INTRODUCTION

The twentieth century has seen a profound transformation in the ground of its thought, a change catalyzed and validated by relativity theory, quantum mechanics, and particle physics. But the shift in perspective is by no means confined to physics; analogous developments have occurred in a number of disciplines, among them philosophy, linguistics, mathematics, and literature. From the vantage of the closing decades of this century, the appearance of a Copernican revolution sweeping through the culture is irresistible. I shall speak of it as a revolution in world view. The people most responsible for the transformation did not necessarily consider themselves part of a larger movement; nevertheless, their streams of inquiry flowed in a similar direction, the converging courses of which changed the intellectual terrain of modern thought.

The essence of the change is implicit in the heuristic models adopted to explain it. Characteristic metaphors are a "cosmic dance," a "network of events," and an "energy field." A dance, a network, a field—the phrases imply a reality that has no detachable parts, indeed no enduring, unchanging parts at all. Composed not of particles but of "events," it is in constant motion, rendered dynamic by interactions that are simultaneously affecting each other. As the "dance" metaphor implies, its harmonious, rhythmic patterns of motion include the observer as an integral participant. Its distinguishing characteristics, then, are its fluid, dynamic nature, the inclusion of the observer, the absence of detachable parts, and the mutuality of component interactions.

This concept is very different from the older paradigm implicit in
Newtonian mechanics, the atomistic, "common sense" perspective we are all familiar with that views the world as composed of objects situated in an empty, rectilinear space and moving through time in one direction. The intuitive obviousness of this view to us is no doubt reinforced, as Benjamin Whorf has suggested, by the deep structure of Indo-European languages, which embodies its fundamental assumptions: the separation between subject and object, the duration of objects through time, and the uniform, unidirectional flow of time. But we should not lose sight of the fact that the scientific expression of this view is a relatively recent phenomenon, dating from the latter seventeenth century. Since its beginning as a scientific world view can be historically determined, its ending perhaps can too. Although it is still the view most of us hold, there are indications that its decline has already begun.

The quantum field theories of high energy physics, for example, can lead to a very different perspective. Some physicists, faced with the dazzlingly rapid transformations that subatomic particles undergo, have suggested that it is more economical to think of the essential entity not as the particle, but as the underlying quantized field. In this view "particles" are expressions of the field's conformation at a given instant, appearing as the field becomes concentrated at one point and disappearing as it thins out at another. Particles are not to be regarded as discrete entities, then, but rather (in Hermann Weyl's phrase) as "energy knots." What the particle was for the Newtonian paradigm, the field is for the new paradigm.

Humanistic disciplines also reflect this change in view, as can be seen by comparing the dominant metaphors of our era with those associated with previous paradigms. When the eighteenth-century rationalists imaged the world as a clock, for example, they implied that the world was composed of interlocking parts, that the parts could be detached from one another, and that an intelligent observer could deduce the function

1Benjamin Whorf, Collected Papers on Metalinguistics (Washington, D.C.: Foreign Service Institute, 1952), pp. 3–8, 27–52. The problem with Whorf's thesis is that in some strains of European culture (for example, alchemical thought in sixteenth- and seventeenth-century England), very different world views have emerged, even though the language was essentially the same as that Newton spoke. Clearly other cultural factors, in addition to the deep structure of language, are responsible for the dominance of the Newtonian world view from the seventeenth through the nineteenth centuries.

of the machine from the workings of its parts. These assumptions were more or less conscious and intentional. The clock metaphor, however, also implied other attributes not foregrounded in consciousness, but nevertheless capable of affecting (or expressing) unconscious expectations about the nature of reality. Among these implications was the inference that the world, like a machine, had a fixed and static form and once set in motion would run itself without further need of divine intervention. Closer to the surface was the premise that its workings were rational, and that the proper way to investigate it was through the linear chains of inductive and deductive reasoning for which Bacon had argued in the *Novum Organon*.

