with the modern term “biosphere.” Shortly thereafter, he takes up the matter of “causative action at a distance” (196) and the problems it posed for Renaissance thinkers, who had trouble accepting the existence of such so-called occult forces as
Although Pierce has the requisite background to understand some of the complexities involved in the Renaissance debate on causative action at a distance as well as the differences between Bruno's conception of a world animal and the science of ecology, Rosengarten does not. Moreover, she appears to see the parallels Pierce draws between magical and scientific thought as evidence of their general equivalence. Rosengarten is not unlike many real-world Westerners who reject science without understanding it while accepting pseudoscience as a viable option.

As Carl Sagan notes, "Pseudoscience is embraced . . . in exact proportion as real science is misunderstood—except that the language breaks down here. If you’ve never heard of science (to say nothing of how it works), you can hardly be aware you’re embracing pseudoscience" (Demon-Haunted 15). So it is that Rosengarten discusses "Renaissance" and "regular" science as if they were practical options—as though physicists might opt to specialize in Renaissance physics over its modern-day equivalent, relying on Renaissance methods and technologies rather than those currently in use. Rosengarten’s misunderstanding of science and scientific methods is nearly complete, and the depth of her misunderstanding leads her to view pseudoscience as a viable alternative to science—a more user-friendly epistemological option that allows her to see the world as she prefers it to be. In addition to believing that Atlantis is rising from the ocean depths based on the "evidence" of some mysterious sounds resembling sonic booms that have been heard off the Atlantic coast, she defines evolution in vague terms as the human responsibility to create magical "power" (198). For those who share Rosengarten’s sensibility, terms like "science" and "evolution" have been cut loose of their moorings and coopted into a highly idiosyncratic metaphysics. Such individuals do not view the universe as what it appears to be nor as what careful observation and experimentation might reveal it to be. Instead, they see it as being subject to personal whim. Rosengarten’s faith that the lost city of Atlantis will shortly resurface is punctuated by the narrator’s emphatic summation of her view of the matter: "she knew it, she just knew it" (198, italics in the original), yet her knowledge

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16 For a discussion of gravity’s "occult qualities" and the problems it posed for Renaissance investigators, see Kuhn’s The Copernican Revolution (252-260).
of this matter is based not on evidence but on faith and, even moreso, desire. Rosengarten believes that Atlantis will rise because she wants to live in a world where such events can take place. In this, she is clearly not alone.

Like many postmodernist novels, *Ægypt* contains its fair share of invented texts, including the New Age bestseller *Phaeton's Car*, whose huge success Rosengarten thinks bodes well for the sales of Pierce's proposed book. *Phaeton's Car* sets out to support a fairly standard New Age thesis:

> Once long ago starships from Elsewhere had landed here, and alien intelligences had dwelt among us; they were responsible not only for most of the titanic and inexplicable earthworks of prehistory (Stonehenge, etc.) but had also left traces of their visit in the corpus of world myth, and even their portraits on cave walls and tombs. (285)

Pierce notes that many of his former students "liked this explanation of history too" (286). Presumably, in addition to the fact that many people find such claims attractive, works like *Phaeton's Car* derive part of their appeal from the fact that they present their claims with a veneer, however thin, of scientific credibility—this despite the fact that they typically set forth little more than unsubstantiated speculation. Part of their pseudoscientific attraction derives from the fact that they refer to and draw on the work of "researchers" who are presented as respectable, a rhetorical subterfuge which Pierce sees through quite easily even if his agent does not. Crowley writes, for instance, that "Pierce always enjoyed the 'researchers' and 'investigators' of books like this one [*Phaeton's Car*]; readers were to imagine disinterested scientists, possibly in lab coats, and not the collection of cranks and odd numbers who actually compiled ‘research’ like this" (286). Pierce's observation on the fatal flaw of such "research" tracts mirrors Sagan's similar assessments in *The Demon*

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17 So too did did Kurt Vonnegut, Jr., who used the same premise for comic effect in *The Sirens of Titan* (1959).

18 New Age strategies intended to legitimize pseudoscience are varied. In one of the more interesting real-world instances, such legitimization was attempted by resorting to popular culture associations: Leonard Nimoy was hired to host the television program *In Search Of*, which dealt with a variety of supposed scientific mysteries which were, in fact, typical New Age fare. Nimoy, of course, was well known to many viewers as the relentlessly logical science officer from the original *Star Trek* television series. It was this association that gave the latter television series some scientific credibility with viewers.
Haunted World (43-59): “Star temples and ley-lines, UFOs and landscape giants, couldn’t
they [the readers of Phaeton’s Car and similar books] see what was really, permanently
astonishing was the human ability to keep finding these things?” (286).

But while Pierce sees some of the flaws of the New Age beliefs espoused by
Rosengarten and others, he is finally unable to remove analogous flaws from his own
reasoning because of his deficient grasp of science. In seeking to understand Renaissance
beliefs as they would have been understood by their original adherents, Pierce concludes
that the “false histories and systems of thought that had been opened to him” are
“inexpressibly rich” (191). The Renaissance that he reconstructs through his research is
indeed something rich and strange, and certainly very different from the conventional
conception of the Renaissance that, in Pierce’s words, is “drilled into” people in the course
of their educations (191). Of course, when reconstructed in their historical context
Renaissance beliefs and science would appear alien to us, despite the fact that they defined
a reality as reasonable to the people of that time as our own is to us. Part of their apparent
strangeness to Pierce results from the fact that, from a contemporary perspective, many
aspects of Renaissance belief are simply so antiquated that they appear—however
unfairly—as absurd; such is the case, for instance, with the belief that human health
depends on the interaction of humors circulating within the body.

The differences between what constituted astronomy and the physical sciences then
and now are similarly dramatic, despite the fact that modern science is built on Renaissance
and pre-Renaissance foundations. In large part, these disparities result from the fact that
most textbook accounts of the development of science are simplified or even fictionalized to
give a greater sense of continuity between the efforts of early practitioners and those who
followed (Gould, Bully 390, 399-401; Kuhn, Structure 167). Often, such accounts
dispensewith details and information which, although clearly extraneous now, was not
originally known to be so. So it is that in explaining his project, Pierce uses fairy tale
diction to reflect the sense of strangeness he feels in his findings as he describes his
research to Rosengarten:

“It’s as though there had once upon a time been a wholly
different world, which worked in a way we can’t imagine; a
complete world, with all its own histories, physical laws,
And then came a big change in all of them... bound up with printing, and the discoveries of Copernicus and Kepler, and the Cartesian and Baconian ideals of mechanistic and experimental science. The new sciences were hugely successful; bit by bit they scrubbed away all the persisting structures of the old science; they actually scrubbed away the actually very strange and magical way the world appeared to men like Kepler and Newton and Bruno. The whole world we once inhabited is like a dream, a dream we forget on waking, even though, as dreams do, it lingered on into all-awake thinking; and even now it lingers on, all around our world, in our thought, so that every day in little ways, little odd ways, we think like prescientific men, magicians, Pythagoreans, Rosicrucians, without knowing we do so.”

(192)

It should be noted, however, that Pierce does not here propose that the world was actually a different place. Instead, he points out that people viewed the world differently, or, to put the matter another way, that the people of Renaissance Europe constructed a reality very different from our own. Pierce, however, not only finds a much more extreme perspective articulated on this matter; he also comes to accept it. In the introduction to an unfinished manuscript by the historical novelist Fellowes Kraft, Pierce encounters a discussion of what Kuhn would call paradigm shifts, written from an extreme cultural constructivist perspective. Kraft writes:

Once, the world was not as it has since become. It once worked in a different way than it does now; it had a different history and a different future. Its very flesh and bones, the physical laws that governed it, were others than those we know. Whenever the world turns from what it has been into what it will be, and thus earns a different past and a different future, there is a brief moment when every possible kind of universe, all possible extensions of Being in space and time, are poised on the threshold of becoming, before all but one pass into nonexistence again; and the world is as it is and not as it was, and everyone in it forgets that it could ever be or has ever been other than the way it is now. (312)

Kraft literalizes Pierce’s figurative statement that the world was once a different place. According to Kraft, by viewing the world differently, Renaissance society literally imbued it with different properties, histories, and physical laws. It is in this viewpoint and in Pierce’s final willingness to accept it that *Ægypt* can be read as a fantasy—provided, of course, that the reader is willing to suppose that human belief can literally determine the
structure of reality rather than simply having a significant effect on the way in which we choose to construct it. As I will discuss shortly, however, I suspect that another interpretative possibility better addresses the textual evidence.

After reading Kraft's introduction, Pierce's approach to his own book undergoes a significant shift. He considers that the world might literally have been different than it was now, presumably because people believed different things about it (372-373). In considering the possibility, he realizes without surprise that "he had long supposed it to be so" (373). As he puts it, "[T]hings do not have to be the way that they are" (374). In taking such a position, Pierce finally enters fully into the novel's New Age milieu. Clearly, his position is no longer commensurate with the understanding of human knowledge he originally intended his book to offer. He does not mean to point out that evolution might have taken a different course, for instance, one that never led to the development of an oxygen atmosphere or intelligent primates. Pierce has something very different in mind than evolutionary contingency. Pierce, like Kraft and Rosengarten, comes to accept that belief literally defines reality.

Although such a position is not unknown in philosophy, pragmatic reasons exist for presuming otherwise. As the noted evolutionary theorist George Gaylord Simpson observes in *The Meaning of Evolution* (1949; revised 1966):

\[\text{It is assumed that a material universe exists and that it corresponds with our perceptions of it. The existence of absolute, objective truth is taken for granted as well as the approximation to this truth of the results of repeated results and experiments. That such assumptions are debatable is evident from the violence with which they have been debated at various times. In practice, however, we all have to take it either that they are true or that we necessarily proceed as if they were true. Otherwise there is no meaning in science or in any knowledge, or in life itself, and no reason to enquire for such meaning.}\]

The perspective Pierce accepts is an extreme form of cultural constructivism. Rather than merely pointing out that social factors have a significant effect on the development of scientific theories, however, this particular position posits a direct relationship between shared social belief and the structure and behavior of the universe, a position which,
although not unknown in fiction, is not, to the best of my knowledge, represented in any of the current literature on cultural constructivism.

**Postmodernist Fiction vs. Postmodernist Criticism**

The preceding analysis of *Ægypt* raises a point about the distinction between postmodernist fiction and postmodernist criticism—namely, that while scientific misunderstandings in criticism can rarely prove to be beneficial to the work in question, errors of science in fiction can often be quite helpful. Moreover, while hostility to science in criticism can generally be taken at face value, the same assumption cannot be made of apparently antiscientific tendencies in fiction.

If a work of cultural criticism bases its assumptions on a fundamental misunderstanding of chaos theory or quantum mechanics, the resulting conclusions will likely be flawed, perhaps seriously. Moreover, in criticism, while a hostile treatment of science might be debunked, it almost certainly cannot be revealed to have been, all along, an appreciation of science.\(^5\) In fiction, on the other hand, we cannot be sure that things are as they might at first appear in this regard. Introductory guides to reading literature routinely warn against confusing authors, narrators, and characters (Rabinowitz 79).

Although Pierce Moffet’s misunderstandings of and hostility towards science as disciplinary knowledge might be, as I have argued, fundamental to our understanding of his character, it does not necessarily follow that the novel of which he is a part is critical of science. A focal character need not be sympathetic, and, indeed, our ability to discern the personal failings of some characters is crucial to our ability to appreciate the fictions in which they appear. If in reading Faulkner’s *The Sound and the Fury* (1929) we fail to see the shortcomings of Jason Compson’s perspective, we will have failed to understand his character and much of the story. Compson is the novel’s villain. In understanding the character, then, we are clearly not justified in equating Faulkner’s viewpoints with

\(^{19}\) See, for instance, the penultimate chapter of Greg Bear’s *Blood Music* (1985) or Kim Stanley Robinson’s “Ridge Running” (1984).

\(^{20}\) The one exception to this assertion that I am aware of is physicist Alan Sokal’s “hoax” article in the Spring/Summer 1996 issue of *Social Text*. There, Sokal pretended to critique science while attempting to demonstrate that even extremely muddled articles can be published in cultural studies of science journals provided that the prose appears impressive enough and the final conclusions match editorial preferences. Andrew Ross’s *The Science Wars* (1996) republished that entire issue of *Social Text* in book form.
Compson's. On the other hand, authors are not infinitely insulated from their creations either, and in analyzing a novel we might conclude that a reasonable reconstruction of its author's intentions equates some of the novel's flaws of research and understanding—as well as some elements of its characters' perspectives—with the author.

Like many works of postmodernist fiction, Crowley's *Ægypt* poses a variety of difficulties in this regard, even if we dispense with attempts to reconstruct the author's intentions and focus instead on the novel's depiction of science. But Pierce's various misunderstandings of science do not finally require that we view the novel as antiscientific, although such a reading is of course one possibility. I would suggest an alternative, however: that Pierce is a particular sort of realistic character, one representative of a society in which confusion about science leads many people to view it with hostility. Such characters are less likely to offer a genuine critique of science than they are to present, as a consequence of their misunderstandings, a critique of the manner in which society practices science and distributes scientific knowledge. As the next chapter's analysis of Don DeLillo's *White Noise* (1985) suggests, figures like Pierce Moffet are by no means rare. In some postmodernist fictions, the interpretive challenge posed by such characters is greatly magnified by their numbers, however, and a casual reading might give the impression that an author's depiction of an entire society is antiscientific. Typically, however, a closer examination of the situation indicates that, once again, the manner in which science is practiced and prioritized in society, rather than science itself, is being critiqued. This is exactly the situation in Ursula Le Guin's *Always Coming Home* (1985).
CHAPTER 2

CRITIQUING PROGRESS: POSTMODERNISM AND THE PERILS OF TECHNOSCIENCE

Take Le Guin’s *Always Coming Home*, which is like an anthropological monograph. You can say, “That isn’t a real book,” and you’d be right—it’s not a “real book,” it’s a box of different sorts of materials that Le Guin assembled. The way to explain how to read this stuff is to have somebody say, “Look, I’ve discovered this interesting thing about this culture, and here are my notes, in this cardboard box. It’s a little messed up, but I know that you, as a fellow academic, will be interested in this.” That’s the literary experience conveyed by *Always Coming Home*. I don’t agree with Le Guin’s politics . . . [b]ut I do respect her a great deal for having done something like *Always Coming Home*. (228-229)

—Bruce Sterling, quoted in Larry McCaffery, *Across the Wounded Galaxies* (1990)

My greatest unhappiness with most popular presentations of science concerns their failure to separate fascinating claims from the methods that scientists use to establish the facts of nature. Journalists, and the public, thrive on controversial and stunning statements. But science is, basically, a way of knowing—in P. B. Medawar’s apt words, “the art of the soluble.” If the growing corps of popular science writers would focus on how scientists develop and defend those fascinating claims, they would make their greatest possible contribution to public understanding. (*Flamingo’s* 417)


Confusion about science results from a variety of factors relating to the production and distribution of disciplinary knowledge. As technoscientific disciplines mature, they become increasingly insular, precluding outsiders from having any detailed understanding of their procedures and conclusions. In many postmodernist fictions, this situation is reflected by the unease and disenfranchisement characters exhibit in the face of technoscience. Often, though, these same characters remain aware of the merits of the scientific project. Thus, although postmodernist fiction typically recognizes both the value and validity of science, it also emphasizes that the situation of technoscience in Western
society poses difficulties. Such postmodernist fictions as *Always Coming Home* (1985) acknowledge the challenges posed by knowledge production and transmission and suggest that Western society consider the benefits of some nonwestern attitudes, practices, and priorities. In addressing similar issues, Don DeLillo’s *White Noise* (1985) does not so much suggest alternatives as locate particular areas of concern.

**Science and Social Worlds in Collision: Ursula Le Guin’s *Always Coming Home***

Authors sometimes use their depictions of technoscience as a means of defamiliarizing Western society, confronting readers with cultures whose norms and beliefs are distinctly different from our own, as in Ursula Le Guin’s *Always Coming Home* (1985), a postmodernized, science-fictionalized *In Our Time*, part fiction about and part ethnography of a future society inhabiting the Na Valley in what is now Northern California. The story of North Owl Stone Telling and the Native American-like society known as the Kesh in which she lives provides the book’s main narrative thread. Interspersed with it are other stories, poems, folk tales, drawings, and interviews between a speaker from our own world and various members of Le Guin’s imagined future society. The book depicts a culture whose relationship to the environment is strikingly different from that of contemporary Western society. In addition to presenting a society with environmentally sound social practices, Le Guin’s novel also pays close attention to the relationship between humans, technology, science, and other forms of knowledge production.

The Kesh do not engage in science or technological production in the way that contemporary Westerners do. They lack heavy industry and global commerce. Local agriculture and crafts support village economies and regional trade. The Kesh also appear to have a very limited interest in scientific investigation. Alongside Le Guin’s human societies exists a culture of artificial intelligences known collectively as the City of Mind. They are what Western readers would identify as the novel’s scientists, and they are very good at their work. As the narrator explains:
Some eleven thousand sites all over the planet were occupied by independent, self-contained beings, self-regulating communities of cybernetic devices or beings—computers with mechanical extensions. This network of intercommunicating centers formed a single entity, the City of Mind. . . . Most of the sites were small, less than one acre, but several huge desert Cities served as experimental stations and manufacturing centers or contained accelerators, launching pads, and so on. All City facilities were underground and domed, to obviate damage to or from the local environment. It appears that an ever-increasing number were located on other planets or bodies of the solar system, in satellites, or in probes voyaging in deep space.

The business of the City of Mind was, apparently, the business of any species or individual: to go on existing.

Its existence consisted essentially in information. (156)

The City of Mind is not isolated from human society. Communication with humanity is conducted through the Exchanges, local branches of the City network located in human communities worldwide. Any settled group of fifty or more people can request that an Exchange be installed by City robots, after which it is jointly maintained by robots and humans (157). How an Exchange functions in a community depends solely on humans, however. As the narrator explains, “Information went both ways through the Exchanges; the nature and quantity of the information was up to the human end of the partnership. The City did not issue unrequested information; it sometimes requested, never demanded, information” (158). For humans, the situation provides optimal benefits with minimal responsibility:

If no information was requested, none was issued. Whatever data were properly requested were issued, whether a recipe for yogurt or an update on . . . weaponry developed by the City of Mind as part of its pursuit of research as a cognitive end in itself. The City offered its data absolutely freely to human use, without restriction, as a function of its perfect nonmanipulative objectivity. Its infrequent requests for information from the human community were usually for data in such fields as current styles in the arts of life, examples of pottery, poetry, kinship systems, politics, and other such matters which robot and satellite observers found difficult to obtain without interference in the behavior of the subjects observed, or not easily amenable to quantification. (158)

A fundamental shift in human priorities has taken place between the present and Le Guin’s invented future. That the people of Always Coming Home appear to take a limited interest
in science has been a matter of particular concern for some commentators. In *Higher Superstition* (1994), for instance, Paul Gross and Norman Levitt argue that

> The strangest aspect of the Kesh culture is the degree to which it has rejected not only technology as such (the Kesh live close to nature, with minimal use of steam power and electricity, and every artifact they produce is handmade and imbued with the qualities of art), but also the entire set of attitudes, ambitions, and obsessions of what we tend to think of as civilization. They have no interest in abstract science. Their philosophy is embedded in their mythology. . . . The notion of knowledge for its own sake is alien to them. (149-150)

As I will shortly illustrate, the text does not support the conclusion that the Kesh are not interested in knowledge for its own sake. Such a conclusion, however, is necessary for Gross’s and Levitt’s rhetorical purposes, since they need to characterize the Kesh as anti-intellectual and antiscience. Thus, they note, “Some readers are repelled by the somnolence of the Kesh and by their renunciation of ambition; but many are charmed and inspired (although Le Guin herself seems, at times, to be wryly ambivalent)” (150). Without revealing at what points in the text Le Guin might be ambivalent, they use their characterization of the Kesh as the basis for a critique of science historian Morris Berman, who suggests the possibility of a future society very similar to the Kesh. They quote, from Berman’s *The Reenchantment of Nature* (1981), the passage:

> Human culture will come to be seen more as a category of natural history, “a semi-permeable membrane between man and nature.” Such a society will be pre-occupied with fitting into nature rather than attempting to master it. . . . We will no longer depend on the technological fix, whether in medicine, agriculture or anything else . . . The economy, finally, will be steady-state, a mixture of small-scale socialism, capitalism, and direct barter. This will be a “conserver” society with nothing wasted and with a great emphasis, to the extent that is possible, on regional self-sufficiency. (qtd. in Gross and Levitt 152-153)

Gross and Levitt assert that “Berman’s ideological purpose is to supplant, with an approach conditioned by ‘spirituality’ and ‘ecstasy,’ the scientific vision that has reigned in Western intellectual life for three centuries” (153). A more succinct formulation of their position is that Berman, the Kesh, and, possibly, Le Guin are antiscientific. Yet the evidence they present in support of that judgment is at best scanty. Even if we ignore the fact that social
prediction is notoriously unreliable, in the passage at issue Berman does not attack science. Whether or not we agree with the politics of Berman's hypothesized society or of Le Guin's Kesh, Berman merely suggests that human societies might adopt practices that have less impact on the biosphere. Harvard biologist E. O. Wilson and journalist David Quammen advance similar arguments and both are decidedly pro-science. Gross's and Levitt's other direct quotation of Berman—which asserts that, "The overall framework of scientific experimentation, the technological notion of the questioning of nature under duress, is the major Baconian legacy" (Berman 31; qtd. in Gross and Levitt 153)—is not necessarily the global indictment of science that they suggest either. Nor, for that matter, are Le Guin's Kesh.

Although Gross and Levitt maintain that the Kesh are satisfied by "[t]heir world of myth, ritual, song, and the slow turning of the seasons" (150), they base their conclusion on the examination of a small sampling of people and their activities. Always Coming Home focuses significant attention on the lives of no more than a few dozen people. The reader is left to extrapolate just what sort of world the Kesh inhabit by considering the various sorts of nonnarrative, ethnographic evidence Le Guin presents. The author herself suggests how we might approach that evidence. In response to an interviewer's statement that her work has been criticized for being antiscientific, Le Guin replied:

I hope I've never been, and never am, perceived as being in any way "antiscience" in my work. Confusion often arises concerning what science and technology are. For example, I thought Always Coming Home was a rather interesting work in the technological mode; I had tried to think out carefully and consistently a highly refined, thoroughly useful, aesthetically gratifying technology for my invented society of the Valley. Being an anthropologist's daughter, I think of technology as encompassing everything a society makes and uses in the material sphere. However, a lot of people now use "technology" simply to mean extremely high-tech inventions that are predicated on and depend on an enormous global network of intense exploitation of all natural resources, including an exploited working class, mostly in the Third World. Technology in this sense doesn't strike me as having much of a future, I must admit. (qtd. in McCaffery 174)

1 See, for example, Wilson's well-known The Diversity of Life (1992) and Quammen's exemplary analysis of island biogeography and its implications for the preservation of global biodiversity, The Song of the Dodo (1996).
Le Guin implicitly asks that readers exercise caution in defining atypical perspectives on technoscience as hostile. Both in the interview quoted above and in *Always Coming Home*, Le Guin is antitechnoscientific only to the extent that she observes that unsustainable technoscience doesn't strike her as having much of a future. She objects neither to science nor technology but to a social order in which technoscientific investigation creates more problems than it solves, thus illustrating that provisional support for technoscience need not be taken as evidence of an antiscientific attitude. As a closer examination of the text illustrates, Le Guin’s alleged antiscientific stance resides in the predisposition Gross and Levitt brought to their reading of *Always Coming Home* rather than in the book itself.

Although the Kesh appear to be modeled on pre-Contact Native American societies, they are not a traditional Native American society. While Native Americans lacked science, the Kesh do not. As a speaker from our time, a consciousness that seems to loosely represent Le Guin herself, observes:

> Ever and again one runs into the bedrock of the Valley mind, the “common knowledge” of the people, what is perhaps their true mythology: unquestioned, unreasoned (though questionable and reasonable), traditional lore: the general outlines of what we would call historical geology, including plate tectonics, of the theory of evolution, of astronomy (unsupported by any telescope capable of seeing the outer planets), and of certain elements of classical physics, along with elements of a physics not familiar to us. (180)

Common knowledge for the Kesh includes a good deal of what Westerners would recognize as science, including not just information with which we would be familiar (e.g. historical geology, evolutionary theory, and astronomy) but also some insights into physics that are beyond our current understanding. At the same time, however, this information is part of a knowledge system, equated with mythology, which is “unquestioned” and “unreasoned.” The Kesh have access to the methods and results of scientific investigations, then, but based on the characters that readers meet, the society is not actively engaged in those investigations. What most people know about science, they know from the City of Mind. The fact that the Kesh lack the technology to view the outer planets is metaphorically representative of their situation. They do not view the universe
through the lens of an optical telescope. Instead, they rely on a metaphorical lens provided by the City, which gathers, processes, and brings into "focus" information about the universe for them.

Nonetheless, science remains an option. For members of settled human groups, instruction in computer use is an ordinary part of education. In the Valley, this instruction principally involves learning the computer language tok, which allows communication between humans and the City (158). What humans opt to do with that knowledge is their own choice. The City will "provide training on any level, from simple gameplaying to the heights of pure mathematics or theoretical physics, for anyone desiring to master some part of the infinite complexities of information retrieval" (158-159). Presumably, training in scientific method or progress reports on ongoing experiments and observations are also available. As with contemporary Western society, of course, technoscientific methods and conclusions are not of universal interest. As the narrator explains:

People whose gifts so disposed them might make communication with the City of Mind their life's pursuit . . . . Others knew and cared nothing about the Exchange or the City. To most people the Exchange was a useful and necessary link to such necessary and undesirable elements of existence as earthquakes, fires, foreigners, and freight schedules; while the City of Mind was one of the innumerable kinds of beings in the world, all of them interconnected, like a forest, or an anthill, or the stars. (159)

Thus, while no scientists are directly mentioned in the novel, the possibility remains that such individuals exist. Apparently, however, they are rare. Readers are left to contemplate the consequences of this rarity for themselves, however. Characteristically, Gross's and Levitt's conclusions are pessimistic. They write, "It is as if the Faustian impulse of humanity had been drawn off and perfused into the circuitry of machines, leaving humans in an Eden of contentment and forgetfulness (150). But while Gross and Levitt view Kesh society as a cautionary example of the dangers of intellectual laziness, I would suggest an equally plausible reading more in keeping with Le Guin's stated intentions. And on at least one point, my reading coincides with Gross's and Levitt's. We agree that one of the
matters most at issue is the situation of technoscience and technoscientific knowledge in society. Where we differ is in determining whether or not and to what extent the Kesh and/or *Always Coming Home* are antiscientific. I argue that they are not.

In an exchange with a Kesh archivist, a speaker from our own time called Pandora explores the role of the City and the placement of knowledge and knowledge production in Kesh society. In answering Pandora, the archivist suggests that in many respects the situation of knowledge in Kesh society is superior to that in the twentieth-century West. As she observes:

"Who controls the storage and the retrieval [of information]? To what extent is the material there for anyone who wants and needs it, and to what extent is it 'there' only for those who have the information that it is there, the education to obtain that information, and the power to get that education? How many people in your society are literate? How many people are computer-competent? How many have the competence to use libraries and electronic information storage systems? How much real information is available to ordinary, nongovernment, nonmilitary, nonspecialist, nonrich people? What does 'classified' mean? What do shredders shred? What does money buy? In a State, even a democracy, where power is hierarchic, how can you prevent the storage of information from becoming yet another source of power to the powerful—another piston in the great machine?" (334-335)

The archivist implicitly asks that we consider whether or not further research is or should be as important a priority as the more effective dissemination of existing technoscientific knowledge. Knowledge is important, but so too are a variety of social issues that have a direct bearing on its distribution and production. It is perhaps more accurate to view the Kesh as a society that has balanced its need for information and technology with the need to preserve the biosphere. By contrast, contemporary Western society appears to have failed badly on both counts.

Although *Always Coming Home* is set in the distant future, contemporary Western life often looms large in the text. Industrial concretions known as fumo bails are so common in some places that particles of this industrial residue represent the main component of beach sand (153n). Other remnants of our world are less benign: some areas have been rendered uninhabitable by radioactive and chemical contaminants (157). In other regions, residual pollution continues to pose health risks, making shellfish a dangerous
food source and leaving members of local communities susceptible to congenital illnesses (448, 204). In light of the slow accumulation of details that suggest the manner in which the world has changed, *Always Coming Home* represents a variant on the science fiction staple of the postapocalyptic tale. What remains uncertain, however, is the extent to which our everyday lives can be differentiated from the apocalypse that gave rise to the world Le Guin describes. On this point Le Guin remains silent, leaving readers to wonder whether anything more dramatic than our daily existence would be necessary to lead to the sort of radical sociopolitical reorganization that, in other novels, are precipitated by nuclear or biological warfare or cosmic catastrophe. The reader is offered only hints.

The stories that the Kesh tell about our world reflect their disdain for and incomprehension of Western life; as Le Guin’s narrator explains, the preeminent ghoul mentioned in their tales is a human with its head on backwards: “These figures of lore and superstition seem to have been the literalisation of a metaphor” (167). More specifically:

> The people of the Valley did not conceive that such acts as they saw and felt much evidence of in their world—the permanent desolation of vast regions through release of radioactive or poisonous substances, the permanent genetic impairment from which they suffered most directly in the form of sterility, stillbirth, and congenital disease—had not been deliberate. In their view, human beings did not do things accidentally. Accidents happened to people, but what people did they were responsible for. So these things human beings had done to the world must have been deliberate and conscious acts of evil, serving the purposes of wrong understanding, fear, and greed. The people who had done these things had done wrong mindfully. They had had their heads on wrong. (167)

*Always Coming Home* merely sets forth the possibility of a society with less destructive approaches to industry and technoscience. What is perhaps most noteworthy about the world of the Kesh is that artificial intelligences conduct science and technoscientific industry using methods that would be welcome models for contemporary Western society. Indeed, the City of Mind suggests that the situation of knowledge and technoscience in Kesh society could have been written in response to many of the same anxieties that plague the characters of Don DeLillo’s *White Noise*.
Critiquing Progress: Science as Noise in Don DeLillo’s *White Noise*

As I have noted, although literary and cultural criticism’s scientific errors indicate that the arguments being advanced might be flawed, analogous scientific “errors” in postmodernist fiction can actually be beneficial to the works in question by contributing to authors’ treatments of thematic concerns. Don DeLillo’s fiction admirably illustrates this general truth by reflecting popular conceptions of technoscience while drawing attention to the shortcomings of the transmission of technoscientific knowledge in mass media society. Jack Gladney, the first-person narrator of DeLillo’s *White Noise*, frequently has disagreements with his precocious fourteen-year-old son Heinrich. Two of those disagreements bear on technoscience’s role in Western society. Heinrich’s major comments on the subject, the first relating to the limits of human perception and the second examining the limitations of human memory, critique both the situation of technoscientific knowledge in American society and Western faith in the notion of technoscientific “progress.” In the face of this critique, Gladney—although well outside his field of expertise—uncertainly and inexpertly acts as a spokesperson for technoscience. As with John Crowley’s *Ægypt* (1987), despite first appearances *White Noise* is not an antiscientific novel—regardless of Heinrich’s frequent criticisms of science and other characters’ anxieties about it.

In considering his society, Heinrich obliquely critiques technoscience by focusing on human limitations. Early in the novel, he implicitly questions the observational and experimental basis of science by focusing on human perceptual limitations. Later, Heinrich’s concern with human limitations, particularly memory, underlies an overt critique of technoscience in which he sees the general public as being estranged from technoscientific knowledge despite its ubiquity in American life. Using Heinrich’s two key statements on this matter as a springboard, it is possible to explore the specifics of his critique and, in so doing, reach more instructive conclusions about the issues that concern him. While Heinrich’s position is flawed, it is flawed in instructive ways.

More specifically, although Heinrich is unnecessarily concerned about human limitations, a more informed consideration of his position suggests several important conclusions about science’s disciplinary nature. Science’s disciplinarity has consequences
for the transmission of knowledge between different scientific communities as well as
between scientific communities and the public at large. A wealth of technoscientific
information remains inaccessible to the general public. Simultaneously, the global situation
of technoscientific knowledge raises socioeconomic barriers to the transfer of knowledge.

Heinrich: Young Spectator of the Sciences Who Doesn’t Trust His Senses

The first of Gladney’s and Heinrich’s exchanges on human limitations results from
what appears to be an uncontroversial comment about the weather on Gladney’s part. “It’s
raining now” (22), he says while driving Heinrich to school. Heinrich makes Gladney’s
observation a matter of debate. Despite ample evidence to the contrary, Heinrich seeks to
deny that it is raining, insisting that a radio station forecast does not call for rain until
evening. In response, Gladney observes that even though the weather report forecasts an
evening rather than afternoon rainstorm, the two of them need not “suspend belief in the
evidence of . . . [their] senses” (22-23) and ignore the raindrops hitting the car’s
windshield. A portion of the exchange that follows, which begins with Heinrich’s reply,
deserves to be quoted in its entirety:

“Our senses? Our senses are wrong a lot more often than they’re
right. This has been proved in the laboratory. Don’t you know about
all those theorems that say nothing is what it seems? There’s no past,
present or future outside our own mind. The so-called laws of motion
are a big hoax. Even sound can trick the mind. Just because you
don’t hear a sound doesn’t mean it’s not out there. Dogs can hear it.
Other animals. And I’m sure there are sounds that even dogs can’t
hear. But they exist in the air, in waves. Maybe they never stop.
High, high, high-pitched. Coming from somewhere.”

“Is it raining,” I said, “or isn’t it?”

“I wouldn’t want to have to say.”

“What if someone held a gun to your head?”

“Who, you?”

“Someone. A man in a trenchcoat and smoky glasses. He holds a
gun to your head and says, ‘Is it raining or isn’t it? All you have to do
is tell the truth and I’ll put away my gun and take the next flight out of
here.’”

“What truth does he want? Does he want the truth of someone
traveling at almost the speed of light in another galaxy? Does he want
the truth of someone in orbit around a neutron star? Maybe if those
people could see us through a telescope we might look like we were
two inches tall and it might be raining yesterday instead of today.”

“He’s holding the gun to your head. He wants your truth.”

“What good is my truth. My truth means nothing. What if this guy
comes from a planet in a whole different solar system? What if what we call rain he calls soap. What if what we call apples he calls rain. So what am I supposed to tell him?” (23)

Heinrich continues to complicate the terms of the question. Finally, Gladney accepts that his son won’t respond and sarcastically observes, “A victory for uncertainty, randomness and chaos. Science’s finest hour” (24). I will return later to the peculiar diction into which Heinrich occasionally lapses in the passage above—as when he says “High, high, high-pitched. Coming from somewhere.”—but for now I would like to focus on the accuracy of the facts that Heinrich uses to support his position. Even allowing that human senses cannot be completely relied upon to reveal a true and complete picture of reality, Gladney expects that his son must agree that human senses can reveal at least some useful information. Thus, although humans can hear only a limited range of sounds (and, although Heinrich doesn’t point it out, can see only a small portion of the electromagnetic spectrum—what we call visible light), they can perceive some phenomena.

Overstating Relativity: Misreading Einstein, Misunderstanding Method

Heinrich’s rigid refusal to privilege his own perspective, what he refers to as his own truth, might seem to echo relativity theory, which established that physicists have access to no privileged frames of reference. While Newtonian physics assumed the existence of absolute time and space, Einstein and Hermann Minkowski showed that time and space mutually determine one another—or, in their terminology, that together space and time constitute spacetime. This conclusion had significant consequences for physics, since it indicated that an object’s absolute velocity cannot be determined because no absolute space exists against which such a measurement can be made. An object’s velocity can be measured only relative to another object. Similarly, such measurements as length, width, and height are also relative, since, as Kip Thorne explains, “They depend on the relative motion of the object being measured and the person doing the measuring” (72). Time, too, becomes relative since another consequence of the identification of spacetime is that “[e]ach person traveling in his or her own way must experience a different time flow than others, traveling differently” (Thorne 72). Einstein determined that Newtonian

\footnote{For those readers interested in the particulars of Minkowski’s and Einstein’s contributions, I recommend as a starting point Thorne (87-120).}
physics provided apparently precise measurements and accurate results only because it had been applied mainly to situations in which objects were traveling at relative speeds significantly below the speed of light. At such speeds, the time and space of the observer and the objects or phenomena observed are close enough for perceptual discrepancies to go unnoticed.

Heinrich suffers both confusion and a sort of scientific angst in the face of Einsteinian theory. "What good is my truth," he comments. "My truth means nothing." Yet Einstein never suggested, and his theoretical work has never been mathematically extended to suggest, that no frame of reference provides a valid basis for observation. Einstein showed merely that no frame of reference is inherently superior or inferior to any other. While human senses are not 100 percent reliable, scientists have developed a variety of technologies and techniques to compensate for their sensory limitations. In the absence of absolute time and space, humans necessarily lack absolute objectivity. Nonetheless, something that we might refer to as relative or sufficient objectivity remains a possibility. Indeed, Alan Chalmers refers to sufficient objectivity as a "practical achievement" of modern science (49). That is, while scientific observations or findings can never be accepted as completely objective, the careful design of experiments and experimental equipment coupled with careful observation allows scientists to collect data that approximate objectivity well enough for scientists to treat them as if they were objective.

Scientists can compensate for factors that prevent accurate measurement and observation. The atmosphere distorts the appearance of starlight, for instance, but astronomers have minimized that distortion by building observatories at high elevations and in dry, cloudless climates. The Hubble Space Telescope represents the ultimate success in minimizing atmospheric distortion by placing observing lenses above the atmosphere. Not all factors can be compensated for with equal success, of course. As Chalmers indicates, scientists may not always be able to obtain the degree of objectivity that they require of their observations, perhaps due to technological limitations, as a brief consideration of astronomy's history illustrates.

From prehistory up until the twentieth century, the technology associated with astronomy was inadequate in providing sufficiently objective information about
astronomically distant objects. Initially, the chief limitation was human eyesight, as astronomy's early development relied on naked eye observations. Even after the development of the telescope, astronomers' understanding of the universe was limited by human subjectivity: visible light, to which humans have evolved a sensitivity, represents only a small segment of the electromagnetic spectrum. In the twentieth century, this particular human limitation has to some extent been circumvented. The development of such supplementary methods as radio-, x-ray, and extreme ultraviolet astronomy allows astronomers to gather knowledge of cosmological objects whose existence is revealed by radiation invisible to the human eye.

Observations, whether of radio, x-ray, ultraviolet, or visible light waves, must be made over a significant period of time and checked and double checked for verification. What might appear to be a detected wobble of a distant sun could prove to be a problem with observational instruments, as occurred in the 1960s (Woodcock 184). Anomalous radio signals that suggest the existence of extraterrestrial civilizations or exotic cosmological bodies of the sort represented by quasars can turn out to be unannounced radio transmissions of military aircraft or satellites (Sagan, Demon-Haunted 178). Despite the precision with which information is gathered, of course, its interpretation can still change over time. The objective facts of one era may reveal very different things to the scientists of another. They may even cease to be of scientific interest. Nonetheless, all that science (or the sorts of everyday situations in which Heinrich is involved) requires of observations is that they function within a specific epistemological context. If they can do so, they are sufficiently objective. Indeed, the notion of sufficient objectivity takes into account that scientific facts and theories are not necessarily eternal truths, as completely objective knowledge would be if it could ever be obtained. As we have seen, science does not promise that its conclusions will last forever. When existing theories can no longer withstand strenuous testing or accommodate new observations, new theories must be formulated based on the available evidence. Given that sufficient objectivity represents the only practical alternative to absolute objectivity, Heinrich's many charges in his exchange with Gladney prove either untenable or beside the point.
Certainly, for instance, the laws of motion are not, as Heinrich asserts, “a big hoax” (23). The laws of motion have been shown, along with Newtonian physics as a whole, to be flawed. As with other outdated models or laws, the laws of motion *seemed* to accurately represent the universe’s behavior, but their limitations were eventually located. Nonetheless, they so accurately predict the behavior of physical systems that they remain useful. Just as it is still possible to navigate a ship based on the apparent motion of the stars and the sun by assuming that those bodies rotate around the earth, Newtonian physics allow us to solve a variety of problems involving the motion of bodies—whether comets, planets, or scientific probes—through space. Simply because scientific conclusions become outdated, they are not revealed as hoaxes. In some cases, as with Newtonian physics, such conclusions can better be termed productive approximations. Heinrich’s other arguments against human perceptions fare no better under close scrutiny.

As Heinrich asserts, laboratory experiments have illustrated the limitations of human senses, but the details of these experiments are not of central importance either for our purposes or Heinrich’s argument. After all, relativity theory illustrates that appearances depend on the observer’s vantage point. Heinrich’s position proves to be correct to at least the following extent: earthbound phenomena—were they visible at all—would indeed appear different to observers traveling near the speed of light or situated near neutron stars or such other exotic bodies as black holes. Gravitational fields deflect both passing objects and radiation. Physicists have shown how the intense gravity associated with neutron stars and black holes could create situations in which human senses would be unreliable. Light waves can be bent in such a way as to make distant stars take on an orientation that does not reflect their actual relative positions; more dramatically, when light is captured by a black hole, the visual evidence of events can be completely concealed from distant observers (Thorne 44, 218-219, 292).^3

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^3 For instance, a star collapsing to form a black hole might appear to a distant observer to cease collapsing, freezing at a certain point in its implosion, even though the star actually completes its collapse. Light released after a certain moment of the star’s collapse simply cannot escape the increasing gravitation. In other cases, gravitationally-related visual effects are less dramatic. Intense gravitational fields can alter the wavelength—and hence, color—of light passing through them. As this limited range of examples suggests, numerous scenarios exist which Heinrich could cite to emphasize the limitations of human perception.
In bringing up examples that involve exotic cosmological phenomena, Heinrich appears to unnecessarily complicate the terms of his discussion with Gladney, since he involves issues covered by Einsteinian physics when a Newtonian framework would readily accommodate the relevant data. Still, if Heinrich’s attention to detail seems finicky, we should recall that there is no reason why he must avoid noting the limitations of his perspective. Yet even after Gladney makes clear that no such disclaimers are necessary, stating that he is interested specifically in phenomena as they appear from his son’s admittedly unprivileged frame of reference, Heinrich refuses to cooperate and shifts the terms of their discussion to involve linguistic and semiotic barriers of his own invention.

Clearly, part of Heinrich’s problem is rhetorical rather than scientific, and, as we will shortly see, Heinrich’s rhetoric provides useful insights into his attitudes toward technoscience. The context within which Heinrich critiques human senses offers an effective starting point in identifying his attitude. The initial comment with which Gladney begins their conversation is an innocent enough observation: the weather report is wrong, since it is raining. Heinrich’s response to his father’s comment is more technical than conversational. He draws on a range of scientific elements, referring to unspecified laboratory experiments and theorems, relativity theory, Newtonian physics, and acoustics. Heinrich’s response is a textbook example of the estranging use of rhetoric Bruno Latour discusses, in which one speaker mobilizes far more elements in support of a position than the situation requires (206-208).

Consider, for instance, Latour’s example: a boy responds to his mother’s comment that “An apple a day keeps the doctor away” by noting, “[T]hree NIH studies have shown that on a sample of 458 Americans of all ages there was no statistically significant decrease in the number of house calls by family doctors; no, I will not eat this apple” (206). The “fact” the mother sets forth is a soft one, a folk observation that she may not even believe. The comment might be nothing more than polite banter or an attempt at light humor. The facts that the boy mobilizes in response are relatively harder and, rhetorically speaking, clearly “out of step” (206). Elements of the sort the boy offers would be appropriate for a response to a harder claim of medical fact (e.g., “Apples prevent cancer, so I would like for
you to eat one every day"). In context, though, the boy’s mobilization of facts is excessive. The repetition of a proverb does not constitute serious medical advice, so technical counterarguments need not be mobilized in response.

Latour offers another example to illustrate the estranging result of excessive one-sided mobilization of facts in response to “soft” statements, one which very neatly parallels Gladney’s and Heinrich’s situation. “If in a bus,” Latour writes:

your neighbor says ‘Nice weather today, eh?’ and you answer ‘That is a ridiculous statement, because the mean temperature today is four degrees below the normal average—computed on a hundred-year basis at Greenwich Observatory by Professor Collen and his colleagues using no less than fifty-five weather stations. Check their methodology in Acta Meteorologica, you fool,’ your neighbor will think you are strange . . . . (207-108)

As with Gladney’s comment that the radio station’s weather prediction is at least partly mistaken, the comment, “Nice weather, eh?” is not a statement Western society defines as scientific. While it is certainly possible to determine that Heinrich’s escalating mobilization of scientific data estranges his father—although his comment is not phrased as offensively as the one offered by the speaker on the bus in Latour’s example—it is impossible to determine with certainty what leads Heinrich to undertake that mobilization. Textual evidence, however, suggests some possibilities.

Part of Heinrich’s argumentativeness might derive from a typical teenage desire to take a confrontational stance relative to a parent. Gladney’s description of Heinrich as often being “evasive and moody” (22) lends some support to such a view, suggesting a frame of mind that might easily tend towards confrontation. More importantly for the purposes of this study, however, are a variety of factors that bear directly on Heinrich’s attitudes about technoscience. Heinrich’s characterization suggests that the estranging rhetoric he employs might result from his attempt to embody some mistaken ideal of the 24-hour-a-day man of science. In Heinrich’s concern with factual accuracy and his earnest desire to expose the apparently irrational stance society takes towards technoscience, he can be seen as a character who attempts to confront irrationality or errors of fact wherever he finds them. As will become increasingly clear, Heinrich is extremely conscious that he benefits from the conditions of modernity, including technoscience and its related notion of progress. Yet he also feels that he should understand the intellectual foundation on which
his modernity rests. If we move from a focus on the context of the passage to a broader focus on the novel as a whole, such a reading becomes increasingly convincing. On at least one level, Heinrich’s estranging mobilization of facts gives expression to his concerns about epistemological limits and his own estrangement from technoscience.