In contrast to these eighteenth-century expectations were those implicit in the nineteenth-century Romantic image of the world as an organism. In his discussion of Romanticism, Hans Eichner points out that the difference between the two metaphors ("Machines do not grow, organisms do") was reflected in many different areas of the culture. In general, the eighteenth-century emphasis on static categories changed in the nineteenth century to interest in the dynamics of change. Taxonomy yielded to evolution in biology, poetics to history in literary theory, and mimesis to a literature of interiority. Moreover, as Eichner observes, if the world is a dynamic, living whole, it cannot be entirely understood through reason alone. The mysterious essence of life requires for its understanding the sympathetic imagination. It is possible to take a machine apart and examine it without imperiling its function; indeed, its end can be most clearly understood if it is divided into parts. But if a living being is dissected, the essential quality of life is destroyed; the remaining parts will never add up to the original whole. There was thus a sense among the Romantics that the whole is something other than the sum of its parts, and this "otherness" was identified with the life force.

The twentieth-century metaphor of the "cosmic dance" has in common with the Romantic metaphor of an "organism" the implication that the whole cannot be adequately represented as the sum of its parts, and the emphasis on the dynamic, fluid nature of reality. But whereas the Romantics identified this dynamism with a specifically *living* force,

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the modern period links it with a breakdown of universal objectivity. This is the difference, for example, between Henri Bergson’s theory of duration, which grows out of his notion of the *élan vital*, and Einstein’s concept of time in the Special Theory of Relativity. Bergson’s time is flexible because it is associated with a life force that perceives in a nonmechanical way; for Einstein, time is relativistic not because the universe is infused with life, but because the motion of the observer affects the language of description. In Einstein’s theory, this qualification does not depend on the observer being animate; the same result would be obtained if the measurement were made by a nuclear decay clock rather than a person.

So far I have been emphasizing the differences between the contemporary world model and Romanticism. Are there no continuities? Is Romanticism a sport in the history of modern thought, a deviation from the otherwise steadily increasing rationalism of a scientific age? This view, which Eichner espouses, depends upon the premise that science in the twentieth century is not essentially different in its philosophical assumptions from science in the 1700s. “If Galileo could be hijacked by a time machine, taught English, and dropped into contemporary Boston,” Eichner asserts, “he would . . . feel completely at home at M.I.T. Schelling would have to be brainwashed.”4 But Galileo would require far more than a crash course in mathematics to become acclimated to twentieth-century science. He would also have to abandon a belief in strict causality and accept the idea that our “particles,” rather than existing as collections of enduring, definitive objects, manifest themselves as “tendencies to exist.” Perhaps most disturbing to the time-transported Galileo would be the notion that a strict separation between subject and object is not possible and that, accordingly, there are inherent limits on how complete our knowledge of any physical system can be. These twentieth-century epistemological assumptions have more in common with Romanticism than they do with seventeenth-century science. Modern science is not renouncing Romanticism, only changing its emphases. If we were to try to graph the relationship between these eras it would not be, as Eichner proposes, a straight line from eighteenth-century rationalism to twentieth-century positivism with Romanticism as a deviant point, but a curve that, by

including Romanticism, thereby proceeds in a radically altered direction.5

One of the important points of continuity between Romanticism and the field concept is the appearance of inherent limits on sequential, logical analysis. In physics, the limit emerges as an upper bound on what can be expressed about reality. Why these limitations occur will be more fully and rigorously explored in the next chapter, when some of the important scientific models that lead to this conclusion will be examined. For the moment, they can be understood intuitively by considering what the nature of the universe would be if it were participating in a cosmic dance.

Imagine, for example, that we are sitting in a diner, waiting for a hamburger. In the ordinary view the plate, knife, fork, and ketchup bottle are “real,” while the pattern they form is a transitory artifact of their relative positions. But suppose that we were to shift our perspective so that we regarded the pattern as “real,” and the ketchup bottle, plate, knife, and fork as merely temporary manifestations of that particular pattern. This radically altered perspective is analogous to the shift in view suggested by quantum field theory, and is what Fritjof Capra, a particle physicist and prophet of the holistic world view, has in mind when he asserts that “the whole universe appears as a dynamic web of inseparable energy patterns.”6