At one point in his exchange with Gladney, Heinrich’s diction suggests that he is either (1) still working through some of the very matters that he seeks to use in support of his position or (2) moving toward a nervous breakdown. Heinrich follows a pair of straightforward comments about the nature of sound ("I’m sure there are sounds that even dogs can’t hear. But they exist in the air, in waves.") with a jarring shift into stream-of-consciousness utterances ("Maybe they never stop. High, high, high-pitched. Coming from somewhere"). Because DeLillo’s dialogue, here as elsewhere, offers few clues about the speaker’s state of mind or the pace or tone of the dialogue’s delivery, it is impossible to determine with certainty which is the more likely alternative, unless Heinrich is both on the verge of a breakdown and thinking about technoscience as he temporarily loses track of rationality or, perhaps, sanity. Whatever the case, Heinrich’s subsequent comments suggest the nature of his unease and suggest that DeLillo’s characters are commenting explicitly on the possibility or impossibility of “truth” in postmodernist fiction.

In his first exchange with Gladney, Heinrich attempts to establish the limits of human senses in order to support the thesis that people cannot know the truth—in short, attempting to problematize the foundation on which science rests. Since scientists seek to more fully understand the universe by identifying and quantifying the natural laws by which it operates, they can be seen as truth seekers. If human observations are fallible, Heinrich implicitly suggests that science cannot be relied upon either. Ironically, though, Heinrich’s argument against an empirical basis for technoscience relies on technoscience. After all, he treats the weather report, which is based on human senses mediated by technology, as a means of apprehending the weather that is superior to his own senses. In arguing against an empirical basis for technoscience, he presents as evidence brief summations of laboratory experiments, astronomical observation, and bits and pieces from at least two physics paradigms. Heinrich is caught in the grips of an epistemological dilemma. He has identified what he sees as flaws in the fabric of technoscience, yet to note
those flaws he must place at least minimal faith in scientific method. This apparent contradiction becomes even more apparent after Heinrich’s impromptu lecture on the nature of a toxic cloud—a scene that takes place just after a chemical accident forces his family to take shelter away from their home and its conveniences.

**Personal Knowledge, Memory, and Disciplinarity in a Specialized Culture**

In his current, primitive setting, Heinrich critiques the concept of progress by considering modern people’s lack of technoscientific knowledge and their inability to make use of existing technology once they are cut loose from their day-to-day cultural infrastructure. “It’s like we’ve been flung back in time,” he says while looking around at his scout camp surroundings.

> “Here we are in the Stone Age, knowing all these great things after centuries of progress but what can we do to make life easier for the Stone Agers? Can we make a refrigerator? Can we explain how it works? What is electricity? What is light? We experience these things every day of our lives but what good does it do if we find ourselves hurled back in time and we can’t even tell people the basic principles much less actually make something that would improve conditions. Name one thing you could make. Could you make a simple wooden match that you could strike on a rock to make a flame? We think we’re so great and modern. Moon landings, artificial hearts. But what if you were hurled into a time warp and came face to face with the ancient Greeks. The Greeks invented trigonometry. They did autopsies and dissections. What could you tell an ancient Greek that he couldn’t say, ‘Big deal.’ Could you tell him about the atom? Atom is a Greek word.” (147-148)

Continuing with this general line of questioning, Heinrich goes on to ask Gladney what he would tell people in the Middle Ages if they were faced with an epidemic. Gladney allows that the only practical advice he could give would be for people to boil their water. Heinrich is unimpressed. While he allows that Western culture has accumulated considerable technoscientific knowledge, he maintains that it exists as a sort of cultural background noise. “What good is knowledge,” Heinrich asks, “if it just floats in the air?” (148).

In critiquing modern conceptions of progress, Heinrich conflates science and technology. Cultural critics, philosophers, and sociologists of science often discuss
science and technology as being so closely related as to be nearly indistinguishable. So common—and, in many discussions, necessary—is the three-word phrase “science and technology” that Bruno Latour coined the term “technoscience” (which I have been, until now, using unacknowledged) to avoid having to repeat it. But while Latour’s discussion of technoscience takes into account the importance of the overlap as well as the distinctions between science and technology, Heinrich’s uncertain conflation and critique of science and technology does not, as a brief examination of the passage above shows. Heinrich alternately points out what he sees as his father’s shortcomings as a builder of tools (specifically refrigerators and matches) and as a provider of scientific knowledge (relating to the nature of electricity, light, and matter), apparently unaware that a clearer distinction between science and technology has important consequences for his understanding of technoscience.

The reader will recall the argument set forth in *The Savage Mind* (1966), for instance, in which Claude Lévi-Strauss relies on an uncertain conflation of science and technology to problematize the distinction between scientific and pre- or nonscientific knowledge systems. Lewis Wolpert argues that Lévi-Strauss mistakenly attributes the use of scientific method to prescientific cultures because he confuses technology with science. Impressive as some of these cultures’ technological achievements may be, Wolpert observes, they are not scientific. The technological advancements of nonscientific cultures, like virtually all of pre-nineteenth-century Western technology, were built on a trial-and-error basis, and although these societies might have made use of a series of “ad hoc hypotheses and conjectures” (30), their efforts were directed toward practical ends rather than toward the formulation of general principles or laws. While the technological achievements of a variety of cultures remain noteworthy, neither the achievements nor the cultures responsible for them are scientific.

In the speech quoted above, Heinrich attempts to illustrate the problematic situation of technoscientific knowledge in Western society. By alternately challenging Gladney’s ability to make technological devices and explain scientific matters, though, Heinrich proceeds on three connected assumptions about the relationship between science and technology. Implicitly, Heinrich accepts that:
(1) scientific and technological knowledge are of equal importance,

(2) scientific and technological knowledge are obtained in a sort of intellectual package deal, where technology reveals things about science and science reveals things about technology, and

(3) in order for people to make technological devices, they need to understand the scientific reasons why the devices in question function.

Heinrich’s first assumption is unproblematic, since technology is undeniably as important as science to the daily conditions of modern life in the West. Technology provides a variety of conveniences which people have come to view as necessities. Heinrich’s second assumption is equally unproblematic since twentieth-century science and technology often develop by mutually reinforcing one another, each component of technoscience providing clues, processes, or artifacts that prove useful both to itself and its sibling. Scientific and technological knowledge have become so closely interconnected that it would be impossible to separate them sufficiently to judge which is the more important. Heinrich’s last assumption, however, is not unproblematic.

People do not require an understanding of the science that underpins a technology simply because they wish to construct or use it. To build a tool, a person needs directions and supplies; to use a tool, a person needs only the tool and directions. Just as I could bake palatable bread without knowing anything about yeast metabolism by following a cookbook’s directions, if I were given a basic enough set of instructions, I could also build a refrigerator without understanding the properties of coolant gases or the principles of heat exchange. While it might be supposed that I am allowed the luxury of ignorance as a consequence of someone else’s understanding of these and a host of other details, a few brief examples will show that this is not necessarily the case.

Inventors can frequently dispense with understanding the underlying scientific principles on which their technological innovations rely. When Charles Goodyear first vulcanized rubber as the result of a lab accident, he did not understand the chemical basis for the change in the rubber’s strength; he noticed only that by exposing the rubber to heat it had become more durable. There was no practical need for him to understand the specifics of the chemistry of vulcanization. In medicine, similar advances are common. Smallpox vaccines, for instance, were in use in the eighteenth century and even more
widely in the nineteenth well in advance of Robert Koch’s 1876 announcement of the germ theory of disease (Lewontin 43-44). Contemporary examples are also available. Aspirin served as an effective pain reliever long before medical researchers understood why it worked. In veterinary medicine, the antibiotic/antiprotozoal metronidazole is known to stimulate the appetite of reptiles, although the mechanism(s) for this effect are unknown. While technological development often involves attempts to understand the mechanisms by which medicines, devices, or processes function, those technologies remain effective even in the absence of fundamental understanding of the relevant mechanisms. Randall Albury offers a particularly telling example that makes clear the distinction between scientific and practical use of technologies (44-45).

In traditional Chinese society, the Dragon’s Backbone pump was used in various regions to irrigate rice paddies. The basic design involved a bicycle-like mechanism that drove pallets up an inclined trough, but slightly different designs—their differences mainly relating to pallet shape—were used in different regions. In the 1700s, de Belidor analyzed the pump geometrically and mechanically. By studying quantitatively how the pump worked, he determined the optimum pallet shape for use in a variety of specific circumstance. His understanding of the Dragon’s Backbone pump involved quantification, one of the hallmarks of scientific understanding. Quantifiable knowledge is not everything, of course. While it is true, as Alan Chalmers points out, that the “traditional Chinese had possessed craft knowledge based on practical experience, [and only] de Belidor’s treatment [of the pump] constituted scientific knowledge” (26), the Chinese still had the use of an effective pump for centuries in the absence of de Belidor’s precise, scientific account of the its operation.

These examples are not intended to suggest that there are not important interrelationships between science and technology. Clearly, some features of modern life justify Heinrich’s conflation of the two areas of knowledge. As I mentioned earlier, especially since the nineteenth century, science and technology have become inextricably linked. A scientific understanding of technology such as de Belidor provided for the Dragon’s Backbone pump can lead to important advances. Not only is an optimally effective pump preferable to one that works only reasonably well, but an understanding of
the mechanisms by which vaccines and pain relievers function can lead to the development of more effective vaccines and pain relievers, and perhaps eventually to altogether different treatments for diseases and pain. To a considerable extent, scientific advances have relied—and continue to rely—on technological advances.

A host of processes and devices from gas chromatography and microscopes to radio carbon dating and the Hubble Space Telescope are crucially important to the day-to-day work of scientists in literally every discipline. In some sciences—particle physics, for example—progress depends on the ability of scientists to work with technologists in designing and constructing new detectors. Similarly, super computers at Los Alamos National Laboratory were instrumental in genetically sequencing human and monkey AIDS viruses and scanning those sequences to construct the viral family tree that helped researchers understand the virus's natural history (Garrett 377-378). In all these instances, it is impossible to draw a clear line between technology and science, since without the technology the science could not have been conducted. Similarly, many staples of modern Western life, from x-ray machines to microwave ovens and televisions, exist because of what was originally pure—rather than applied—research in physics. Heinrich is certainly right in observing that Westerners think of themselves as being modern and in attributing our modern self image to technoscience. To assess Heinrich's critique of progress, though, we must determine to what extent individual understanding of technoscience represents a necessary precondition for modernity. Here more than anywhere else Heinrich goes astray, equating the specialization he notes in his culture with inherent intellectual weakness.

Recall that Heinrich is concerned about what seems to him to be detached knowledge, which he sees as floating in the air where it is of no use to anyone. As he observes, contemporary Western society has achieved a variety of remarkable technological feats (the moon landings and artificial hearts to which he refers), and it has also inherited a rich scientific tradition (included under the umbrella of the "centuries of progress" Heinrich mentions). In spite of these things, or perhaps because of them, Heinrich still wants to know of what use all of his culture's accumulated knowledge is to average people once they are separated from their social infrastructure. As his experience as a refugee from a
chemical disaster shows him, refrigerators are wonderful and useful only if they can be plugged into a working power grid. His conversation with his father illustrates that he is troubled by the fact that few Americans could build a refrigerator or a system to power one without directions, even if the basic components were available. But of course Heinrich directs his critique of progress not at society as a whole but at his father, an individual who is not, in intellectual terms, average. Gladney is particularly well educated, although his field of expertise is history (or, more specifically and more in keeping with the tone of DeLillo’s darkly comic novel, Hitler studies) rather than biology, chemistry, medicine, physics, or refrigeration technology. Still, as Heinrich points out, Gladney has read “hundreds of books and magazines and seen a hundred TV shows about science and medicine” (148). The implication is clear: despite Gladney’s education, his grasp of technoscience is exceedingly slight. Following Heinrich’s reasoning, the reader is prompted to wonder how much more tenuous other people’s grasp of science might be.

On one level, the nature of Gladney’s intellectual and professional specialization—like the nature of everyone else’s specialization in Western culture—is exactly the point at issue. Everyone does not need to know how to make matches, build refrigerators, or respond to epidemics. Western society involves both a division of labor and a division of the knowledge required to undertake each type of labor. Research and development allow a small percentage of people to determine how things—including matches and refrigerators—can best be made, then these things are constructed and marketed. Similarly, an overlapping series of governmental bodies and scientific and medical organizations contend with outbreaks of illness. Other people undertake research in the pure sciences. In a society of specialists, different groups undertake virtually any scientific, intellectual, or technological task that the culture values. The advantage that such a system confers to its members is that over time specialists become increasingly adept at working within their fields. They can then add to their culture’s knowledge of those disciplines and technologies through observation and research. The tradeoff—which Heinrich apparently finds so troubling because it strikes him as being unmodern and/or unscientific—is that individuals in such cultures can develop personal expertise in only a few related fields. Gladney, caught in a moment of disagreement with his son about a
matter outside his area of expertise, fails to move beyond his son’s limited perspective on technoscience. We, on the other hand, have the luxury of considered reflection on which to base a response to Heinrich’s criticism—and the basis of that criticism is of central importance to an understanding of technoscience’s role in contemporary Western culture.

The Disciplinary Nature of Science, The Importance of Method, and the Consequences of Intellectual Specialization

Like a science teacher who loses sight of the significance of scientific method after getting caught up in a long list of facts, Heinrich confuses the importance of information with the importance of method and nudges Gladney into a similar confusion. Despite Gladney’s inability to muster useful advice with which to improve the situation of Heinrich’s hypothetical stone agers, what Gladney might have been able to offer them and what Heinrich almost certainly could (whether he knows it or not) is a generalized method for conducting science rather than the massed results of all his culture’s technoscientific achievements. The difference between these two things—methods and massed results—is vast. As Stephen J. Gould notes, “Science, in its most fundamental definition, is a fruitful mode of inquiry, not a list of enticing conclusions. The conclusions are the consequence, not the essence” (Flamingo’s 417). A general system involving the presentation, testing, and refining of hypotheses through observation and experimentation offers a flexible approach that, with modifications, can be used in a variety of contexts to investigate phenomena or develop technologies. One individual’s personal store of technoscientific facts, on the other hand, might or might not be useful in any given situation and, without the benefit of the method that led to its discovery, the information itself provides no means of discovering other facts that might be of equal or greater interest in different situations. As a consequence, when Heinrich observes that Westerners view themselves as great and modern because of technoscience, he locates a mistaken basis for modern egotism since we are neither as intelligent as we might like to believe nor were our predecessors so unintelligent. To whatever extent we might think of the knowledge that accompanies our modernity as being “great,” that belief is due much less to what we know as individuals than it is to what we are freed from having to know. In a specialized society like our own,
people keep track of important information for the culture at large by working within specific disciplines and relying on the work of those in other disciplines who do the same. Heinrich never realizes the significance of this disciplinarity, although he comes close.

When Heinrich comments that Gladney would have nothing to tell an ancient Greek that the Greek couldn't respond to by saying, "Big deal," he emphasizes that he has confused science with a body of facts rather than equating it with a method of inquiry. On one level, although probably unintentionally, Heinrich makes a valid point. Part of what science is at any given time involves the cultural matrix that fosters it. Outside such a matrix, sciences might not even be recognized as sciences. It would be difficult to see how anyone, even a Nobel laureate in physics or biology, could impress the ancient Greeks with his or her scientific knowledge. The culture of modern science, based as it is on a host of experiments, technologies, and social predilections, is radically different from its ancient Greek counterpart, so much so that the scientists of the two eras would face not only a language barrier but a variety of conceptual hurdles as well. Guiding assumptions and paradigms on which modern scientists rely were gained through centuries of investigation. The disciplinary nature of the sciences along with the situation of these disciplines within or relative to other technoscientific matrices mean that no one could recreate an entire scientific heritage with its basic reference works and relevant technologies from memory, let alone do so in such a way as to make it appear reasonable to people who know nothing about it. Contemporary science relies on a variety of technological black boxes that are accepted as reliable, but even such now-basic tools as thermometers and telescopes were once as problematic as today's advanced prototypes. The reliability of technologies that contemporary scientists take for granted was established through debate, observation, and experiment. It is difficult to see how any one person could be expected to reconstruct these devices and the justificatory strategies needed to legitimate them in the eyes of informationally and/or chronologically distant cultures. As Latour recognizes, a great deal of work has gone into making the science of any given moment what it is, and underlying any science's accepted assumptions and statements of fact are a variety of experiments and

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See, for instance, the discussion of early vacuum pumps as the British Restoration-era equivalent of Big Science in Steven Shapin's and Simon Schaffer's *Leviathan and the Air-Pump* (1985) (38n. 237, 257, 274-276).
arguments that are no longer of current concern. Latour’s rhetorical question, “Who refers to Lavoisier’s paper when writing the formula $\text{H}_2\text{O}$ for water?” (43) emphasizes this point. Of course, no practicing scientist needs to refer to Lavoisier’s paper, and that cumulative aspect of the investigative enterprise is what allows science to progress. But a contemporary chemist attempting to explain her science to an ancient Greek would probably need to refer to the content of Lavoisier’s paper in detail.

A variety of very different attitudes and beliefs underpin the sciences of ancient Greece and contemporary Western societies—so much so that the scientists of each time and place would probably even disagree about what sorts of tasks and procedures could be considered scientific and what sorts of evidence could be counted as valid. If anything, Heinrich underestimates the likely reaction of an ancient Greek hearing of contemporary science. Faced with a system of thought so alien to his own, an ancient Greek would likely respond to a modern American’s account of her science by saying, “You’re insane,” rather than, as Heinrich suggests, “Big deal.” We can see why this would be the case through an example involving a far less substantial gulf than the one separating our hypothetical twentieth-century chemist from the ancient Greeks. Consider the assumptions that separate contemporary geology and paleontology from the equivalent disciplines practiced in the early nineteenth century. If a contemporary geologist or paleontologist were to begin explaining that his science did not look to the Bible as a necessary source of information or theoretical verification, whatever remaining discussion the two scientists might have would likely be very brief. Early geology and paleontology were very much Bible-based, and their reliance on a religious text was not seen as being at all unscientific. Geologists and paleontologists did not begin to remove the Bible from their disciplinary matrices until it became clear in the 1840s that the geological record did not show evidence of a Noachian flood (Gould, Flamingo’s 114-125). Still, while it is true that an ancient Greek scientist might not be overly impressed by even a well-informed overview of contemporary science, modern science certainly would remain a very big deal indeed by ancient Greek standards, as a closer consideration of Heinrich’s example shows.

As Heinrich says, “Atom is a Greek word,” but the Greek conception of an atom differs greatly from its contemporary counterpart. While Democritus and Leucippus taught
that matter consisted of atoms, they had no way of testing that speculation or establishing its superiority over a variety of alternative accounts of matter's composition. Nobel laureate physicist Steven Weinberg elaborates on exactly this point when he notes that although early Greek atomists “may seem wonderfully precocious” none of them had anything like our idea of what a successful scientific explanation would have to accomplish: the *quantitative* understanding of phenomena. How far do we progress toward understanding why nature is the way it is if Thales or Democritus tells us that a stone is made of water or atoms, when we still do not know how to calculate its density or hardness or electrical conductivity? And of course, without the capacity for quantitative prediction, we could never tell whether Thales or Democritus is right. (7)

Weinberg observes not that modern scientists have at their disposal more knowledge in absolute terms than did the ancient Greeks—although modern scientists do have far more tested “facts” and technological black boxes. Instead, he recognizes that because of the long-term, ongoing testing of hypotheses and the building, testing, and refining of technologies, modern scientists have a clear edge in their ability to propose and test hypotheses. Rigorously tested theoretical underpinnings coupled with technological advancement allow investigators to gather and analyze data using techniques the likes of which the ancient Greeks could not have dreamed. Hypotheses suggesting that matter is composed of water or fire have been shown by direct observation, experiment, or both to have been mistaken, while observation and experiment have not only established that matter is composed of atoms but have also revealed a great deal about the structure and behavior of both atoms and subatomic particles.

To take another example of the difference between classical and contemporary science, we might observe that Aristotle defined and provided the correct answer to the preformation/epigenesis debate of embryology over 2,000 years before it was settled in modern times (Wolpert 125-129). While some ancient Greeks maintained that embryos were tiny, fully formed organisms that simply grew larger over time (the preformation view), others thought that the parts of the embryo formed in succession (the epigenesis view). It would even be possible to argue that Aristotle undertook experiments, since he argued in favor of epigenesis after opening chicken eggs. As with Democritus, Leucippus,
and the atom, however, Aristotle's achievement is far less impressive than a carefully spin-doctored account might suggest. Aristotle based his argument for epigenesis on philosophy rather than observation. Indeed, as Wolpert observes, "Aristotle's theory . . . was not based on any real evidence. Though we now know that embryos do develop by epigenesis, he was correct for the wrong reasons: it was little more than an inspired guess" (126).

For its time, the science of the ancient Greeks was impressive, but when considered in historical context the science of any period is likely to be equally impressive in some respects. Similarly, when compared to early science, later science virtually always appears dramatically successful. The cumulative nature of scientific enterprises nearly guarantees that this should be the case, as does the fact that the shortcomings and outright mistakes of any period's sciences are not likely to be apparent to their practitioners. As the astronomer protagonist of Carl Sagan's novel Contact (1985) notes of her research on lasers:

To anyone ignorant of the underlying physics, it might seem the most arrogant and pretentious necromancy. How would you explain this to the best scientist of a thousand years ago, who knew about air and rubies and lodestones, but not about liquid helium, stimulated emission, and superconducting flux pumps? In fact, she reminded herself, they did not have even the foggiest notion about the radio spectrum—except vaguely, from contemplating the rainbow. (41)

Science is a cumulative enterprise, and disciplines must crawl before they walk, run, or fly.

Information Overload: Can Knowledge Just Float in the Air?

Although it troubles Heinrich that people do not know as much about contemporary technoscience as he would like, his concerns about the transmission of knowledge in American society are more than an expression of teenage angst. Recall one of Heinrich's objections to his father's knowledge of technoscience: even though Gladney has been exposed to hundreds of books, magazines, and television shows about science and medicine, he knows little about these subjects. Partly at issue here is the nature of scientific popularization. As Heinrich asserts and the constant information overload depicted in DeLillo's novel illustrates, knowledge is not only available, its availability is overwhelming. As Heinrich says, "It goes from computer to computer. It changes and
grows every second of every day. But nobody actually knows anything” (148-149). Heinrich’s experiences support his claim, if we grant as an exception that specialists know something about their specialties. Despite his family’s exposure to science from popular sources, he is usually the only one who can keep his facts straight. The Gladneys repeatedly have tangled discussions in which once-learned scientific facts—the original nature of which is hinted at by the snippets of technoscientific information that occasionally appear as the background noise of television sets tuned to educational programming—are hopelessly confused into tenuously held misconceptions (81, 176, 232, 264). If the bright and educated Gladney family cannot keep these facts straight, the problem might be less with the Gladneys than with the presentation of those facts and/or the sheer quantity of facts presented. Sociologists and historians of science suggest as much.

John C. Burnham, for instance, asserts that since the nineteenth century, popularizations of science have “changed from [texts offering] a coherent view of nature, including humans, into [texts that present] choppy, unconnected ‘facts’” (5). Both Burnham (208) and Elisabeth S. Clemens note that even professional scientists rely on popular science sources to understand fields in which they are not specialists. Yet journalists often need—or at least feel they need—to simplify their discussions of scientific subjects in order to make their writing entertaining and understandable. Unfortunately, such simplifications minimize the complexity of the relevant issues or conceal the existence of disagreement about a variety of potentially significant methodological, evidentiary, or theoretical issues (Burnham 208; Clemens 115; Fleck 112; Nelkin 120). To understand exactly what this means, we must be clear that science involves different kinds of facts.

Some facts are more fully established than others—the chemical formulas for water or oxygen, for instance—which are well understood and fully integrated into their scientific contexts. Other, usually newer, facts and their significances may not yet be fully understood or agreed upon. Among these controversial facts would be many of those that relate to the mechanisms of the mass extinction that took place about 65 million years ago at the boundary of the Cretaceous and Tertiary periods, the so-called K/T extinction event. While it is a fact that an iridium-rich stratigraphic layer marks the period of the K/T extinction, the complex of considerations accompanying that fact enjoy far less consensus.
among scientists than do such shorthand statements as H₂O or O₂. Some scientists accept the iridium layer as persuasive evidence for the impact of one or more massive meteors or comets (referred to as bolides) near the time of the K/T extinction. Since iridium is rare in the earth’s crust, they consider that bolides colliding with the earth could account for the quantities present in the K/T boundary layer (Alvarez; Carlisle; Fastovsky and Weishampel 399-429; et al.). Others see the iridium layer as evidence for massive, global volcanic activity near the time of the K/T event because iridium, which is more common deep within the earth, is present in lava (Officer and Page). Whether or not the iridium layer resulted from bolide impacts, volcanic activity, or both, the role of impacts and volcanism in the K/T extinctions also remains unclear. Some paleontologists remain convinced that the extinction event that wiped out the dinosaurs can be best explained without resort to any cataclysmic events but instead as a consequence of the lowering of global sea levels and the subsequent shifts in species distribution that resulted when intercontinental land bridges allowed for direct competition between species that had long been isolated (Bakker 425-444). Alternately, it might turn out that the dinosaurs were eliminated not by any one cause but, instead, by a “symphony of causes” (Dodson 280), from changing sea level and climactic shifts to volcanism and mountain building. Clearly, many questions remain unanswered. Did impacts or volcanism cause some or all of the extinctions, or did the extinctions occur before the impacts or volcanism? How many impacts or eruptions took place and over what time frame? As the example posed by one ongoing debate suggests, facts of the still-controversial sort are frequently in evidence when popularizers discuss scientific debates that have not yet played themselves out. If an ongoing scientific debate is an energetic one, it can easily lead not only to considerable popular media coverage but also to extensive professional research and scientific publications.

By 1989, over 2,000 professional publications addressed some aspect of the debate engendered by the 1980 Science article that identified the cause of the K/T extinction as a meteorite impact (Glen 58). Members of the media are faced with a difficult reporting task. In these publications, scientists from different disciplines routinely emphasize the significance of different pieces of evidence and weight the same evidence differently. Moreover, scientists from different disciplines and subdisciplines tend to reach very
different conclusions not only about whether or not one or more impacts occurred but also about what relationship—if any—these impacts might have to the K/T extinction. Not surprisingly, popular press coverage of the debate occasionally runs into difficulties. Television programs of the sort that frequently provide the background noise in the Gladney home in *White Noise* are as prone to oversimplification and distortion as popular science print journalism. William Glen notes that such science documentary programs as *Nova* and *National Geographic* offer “increasingly sophisticated and elaborate presentations on aspects of the [K/T extinction] debates” which are used in education and viewed by home audiences and “much of the scientific community” (87). Yet of the two programs Glen watched that dealt with the controversy concerning the K/T extinction, “one was flawed in its facts and somewhat partisan” (87), while the “other was more factually correct, but astonishingly presented the controversy, at the time of broadcast . . . in 1987, as more or less closed” (87). The K/T extinction debate suggests that even if people could remember and organize the facts they are exposed to, they would very likely still end up developing oversimplified or mistaken ideas about the scientific issues being debated.

The extremely large number of publications dealing with the K/T debate supports Heinrich’s assertion that knowledge which “just floats in the air” is not particularly useful. Certainly, in the case of the ongoing debates about the K/T extinctions, the sheer quantity of professional publications has made it difficult for concerned scientists to keep track of all the conflicting arguments surrounding different pieces of evidence. While the K/T debate represents a particularly striking example of information overload in an ongoing debate, Glen and others have noted that investigators in other areas of the natural sciences experience similar difficulties. Published literature in many of the natural sciences shows a doubling rate of about seven years (Glen “Musings”), while Gary Stix reports more generally that “the wealth of scientific information doubles about every 12 years” (107). To illustrate how much information is at issue, Stix provides a graph showing that the pile of journals referenced in the Medline bibliographic database of biomedical literature during one year would stand about 800 feet tall—about 250 feet taller than the Washington Monument (108). This information explosion, in Glen’s words, “has drastically eroded scientists’ ability to keep up with their own literature” (81-82). Writing of his own
scientific specialty, Ernst Mayr makes a similar observation, noting that “more papers (and pages) are published in the course of a few decades than in the whole antecedent history of biology” (*Growth* 112). “Even specialists complain that they can no longer keep up with the avalanche of research output in their own field” (*Growth* 16).

It has long been possible to overlook potentially important published research in the natural sciences, and few new ideas, even apparently novel ones, are actually either completely new or novel. Three scientists—Hugo De Vries, Karl Correns, and Erich von Tschermak—independently rediscovered the principles of Mendelian inheritance, the basis of modern genetics, at the beginning of this century. Their significant achievement is overshadowed by Gregor Mendel’s 1866 publication of his findings on inheritance in an obscure European journal, the *Proceedings of the Natural History Society of Brün*, where they were left unappreciated for decades. As Philip Kitcher observes, it is one of the great ironies of modern biology that Darwin—to whom Mendel had sent a copy of that paper—had in his possession information which could have been a great help in his repeated, failed attempts in later editions of the *Origin* to address questions dealing with heredity (9). Thus virtually from the very beginnings of modern evolutionary biology, it has been possible for scientists to overlook publications of key importance to their research. Yet the current scientific information overload results from an overabundance of information of a far greater magnitude than what Darwin faced.

The extent of the current overload is partly due, of course, to the fact that as sciences mature, they allow ever more opportunities for specialization within disciplines. As a field, evolutionary biology did not exist until the publication of Darwin’s *Origin* in 1859. Now, biologists working in such fields as biochemistry, biogeography, genetics, ecology, and paleontology approach evolutionary questions from a wide range of subdisciplinary angles. If Darwin could overlook a significant citation when the branch of biology he ushered into existence was not even a decade old, contemporary scientists clearly face an even greater difficulty. Given the continuous rise of global population, there are far more practicing scientists now than at any time in the past. More scientists undertake more research and report more findings, adding to the often difficult-to-manage
information pool. The “publish or perish” mentality typical of academic environments exacerbates the situation by linking publication to academic appointments and funding.

The situation of knowledge in Western societies represents something of a double-edged sword. Knowledge can provide obvious benefits, but the more knowledge there is, the more difficult becomes the task of managing it. On the one hand, technoscientific research leads to fully articulated disciplines that can investigate more phenomena. Whether the insights gained are of immediate practical benefit (as with research into gene therapy) or not (as with the identification of new fundamental particles), in the long term scientific knowledge can lead to technological benefits, from refinements of existing technologies to the development of entirely new ones. Similarly, research can allow societies to better manage natural resources and encourage other nations to do the same. In the absence of knowledge about global biodiversity or data showing a breakdown of the ozone layer, the threats posed by habitat destruction, species extinctions, or ozone depletion could not be addressed. At the same time, the general public must remain largely ignorant of the relevant issues involved in these and a host of other scientific topics. People cannot keep track of all the technoscientific matters and debates that bear on their daily lives. In this, DeLillo’s depiction of the Gladney family’s numerous scientific confusions is a realistic portrayal of intelligent nonscientists confronted by an overabundance of information.

The Gladneys are confused by scientific data precisely because they have neither a framework within which to situate that knowledge nor any compelling need to situate it. Like most Westerners, they are not scientists; rather, they semi-interested spectators of the sciences who occasionally read articles or watch television programs dealing with science and nature. They can afford to take no more than a passing interest in the sciences because their day-to-day work requires no more than that from them. In this, the Gladneys are generally representative of the public at large in virtually any industrialized nation. Like the Gladneys, the public is not a disciplined body capable of making use of scientific findings in the same way as are the scientific communities who produce them. As a consequence, the public can almost never fully contextualize—or fully appreciate the significance of—the scientific data they encounter.

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When Jack Horner began publishing findings suggesting that duckbilled dinosaurs exhibited nesting and herding behaviors, his data had a variety of significances in the context of vertebrate paleontology and evolutionary biology which were not apparent to the people who read about the news with their morning coffee or heard it mentioned during the evening news. The fossil finds that provided information about herding and nesting behaviors also provided a variety of insights and hints about the ecological conditions of the duckbilleds' habitat, their metabolism, and the evolution of complex social behaviors. To understand and appreciate with any reasonable degree of thoroughness the significance of Horner's fossil finds, people had to understand something of the broader disciplinary context of those discoveries and their implications for other areas of paleontology and evolutionary biology. Yet a great deal of the work that vertebrate paleontologists do is not of particular interest to the public, nor is it readily comprehensible. As Peter Dodson notes, "Few amateurs worry at night about whether Stegoceras is a suitable outgroup for the Ceratopsia or whether the lack of parietal fenestrae in Triceratops is a retained basal character or a character reversal" (15). The findings of scientists in a variety of other disciplines appear equally uninteresting, inconsequential, and baffling. Because Heinrich is not a member of a scientific community, for him knowledge does appear to just float in the air. Similarly, the fact that an interest in Western-style technoscience is not widespread in Kesh society does not necessarily need to be taken as an indication that they are hostile towards science. Given the City of Mind's successes in investigating the universe, it is just as likely that the quantity of technoscientific knowledge in existence has far outstripped the average person's ability to understand it in anything more than a rudimentary way.

For members of various scientific disciplines today, however, knowledge behaves differently; while it may not be completely accessible, it is still situated within the context of various, sometimes overlapping disciplinary matrices, where it provides hints about and insights into those disciplines, including potential clues about how to refine or expand them through further research. More information might be available than any one person can conveniently keep track of, but so far scientists have been able to use that information—although not always easily. As investigators further specialize and found new journals in which to report their research, libraries are forced to keep up with the glut
of information (Stix 107). But even while many scientists note that it is becoming increasingly difficult to keep track of new publications in their fields, few would argue that new research and publications should cease until they have sufficient time to catch up on their reading. Despite some of the difficulties I’ve outlined, virtually no scientists are calling for a moratorium on knowledge production. Yet while the availability of technoscientific data continues to pose difficulties in the West, Third World scientists face the opposite difficulty: information scarcity.

The Ripple Effect of Information Scarcity

In many developing nations, a serious lack of vital scientific information hinders scientists in their day-to-day work. As the cost of institutional journal subscriptions increases and the exchange value of Third World currencies decreases, academic libraries in many nations are unable to maintain subscriptions that Western institutions consider necessary for basic research (Gibbs, “Information” 12). While journal costs strain the budgets of Western research libraries, the limited funds available to their Third World counterparts make many subscriptions impossible. An annual subscription to some journals can cost as much as a Ford Escort (Stix 108). With the increasing tendency toward intellectual specialization and the accompanying rise in the number of journals being published, U. S. research libraries are often forced to let some journal subscriptions lapse. Not surprisingly, libraries in developing nations face even more severe financial constraints. Amy Gimbel, director of the sub-Saharan African program of the American Association for the Advancement of Science, reports that not one of the 31 libraries surveyed in 13 African countries had a viable serials collection (qtd. in Gibbs, “Information” 12). Eight of those libraries were completely dependent on donations for foreign subscriptions. While not all developing nations are as information-starved as many African countries, other parts of the world are experiencing a similar information drought. India, which received about 20,000 journals in 1983, now receives fewer than 11,000, and the number of copies of each journal has also decreased (Gibbs, “Information” 12).

It has become commonplace to hear that recent trends toward increased communication via the Internet and electronic mail will allow scientists to meet the
challenge of information overload in the West, yet these trends have so far tended to exacerbate rather than alleviate inequities in information distribution in developing nations. While it may be true, as Stix writes, that thousands of scientists worldwide rely on a Los Alamos National Laboratory researcher’s computer as a sort of wire service for math and physics research, some parts of the world are far more able to make use of that information than others. It may not at first appear that way, since roughly 20,000 electronic-mail messages per day carry abstracts of new papers stored in the computer’s databases to more than 60 countries, after which users can download complete texts (Stix 106). In Africa and the poorest parts of Asia, though, telephone lines are either too rare or too unreliable to support the high-speed communication required by Internet applications (Gibbs, “Lost Science” 99). Several African nations have no Internet access at all, while others have access only to e-mail. The rarity of basic telecommunications resources in these regions makes clear the limitations local scientists face: the entire African continent contains fewer telephones than Manhattan (Gibbs, “Lost Science” 99). The scarcity of communications technology and services means that their cost usually remains prohibitively high.

Limited access to telecommunications technology is not the only problem. Fewer than ten percent of African research libraries have even one computer (Gibbs, “Lost Science” 96), which means that in addition to being unable to access Internet journals, they cannot make use of CD-ROM format publications. Without access to Western-style technological infrastructures, many nations are forced to opt for conventional paper formats for the journals and indexes to which they subscribe. Subbiah Arunachalam of India’s Central Electrochemical Research Institute notes that publishers tend to “adopt a pricing policy which makes the print-on-paper form more expensive than the [electronic] forms [of the same texts]. Thus, the poor end up paying more for the same information than the rich!” (qtd. in Gibbs, “Information” 12). The likely result if this situation continues is not difficult to predict. As University of Cape Town archaeologist Martin Hall observes:

“The huge danger is that the Internet might create a global impoverished class that doesn’t have access to information systems. In five years we will be dealing with mostly paperless journals. Right now many African researchers depend on charity for their printed journals; paperless journals will be completely denied to these scientists.” (qtd. in Gibbs, “Lost Science” 99)
The discrepancy between the information wealth of developed countries and the information poverty of developing nations might lead us to seriously consider observations such as Chalmers's that, "[T]he problem of making more equitable use of [existing] scientific knowledge . . . is a more pressing problem than the production of more scientific knowledge in contemporary society" (40, 123). Unless the distribution of knowledge becomes more equitable, a variety of potentially important innovations and discoveries stand to be missed. The current distribution of information means that even if Third World researchers' experiments are well-planned, their work will often fail to pass the editorial muster of Western journals because they will have been unable to take earlier research into account. As a consequence, these researchers will be forced to publish their results in local journals that are not indexed in the West or, perhaps, not even indexed outside of their country of publication. Virginia Cano notes, for example, that since 70 percent of Latin American journals are not listed in any index, the articles they publish "are condemned to a ghostlike existence" (qtd. in Gibbs, "Lost Science" 94). In this, First- and Third World researchers alike stand to lose.

Currently, the output of Third World researchers accounts for a tiny percentage of the total number of scientific publications listed by Western indexers, a percentage which many, like Christopher Zielinski of the World Health Organization, believe is too small. Zielinski argues that

the 2 percent participation in international scientific discourse allowed by Western indexing services is simply too little to account for the scientific output of 80 percent of the world. This is particularly true in fields such as medicine, where diseases are no respecters of frontiers, especially with the resurgence of communicable diseases such as measles and tuberculosis. These diseases, as well as unique information on such topics as AIDS, tropical biodiversity and traditional medicine, are particularly well covered in the local journals.

Although some editors believe that significant research will come to the attention of Western journals, others agree with Zielinski. Richard Horton, editor of the Lancet, argues that "one of the reasons that infectious diseases such as the Ebola virus are emerging is that economic changes in developing countries are bringing humans into contact with previously isolated ecosystems. The only way to understand the process and its effects is
to publish work from local researchers” (qtd. in Gibbs, “Lost Science” 93). While some illnesses might appear to Westerners far too distant to be of immediate, practical—as opposed to theoretical—concern, pathogens have a way of jumping from population to population without regard to national boundaries. Luis Benítez-Bribiesca, editor of the Mexican journal Archivos de Investigación Médica, notes that research into new cholera strains has not been of interest to Western journals or U. S. researchers even though cases are becoming increasingly frequent in Mexico. “But what if these strains spread across the border to Texas and California?” he asks. “They will think it is important then” (qtd. in Gibbs, “Lost Science” 94). Similarly, Bryan L. Duncan, director of the International Center for Aquaculture at Auburn University, observes that, “A lot of locally published literature is just lost” (qtd. in Gibbs, “Information” 14). Clearly, intelligence and the ability to undertake useful technoscientific research are not distributed with any particular regard to political or socioeconomic boundaries, although the opportunities and infrastructure that allow people to develop their abilities frequently are. In fact, partly because there is more information available than many developing nations can afford, some knowledge ends up not only floating in the air, as Heinrich thought, but simply lost.

**Contemporary Western Culture: Just How “Great and Modern” Is It?**

When Heinrich comments that “We think we’re so great and modern,” he refers to Western society in general. To whatever degree Westerners see themselves as modern, part of that self conception probably does involve a belief that we enjoy technoscientific advantages that previous Western cultures as well as a variety of nonwestern cultures—both past and present—simply did not and do not possess. From a contemporary perspective, though, it is easy to overlook the fact that current state-of-the-art technoscience enjoys about the same amount of public acclaim and admiration that state-of-the-art technoscience enjoyed two, five, or twenty decades ago. We might go to an antique store to buy an icebox made in the 1920s for use as a decorative liquor cabinet. In the decade after that ice box was first made and blocks of ice were available to keep its interior cool, though, it was as much a fixture of modern life as the refrigerators that Heinrich discusses are a fixture of our own modernity. In the 1920s just as in the 1990s,
Westerners no doubt viewed older technoscientific facts and artifacts as picturesquely primitive, but who is to say that state-of-the-art 1990s refrigerators might not end up as the decorative antique liquor cabinets of the 2050s? From the point of view of their own state-of-the-art presents, a self conception involving some sense of being "great and modern" has been a fixture of Western cultures for centuries.

When Lapérouse captained *L'Astrolabe* and led it and its companion exploratory ship in the 1780s, those ships were provided, in Latour's words, "as scientific satellites are today, with all the available scientific instruments and skill" (215). They were provisioned with the finest available clocks and compasses, and the ships were crewed by astronomers, botanists, mineralogists, and naturalists, all of whom sought to provide fuller, more accurate maps and more reliable accounts of the places they visited. Would not Lapérouse have felt as justifiably pleased—perhaps even proud—of his ships as Captain James T. Kirk felt of his *Enterprise*, or as proud as Heinrich's characterization of Westerners suggests we might feel about such state-of-the-art technology as the NASA shuttle *Enterprise*? Originally Thomas Edison's light bulbs were remarkable, although we now turn them on and off without a second thought. No doubt the ancient Greeks found their geometry very state-of-the-art even though contemporary Westerners consider it one of life's givens. During different historical periods and in different nations, people like Heinrich might have set forth the very criticism that Heinrich does of his own culture's self conception; they would simply have used different examples. It is only when we consider the technoscientific history of the West or the possibilities of its future that the everyday technoscientific fixtures of our lives come into focus with any sense of temporal perspective. We then see that those things that are integral to our modernity may not be viewed similarly by the generations that will follow us, a general truth we can most easily recognize by considering the technoscientific gap between several points in the past and the present. In part, for instance, Kirk's *Enterprise*—in each of its reconceptualizations between the 1960s and the 1990s—was an attempt on the part of writers and special effects teams to offer a reasonably impressive vision of future technology. By guessing how
current technoscience would have been impressive to the Westerners of centuries past, they imagined a fictional counterpart that would appear as impressive to contemporary audiences.

The fact that Western societies have tended to admire the current state of their technosciences does not change the fact that they—and we—also recognize its limitations. Lapérouse’s ship was as fine an achievement for its time as are today’s satellites and space probes. The intention behind the technoscientific achievements of these two very different periods is the same: to further extend the domain of the knowable. Nonetheless, people feel great and modern within fairly limited boundaries. Contemporary Westerners may appreciate the availability of artificial hearts, but they also have cause for concern if they need to rely on these still imperfect devices. While a variety of medical conditions that might have been fatal several decades ago can now be handled routinely, a focus on those problems that have been solved is far too myopic. Few people celebrate the dwindling mortality rates associated with appendicitis given the existence of drug resistant strains of tuberculosis. Nor do contemporary cancer patients feel “great and modern” as they undergo chemotherapy, often knowing that the treatments can at best extend their lives several months or, perhaps, a year or two. Heinrich’s other prototypical example of progress is the moon landing, which does represent a remarkable feat. Yet few in NASA celebrate moon landings when manned and unmanned missions to other planets could reveal new information at least as significant as did the Apollo missions. With medical researchers as well as NASA scientists, I would suggest that there is less self-satisfaction and more of a balance between grateful pride in things already accomplished and a dissatisfaction that more hasn’t been achieved.

What Heinrich identifies as a problem of information being reduced to background noise turns out merely to be a discernible trend toward greater technoscientific information wealth. In a sense, he proves to have been right in doubting his own perspective. From Heinrich’s vantage point, information appeared as background noise floating in the air, but from a variety of disciplinary perspectives what appeared to him as white noise was the visible evidence of an ongoing information exchange. The more disturbing sounds were the ones not heard, the Third World scientists whose work never enters into the buzz and
chatter of global information flow. In addition, Heinrich recognizes the possibility of a future technoscience that, although as familiar from a future perspective as light bulbs and automobiles are to us, is far more incomprehensible to those who use it than are our own technologies are to us. We might wonder what the consequences might be in 100 years if the natural sciences experience a doubling rate averaging six years. Heinrich’s example suggests we ask, “What happens then?”

Theoretically, technoscientific knowledge—even knowledge very much in advance of our own—could exist in what might be called a cookbook format, with a society drawing on knowledge without either fully understanding it or feeling any need to. In several novels, particularly, *Startide Rising* (1983), *The Uplift War* (1987), and *Brightness Reef* (1995), David Brin presents just such a situation: members of a long-lived and loosely allied but competitive intergalactic culture rely on an established body of technoscientific knowledge contained in a Galactic Library. With a tradition spanning millions of years, Galactic culture views the Library as containing virtually all useful knowledge. When confronted with any sort of difficulty, Galactics have grown accustomed to visiting the local branch of the Library for solutions, looking to see how similar difficulties were overcome in the past. Once they have located appropriate technologies along with instructions for their manufacture, they use them whether or not they understand the relevant scientific underpinnings. Although Heinrich never says so, his conception of contemporary Western culture suggests that our lives have parallels with Brin’s Galactic culture. Specialization, after all, necessarily involves some degree of intellectual tunnel vision. Although contemporary Western culture is, at best, no further developed than the technoscientific early infancy of Brin’s Galactics, Heinrich’s example shows that not only the nature of technology but also the nature of technoscience has become increasingly distant for many.

While it was once possible to explain the latest scientific findings in generally nontechnical language, such explanations become increasingly difficult to render. It remains possible—although often barely—to keep pace with developments in several related technoscientific fields. Thus, although Heinrich’s conception of information’s place in Western culture is mistaken now, it might eventually be accurate. We might well
wonder how distant Western society is from cookbook-format technoscience—although it is of course possible that our species will never achieve anything so efficient. Le Guin’s City of Mind suggests another alternative: that a vast library of technoscientific knowledge will exist, but that the very wealth of data will deter the typical person from studying it. In Always Coming Home, an expertise in information retrieval is a prerequisite to any study of science. Despite the fact that Heinrich frequently misunderstands the issues on which he bases his conclusions, then, his errors provide the reader with some genuine insights into technoscience’s place in Western society. So, too, do Le Guin’s Kesh, who suggest that in being “great and modern” in the sense that Heinrich uses the phrase, we might be practicing a way of life that is doomed to failure.