The resistance of our language to expressing this view can scarcely be overestimated. If we try to construct an objective description of it, the difficulties will quickly become apparent. First of all, such a description must proceed from a point within the “dynamic web,” for if the dance is the universe, there is no point outside it. Imagine, then, attempting an internal, causal description of these “events.” As one configuration shifts to another and as “particles” appear or disappear in response to the field as a whole, the usual distinction between cause and effect breaks down because linear sequences of causality depend upon being able to define a one-way interaction between the event regarded as a “cause” and that considered as an “effect.” But when the interaction is

5Eichner acknowledges that Galileo would have a few uneasy moments wrestling with Heisenberg’s Uncertainty Principle. In my opinion, this formulation trivializes the epistemological issues that are involved. The extent and depth of these issues will be explored in the next chapter.

multidirectional—when every cause is simultaneously an effect, and every effect is also a cause—the language of cause and effect is inadequate to convey the mutuality of the interaction. Causal descriptions will not do because causal terminology implies a one-way interaction that falsifies the essence of what we want to convey.

Suppose instead we try a metaphor, or perhaps I should say, a different metaphor: a constantly turning kaleidoscope whose shifting patterns arise from the continuing, mutual interaction of all its parts. Two restrictions to a complete description then become apparent. Because we cannot describe the totality of the dance, which is incessant and infinite, we must stop the kaleidoscope in our imaginations, calling each slice-of-time configuration a “pattern.” But by stopping the kaleidoscope we have lost the dynamic essence of the dance, for the static “patterns” never in fact existed as discrete entities. The problem is endemic to synchronic analyses; any finite, slice-of-time model will encounter the same problem. One set of limitations thus emerges from the dynamic nature of this reality.

A second group of limitations derives from the lack of an exterior, “objective” point from which to observe. No matter where we stand we are within the kaleidoscope, turning with it, so that what we see depends on where we stand. To change positions does not solve the problem, because the patterns are constantly changing: what we see when we change positions is not what we would have seen, for in the intervening time the patterns will have changed, and our shift in position will be part of that change. Moreover, there will always be one place we can never see at all—the spot we are standing on. Like the figure in a painting who wishes to gesture toward the picture that contains him, we can never arrive at a complete and unambiguous description of this reality because we are involved in what we would describe. To posit such a reality is inevitably to encounter these limitations, because its essence, its all-of-a-piece dynamic wholeness, is what causes the limitations to occur.

So far I have been speaking of the obstacles to a complete description that occur when we try to use a natural language. But the difficulties are more general than this; as we shall see in the next chapter, they also appear when one attempts a complete description in scientific and mathematical languages. The realization that there are inherent limits on what can be spoken, and that these limits arise because language is
part of the field being described, is at the heart of the revolution implicit in a field concept of reality. The stickiness of this situation, our inability to extricate the object of our description from the description itself, suggests that a more appropriate image for the field concept than the “cosmic dance” is the “cosmic web.”

A central metaphor in this study, the cosmic web has connotations worth exploring. Readers who desire a visual image to go along with the metaphor may imagine it as a network of strands coextensive with space. Note that the web is not space itself, nor does it “contain” space. Rather it is an artifact, a created object whose artificiality corresponds to the conceptualization of the field models it signifies; what we are concerned with in these models is not reality as such, but conceptualizations that may or may not correspond with whatever we call reality. Imagine further that the web is composed of articulated joints, much as a spider’s web is. These joinings will serve as a convenient reminder that the verbal models we shall be examining are also articulated, in the double sense of being utterances and of being composed of discrete units joined together. Once the web is constructed, these joinings may stand for, or gesture toward, a seamless whole; but this evocation can be attempted only through a medium that is itself linear, sequential, and articulated. The prey the cosmic web is designed to entrap is the dynamic, holistic reality implied by the field concept. But the prey always escapes, precisely because the web is articulated; as we shall see, to speak is to create, or presuppose, the separation between subject and object that the reality would deny. What is captured by the cosmic web is thus not the elusive whole, but the observer who would speak that whole. Hence the cosmic web is inherently paradoxical, deriving its deepest meaning from a whole that it can neither contain nor express. Its history can be told as the history of certain paradoxes.