The Dedicated Man of Science vs. the Dedicated Semiotician of the Supernatural

Heinrich becomes increasingly disturbed about the situation of knowledge in Western society after being forced out of his home and the comfort it affords him. The toxic cloud’s appearance emphasizes that the veneer of progress adorning Western society can be stripped away with shocking suddenness. As the effects of the toxic cloud illustrate, although technoscience provides privilege and convenience, it also brings problems of the sort that Le Guin suggests might outlast our society by centuries or millennia. Because of their ambivalence towards technoscience, several members of Gladney’s family experience a dread in the face of science that recalls Heinrich’s anxiety about information that just floats in the air. But in contrast to Heinrich and his family, Professor Murray Jay Suskind delights in Western society’s information richness. It is mainly through his character that the novel deals with the supernatural, but since he remains a minor character, the supernatural remains a minor theme, significant mainly for what it reveals about the Gladney family’s various anxieties. Nonetheless, Suskind’s tendency to characterize society’s understanding of science in terms of the supernatural suggests that he views Westerners as privileged but irrational.

A semiotician at large, Suskind finds grist for the intellectual mill everywhere. “I read the TV listings, I read the ads in Ufologist Today,” he says. “I want to immerse
myself in American magic and dread” (19). In accomplishing this immersion, he repeatedly equates technoscience with magic, emphasizing those instances in which other characters undertake similar conflations. In one incident, for instance, Gladney and his wife Babette discuss how scientific advances elicit in them primitive fear responses, with greater advances causing more primitive terrors (161). It is as though science strips them of their modernity in direct correlation to the magnitude of its discoveries. But what science takes away it can sometimes restore, as Suskind suggests in considering the flip side of his argument. For instance, he asserts that, “Internal medicine is the magic brew”—that a good internist confers the sort of strength and charisma that a fetish would have in traditional societies (217). Far from being a consistent source of comfort, however, Suskind either suggests or makes explicit the sorts of anxieties implicit in Gladney’s life. It is he, for instance, who insists in the face of Gladney’s objection that the family unit emphasizes the normal human tendency toward ignorance, that “Magic and superstition become entrenched as the powerful orthodoxy of the clan” (82) as an insulating measure. For Suskind, then, although magical thought represents a variety of epistemological cowardice, that cowardice at least has semiotically interesting consequences.

The example posed by Suskind suggests that one postmodernist strategy for depicting technoscience might be to utilize supernatural atmospherics and imagery in an effort to supernaturalize or defamiliarize it. Such a strategy would be ideally suited to attempts at placing science and nonscientific belief systems on more equal ontological footing. As I will show in my next chapter, exactly this strategy is utilized in such works of magic realism as Gabriel García Márquez’s *One Hundred Years of Solitude* (1967; tr. 1970). Even in the midst of the ontological leveling that takes place in magic realism, however, science is often validated. Significantly, however, other postmodernist fictions take a different course in depicting science and the supernatural. In fictions at the interface of postmodernist and science fiction, for example, even though some attention might be paid to supernatural knowledge systems, those knowledge systems are eventually revealed to be rooted in nonsupernatural phenomena. While science is always a legitimate possibility in postmodernist fiction, often, the supernatural is not.
CHAPTER 3

SCIENCE AND THE SUPERNATURAL IN POSTMODERNIST FICTION:
ONTOLOGIES IN COLLISION AND COEXISTENCE

One afternoon the boys grew enthusiastic over the flying carpet that went swiftly by the laboratory at window level carrying the gypsy who was driving it and several children from the village who were merrily waving their hands, but José Arcadio Buendia did not even look at it. "Let them dream," he said. "We'll do better flying than they are doing, and with more scientific resources than a miserable bedspread." (38)

— Gabriel García Márquez, One Hundred Years of Solitude (1967; tr. 1970)

No idea is ever examined in all its ramifications and no view is ever given all the chances it deserves. Theories are abandoned and superseded by more fashionable accounts long before they have had an opportunity to show their virtues. Besides, ancient doctrines and 'primitive' myths appear strange and nonsensical only because the information they contain is either not known, or is distorted by philologists or anthropologists unfamiliar with the simplest physical, medical or astronomical knowledge. Voodoo . . . is a case in point. Nobody knows it, everybody uses it as a paradigm of backwardness and confusion. And yet Voodoo has a firm though still not sufficiently understood material basis, and a study of its manifestations can be used to enrich, and perhaps even to revise, our knowledge of physiology. (35-36)

— Paul Feyerabend, Against Method (1993)

If, as I have suggested, the impulse toward the postmodern in fiction involves an effort to define the proper relationship between scientific and supernatural knowledge systems, science- and/or postmodernist fiction should juxtapose scientific and supernatural themes and motifs. This is often the case. Yet although postmodernist fictions address such questions as "What world is this?" and "How are we to live in it given the limitations we face in understanding it?", they address them in different ways. As my previous chapters illustrate, some postmodernist fictions focus on the dilemmas of day-to-day Western life. Although the characters and incidents of Ægypt or White Noise may appear eccentric or peculiar in the extreme, the world under discussion in these novels is our own.
Other postmodernist fictions take a different approach, either juxtaposing conceptions of reality that embrace distinctly nonwestern assumptions about nature or exploring our construction of reality through the use of science fiction’s defamiliarizing techniques. Even these more ontologically radical sorts of postmodernist fictions validate science, however.

In the first category of fiction is magic realism, where the supernaturally infused realities of Isabel Allende, Alejo Carpentier, Gabriel García Márquez, and Ben Okri suggest that our reality encompasses unrealized metaphysical truths. Indeed, events that the typical Western reader would consider magical or supernatural are presented as mundane. García Márquez’s *One Hundred Years of Solitude* (1967; tr. 1970) and a variety of related fictions suggest that it is no more unreasonable to accept the reality of such things as ghosts, spirits, and voodoo than to subscribe to allegedly “reasonable” Western beliefs about the supernatural. To believe in the supernatural, however, is not necessarily to ignore science and other manifestations of Western reality. Typically, technoscience is conspicuously present in one form or another in magic realist fiction. There are, however, exceptions, as in Carpentier’s *The Kingdom of this World* (1959; tr. 1989), in which technoscience’s absence from the novel indicates that, at least for a brief period during the nineteenth century, Haiti’s reality was completely nonwestern. In sum, though, magic realism treats science and the supernatural relative to one another in one of two ways. Science is either placed on equal footing with or, more rarely, given a less privileged epistemological position than the supernatural.

Still other postmodernist fictions address the relative status of scientific and supernatural knowledge systems differently. In novels by William Gibson and Lucius Shepard, reality is viewed as inherently naturalistic and subject to scientific investigation. The depictions of voodoo in Gibson’s *Count Zero* (1986) and *Mona Lisa Overdrive* (1988) and Shepard’s *Green Eyes* (1984) implicitly identify the supernatural as an erroneous intellectual category which, when treated rationally, can be demystified. In Gibson’s novels, events that appear supernatural can traced to the activities of the same sorts of artificial intelligences (AIs) that appeared in *Neuromancer* (1984). The apparently
supernatural events in *Green Eyes* can be similarly explained in light of biophysics and cosmological theory. In this variety of postmodernist fiction, supernatural atmospherics are subject to scientific explanation.

**Science and the Supernatural in Collision: Magic Realism**

One function of the supernatural in postmodernist fiction is to draw attention to Western society's codification of reality by juxtaposing it with alternatives from different societies or eras. Let me begin with an assertion that will require a good deal of qualification: the term magic realism (or magical realism, since they are used interchangeably) refers to those fantasy fictions that directly foreground an interest in "real world" politics. Even though a work such as Frank Herbert's *Dune* (1965) is a fantastic text (usually described as science fiction although sometimes as science fantasy or fantasy) and it is very much concerned with politics, it would not qualify as magic realism because, however much the political intrigues of the novel owe a debt to Machiavelli, the novel does not *foreground* an interest in real world politics. On the other hand, *One Hundred Years of Solitude* or *The Kingdom of this World* relate directly to twentieth-century politics. Yet these politically-oriented fictions also depict versions of reality that differ fundamentally at the level of nature and natural law from contemporary Western conceptions. These departures from everyday reality have direct relevance to these fictions' political concerns, as some background on the relationship between magic realism and postmodernist fiction illustrates.

The notion that magic realism represents a subset of postmodernist fiction, although generally recognized (D'haen 194; Faris 165; Lemaitre 129), has not been accepted without reservation (Foster 268). In general terms, however, locating magic realism within a broader postmodernist literary tradition is a generally unproblematic and uncontroversial move, since magic realism was written with an awareness of—and, to some extent, in response to—modernist literary experiments. Moreover, in addition to the fact that magic realism tends to exhibit features associated with postmodernism, definitions of postmodernist and magic realist fiction share considerable common ground. This overlap is particularly evident in Brian McHale's definition of postmodernist fiction. As I have
mentioned, McHale relies on the Russian formalist concept of the dominant, “the focusing component of a work of art” (Postmodernist 6). McHale suggests that while modernist fiction possesses an epistemological dominant, postmodernist fiction’s dominant is ontological. That is, while modernist fiction addresses matters of knowledge and the way it is gathered and transmitted, postmodernist fiction considers questions bearing on what is real and how people are to live given the limitations they face in knowing reality.

According to McHale, postmodernist fiction involves the intrusion of one entire world view on another, either directly, as in science fiction, when characters from one world visit another in the course of the narrative or, indirectly, when readers encounter secondary worlds whose ontologies differ from their own. McHale’s definition of postmodernist fiction coincides with other critics’ attempts at identifying magic realism’s defining features. Marguerite Suárez-Murias, for instance, observes that among magic realism’s central features is an acceptance of the “validity of interior worlds of faith which blossom in everyday realities and coexist with other available realities” (105). Rawdon Wilson writes that in magic realist texts, “It is as if there are two worlds, distinct and following dissimilar laws, that interpenetrate and interwind” (222). Similarly, Jon Thiem notes that in one type of magic realism, “[T]he world of the text literally intrudes into the extratextual or reader’s world” (236).

When critics discuss magic realism, the text most often mentioned is One Hundred Years of Solitude. A closer look at the phenomenon of magic realism reveals that it is the Cuban author Carpentier who is generally credited with coining the term lo real maravilloso—or marvelous realism—having used the term in the prologue to his novel The Kingdom of this World. Roberto González Echevarría notes that identifying Carpentier as magic realism’s originator oversimplifies matters slightly since the term appears earlier in both Europe and Latin America (108-109). Still, because Carpentier’s vein of magic realism has thrived and continues to inform contemporary conceptions of magic realism, a slight oversimplification in this regard poses no problems. The differences between the two types of magic realist texts and the manner in which they treat the magical/supernatural do present a slight complication, however.
The best known type of magic realist text—which, chronologically speaking, is also the later type—is best represented by *One Hundred Years of Solitude*, which tells the story of the Buendía family and the town of Macondo in a clearly fantastic mode. Among a host of magical or potentially magical events, dozens admit neither to psychological nor physiological causes (e.g. hallucinations or optical illusions) nor metaphorical expression or unreliability on the narrator’s part. Among these incidents are numerous typically fantastic occurrences, such as ghostly appearances and predictions of the future. But there are other incidents of a more peculiar sort: Gypsies bring a functional flying carpet to town (38); a plague of insomnia causes everyone to see the images of their own and other people’s dreams (51); on Ash Wednesday, Colonel Aureliano Buendía’s illegitimate sons receive indelible ash crosses on their foreheads although everyone else’s crosses wash off normally (205); and dropped chick peas fall “in a perfect geometrical pattern in the shape of a starfish” (316). To note only that the novel embraces the magical and the supernatural, however, is to miss the point. Indeed, as with much postmodernist fiction (and here the example of Thomas Pynchon’s *Gravity’s Rainbow* comes immediately to mind), García Márquez’s novel exhibits an interest in the supernatural but also in science.

The slow intrusion of science from the outside world into Macondo recapitulates the growth of science in the West. As McHale notes, though, the Macondoans’ responses to the magical/supernatural on the one hand and scientific or otherwise “normal” events on the other represents an inversion of a typical Western reader’s expectations (*Postmodernist 77*). Such events as the arrival of the Gypsies and their operational flying carpet are considered routine. In fact, the family patriarch José Arcadio Buendía not only forbids his sons to ride the flying carpet, he dismisses as inconsequential both the people who ride it and the very existence of the thing, telling his sons, “We’ll do better flying than they are doing, and with more scientific resources than a miserable bedspread” (38). When the Gypsies bring ice to Macondo, however, the marvel so amazes José Arcadio Buendía that he brings his sons to see it and pays an extra fee so that they can touch it. Throughout the novel, things that twentieth-century Western readers think of as normal are presented as remarkable and vice versa. For my purposes, McHale locates the importance of García Márquez’s approach in this regard when he observes that among those things that appear
normal to the reader but impossible to the novel’s characters is a massacre of demonstrators (Postmodernist 77). McHale refers to the novel’s second government massacre (282-284). The event’s sole survivor is José Arcadio Segundo, who wakes up on a train transporting 3,000 victims from the scene (285). By the time José Arcadio Segundo escapes the train and returns to Macondo, the official version of history has already been codified and few believe—or are willing to admit that they believe—the massacre ever occurred (285-286). Eventually, people forget that the banana company that influenced the government to perpetrate the massacre ever existed (359).

Here, the supernatural problematizes the notion of political reality by embracing religion and religious events (as is evidenced by the indelible crosses, among other incidents), aspects of everyday supernatural reality people have long believed in and continue to accept as true (ghosts, prophecies, and the like), as well as magical and/or fantastic artifacts and events drawn neither from religion nor local folk belief (flying carpets and insomnia plagues, for instance). This barrage of magical events and beings defamiliarizes everyday reality for the reader, partly by associating some political events with the impossible (as with the banana massacre—which virtually no one believes happened even though it did) but also by associating other political events with incidents so peculiar that they strike the reader as being no more unbelievable than the flying carpet that everyone in the novel accepts as perfectly normal. Finally, García Márquez makes the political a feature of his fantastic landscape, blurring the lines between the reasonable and the magical through his treatment of massacres, wars, and his characters’ often absurd relationships to politics. García Márquez similarly softens the boundary between science and magic, repeatedly reminding the reader through the character of José Arcadio Buendía and his imperfect differentiation of science and the supernatural that science and empiricism developed within a society with an essentially supernatural world view. If we do not come away from One Hundred Years convinced that the world is magical, we at least have a slightly fresher perspective on the normal features of life that García Márquez has defamiliarized. Magic realism of this later sort is very near to the mainstream of postmodernist fiction.
In the earlier variety of magic realism—for which Carpentier's *The Kingdom of this World* represents the prototype—the confrontation between ontologies is very different. In Carpentier's novel the focal character Ti-Nöel, a slave, provides a perspective on Haiti's successive movements from one form of governmental oppression to another, starting with French colonial rule, moving through King Henri-Christophe's reign, and, finally, to the rule of the Republican mulattos. The perspective of the white colonialists and the Republican mulattos is essentially empiricist, while the slaves view the world from what most Western readers would describe as a magical perspective. The incidents in the novel that are perhaps most emblematic of their mutually exclusive ontologies occur when Macandal, who the blacks accept as a *houngan* [priest] of the Rada rite and a man of supernatural power (41-42), is taken to be executed for leading a slave rebellion. The French force the slaves to watch Macandal's burning as an object lesson, but while the whites see Macandal die, the slaves see him escape. As a result, the slaves leave the execution "laughing all the way . . . [believing that] once more, the whites had been outwitted by the Mighty Powers of the Other Shore" (52).

It is difficult to find textual evidence proving that either one or the other version of events is the correct. A bias against voodoo beliefs would probably predispose many critics to assume that Macandal burns to death in preference to a contrary interpretation or even a reading in which the two scenarios are not seen as mutually exclusive (i.e., one in which the slave owners see Macandal's physical body burn while the slaves see his soul escape). Focusing on the scene of Macandal's burning, it would be possible to construct a reading of the novel attributing to Ti-Nöel the role of an unreliable narrator who sees magic where none exists. Yet voodoo is not only a fact of Ti-Noël's life; it is also a feature of his peers' reality. Moreover, Pauline Bonaparte—a sort of symbolic daughter of the Enlightenment who is neither a slave nor uneducated—also comes to partake of this supernatural world view (93, 94, 99). At other points, Carpentier also undermines the distinction between the two ontologies, suggesting not so much that one is magical and the other not, but that both are magical although in different ways. Bouckman—like Macandal, another revolutionary believed by the slaves to possess supernatural powers—speaks of the voodoo spirits, known as loas, as beings on which the blacks can
rely but describes the religion of the whites as one which seeks to enslave them (66-67). For their part, the whites speak of the blacks' secret religion as savagery (78-79). But while each group dismisses the other's supernatural world view, Ti-Noël notes the marked similarities between Christianity and voodoo, observing "in the Spanish churches a Voodoo warmth" (86) and noting, "[T]he shepherd's instruments played on Christmas Eve had an attraction, a power of seduction in presence, symbols, attributes, and signs similar to those of the altars of the houmforts consecrated to Damballah, the snake god" (86). The presentation of both Christian and voodoo conceptions of reality suggests the ontologies have more in common than Western readers typically suppose.

The constituent words of the phrase "magic realism" suggest the form's potential in reconceiving our ontological model(s): "magic" is yoked with "realism" in direct contradiction of the norms of modern, Western common sense, which views magic as impossible. Magic realism, though, suggests that Western culture, despite the relative dominance of its prevailing viewpoints and biases, doesn't necessarily have a monopoly on truth. Fictions like The Kingdom of this World reflect what Brian Attebery has termed "non-Western realities" (23), an observation which suggests why the words "magic" and "realism" were originally combined in one phrase in the first place: fictions of this sort depict other sorts of realities and, consequently, other sorts of realism, what Attebery might call "non-Western realisms." Although Carpentier's novel is an early example of this sort of fiction, there are many later examples. Isabel Allende's short story "Walimai" (1989) is an equally representative story of this type in which the title character, a native of a South American rain forest, encounters an outside, Westernized culture, has trouble understanding it, and retreats. Before he leaves, and out of mercy rather than malice, he kills an Indian woman who's being forced to serve as a sex slave. Walimai relates how he carries the woman's ghost for an appointed time before he is able to set it free by fasting. Here even more than in the case of Ti-Noël in Carpentier's novel, Walimai's world view offers an ontology in conflict with that of most Westerners. Walimai's is the only ontological perspective the reader directly encounters in Allende's story, which places readers in a position of having to supply the details of the implied Western ontology that Walimai can observe only through a few of its visible fragments.

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Chinua Achebe’s *Things Fall Apart* (1958) offers an analogous confrontation, with the Western colonial culture’s ontology similarly implied and the traditional Ibo ontology acting as the lens through which the narrator presents the story. Ben Okri’s *The Famished Road* (1991) presents a fuller treatment of a similar confrontation. While Achebe’s novel briefly treats the Ibo idea of *ogbanje*, “wicked children who, when they died, entered their mothers’ wombs to be born again” (54-57), Okri uses such a child as his narrator, although in the tribe about which Okri writes, these children are called *abiku* and are more commonly referred to as “spirit children.” Due to his special relationship with the spirit world, the narrator Azaro, who can both participate in and observe supernatural events, provides a more detailed account of the magical aspects of his world than does Allende’s Walimai. As in *One Hundred Years of Solitude*, the magical-supernatural aspects of Okri’s landscape are finally indistinguishable from its political elements. The narrator makes the connection explicitly when he is kidnapped by a group of unusual and probably supernatural strangers. The context of the incident suggests the kidnapping might have been instigated by Azaro’s former companions in the spirit world, who want Azaro to die so his spirit can return to them. Although Azaro’s abduction has connections with the supernatural, Okri also politicizes the incident.

When the strangers throw Azaro into a sack and carry him off, he yells, “Politicians! Politicians are taking me away!” (111). Significantly, he does not mention kidnappers or agents of the spirit world. Azaro’s comment suggests that politicians are the new monsters of Africa, having displaced any other menaces in the boy’s mind. He cuts his way out of the sack with a knife he was given either by or at the order of the spirit king, a figure who repeatedly aids him—thereby using a supernatural connection to overcome a political difficulty (112). The superimposition of the supernatural and the political becomes increasingly apparent throughout the novel. When the family’s door is marked after Azaro’s father challenges the Party of the Rich, Azaro equates supernatural menaces with political ones, imagining a spirit he fears, the “great monstrous Egungun, belching white smoke from seven ears, bursting into our room and devouring us all with his bloodied mouth” (228). He doesn’t fear the arrival of political thugs although he has already encountered some in the guise of kidnappers. For Azaro, political thugs and supernatural
menaces are equivalent. Since his reality embraces both what Westerners would term the natural and the supernatural, from his perspective it would be inaccurate to say that the supernatural intrudes on his life. For him the supernatural is natural. As a result, Azaro sees no reason to distinguish between monsters: for him, political thugs and malevolent spirits are simply varieties within a category.

Azaro's experiences consistently supernaturalize the political. When a political party's van comes into his neighborhood, delivering messages with a megaphone and producing a sound of a sort the boy has never heard before. He says: "I felt... they were another manifestation of the spirits" (122) and describes how to the people of the neighborhood, the arrival of the politicians' van is like "some fantastic new spectacle" (122). The Party of the Rich makes a variety of unrealistic promises (123), gives away free milk (124-125) which turns out to be unhygienic and sickens everyone who drinks it (130-131). Later, the van returns and its occupants blame the bad milk on the Party of the Poor, saying that the other party sought to discredit them by distributing the tainted milk (152). The locals don't believe this transparent attempt to shift the blame and a riot ensues (153-155). This is one of many examples—and not even the most flagrant—of politicians' unreasonable tendency to assume the poor are stupid. As in One Hundred Years of Solitude, politics are presented as one of many peculiar features of the novel which are no more unbelievable than the supernatural elements pervading the story. The mingling of the supernatural and political is not merely an artistic decision, however. It depicts aspects of setting and character realistically. In societies which embrace supernatural events as everyday realities, the political is often equated with the supernatural, since magical and political power are typically seen as related. In The Famished Road, this relationship is particularly clear in the character of Madame Koto, whose supernatural and political power grow in unison. As we will see later, Azaro's equation of the political with the supernaturally monstrous parallels recent real-world events in the Caribbean.1

1 Similar equations of the supernaturally and political monstrous occur in other magic realist fictions—including Mario Vargas Llosa's Death in the Andes (1996), in which the anti-western, anti-intellectual terrorists of The Shining Path are so closely equated with vampires and evil spirits that they begin to take on the character of a monstrous supernatural-political hybrid. I offer a more detailed discussion of the overlap between the supernatural and the political later in this chapter.
Closing Thoughts on Magic Realism

Perspectives on magic realism can easily tend towards the close-minded and condescending given that people tend to hold the components of their own ontologies as undeniable truths. For this reason, there are a few things that I’d like to emphasize about magic realism before concluding. To a large extent, my concerns are an outgrowth of a comment Attebery makes but does not pursue. Attebery notes:

Magical folklore is not a thing of the past in parts of India or Africa or Latin America. Even though writers like Salman Rushdie or Gabriel García Márquez are Western educated and are working in Western literary forms, they are not obliged to adopt a Eurocentric viewpoint that privileges rationality and calls everything else primitivism . . . . I suspect that is why mainstream critics tend not to use the term fantasy to describe stories by Amos Tutuola or García Márquez, or, for that matter, by Native American or African American writers like Leslie Marmon Silko and Gloria Naylor. Fantasy is deliberate, a choice; people from Other places obviously don’t know the difference between the real and the fantastic, so it all gets jumbled up in their work. Let’s not call it fantasy, let’s call it magic realism and dismiss it while pretending to admire it. (16-17)

I find Attebery’s final sentence here particularly troubling. Unfortunately, he offers no examples of the criticism he finds objectionable. Based on my own encounters with the term magic realism and my preliminary survey of the relevant criticism, though, I’d tend (provisionally, at least) to grant Attebery’s point.