To enumerate these paradoxes is to begin to realize the scope of the paradigm shift which has brought them into focus. Since any statement in a field model can be made to refer to itself if the statement is part of the field that the model posits, statements have the potential to become self-referential, a realization as central to Gödel’s theorem as it is to Borges’s fictions. The supposition that there is a speaking subject separate from the object that is being spoken about also becomes problematic, and generates an uneasiness that is as apparent in most modern interpretations of the Uncertainty Relation as in Pynchon’s Gravity’s
Rainbow. Another assumption that becomes paradoxical in a field model is the premise that it is possible to establish an unambiguous time-line for spatially separated events, a conception whose unraveling is as important to relativity theory as it is to Nabokov’s Ada.

These brief references are meant to give the reader a sense of how developments in a number of different disciplines can be related to the emergence of modern field models; they will be discussed in more detail in the following chapters. This is primarily a study about literature, however, and my major emphasis is on how literary theory and form have been shaped by the change of paradigms. The groundwork for a field view of language was laid in 1916 with the posthumous publication of Ferdinand de Saussure’s Cours de linguistique générale. In proposing la langue as a proper subject for linguistics, Saussure argued that language systems should not be regarded as collections of discrete semantic units, but as unified systems in which meaning derives from the relational exchanges between signs. The effect of this view was to locate meaning not in a one-to-one correlation between the sign and its external referent, but in the relations between signs. When Saussure argued that the entire linguistic structure changes with the addition or omission of a single lexical unit, he conceived of language as an integrated, nondivisible whole, that is to say, as a unified field composed of parts but not reducible to the sum of its parts.

That Saussure’s proposals are remarkably similar in spirit to those occurring about the same time in physics and mathematics does not require that Saussure knew of Einstein’s 1905 papers or read Principia Mathematica. Indeed, to suppose that such parallels require direct lines of influence is to be wedded to the very notions of causality that a field model renders obsolete. A more accurate and appropriate model for such parallel developments would be a field notion of culture, a societal matrix which consists (in Whitehead’s phrase) of a “climate of opinion” that makes some questions interesting to pursue and renders others uninteresting or irrelevant. Such a field theory of culture has yet to be definitively articulated, and is beyond the scope of this study. But it is already possible to see some of the elements it would include. It would, for example, define more fully how a “climate of opinion” is established, and demonstrate that it is this climate, rather than direct borrowing or transmission, that is the underlying force guiding intellectual inquiry. This climate would be, of course, as capable of influencing
scientific inquiry as it is of guiding any other conceptualization. Such a
history would insist that we not be misled by a causal perspective into
tinking of correspondences between disciplines as one-way exchanges,
for example, by asserting that the change in scientific paradigms caused
a shift in literary form. In a field model, the interactions are always
mutual: the cultural matrix guides individual inquiry at the same time
that the inquiry helps to form, or transform, the matrix.

In its treatment of the modern novel, this history would show that
the cultural matrix was so configured as to draw modern novelists to
considerations similar to those Saussure entertained. It would point
out, for example, that just as linguistic meaning in a field model was
deemed to derive from relational exchanges within the language system,
so meaning in a literary text was deemed to derive not from a mimetic
relationship between the text and “real life,” but from the internal
relations of literary codes. It could then show that explorations of this
possibility in the novel proceeded in two different but related direc­
tions. One turned inward, assuming that literature, like language, is an
internal system that has no necessary reference to anything outside
itself. In extreme form, this train of thought resulted in a literature that
is both nonreferential and solipsistic. One thinks, for example, of the
narrator of Beckett’s The Unnamable, whose connections with external
reality have been progressively stripped away until there is finally not
even a truncated body attached to the voice; all that exists is the voice,
speaking to itself. Because this inward-turning literature is nonmimetic
in its orientation, the term “anti-realism” can properly be applied to it.