As I have discussed magic realism, it is not strictly a Latin American phenomenon. García Márquez suggests as much in One Hundred Years of Solitude when a minor character named Gaston is revealed to be involved in a commercial airmail project. He had originally intended to operate in the Belgian Congo, “where his family had investments in palm oil” (352), but decided it would be “just as well to be a pioneer in the Caribbean” (355). Gaston’s business is partially underwritten by another colonial-imperialist venture, one that perhaps parallels the banana company’s activities in Macondo. These brief passages suggest the possibility of a parallel story set in a Macondo-like place in Africa. Interestingly, García Márquez further reinforces this suggestion when he mentions a tribe of Makondos in Tanganyika who are mistakenly sent an airplane that Gaston orders (373). Those works by African or African-born authors I have discussed amply suggest that
parallel magic realist tales exist, and, of course, other cultures partake of the tradition too. But it seems to me that magic realism is not necessarily solely a phenomenon of postcolonial nations. To the extent that magic realism is a product of Third-World authors or marginalized writers in the West belonging to ethnic or racial minorities, however, it risks being ignored as Attebery suggests.

González Echevarría once wrote that the term magical realism “lies in a theoretical vacuum” (108). At first glance, this would certainly seem to be less true today than it was when he made the point over fifteen years ago. The appearance of Lois Parkinson Zamora’s and Wendy B. Faris’s *Magical Realism: Theory, History, Community* (1995) for instance, finally provides English-language scholars with the sort of crucial reference resource that was for so long unavailable. Nonetheless, if a theoretical vacuum no longer exists, the atmosphere surrounding magic realism remains rarefied. Spanish-language magic realist fiction is often unavailable in English editions. Well over half the novels discussed in María-Elena Angulo’s recent study *Magic Realism: Social Context and Discourse* (1995) are either currently out of print in the United States or were never translated into English in the first place. Despite the number of times I’ve heard the term “magic realism” used in conference presentations and lectures, I’ve heard no one define it.

Given this situation, it is hardly surprising that magic realism’s treatment of scientific themes and motifs has been so little studied. In addition to having suggested the possibility of more broadly based, in-depth analyses, my brief discussion has also suggested that magic realism’s treatments of science is generally more positive than might be expected of fictions in which alchemy, flying carpets, and ghosts exist alongside Western colonialism, scientific method, and capitalism. While magic realist authors generally treat science with some deference, however, writers working in the overlap between postmodernist fiction and science fiction take a different course. Although they pay close attention to the details of supernatural knowledge systems, in the final analysis they suggest that the supernatural is an erroneous category.
POSTMODERN VOODOO: LUCIUS SHEPHERD, WILLIAM GIBSON, AND THE SEMIOTICS OF THE SUPERNATURAL

In order to provide some necessary background on the novels I will shortly discuss, I would like to move briefly away from fiction to the “real world” as it is represented in mainstream print news media. What follows is the first full paragraph of an item that appeared in a 1994 issue of *Time* magazine, fairly early in the most recent occupation of Haiti by U. S. forces:

> It was nearly dusk . . . when a U. S. special forces team walked into a village northeast of Port-au-Prince and encountered a problem for which their training manuals had not prepared them. Several mothers were convinced that a pair of werewolves, in the form of two local women, had placed a curse on the village children and were now preparing to consume their babies’ souls. As he listened, the team’s warrant officer tucked his hand into his pocket, snapped open a chemical light stick that soldiers use as markers at night and announced in Creole that he would break the curse. Mumbling incantations, the officer anointed each child’s forehead with a smear of the glowing green liquid. After declaring “the spell has been lifted,” he turned to the stunned werewolves and promised that if they ever pulled such a stunt again, he would put a spell on them: his magic was much more powerful than theirs. (Fedarko 38)

The author goes on to note of occupying U. S. forces that, “Their tactics, often devised on the spot, have been unusual to say the least. To clear the streets of thugs, Green Berets on patrol took to inverting their night-vision goggles so that they glowed in the dark” (38). This strategy was presumably meant to give locals the impression that supernatural creatures were afoot. In this article, American soldiers are portrayed as dealing pragmatically with superstitious locals. For contrastive purposes, I would like to move from the *Time* article to a *Baltimore Sun* story concerning convicted heroin trafficker and money launderer Christopher Tizhe (Higham).

Tizhe was alleged to have used African witchcraft, known as “juju” in his home country of Nigeria but referred to as voodoo in the courtroom, to threaten potential prosecution witnesses. One of his Tizhe’s criminal associates was also accused of having tried to cast a spell on a Baltimore judge and three federal agents assigned to the case; another attempted to have spells cast on agents for the Internal Revenue Service, U. S. Postal Inspection, and U. S. Customs along with a U. S. magistrate. Tizhe’s and his associates’ threats to use supernatural forces against their enemies became a legal issue,
when the judge ruled that threats of spell casting could be considered in determining the
defendant's guilt or innocence. The case offers a rare window into the treatment of the
supernatural by the American legal system. Consider, for instance, the exchange between
the prosecutor and a prosecution witness:

PROSECUTOR: Is voodoo regarded seriously in Nigeria?
WITNESS: [Averting his eyes from Tizhe's stare.] It is
regarded very seriously.
PROSECUTOR: Is it used to kill someone?
WITNESS: Yes, it is. That is a constant in Nigeria. (1A)

The lawyer for the defense attempted to rebut the witness's testimony by resorting to cross-
cultural snobbery:

DEFENSE: [Question laced with sarcasm] Was it your
testimony that he was going to kill you with, or harm you
with voodoo?
WITNESS: It's the same thing.
DEFENSE: Is to kill the same thing as voodoo?
WITNESS: Yes, it is. (4A)

The defense strategy failed. Testimony bearing on Tizhe's attempts to use voodoo coupled
with accounts of more conventional criminal activity proved too much for the defense.
After testimony concluded, Tizhe pled guilty to money laundering and heroin importation
and received a 14-year sentence without the possibility of parole.

In both these instances, belief in voodoo is foreign. Haitians fear supernatural
forces that American soldiers do not, while in the Baltimore court case, belief in voodoo is
limited to a small circle of Nigerian nationals and immigrants. These situations reflect
typical Western views of nonwestern supernatural belief systems. Voodoo is rarely seen as
real in the U. S. More often, it is a colorfully connotative word deployed for rhetorical
purposes. From the examples discussed here, voodoo's variable nature is also apparent.

1 Examples are numerous. In the midst of the 1980 Republican primaries, George Bush referred to Ronald
Reagan's "trickle-down" economic plan as "voodoo economics." During a press conference, Colorado State
University forensic scientist Dr. Michael Charney accused the U. S. Army Central Identification Library of
practicing "voodoo science" (Maples and Browning 198). Although voodoo is a term usually used
pejoratively, it occasionally emphasizes that the matter under consideration is peculiar in the extreme. An
item in the journal Science referred to the unusual behavior of subatomic particles as "quantum voodoo" not
to question the integrity of the research but to emphasize the unusual nature of the phenomenon (Taubes).
Anthropologists also use the phrase "voodoo death" to refer to deaths that occur in response to nonphysical
causes (e.g., curses or the violation of taboos). Although instances of lethal cursing have been observed in
traditional societies in Africa, Australia, South America, and New Zealand (Cannon; George 303),
presumably "voodoo" is a constituent of this phrase because the phenomenon is so often associated with
Afro-Caribbean belief systems that fall under the voodoo rubric.
There are a variety of related Afro-Caribbean and Afro-Latin religious traditions generally similar to Haitian voodoo, including Santeria in Cuba, Shango in Grenada and Tobago, Obeah in Jamaica, and Candomble and Umbanda in Brazil (G. E. Simpson). If, as some have maintained, African cultural traditions survived in more intact condition in the Caribbean and Latin American (Herskovits), then equating juju with voodoo is a slight but not egregious oversimplification. Just as we might refer to the Baptist and Methodist faiths as roughly equivalent since both are protestant forms of Christianity, we can similarly consider these supernatural belief systems as generally equivalent so long as we keep in mind that they differ in some of their particulars.

Although by no means a prominent motif in contemporary literary fiction, voodoo does occasionally occur. Outside of horror and fantasy fiction, however, it is normally treated in terms that most Westerners would call "realistic." The title character of Alice Walker's "The Revenge of Hannah Kemhuff" (1967) employs a voodoo practitioner to place a curse on the woman she believes led her family to ruin during the Great Depression. Although the spell is never completed, its intended target dies of a wasting illness soon after she hears of it. In Robert Olen Butler's "Love" (1992), a former Vietnamese spy, once on the U. S. payroll but now living in Louisiana, goes to a "voodoo man" for assistance with a romantic rival. In this instance, too, the spell is never successfully completed but the desired result is achieved. In these and similar instances, there is considerable doubt as to whether voodoo has any supernaturally-based efficaciousness. In Walker's "The Revenge of Hannah Kemhuff," the power of suggestion appears to be the likely cause of the woman's death, while in Butler's "Love," it is the husband's willingness to act that ends his wife's affair and restores their relationship. Voodoo is a much more common fixture in popular culture forms specializing in supernatural horror, from comic books, games, and paperbacks to movies and television. Here, voodoo is portrayed as efficacious and necessarily so: if voodoo were not functional, there would be no zombies, magically-induced wasting illnesses, or so-called voodoo dolls with which to frighten audiences. In the fictions under discussion here, voodoo remains efficacious but

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1 Instances are legion. Among the most high-visibility recent examples is an episode of the television series *The X-Files*, "Fresh Bones" (air date: Feb. 3, 1995), which deals with the practice of voodoo at a Haitian refugee camp in Norfolk, Virginia.
does so within much more limited boundaries. In both Gibson’s and Shepard’s fiction, voodoo is not a supernatural tool but a sociopolitical system of organization.

William Gibson: Cyberpunk and the Semiotics the Supernatural

With few exceptions, science fiction has traditionally steered clear of supernatural events and motifs. We might reasonably expect this situation to have changed recently. If, as I have suggested, postmodernist fiction is in part concerned with exploring the relationship between science and the supernatural, current science fiction and/or science-fiction-influenced postmodernist fiction should involve juxtapositions of the scientific and what was formerly considered to be its opposite: the supernatural. This has indeed happened. One such juxtaposition of particular interest to the current study occurs in William Gibson’s fiction, particularly the cycle of novels beginning with Neuromancer (1984) and continuing through Count Zero (1986) and Mona Lisa Overdrive (1988).

The first of these novels, Neuromancer, does not appear to promise any supernatural involvement. It details the efforts of one AI, Wintermute, to forcibly unify itself with another, named Neuromancer, in order to create a new, more advanced order of intelligence (Neuromancer 120). Wintermute is ultimately successful, in large part due to the actions of a team of mercenaries it employs. Key to Wintermute’s plans are the novel’s two focal characters, the computer hacker Case and the weapons and combat expert Molly. Although the narration is limited omniscient, the reader sees the novel’s action mainly from their perspective. After the Wintermute-Neuromancer unification, the newly created AI appears on a computer monitor and speaks to Case, telling him, “I’m the matrix . . . . the sum total of the works, the whole show” (Neuromancer 269). This newly manifested intelligence reveals that it has made contact with an analogous alien information matrix in the Centauri system (Neuromancer 270), which suggests that there are many such “shows” in the universe, all of them, perhaps, at least as complex as the one created by humans. In the world of Neuromancer and its sequels, multiple, nested realities are common.

Fragments of the AI that was once Wintermute and Neuromancer will later capitalize on this

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Among the exceptions are Arthur C. Clarke’s short story “The Nine Billion Names of God” (1953) in which the stars start blinking out after a computer finishes a cross-cultural listing all the known names of God.
ontological plurality. In the meantime, however, the reader must be introduced to the ramifications of this ontological plurality—an ongoing process when reading *Neuromancer*. On several occasions, Case enters computer-mainframe reality constructs that, to those inside them, are indistinguishable from the “real” world. At the novel’s conclusion, while in cyberspace, he also distantly sees constructs of people he knew who had died and with them is yet another construct—one of himself, which was encoded and saved from one of his earlier visits to a reality construct. All of these simulacra—which represent a special class of AI—had presumably been “living” within one or more of the sorts of reality constructs Case encountered earlier. Their lives are not, for the most part, appreciably different from Case’s.

*Neuromancer* and *Count Zero* are firmly anchored in the traditions of hard-boiled crime and action-adventure fiction but from one novel to the next Gibson comes to take a greater interest in interrogating the nature of reality. In *Count Zero*, reality constructs become both more abundant and increasingly complicated, both in and off themselves and in their relationships to one another and to the real world. Humans once again interface directly with computers and enter into computer-generated virtual universes, but the AIs inhabiting these spaces also use various means of manifesting themselves in the world of human space. In *Count Zero*, for instance, AIs strike a bargain with an engineer. They provide him with profitable designs for advanced biological chips and circuitry; in return, he modifies his daughter’s brain to their specifications, allowing the AIs to manifest themselves in human space by “possessing” her. In essence, the girl, Angie, is a biological system whose gray matter hardware is modified to run the software programs that constitute the AIs. She provides them with a fully interactive, real-time connection to human space. With its depiction of ever more complex secondary realities and their various interconnections, *Count Zero* sets the stage for a still more direct focus on ontological matters in which humans become so intrigued by the possibilities offered by secondary realities that they are willing to leave the real world behind to explore them.

At the conclusion of *Mona Lisa Overdrive*, Newmark and Angie (the only key characters to recur from the previous novel), allow their bodies to die so that their encoded consciousnesses can live on within a device called the aleph, a freestanding, self-contained
“model of cyberspace” (MLO 307). The term “model,” however, minimizes the device’s significance. Gentry, the novel’s obsessive cosmologist of cyberspace, describes the aleph as a “solid lump of biochip” with a “virtually infinite” information storage capacity (MLO 128). He says of the aleph that Newmark “could have a world in there. Worlds. Any number of personality constructs . . . he literally could have anything at all in there. In a sense he could have an approximation of everything” (MLO 128). Once Angie joins Newmark within the aleph, they ready themselves for a journey with an AI named Colin and one of Gibson’s recurring minor characters, The Finn, who is now dead and, like Bobby and Mona, encoded as a self-conscious program. Only at this point are significant details relating to the unification of the AIs Neuromancer and Wintermute in Neuromancer clarified. When the AIs merged, the human information matrix became self-conscious before fragmenting into a host of individual consciousnesses, all of which are modeled on the loas or lwas—the spirits—of voodoo.

These revelations are not entirely unexpected. In Count Zero, characters familiar with cyberspace suggest that the intelligences inhabiting it, although taking on personalities and attributes based on the key figures of human supernatural belief systems, are actually non-supernatural AIs. The retired computer cowboy (i.e., computer hacker) Jammer comments specifically that the loas purposely molded themselves to fit voodoo’s preexisting sign system (190). He speculates that AIs “found a way to split parts of themselves off into the matrix” (192), a hypothesis that originated not with Jammer but with a Tibetan computer hardware specialist he knew who called the loas “tulpas.” Jammer dismisses the possibility that they loas are literally the tulpas of Tibetan folklore, yet in speaking to Newmark, Jammer’s description of tulpas coincides with what the reader learns about the loas. Jammer says, “A tulpa’s a thought form, kind of. Superstition. Really heavy people can split off a kind of ghost, made of negative energy” (192). Although the loas probably cannot be described as beings of negative energy in any sense of those terms that is in direct keeping with traditional Tibetan belief, the loas do rely on negative energy, specifically electricity—which consists of electrons (i.e., negatively charged particles). From the perspective of a computer cowboy, while the AIs Neuromancer and Wintermute could not be described as people, the range of their abilities
and resources would certainly have qualified them as “heavy.” Their unification to form a higher order of sentience would make the adjective even more applicable, since their abilities and resources would also jump to a correspondingly higher level. Thus, Jammer’s tulpa analogy supports his interpretation of the loas as fragmented aspects of the newly created AI (CZ 192). The Finn offers related speculations on the manner in which cyberspace has changed (CZ 135-137) and concludes Mona Lisa Overdrive by assessing the reasons for that change in much the same way as Jammer. In general, cowboy lore accords with Jammer’s version of the loas’ origin, as Bobby learns (MLO 105). The loa calling itself Brigitte verifies much of the cowboy version of the events commonly referred to as When It Changed (MLO 215), as does the remnant of the Wintermute-Neuromancer amalgamation (CZ 257). In light of this evidence, there can be little doubt that the loas’ origins have been accounted for in nonsupernatural terms.

Although the existence of the loas can be explained without resorting to supernatural causes, in Gibson’s created universe(s) members of an advanced technoscientific society appreciate the nuance and applicability to their lives of a supernatural belief system. In addition, Gibson uses voodoo to explore ontological issues central to these novels. In part, Gibson accomplishes that goal in Count Zero and Mona Lisa Overdrive by intellectualizing and demystifying voodoo and treating it as a semiotic system—an approach very much in keeping with these latter two novels, particularly Count Zero, which reflects a deep interest in symbols and semiotics.  

Things are not only themselves in the novel; frequently they are also signs representing other things. Gibson’s semiotic playfulness reveals itself through many characters but does so most directly through a corporate mercenary named Turner. In a move unique in Gibson’s fiction, the novel’s action temporarily shifts from an urban setting to a rural, wooded one. There, Turner recalls boyhood times spent hunting squirrels, when he wore jeans rather than combat gear and carried a hunting rifle rather than

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5 Gibson’s most recent novel Idoru (1996) contains a brief reference to voodoo which, although not central to either the novel in question or the present study, merits brief mention. Laney, one of the story’s focal characters, recalls finding offerings to the loa outside of a courthouse, and is told by a friend that they were left to gain favor with the loa in hopes that the spirits would bring the defendants favorable legal outcomes (249-251). Since the action of Idoru occurs earlier than the events detailed in Neuromancer and its sequels, Laney’s recollection suggests the manner in which voodoo belief persisted long enough to provide a viable semiotic system for Gibson’s AIs to appropriate.
one designed specifically for combat. We learn that the squirrels—which Turner consciously equates with himself on at least two occasions—could not “hold two messages in their brains” at once and therefore “forgot the clear glyph of death spelled out for them in patched denim and blue steel” (126). Turner reads a lesson in the squirrel’s inability to process signs and reminds himself that he needs to be a much better semiotician if he is to survive. Ironically, just as it would be unreasonable to expect squirrels to display the semiotic awareness necessary to avoid the “glyphs of death” Turner and his rifle once represented, it would be similarly unreasonable to expect Turner to grasp the significance of the signs he encounters. Like many a hard-boiled hero before him, Turner is out of his depth. He can take practical steps toward self-preservation, but a full understanding of the events he’s involved in must be left for a later date.® Virtually every main character in Count Zero is in a similar situation, as the signs in the novel make abundantly clear.

Bobby Newmark’s surname, when broken into its root words, becomes “new mark”—literally a new symbol or sign. Newmark is both a person and a symbol with ties to another human symbol. Young and unsure of himself, Newmark repeatedly thinks that he is either “being” or “pulling” a “wilson,” a figure of speech roughly equivalent to “screw up”: a “wilson” is something a person can either do (as in “to screw up” or “pull a real screw up”) or be (as with, “He’s a real screw up.”). When the Finn hears Newmark use that trope, he realizes that the term originated with Bodine Wilson, whose one significant failure as a hacker led his name to be translated into a figure of speech—another sign. “First guy I ever knew wound up as a figure of speech,” Finn says of Wilson (119). Significantly, the Finn makes that comment in the presence of a character whose name suggests his semiotic similarities to Wilson. Unlike Wilson, however, whose name becomes metonymized on the basis of his own actions, Newmark’s name literally “marks” him as a sign before he has ever done anything.

Angie, who shares with Armitage from Neuromancer the reversed role of a human programmed by software, is also laden with semiotic significance. In addition to speaking

* When Turner last equates himself with squirrels the situation has changed somewhat. In the novel’s final lines, his stepson asks if it’s true that squirrels are “just so dumb, they’ll come back over and over and get shot?” Turner replies, “Yes, it is,” but then smiles and modifies his answer, concluding: “Well, almost always . . .” (278, ellipses in original). Evidently, even though people cannot always fully interpret the signs surrounding them, they can sometimes understand enough about the ones warning of danger to get to safety.
in tongues when possessed by the voodoo loas/AIs (CZ 155) and thereby accruing an aura of mysterious signification, she becomes something of a sign because of her link with the loas. As Turner tells Newmark, "She's one thing to me, maybe something different to Jackie. To you, she's just a scared kid" (229). Here, Turner partially—but, again, understandably—misreads the signs. Whatever or whoever else she might be, Angie is not just a frightened child to Newmark. She is also his savior. Early in the novel, she intervenes and saves his life when his attempt to penetrate the countermeasures protecting a cyberspace target fails. Although Newmark comes to realize only slowly who she is, as we will shortly see, others immediately understand what she represents. In addition to functioning as a sign, she is also a site of considerable signification. The loa known as Mademoiselle Brigitte, "eldest of the dead" (MLO 18) manifests for Angie, telling her "your father drew vévés in your head . . . in a flesh that was not flesh. You were consecrated to Ezili Freda" (MLO 19). In voodoo, a vèvè is a symbolic drawing of the loa meant to invoke the spirit (Hurbon 65, 168), and Ezili Freda is a loa associated with the Rada ritual, which honors spirits of Africa's Dahoney/Benin region. The Rada loa are generally considered good; Ezili is variously associated with love, beauty, and sensuality or, as in Gibson's fiction, treated as the voodoo equivalent of the Virgin. In this variousness—which is characteristic not only of Ezili but of voodoo in general—Gibson has selected a richly textured, highly flexible semiotic system. The fact that Angie has vèvès literally drawn into her head (i.e., her brain contains biocircuitry and is engineered to the parameters stipulated in her father's agreements with the loa) makes her a mobile holy place; she perpetually invokes the spirits. While vèvès are normally drawn on the ground with coffee or flour, those etched into Angie's brain are concealed—above and beyond the fact that they are internal. The vèvès cannot be detected by medical scans (MLO 83)—probably, she suspects, because the chief loa, Legba, manipulates any computer systems that are used in attempting to image them (MLO 84). The concealment of signs is a recurrent motif in Count Zero. Not only are many matters relating to voodoo not to be

\footnote{In Gibson's fiction the term is punctuated: vévés; it is also written: vèvès. In Lucius Shepard's fiction, it appears unaccented but italicized as veves. Outside of direct quotations, throughout the remainder of this chapter I have maintained the more standard punctuation and type style.}
talked about—as Newmark learns—they are to be concealed from the uninitiated. Often, too, the concealment of signs and significances is presented as a normal event when any semiotic system is used.