Our supposed history could then go on to show that the “anti­
realism” rubric often includes other narratives whose orientation is,
however, quite different. These texts, although they may possess “anti­
realistic” traits, turn outward toward an apparently external referent.
The nature of the reality being represented is, however, radically al­
tered, for it is no longer simply external and objective, nor is it repre­
sented as an object separate and distinct from its verbal expression.
Rather, it is assumed to be continuous with the text, interpenetrating
the signifiers that re-present it. A conservative example is Conrad’s The
Heart of Darkness, in which external reality is filtered first through the
narrator, then through the internal perceptions of the protagonists, so
that the meaning exists, as the narrator asserts of Marlowe’s story­
telling, not as the kernel of a nut but as a kind of luminous haze without
a definitive locus in the signifiers themselves. Here two implications of the field concept come into play: that the whole is composed of parts but cannot be reduced to them; and that the observers are an inextricable part of the field. In more radical versions the external reality, though putatively existing, is irrecoverable, for the subject's perceptions of it have so deformed and merged with it as to eradicate the possibility of recovery; one thinks here, for example, of Faulkner's *The Sound and the Fury*.

Our history could further demonstrate that the impulse to represent a continuous reality need not necessarily be expressed as extreme subjectivity. Also possible are literary texts that try to re-create the continuum within the text. This immediately involves the author in paradoxes of self-referentiality, for the enabling premise that the text is part of the whole also implies that the whole can be contained within the part, leading to the infinite regress of a part containing a whole within which is contained the part. . . . Familiar examples here include many of Borges's fictions.

My purpose in sketching these possibilities obviously is not to write this history, but to show that it is possible, and to suggest some possible points of reference. The present study begins with the premise that such a history would end by establishing: that well-known developments in the modern novel are part of a larger paradigm shift within the culture to the field concept. Rather than attempt this history, I have assumed it by locating a group of representative novels within a larger cultural context that includes physics, mathematics, and philosophy. By demonstrating the usefulness of the premise in understanding these texts, I hope to encourage further work that would undertake to explore the premise.

Since I am assuming that these novels are affected by the shift toward the new paradigm, the reader may wonder whether I also mean to imply that the authors are thoroughly conversant with field models, or are trying to re-create it within their works. In my opinion, both of these models of "influence" oversimplify the interaction between an author and his culture. Most of the authors I am concerned with know little of science, and what little they do know is often colored by their idiosyncratic interpretations. In addition, most of them write for a small literary audience, and this further helps to insulate them from developments in science. With few exceptions, these authors are react-
ing not to science as such, but to a more general set of ideas pervasive in the culture. One purpose of this book is to provide readers from both sides of the cultural divide with the information they need to see that the connecting link between these ideas is the field concept, and to demonstrate that it is as capable of informing literary strategies as it is of forming scientific models.

Given the hundreds of literary texts that might be studied, what has governed my choice? There can be no question of choosing the “right” texts, for the argument is that the influence of the field concept is pervasive throughout the literature. My selection was guided by two criteria: first, I wanted texts that would reveal how wide the range is of literary strategies that can emerge from an author’s encounter with the field concept; and second, I wanted texts that would evidence varying degrees of knowledge and sympathy toward science. Lawrence and Nabokov know little about the science, whereas Pynchon knows a great deal; Lawrence mostly dislikes what little he knows, while Borges delights in modern set theory and reads mathematical texts to learn more. The selection is diverse enough to show that a writer does not have to be post-modernist to be affected by the field concept; authors as different in their literary techniques and philosophies as Lawrence and Nabokov, Pynchon and Pirsig, are all affected.

The desire to show the full complexity and range of response has also dictated the book’s organization, for the literary chapters are arranged according to the authors’ increasing resistance to the field concept. Robert Pirsig’s Zen and the Art of Motorcycle Maintenance comes first because he seeks most wholeheartedly to embrace it. It is interesting that few of Pirsig’s sources come directly from physics; Einstein is merely mentioned, for example, and Heisenberg appears not at all. Consequently, this text also demonstrates that a writer can be concerned with issues that have been brought into focus by the paradigm shift without necessarily being familiar with those sources that most directly brought it about. Pirsig’s book is the one work of this study that has not been incorporated into the literary canon, finding its audience in the mass market rather than among a literary coterie. It is thus an important text for demonstrating how a set of ideas can be broadcast through the culture, transforming it in turn. From this popular treatment of the field concept emerges a question that haunts all of the writers in this study: can the representation of a holistic field be accom-
plished within the linear flow of words, or is the attempt inherently limited by the fragmentation of the medium?