*Count Zero* is so saturated with signs and signification that its characters always risk missing the messages they most need to receive. In this, all of the protagonists share something with Turner's squirrels. During a routine elevator ride, Bobby and Lucas see that "everything, every visible surface, was covered with an interlocking net of graffiti, so dense and heavily overlaid that it was almost impossible to pick out any kind of message or symbol" (110). The box sculptures that art expert Marly Krushkhova is hired to find are presented as signifieds lacking signification that mean different things to different intelligences: human, semihuman, and nonhuman. The Finn calls them junk, while to Krushkhova's artistic eye they represent "geometries of nameless longing" (140). To the utilitarian, ultrawealthy, and inhuman Josef Virek they are merely direction "signs" in his search for information, meaningful only for what they can do to lead him to the AI responsible for their creation. To their creator, the recently formed AI of *Neuromancer*, the boxes are something different and far more cryptic, "songs . . . of time and distance" (*CZ* 257). Arguably, however, these and similar examples are themselves merely signs of a more general semiotic confusion that is central to the novel.

After Newmark's abortive cyberspace run and his rescue by a mysterious entity that is later revealed to be Angie, two strangers show a sudden interest in the novice cowboy. These men, Beauvoir and Lucas, ask about "the Virgin," and when Newmark doesn't understand their question, they attempt to clarify matters by referring to her as *Vyèj Mirak*, Our Lady Virgin of Miracles, and Ezili Freda (67). To Beauvoir and Lucas, the fact that Newmark encountered *Vyèj Mirak* indicates that he is "chosen of Legba . . . [the] master of roads and pathways, the loa of communication" (67). For Newmark, much of the novel involves the often complicated process of coming to understand all of this. *Count Zero* and *Mona Lisa Overdrive* gradually reveal to the reader much of what he learns.

There are "Sprawl oungans" (90), which Beauvoir explains to Newmark by equating them with sorcerers. In traditional voodoo belief, however, an oungan—also written "hungan" or, more typically, "houngan"—would better be described, as Beauvoir
initially tries to explain, as a priest—but in a sense of that term particularly appropriate to
Gibson’s context. As Harold Courlander observes, the houngan is a “mediator, the
interpreter, a human who has come closer to the supernatural than others of his
community . . . . Through the oungan man converses and communes with the forces of the
universe . . . [and] supplicates protection from impending dangers” (8). Both Beauvoir
and Lucas are houngans, intermediaries between the loas and humans. Rhea and Jackie are
members of the same hierarchy, although they apparently occupy positions involving less
authority. Those with the greatest power, of course, are the loas, who are uniquely
positioned to access and transmit information due to their ability to counteract the anti­
intrusion measures, many of which are dangerous, used to protect various databases.
Beauvoir and Lucas undertake deals with and on behalf of the loas, acting as their agents in
human space. The details of their interactions, although expressed in terms of voodoo
terminology, are in no way novel. All have parallels in the languages of commerce and
technoscience. Lucas is perhaps most successful in explaining the loa to Newmark, and
his success derives from his ability to make this connection clear. As he tells Newmark:

“When Beauvoir or I talk to you about the loa and their
horses . . . . you should pretend that we are talking
two languages at once. One of them, you already
understand. That's the language of street tech . . . .
We may be using different words, but we're talking
tech. Maybe we call something Ougou Feray that you
might call an icebreaker . . . . But at the same time,
with the same words, we are talking about other
things, and that you don't understand. You don't
need to.” (CZ 130)

Lucas and Beauvoir repeatedly attempt to explain voodoo to Newmark by equating the
unfamiliar with the everyday. To avoid confusing him, however, they focus as minimally
as possible on metaphysical issues. Beauvoir, for instance, suggests that Newmark not
come with himself with whether or not voodoo is a religion. Instead, he presents the belief
system as a knowledge “structure” (88). As he explains, “[W]e’re concerned with
systems” (89). Voodoo

isn’t concerned with notions of salvation and
transcendence. What it’s about is getting things
done. . . . In our system there are many gods, spirits.
Part of one big family, with all the virtues, all the
vices. There’s a ritual tradition of communal

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Rhea complicates Newmark’s attempts to make sense of the signs relating to the loa. When he mistakenly considers Beauvoir’s comment that Jackie is a “horse” to be a sexual reference, rather than explaining that she is a person who is ridden (i.e., possessed) by the loas, Rhea silences his attempt at understanding, telling him “[I]t’s nothing to talk about” and warning him that direct, casual use of voodoo terminology is dangerous (CZ 125-126). In Count Zero and Mona Lisa Overdrive, as in many traditional supernatural belief systems, some signs are not to be referred to directly: powerful or dangerous words must be approached circuitously, through metaphor and euphemism. For Newmark, at least initially, a limited, utilitarian understanding of the relevant semiotics must suffice. For others, however, more detailed knowledge is a necessity.

As with all sign systems, voodoo has a variety of rules of interaction—these derive from the pacts between the loa and voodoo’s adherents to which Jackie refers (CZ 190). These rules also constitute part of the code of signification, however. Deviations from the rules signify unusual circumstances and, in and of themselves, can transmit information. At one point in the novel, based on the unusual nature of the loas’ manifestations and their misordered sequence of appearance, for instance, Jackie realizes that a generalized warning of danger is also a message that Lucas has been killed. Jackie’s intimate knowledge of voodoo’s semiotics allows her to read signs that ± e other characters present (as well as the reader) cannot (CZ 190).

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* As Katharine Briggs explains, for instance, in traditional European belief it was considered prudent to refer to fairies euphemistically (127). In Ireland, they were called Sleagh Maith (i.e., the Good People). This and other euphemistic names (the “good neighbors,” the “honest folk,” and the “little folk” among them) were intended to minimize the chance that a mention of fairies would lead these dangerous beings to consider themselves summoned. Also, such substitute names tended to be complimentary — another reasonable tactic. If it’s necessary to mention a dangerous creature or class of creatures that might hear what you have to say, it makes sense to say something nice. For similar reasons, in Ancient Greece and Rome, the Furies were called “The Eumenides” (i.e., “The Kindly Ones”). In Haiti, the loa are collectively referred to in similar terms as The Invisibles.
Despite the prominent technoscientific features of Gibson’s fictional universe, then, supernatural knowledge systems retain their validity. Voodoo, which I have focused on since it is the most fully articulated of these systems, is not the only one. Reference is made to another, more general but related myth structure known as “When It Changed.”

As the AI Continuity explains in beginning the following exchange with Angie:

“The mythform is usually encountered of one of two modes. One mode assumes that the cyberspace matrix is inhabited, or perhaps visited, by entities whose characteristics correspond with the primary mythform of a ‘hidden people.’ The other involves assumptions of omniscience, omnipotence, and incomprehensibility on the part of the matrix itself.”

“That the matrix is God?”

“In a manner of speaking, although it would be more accurate in terms of the mythform, to say that the matrix has a God, since this being’s omniscience and omnipotence are assumed to be limited to the matrix.”

(Continuity’s explanation dovetails with the various mentions of cowboy beliefs relating to the changes in cyberspace that date to the time of the Wintermute-Neuromancer unification—an event which, although well known to readers, is not common knowledge for Gibson’s characters. Those interested in cyberspace understand that it has undergone alterations, but they do not fully understand either the nature of those changes or their cause. In light of their epistemological limitations, attempts to make sense of the changes are codified as modern myths. The reader, unlike the myth-making cowboys of Gibson’s novels, is in the privileged position of understanding how voodoo beliefs relate to specific textual events. Although the particulars of Shepard’s treatment of voodoo are distinct from Gibson’s, both authors place the reader in a privileged position relative to the novel’s characters. Only from the reader’s vantage can the stories’ events and their treatment of technoscience be fully understood.

Alternative Voodoo: Lucius Shepard’s Green Eyes

Lucius Shepard’s deceptively complex and ontologically convoluted novel Green Eyes (1984) offers a decidedly different treatment of voodoo, involving neither computer-moderated realities nor the sorts of reality interfaces characteristic of Gibson’s fiction. The
novel's premise is that certain bacterial strains, when introduced into the brains of newly dead corpses, can reanimate the bodies and, in the process, foster the development of totally new consciousnesses. The bodies that host these Bacterially Induced Artificial Personalities (BIAP), often referred to as "zombies," develop phosphorescent green eyes as the reproducing bacteria impinge on their optic nerves. As zombies regain their strength and coordination, they gradually develop a variety of heightened perceptual abilities which might best be called psychic. They concurrently develop personalities that researchers assume are based on false memories of lives they never lived, which are prompted by cues from and interaction with therapists. Time is of the essence in trying to learn from and about the BIAP. Eventually, the bacteria that animate their hosts once again kill them by exhausting their ecological carrying capacity (86-87). Although most BIAPs persist for a few days, some live for months; these so-called "slow-burners"—particularly Donnell Harrison, and, to a lesser extent, Hilmer Magnusson and Jack Richmond—are the novel's main focus. Harrison, who inhabits the host body of Steven Mears, a carnival worker who dies of alcohol poisoning at the age of 29, gradually "remembers" being a poet who lived with his wife in a mountain cabin until her accidental death. His therapist, Jocundra Verret, has the responsibility for drawing him out of his shell, but she is troubled by the researchers' unethical treatment of the study's subjects, particularly the fact that the subjects are led to believe that they are at the research center in order to prepare for a return to their "normal" lives.

Harrison is galvanized into action by the dying Magnusson, a medical genius inhabiting a body that once belonged to a derelict. Magnusson learns that the project's cover story is fraudulent, that none of the BIAP are who they remember, and that they are not being rehabilitated for reentry into society. He prompts Harrison to leave their residential research station, a converted Louisiana estate called Shadows, by committing suicide and making sure that Harrison can secretly observe the subsequent autopsy, correctly guessing that the doctors, caught up in the excitement of an unusual and potentially important opportunity, will reveal clear contradictions between what is actually happening and what the BIAP have been told (62-70). Even after his death, Magnusson remains a crucial figure. A notebook he leaves for Harrison introduces the poet to the
range of psychic abilities that all the BIAP develop and prompts Harrison to consider the
source of his identity, a troubling question given the fact that his consciousness is not the
one that originally inhabited his body. Magnusson attempted to address the question of
BIAP consciousness by seeking common denominators, and, although he reached no final
conclusions, his observations provide Harrison with important clues. Magnusson, for
instance, writes about the BIAP obsession "with nobility . . . [and] regal imagery," noting
that

it seems to comprise part of our innate self-image. I suspect a
psychiatrist might countenance this as a result of death
trauma, suggesting we had linked the myth of Christ arisen to
our deep insecurity at having died and been reborn so changed
and incomplete. But I sense in myself and the others nothing
that reflects the gentle Christian fabrication; rather the imagery
is of a pagan sort and the feeling of nobility is one of a great
brooding spirit, half-animal, his perceptions darkening the
trivial light of day. When I feel this spirit moving within me,
I cannot believe otherwise than that all my illusory dry-as-dust
memories . . . have been foisted on me by the process of my
life at Shadows, and that they are a veneer covering a
reservoir of more potent memories. (72)

He continues, "All of us [the BIAP] now alive embody this spirit in individualistic fashion"
(72), describing Richmond as a "hoodlum warrior" and Harrison as a "bleak poetic prince"
(72). In explaining the magnetic orientation of the bacteria as well as the manner by which
they kill BIAPs by migrating within and overpopulating their habitat (86-87), Magnusson
gives Harrison a concrete reason to leave: self-preservation. Harrison hopes to find
assistance in manipulating the growth and migration of the bacterial colony so that he can
prevent them from killing him. Certain that he cannot trust the project leader for assistance,
he enlists the aid of his therapist Verret and, accompanied by Richmond, escapes.

Within a few days, Richmond, aware that he is close to death, instigates a gun
battle and is killed. After they flee the scene, Harrison and Verret encounter the faith healer
Papa Salvatino, whose authentic psychic abilities Harrison recognizes. After a
confrontation with Salvatino nearly leads to a riot, Harrison and Verret retreat to the home
of one of Verret's friends in the bayou country. Having learned from Salvatino that his
abilities allow him to heal the sick, Harrison soon begins tending to the ill. After word of
his activities spreads, they receive a visit from Salvatino, who brings a message from the

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wealthy Otille Rigaud, whose family has ties to voodoo going back several generations. Eccentric and prone to bouts of mental instability, she surrounds herself with petty criminals and a small group of psychics she refers to as "pets" on whom she conducts informal experiments to test the range of their gifts. Hearing of Harrison's remarkable abilities, she offers to add him to her human menagerie. Realizing that he has a purpose to fulfill, Harrison accepts the offer, and he and Verret relocate to the Rigaud mansion, Maravillosa, where Otille agrees to finance the project that Harrison believes can save his life.

The secondary world of Green Eyes is initially only a grim, fantastic place that Harrison chronicles in his writing. Verret is unsettled by the "circuitous plot and grisly horrors" (243) of a story that is set there. Interestingly, however, the "violent and involuted fantasy" (243) authored by Harrison not only has marked parallels with their current situation, it might actually overlap it—by providing a key to the source of Harrison's personality and memories as well as to those of many of the novel's other characters. The other world of Harrison's fiction is dominated both geologically and psychologically by a mountain known as Moselantja, where hopeful military recruits attempt to endure the rigors of training in order to enter into the prestigious military cadres of the Yoalo. Throughout the novel Harrison's stories reveal further details about the place. Moselantja and the caravans that bring inductees there are described, as is the way of life in this world. As Harrison writes, "War is the obsession of Moselantja... an ecological tool designed to cultivate the species, and the cadres of Yoalo... are considered its prize bloom" (146). It is a harshly militaristic world for prospective soldiers:

Failure, no matter how slight, is not tolerated and has but one punishment. Each day's crop of failures is taken to the high turret of Ghazes from which long nooses... are suspended. The nooses are designed not to choke or snap, but to support the neck and spine. The young men and women are stripped naked and fitted with the nooses and lowered into the void. Their arms and legs are left unbound. And then, from the clotted darkness... comes a gabbling, flapping sound, and the beasts rise up... There are watchers upon the battlements of Ghazes... who stare at failed recruits through spyglasses. As the beasts clutch and rend their prey, these watchers note every twitch and flinch of the dying, and if their reactions prove too undisciplined, black marks are assigned to the cadres from which they have been expelled. Many of the
recruits are native-born to Moselantja, and these are watched with special interest. Should any of them cry out or attempt to defend themselves or use meditative techniques to avoid pain, then his or her parents are asked to appear the next day at Ghazes for similar testing. And should they betray the disciplines, then their relatives and battle-friends are sought out and tested until the area of contagion is obliterated. Occasionally a seam of such weakness will be exposed, one which runs throughout the turrets, and entire cadres will be overthrown. Such is the process of revolution in Moselantja. (146-147)

This bleakly gothic world is not merely an alien, Other place; it is intricately involved with Earth. When Otille’s pets interrogate Harrison before a failed attempt to murder him, he tells them “of Moselantja and the purple sun . . . a world whose every life ha[s] its counterpart in this one, joined to each other the way dreams are joined . . . and whose every action also ha[s] its counterpart, though these did not always occur simultaneously due to the twisty interface between the worlds” (216). Harrison informs the would-be murders that there are many worlds that are similarly joined, and the Yoalo “have made inroads into all of them” (216). In the multiple realities of Green Eyes, voodoo offers not merely a convenient semiotic code to be utilized by AIs but, rather, an organizing set of metaprinciples addressing the interconnected nature of reality. Psychic gifts are a prerequisite to joining the Yoalo, and Harrison reveals to those who plan to murder him that they are all involved with the loas not only in this world but in the other as well. “[A]ll here,” he says,

“rank high in the cadres, servitors to one or another of the Invisible Ones, the rulers of Moselantja. Legba, Ogoun, Kalfu, Simbi, Damballa, Ghede or Baron Samedi, Erzulie, Aziyan. Men and women grown through much use of power to stand in relation to ordinary men as stone is to clay.”

The story he told did not come to him as invention, but as the memory of a legend ingrained from childhood, and in the manner of the Yoalo balladeers. (216)

Shepard’s treatment of voodoo is every bit as rational as Gibson’s, but the ontological relationships between worlds is less easily traced, lending the world of the Yoalo a magical appearance which results in part from its apparently feudal structure but also from the novel’s general gothicism.
Green Eyes is a novel rife with gothic spaces. The BIAP research station is a converted Louisiana mansion, described as being an “unlikely place for scientific work” with a “gothic atmosphere” (13), as its name, Shadows, suggests. The Rigaud mansion Maravillosa is also appropriately named: the Spanish term maravillosa means “marvelous” or “wonderful,” and the term applies. The mansion is nearly a caricature of the gothic: painted black with landscaping out of a horror movie and decorated by grotesque interior wall sculptures that give the impression of people struggling to escape from some tarry substance. During a tour of the grounds, Verret equates the place to “an evil theme park” (184). Finally, of course, the world of the Yoalo is a gothic metaspace: a planetary terrain of exotic and violent customs. The key to the world of the Yoalo and to Harrison’s identity are revealed by and intricately related to vèvès.

Shepard’s Vèvès: An Alternate Semiotics of Voodoo

As in Gibson’s novels, vèvès play an important role in the characters’ (and the reader’s) unraveling of the novel’s supernatural semiotics, although that does not become clear immediately. Magnusson sketches three symbols in his notebook that are eventually revealed to be fragments of a vèvè, writing next to them:

“What the hell are these chicken-scratchings? Been seeing them since day one. They seem part of something larger, but it won’t come clear. Odd thought: suppose the entirety of my mental processes is essentially a letter written to my brain by these damned green bugs, and these scribbles are the Rosetta Stone by which I might decipher all.” (88)

Magnusson’s hunch turns out to be generally accurate: the bacteria apparently encode an otherworldly personality, and vèvès are involved in that process. Like Magnusson, Harrison sees symbol fragments that appear as occasional flashes of gold light. He draws one of these, which, although similar to those in Magnusson’s notebook, incorporates several of the fragments he had previously seen into a single design (137). After Otille Rigaud’s messenger departs, leaving one of her cards behind, Harrison realizes that his sketch is a fragment of the vèvè on the card (153). Even before he knows what it is, Harrison comments, “That’s what I want to build with copper . . . I’m sure of it” (154). Jocundra then identifies it as a vèvè, defining the term as a “ritual design used in voodoo to
designate one of the gods, to act as a gateway through which he can be called” (154). She recognizes that this one belongs to one of the aspects of Ogoun, but she is unable to remember which one, although Otille later tells Harrison that it’s the vèvè of Ogoun Badagris (155), a loa that BIAP project director Anthony Edman recognizes as “One of the aspects of Ogoun . . . [a] warrior hero of the pantheon” associated with wizardry (166). As Edman notes, Ogoun Badagris is a “rada aspect . . . Rada and petro are more or less equivalent to white and black magic. Good and evil” (166), with rada representing the good.

With Otille Rigaud’s financial backing, a giant representation of Ogoun Badagris’s vèvè is made from three tons of copper on the assumption that Harrison can use its magnetic field to control the migration of the bacterial colony inhabiting his brain. Even before construction is completed, however, Verret recognizes that the vèvè might represent something more. Like Magnusson, she correctly intuits that both the vèvè and voodoo in general might have a deeper significance for the BIAP. She suggests, first, that the vèvè might be “an analogue to some mechanism in the brain . . . [that] can therefore be used by mediums as a concentrative device, one which Donnell [Harrison]—because of his abilities—can use in a more material way” (183) and that there might be “valid psychological and even physiological principles embedded in the rituals” of voodoo (183).

Static displays and dramatic winds result when Harrison’s manipulates his magnetic field in relation to that of the huge copper object, but the process has the desired effect: he trims the size of the bacterial colony (224-226). But these “treatments” have the unanticipated effect of stimulating the rate of the bacteria’s reproduction, leading to speculation that Harrison would die were he to go without them for more than a few weeks (229). The need for repeated exposure to the device does not trouble Harrison, however—he actually seems relieved to learn that he can use it every day. Although he doesn’t share the information with the other characters, the narration reveals that the vèvè transports Harrison to Moselantja (226-227). Harrison finds the key to his identity in the vèvè and the gateway it offers to the world of the Yoalo.

His daily trips to the vèvè give him opportunities to explore the secondary world of the novel, an activity that allows him to reconstruct his past. Verret eventually finds
Harrison's journal of his travels in the secondary world and learns that motion along the vèvè allows him to move correspondingly in the world of the Yoalo. His notebook includes a sketch of the vèvè with all the junctions numbered, information about what parts of the secondary world these junctions correspond to, and a list of the ranks of the Yoalo (230). Harrison also finds that while in the world of the Moselantja he wears one of the “black suits of synchronous energy” (146) he described in his first story about the place. This shimmering, unfeatured black suit allows nearly instantaneous motion along line-of-sight distances and orientation relative to geomagnetic fields (230-231). All vèvès are not alike, however.

During a visit to the tomb of Otille’s evil ancestor Valcours Rigaud, the sight of Mounanchou’s vèvè fills Harrison with rage (209). That Mounanchou was Valcours’s patron loa suggests the possibility of enmity between himself and Otille, despite her financial support of his project. Verret’s characterization of the Rigaud family as “one terrible creature stretching back through time, some genetic flaw or chemical magic binding the spirit to the blood” (201), although founded only on intuition, turns out to be generally accurate. If, as Harrison told the pets before their failed attempt to murder him, many of those currently at Maravillosa figure prominently in the cadres of the Yoalo, it stands to reason that those in important positions in the Rigaud hierarchy have otherworldly counterparts among the Yoalo’s upper echelons. After bacteria gathered from Valcours’s grave site apparently reincarnate the long-dead voodoo practitioner, a man evil enough in life to have become a feature of local folklore, the relationship between Harrison and the Rigaud family becomes clear—both in this world and the other. Harrison bears the rank of Aspect in the otherworldly town Badagris (253). As such, he says he is Ogoun’s judgment there, literally a representative responsible for interpreting and enforcing Ogoun’s laws. Similarly, as Ogoun’s emissary, Harrison is also his judgment on Earth (259, 265). But one-to-one correspondences are not easily made, as a result of the “twisty interface between the worlds” that Harrison mentioned earlier (216). Events and personalities on the two worlds have correspondences, but their relationships are complex.

In fighting a duel with the BIAP calling itself Valcours Rigaud, Harrison also faces Valcours’s double in the other world, a candidate-challenger for Election to the position of
Badagris's Aspect (254). In killing the challenger while, experientially at least, within the other world, Harrison also kills Valcours in the primary reality of the novel's action (259-260). Harrison's intuition that he has a violent purpose akin to the one that led Richmond to his death in a gun battle is finally confirmed. He realizes that he is responsible for dealing with the "aberrant High Aspect of Mounanchou" and returns to Maravillosa to kill Otille (260). Although Otille's card bears the vèvè of Ogoun Badagris and she has told Harrison and Verret that she rejected the petro, she remains linked to it and to her evil grandsire's loa. Otille, who funded the BIAP project under the auspices of the Rigaud Foundation—ostensibly a charitable institution but in fact an organization funding research into zombification—is revealed to have secretly manipulated events. But her actions have significance well beyond those that are readily apparent.