Lawrence and Nabokov come next because they demonstrate how writers who are relatively ignorant of the new science nevertheless participate in the cultural matrix and so, willy-nilly, encounter in some form the matrix’s underlying paradigm. Nabokov and Lawrence are further tied together by their ambivalence toward the new science; neither is fond of the theoretical sciences, yet both find in it propositions that they wish to appropriate for their own ends. Lawrence in particular had only the foggiest notion of what relativity was, but he knew enough to sense that the old ways of looking at the world were crumbling, and into the gap he meant to insert his own version of a field model. Working partly from ignorance, partly from intuition, and partly from Bergsonian theory, Lawrence proposed a “subjective science,” at the center of which is a psycho-physical model that unites subject and object into one pulsating, dynamic field. But the only way Lawrence could envision this unified field was as two polarities locked together into tense opposition in highly unstable configurations. As a result, this holistic “field,” which Lawrence identifies with the unconscious, keeps fragmenting and reforming, only to break apart again. Ironically, the attempt to sustain the field fails not because Lawrence finds it impossible to represent, but because he fears what such a reality would entail if it were represented. Lawrence’s fiction thus evolves in dialectical fashion from two world views, the old in his opinion moribund, but the new too fraught with danger for him to sustain it.

Unlike Lawrence, Nabokov chooses to ignore the psychological implications of a field model, concentrating instead on the one implication of this model that he finds attractive: that time may be reversible. Informed by Nabokov’s ambivalence toward the field model, Ada has inscribed within it two contradictory impulses: the desire to move into the future, whence comes the scientific validation for reversible time; and the nostalgic wish to recover the past—an enterprise which, if the theory is correct, should be possible. The problem is how to represent both of these impulses at once, since they point in opposite directions. Nabokov’s solution is to imagine twinned worlds, Terra and Antiterra, with a not-quite-perfect alignment between them that keeps them from canceling each other out. The dialectic of Nabokov’s fiction is thus
between the deterministic past of the Newtonian world view and the reversible future of post-Einsteinian relativity, between the confinement of a static, predictable space and the free-wheeling permutations of a synchronous field.

Compared to the impressionistic way in which Lawrence and Nabokov interpret a field model, Borges’s response is extremely precise, though no less problematic. What fascinates Borges is the prospect of a set that contains itself, a whole that both contains and is contained by the part. Such paradoxes are implicit in many representations of field models, because the representation is at once the whole, in the sense that it images the field, and the part, in the sense that it is contained within the whole it figures. This paradox, central to Borges’s fictions, is explored through the infinite sets and transfinite numbers of Cantor set theory. Borges’s assumption is that the Newtonian universe must crumble when confronted with the antinomies to which this theory gave rise. But he does not want a new reality to come into being either. Rather, he juxtaposes the new “loss of certainty” with old certainties to render everything uncertain. In this chapter the new world model engages the old not so much in a dialectic as in a collision that subverts both. Borges’s response to the field concept is thus essentially a strategy of subversion.

At the center of Pynchon’s Gravity’s Rainbow is the question with which we began—can a holistic field be represented in a linear flow of words?—and his treatment of it is formidably complex. His exploration of its implications includes meditations on the indeterminacy of the new physics, speculations on modern cosmology, even a field theory of film. This dissipating focus is part of the point, for Pynchon leads us to the recognition that what he has rendered is not at all the simultaneous interactions of a field concept, but fallen, preterite versions of it may be all our cognitive consciousness can grasp. As the text plays with these transformations, we gradually realize that the point of the attempted returns to a single, unifying perspective is that there can be no true return, because we remain within the fragmented consciousness of modern analytical thought. More than any other writer in this study, Pynchon understands what it means to be caught in the cosmic web.

All these texts thus wrestle in some way with the implications of the field concept, from the first tentative imaginings of it in Lawrence to
the exploration of the limits of imaging in Pynchon. It is in this rich diversity of strategies, the multiform ways the concept is transformed into literary form, that its importance for literature is found. For whatever stance these authors take toward the field concept, their encounter with it is affecting the shape of modern fiction.