In realizing that killing Otille is the "summary act of his existence" (263), Harrison also comes to understand the task's importance (263). The aberrations of Otille's behavior had caused trouble not only on Earth and in the world of the Yoalo but among other worlds as well and

it had been past due that someone be elected to befriend the cadre and eliminate the seam of weakness, disperse the recruits, [and] punish the High Aspect and her officers. He had been an obvious choice; after all, twice before the Aspects of Badagris had dealt with the cadre of Mounanchou. Such purges were becoming a tradition. It might well be time for a restructuring of the cadre's valence, for bringing forth an entirely new aspect from the fires of Ogoun. (263)

In short, Harrison is doing his military duty—effectively even if unconsciously. By the time he kills Otille, the seam of weakness has already been nearly obliterated. The numerous hangers-on present at Maravillosa when Harrison and Verret arrived have already been driven away. Similarly, virtually all of those closest to Otille among the pets—who appear to be the primary world counterparts of her officers—are dead.

The interpretive question the novel finally poses is whether the reader can reasonably understand the story's events as Harrison does. Although the novel might be about the experiences of a world-hopping sentience on a military-political mission, the possibility remains that Harrison's version of events might be the invention of a creative mind attempting to deal with his lack of a genuine past. After reading half of Harrison's
journal of his travels in the world of the Yoalo, Verret realizes the same pair of possible interpretive options: either the immense electromagnetic forces associated with the vèvè were unhinging Harrison, "fueling fantasies with which to form a surrogate past, or—and this she could not fully disbelieve—he was actually traveling somewhere" (232). Certainly, some evidence of the gateway to Moselantja is visible to Verret (227-228), but support for the existence of the other world comes not so much in the form of ironclad proof as in smaller, cumulatively persuasive suggestions and evidence that come from several characters.

Much of the evidence comes from Harrison himself, of course. When he realizes that his earthly self won't long survive the wound he received during the battle between Valcours Rigaud and his other worldly double, he speaks to Verret in a "guttural language" (262), presumably the native tongue of his other worldly self. His connections to Verret's world dwindling, Harrison becomes increasingly unfamiliar to the reader as he recalls his otherworldly identity. Before his departure from the novel's primary world, to recall Magnusson's phrasing, Harrison finally bypasses the veneer of false memories of his earthly existence and taps into a reservoir of "more potent" and apparently genuine memories (72).

In addition, the gothic, heavily embellished style of Maravillosa's decor recalls to Harrison the world of the Yoalo and seems to be modeled on it. Otille admits on two occasions that that her inspiration for the decor was inspired by a dream (174, 205), most significantly when, shortly before Harrison's first experience on the vèvè, he recognizes the similarities between the decor of Otille's bedroom and the setting of his stories (205). The realistically carved, life-sized ebony sculptures resembling "ghosts that had been trapped while passing through the tarry substance of the boards" paneling the walls are revealed to have been something other than a gothic affectation (181); they bear a striking resemblance to the energy suit that Harrison's other worldly self and presumably all of the upper echelon Yoalo wear. All these instances suggest that the similarities between Maravillosa and the other world are more than can be explained by coincidence or shared delusion. Apparently, Otille has decorated her home to reflect the glimpses of the other world that she has seen in dreams and with the assistance of her psychic pets.
The molecular biologist responsible for perfecting the BIAP process, Yoshi Ezawa, also presents important evidence. This minor character also enjoys the most significant and complicated relationship to science and the supernatural. Ezawa is said by the project leader at Shadows, psychiatrist Anthony Edman, to be a man “for whom the truth appeared to consist of microbiological data” (3), although the biologist’s use of the term zombie in preference to Bacterially Induced Artificial Personality signals to Edman “some backsliding from his position of scientific rigor” (3). With access to elements of the story to which Edman is not privy, the reader recognizes that Ezawa’s diction reflects both Otille’s influence and Ezawa’s own conclusions about the BIAP process. A comment by Ezawa recounted early in the novel suggests that the story will involve a rationalization of the supernatural akin to that which occurs in Gibson’s novels. “I must admit,” he says, “the [BIAP] process has elements in common with a voodoo recipe. We do isolate the bacteria from dirt taken from the old slave graveyards, but that’s simply because of the biodegradable coffins . . . . They permit the decomposing tissues to interact with microorganisms in the soil” (3, ellipses and italics in the original). After a longstanding and nearly complete absence, Ezawa reappears late in the novel, having succeeded in creating a BIAP with exceptionally powerful psychic abilities by using bacteria harvested from the grave of Valcours Rigaud. “Astounding, isn’t it?” he says of the achievement. “It’s enough to make me reembrace the mysticism of my ancestors . . . . The entire experience has been quasi-mystical . . . . Pagan science!” (243, my ellipses).

Ezawa’s phrasing suggests that his research has allowed him to formulate and refine the principles that had been only partially glimpsed by pre- and nonscientific Afro-Caribbean societies. Contrary to Paul Feyerabend’s comment that ancient doctrines and “primitive” myths appear strange and nonsensical only because they are insufficiently understood and generally unstudied, Shepard’s novel gives voodoo’s ethnobotanical and metaphysical dimensions sustained, if highly speculative, attention. Feyerabend’s complaint of voodoo that “Nobody knows it, everybody uses it as a paradigm of backwardness and confusion” (35-36) is certainly not substantiated here. Indeed, Shepard’s novel suggests that voodoo could be a matter of legitimate scientific interest. Clearly, some genuine biological principles are involved, however much one of them
smacks of Lamarckian inheritance. Moreover, although the existence of connected, semi-contiguous worlds might suggest that the novel is an undisciplined fantasy, such possibilities are a feature of contemporary cosmology and physics. Although not without critics, such theorists as Stanford’s Andrei Linde have argued that large numbers of universes, perhaps even an infinity of them, either currently exist or once existed (Easterbrook 893; Weinberg 174).

The interpretative questions Ezawa poses are consistent with the strains of epistemological and ontological uncertainty running throughout the novel. In the tradition of a 1920s pulp story, Ezawa is a mad scientist manipulated by a femme fatale with an aura of supernatural menace. What remains an open question, however, is whether his madness affects his understanding of the events in which he participates. In harvesting the bacteria from Valcours’s grave and introducing them into the body of a dead psychic, have Ezawa and Otille actually managed to reincarnate Valcours, as they seem to believe, or have they directed (consciously or not) the BIAP’s personality development in such a way as to lead the creature to believe and act as though it were Valcours? The possibility that those involved with the BIAP project are experiencing a mass delusion, although impossible to refute with certainty, becomes increasingly unlikely. The final suggestion that Harrison’s version of events is correct derives from the presentation of a key scene.

At the novel’s conclusion, Harrison is no longer the person he was at Shadows. In his own mind and probably in terms of the story’s reality as well, he is the Aspect of

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6 I refer to the apparent transmission of Valcours Rigaud’s personality into a BIAP when bacteria from his grave are introduced to a corpse. Lamarck proposed that parents could pass on acquired traits to their offspring. The standard example is the giraffe, whose ancestors stretched to reach the leaves of high branches, slightly elongating their necks in the process. This trait would then have been passed down to offspring, who would have also stretched their necks in reaching for still higher leaves when browsing and, in due course, passed down their tendency for still more elongate necks to their offspring, until, over many successive generations, animals resembling today’s giraffe’s evolved. In fact, acquired traits are not heritable. In the case of giraffes, natural selection favored those animals who were best able to exploit high-growing foliage. Giraffes developed toward their current form when, from generation to generation, genes conferring shorter necks and less overall height were weeded out of the species’s gene pool while those for elongate necks and greater overall height were maintained. For a fuller accounting of the problems inherent in Lamarckian inheritance, see Richard Dawkins’s The Blind Watchmaker (1987) (290-312).

10 Hypotheses such as these, which are in part built on Alan Guth’s so-called inflationary cosmology (Weinberg 299n) certainly draw fire. Nobel-laureate physicist Charles Townes, for one, characterizes such speculations as excessively “freewheeling” (Easterbrook 893)—although in rendering that judgment he is somewhat outside his field of expertise. Astrophysicist Kip Thorne, whose research directly involves such possibilities, gives the notion of alternate universes a more sympathetic hearing in his brief discussion of Hans Reissner’s and Gunnar Nordström’s 1916-1918 solutions to Einstein’s equation (456-458).
Badagris, what passes as the local legal authority in that otherworldly place. Realizing that as Donnell Harrison he will soon die and secure in the knowledge of his own identity, he returns to the world of the Yoalo after completing his mission, leaping from the upper floor through a gateway to his own world. From his perspective, he makes the transition successfully (270). Verret, however, sees him leap away from the building as if he were jumping toward something, only to fall to his death (274). This scene has intriguing parallels with one of the key incidents in Alejo Carpentier’s *The Kingdom of this World*, which has already been a matter of interest: the scene of Macandal’s execution. Although the colonists force the slaves to attend the public burning to demonstrate the consequences of rebellion, their intentions are thwarted when the slaves see him escape and leave the execution believing that the “whites had been outwitted by the Mighty Powers of the Other Shore” (52).

As I have already mentioned, textual evidence cannot be relied upon to prove that either one or the other version of events is correct, although a bias against voodoo beliefs would probably predispose most Western critics to assume that Macandal burns to death in preference to a contrary interpretation or even a reading in which the two scenarios are not mutually exclusive. Harrison’s final appearance in *Green Eyes* poses a similar interpretive difficulty, although in doing so it tends to support an alternate reading of events. *The Kingdom of this World* does not narrate Macandal’s execution from his perspective; the reader is told only that the slaves leave the scene believing that he has escaped. Shepard uses an almost diametrically opposite strategy in presenting Harrison’s death/departure. Here, the more “natural” explanation (i.e., that Harrison falls to his death) is given exceedingly short shrift; it is not presented directly, only briefly recalled in conversation after the fact by Verret. On the other hand, the version of events involving Harrison’s departure to another world is offered in chronological sequence and at far greater length from the perspective of the relevant character. Moreover, the departure provides an *in medias res* conclusion for Harrison’s part in the novel which would be difficult to explain if he had fallen to his death.

After his apparent death, a shrine is built to Harrison and offerings of food are regularly left there by the people he healed (272). Such offerings are in keeping with
voodoo tradition, in which loa are given a variety of offerings, particularly food and livestock. That such offerings are made to Harrison suggests the possibility of his eventual deification. It should also be noted, of course, that from the perspective of one of voodoo's adherents, there is no necessary reason to consider him dead in any final sense of that term. From what the reader learns during the course of the novel, there is no reason why Harrison could not, as the loas he mentions have, eventually grow through the use and exercise of great power to eventually "stand in relation to ordinary men as stone is to clay" (216). Although his other worldly self has not yet reached the rank of High Aspect, he could be considered a loa both before and after his apparent death. The reader will recall that Ogoun Badagris was earlier described as an aspect of the loa Ogoun in a sense of the term "aspect" that is roughly equivalent to "avatar." By the novel's conclusion, however, the term Aspect has also been used to refer to a military rank among the cadres of the Yoalo. The term "loa" appears, then, to be either a cognate or a corruption of the otherworldly term "Yoalo." It follows, then, that since Harrison is Ogoun's Aspect in Badagris, he can in one sense be rightly referred to as Ogoun Badagris. The vèvè to which he feels drawn is not merely that of his otherworldly commander; it is his own. The significance of the vèvè along with its semiotic ramifications become apparent only at the novel's conclusion.

*Green Eyes,* like *The Kingdom of this World,* is the sort of fiction McHale has in mind when he writes, "Intractable epistemological uncertainty becomes at a certain point ontological plurality or instability: push epistemological questions far enough and they 'tip over' into ontological questions" (*Postmodernist* 11). Thus, the novel's significant epistemological concerns finally tip the work towards postmodernism by problematizing its ontological footing. Indeed, had *Green Eyes* unequivocally depicted the secondary world of the Yoalo, it would have required of its readers a much less rigorous examination of ontological issues. As it is, however, *Green Eyes* poses questions, many of them finally unanswerable, which relate not only to the reality of the world of Moselantja but also the possibility of the many other worlds into which Harrison maintains the Yoalo have made inroads (216). From a slightly different perspective, Harrison's depiction of a fictional
world that turns out to be potentially real also raises the possibility that the act of literary creation itself is undergirded with unsuspected ontological significance.

Supernatural Atmospherics/Natural Realities: Some Closing Thoughts

Both Gibson and Shepard depict voodoo as a pragmatic system of belief and behavior. Beauvoir’s comment in *Count Zero* that voodoo is about “getting things done” (88) applies as much to Shepard’s *Green Eyes* as to Gibson’s novels. In the various nested and parallel realities in all of these works, voodoo codifies power relationships as well as interactions between those at different levels of authority. As Beauvoir explains to Newmark, when you need something taken care of, you’re not in a position to worry about “notions of salvation and transcendence”: “You go to somebody . . . who can get the thing done” (*CZ* 88-89). This is certainly the case in Gibson’s fiction, but it is just as true in *Green Eyes*, where Harrison’s persistence explains the achievements of his otherworldly self. The implications of these literary treatments of voodoo go beyond literature, however. There is a noticeable overlap between these literary depictions of voodoo and a variety of real world events that occurred before, during, and after their publication.

In Haiti, the phrase *Tonton-macoute* literally means “uncle satchel!” and was originally used to refer to wandering herbalist-voodoo practitioners. Later, it came to mean “political roughnecks” (Francis Huxley 241) or, more specifically, members of the secret military police (Hurbon 119). Between 1957 and 1971, Haiti’s dictator Jean-Claude “Papa Doc” Duvalier used a system of houngans as informers and enforcers while providing government funding for voodoo ceremonies in an effort to gain the goodwill of both the loa and the faith’s adherents so he could challenge the traditional powers of the Catholic Church, the middle class, and the mulatto elite (Hurbon 119). Although the notion that the gods could be bribed might strike us as unusual, it is very much in keeping with a pragmatic perspective on voodoo—as I will explain shortly. When Duvalier’s

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11 It ought not strike us as too unusual, however. The idea that the gods could be influenced by making the proper offerings is cross cultural and even applies in at least one peculiar sense to Christianity. When some wings of the medieval church became corrupt enough, the wealthy (including members of the emerging middle class) were given the opportunity to buy their way into heaven by purchasing indulgences from the clergy, in theory if not in practice allowing those with money to get to heaven while bypassing the need for moral behavior, faith, good works, or prayer.
regime fell in February 1986, dozens of Tonton-macoutes were lynched. Several months after Duvalier fled the country, Protestant ministers used the political instability to turn public opinion against voodoo for their own purposes—in the process causing still further civil unrest by encouraging mobs to continue confusing houngans, evil sorcerers, and political thugs (Hurbon 122-123). The supernatural is often political not only in literature but in life.

Here as much as in the incidents in which an American soldier dealt with alleged werewolf activity or Christopher Tizhe threatened his enemies with magical violence, voodoo is treated pragmatically. Voodoo is a sociopolitical tool. In Mona Lisa Overdrive, when Angie tries to explain her involvement with voodoo, her friend Porphyre teases her by treating the subject dismissively, mentioning hoodoo signs and chicken bones. Angie replies, “You know it isn’t like that” (155-156). And of course, Angie is right: in these novels voodoo isn’t like that. Voodoo spells, for instance, are never involved. The hoodoo signs and chicken bones to which Porphyre refers are beside the point of these literary depictions of voodoo. Spells, apparently, really are superstitious, a veneer of misunderstanding concealing decidedly unsupernatural processes: the activities of AIs or the interaction of bacteria and magnetic fields. There are other worlds and, necessarily, other ontological concerns, but the reader’s grounding in reality is not severely affected as a result of these revelations. In fantasy and magic realism, magic and the supernatural play a real part in human affairs. At the borderline of postmodernist- and science fiction, however, they do not. Reality might be different than we expect, but its strangeness remains both natural and explicable.

At the conclusion of Carpentier's The Kingdom of this World, the novel’s focal consciousness, Ti-Noël, lives amongst an accumulation of objects salvaged from his former master’s plantation. Amongst the various artifacts of an alien, European culture are an “embalmed moonfish, the gift of the Royal Society of London to Prince Victor” and “three volumes of the Grande Encyclopédie on which he was in the habit of sitting to eat sugar cane” (170). London’s Royal Society is the among the oldest, continually active scientific organizations in the world, while the Grande Encyclopédie was an important compendium of the knowledge in its day. In Haiti, however, the visible artifacts of the
Royal Society's existence or of the Enlightenment project to know the world are reduced to trivial possessions. The embalmed fish and the encyclopedia are stripped of both their utility and symbolic importance. They are fragments dissociated from their epistemological context and situated in a place where people must invent new uses for them. In the novels by Gibson and Shepard I have discussed, the situation is reversed: it is as though some fragments of Ti-Noël's reality have been found by a team of researchers. Although these artifacts might offer insights into their source culture, they are of greater interest in and of themselves. Those elements of the alien world view that are subject to examination within the parameters of science (e.g., ethnobotany, semiotic systems) are examined and utilized; those that are not (e.g., metaphysical beliefs, spells) are ignored. Although, as McHale suggests, the confrontation of ontologies is a crucial factor in defining postmodernist fiction, we sometimes find that although there might be other worlds, realities, and ontologies, despite initial appearances, those Other Places are more like home than we might first suspect.
CHAPTER 4

SCIENCE, PSEUDOSCIENCE, AND THE SUPERNATURAL: CLOSING
THOUGHTS ON THEIR ONTOLOGICAL STATUS

Reality is a question of perspective. (197)


In addition to considering science and its place in Western society, postmodernist fiction—including many works at the interface of science fiction—attends closely to matters that were once rarely seen in the pages of either science fiction or mainstream literature: magic, the supernatural, and pseudoscience. These subjects are addressed, often jointly, in an attempt to explore how science and other knowledge systems relate to one another and to consider the matter of what their proper relationship should be. Postmodernist fiction emphasizes that science is one of many possible strategies of seeking to understand the universe, although people rely on a variety of other knowledge and belief systems to accomplish that task. Commentators like Paul R. Gross and Norman Levitt have in part mistaken contemporary criticism’s recognition of ontological plurality for an attack on science. More specifically, they have failed to consider the degree to which postmodernist fiction takes a provisionally supportive view of science.

Such novels as Don DeLillo’s *White Noise* (1985) illustrate that despite science’s dramatic successes, its disciplinarity precludes nonscientists from fully understanding it—virtually guaranteeing that many epistemological/ontological options to and supplements of science will continue to attract adherents. In some cases, as John Crowley’s *Ægypt* (1987) illustrates, misunderstandings about science can lead people to accept pseudosciences or New Age belief systems as sciences or science equivalents.

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Nonscientific belief systems are not by definition, however, science competitors. In the case of many religions, for instance, supernatural knowledge systems coexist comfortably with science.¹ People can even simultaneously hold pseudoscientific and scientific convictions, particularly if their beliefs bear on distinct areas of their intellectual lives.² In an age of information, a variety of ontological options will always be available. Given the ontological plurality evident both between and within societies, then, it is hardly surprising that many literary attempts to depict the variety and complexity of human thought address science, pseudoscience, and supernatural knowledge systems—sometimes within the context of the same work. Having noted and given a preliminary accounting of the different sorts of ontological juxtapositions that occur in postmodernist fiction in the preceding chapters, I am necessarily led to consider their significance. In particular, I am left to define the sum effect of postmodernist fiction’s treatments of science. What, in particular, does postmodernist fiction suggest about the role of science in Western society and its proper relationship to nonscientific knowledge systems?

First of all, science maintains an ontologically privileged position in postmodernist fiction. In the fiction of Crowley and DeLillo, for instance, although individual characters might feel ambivalence about or hostility towards science, their concerns and anxieties result from misunderstanding. Such characters as Crowley’s Pierce Moffet and DeLillo’s Heinrich reveal that many objections to science result either from erroneous assumptions about science or concerns about the manner in which scientific information is transmitted. However, even in validating science, postmodernist fiction is not uniformly hostile towards nonscientific knowledge systems or the supernatural. In fact, postmodernist fictions frequently illustrate that science and the supernatural, although different sorts of knowledge categories, are not necessarily binary opposites. Magic realist fiction, for instance, often takes an intermediate position in defining the relative ontological status of scientific and supernatural knowledge systems. The fiction of Gabriel García Márquez and Ben Okri, for instance, typically allows for the coexistence of Western technoscience and a host of

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¹ Despite the Catholic church’s antiscientific reputation, for instance, even it has issued statements admitting that evolution is more than a hypothesis. Persistent stereotypes notwithstanding, these days Christians are as liable to be evolutionists as Biblical literalists.

² For instance, an astrophysicist might hold creationist convictions while a biologist could accept astrology’s validity.
magical/supernatural creatures, events, and devices. Outside of the magical realist tradition, authors have taken different positions in depicting science's ontological status relative to other knowledge systems. For some, technoscience is presented as one of many important elements that must coexist to create a sustainable society. In Ursula Le Guin's *Always Coming Home* (1985), various components of biological, geological, and physical theory are among many elements constituting Kesh mythology and lore, but their everyday relevance does not appear to be any greater than that the esthetic concerns or spiritual beliefs with which they are intermingled. Other postmodernist fictions treat the supernatural sympathetically despite the fact that they finally explain it away as a misunderstanding. In the novels of William Gibson and Lucius Shepard, for instance, voodoo is given sustained, careful attention even though it is finally revealed to be subject both to rational explanation and scientific analysis. Only occasionally and intermittently is science itself seen as a marginally important mode of understanding the universe—for instance, in Alejo Carpentier’s *The Kingdom of this World* (1959; tr. 1989).

To argue that the sciences are merely one type of knowledge system among many, then, is to ignore the evidence offered by postmodernist fiction. Although many sorts of nonscientific knowledge systems remain current, science is typically depicted as the preeminent mode of investigating reality. As in Crowley’s *Ægypt*, pseudosciences’ inherent flaws render them unsuitable for such an endeavor. Even in most magic realist fiction, where supernatural belief systems are depicted as offering important advantages in interpreting reality, supernatural knowledge systems are not by themselves sufficient to the task. In García Márquez’s *One Hundred Years of Solitude* (1967; tr. 1970), for instance, José Arcadio Buendía’s experiences with magic and the supernatural only highlight his need to understand the world by resort to science. In other works of postmodernist fiction, science actually destroys the ontological foundations on which supernatural knowledge systems rest by naturalizing the supernatural, as in Gibson’s *Count Zero* (1986) and *Mona Lisa Overdrive* (1988) and Shepard’s *Green Eyes* (1984), where the basis for belief in voodoo is explained rationally.

In sum, postmodernist fiction recognizes the variety of worldviews currently in circulation. In doing so, however, it also tends to validate science by depicting it as an
important mode of understanding the universe and humanity's place in it. In postmodernist fiction, science might be represented as the ontological equal of other knowledge systems, particularly religions, or the superior of others, such as pseudosciences or New Age belief systems, but science is rarely depicted as a second-rate ontological option. Thus, to whatever extent postmodernist thought can be viewed as inherently antiscientific, such an evaluation cannot fairly be extended to postmodernist fiction. Although postmodernist fiction reflects Western society's confusions and anxieties about science, it does so in such a way as to illustrate that those difficulties proceed not from anything inherent to science but from misunderstandings about it.


Barrows, D. P. *The Ethno-Botany of the Coahuila Indians of Southern California*. Chicago, 1900.


Clemens, Elisabeth S. “The Impact Hypothesis and Popular Science: Conditions and Consequences of Interdisciplinary Debate.” In *Glen*. 92-120.


Jacobs, Wilbur R. “Indians as Ecologists and Other Environmental Themes in American Frontier History.” Vecsey and Venables, ed. 46-64.


