

INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

**ProQuest Information and Learning
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
800-521-0600**

UMI[®]

A

NARRATIVE *TELOS*: THE ORDERING TENDENCIES OF CHANCE

by

VICTORIA N. ALEXANDER

A dissertation submitted to the Graduate Faculty in English in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2002

UMI Number: 3047192

Copyright 2002 by
Alexander, Victoria N.

All rights reserved.

UMI[®]

UMI Microform 3047192

Copyright 2002 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

© 2002

VICTORIA N. ALEXANDER

All Rights Reserved

This manuscript has been read and accepted for the Graduate Faculty in English in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

15 April 2002
Date

Joan Richardson
Chair of Examining Committee

15 April 2002
Date

Joan Richardson
Executive Officer

Professor James P. Crutchfield

Professor Angus Fletcher

Professor Joan Richardson

Professor Eve Kosofsky Sedgwick

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

NARRATIVE *TELOS*: THE ORDERING TENDENCIES OF CHANCE

by

Victoria N. Alexander

Advisor: Professor Joan Richardson

This work makes distinctions between and reexamines different kinds teleology in light of nonlinear dynamics and evolutionary theory, which study telic phenomena (i.e., emergent complexity and self-organization). Firstly, Aristotle's teleology is categorized as *nonmental*. In order to explain telic phenomena, he posits an *internal* set of constraints, which imply, not a rational Creator but a rational universe. His *telos* guides events that are *probable*. He claimed, therefore, that no rare accidental function should be called purposeful—for this would imply an intrusive *Deus ex Machina*. On these points, Aristotle compares to complexity scientists studying spontaneous organization who are also concerned only with internal constraints that are immanent in the dynamics of the process. Secondly, Christians, in contrast to Aristotle, argued especially fortunate or unfortunate accidents are caused by the *telos* of an *external* agent. This *telos*, known as

Providence, is mysterious to humans who exist in linear time. Because all time occurs at once to God, the end can affect the beginning. Coincident, physically unrelated events are linked by the *idea* of justice they serve, lending this *telos* a *mental* aspect (in contrast to Aristotle's nonmental approach). This *telos* functions in chaotic "road" narratives, for example, Spenser's *Faerie Queene* and Amis' *Money*, that contain hidden order. Thirdly, although 19th century teleology may appear linear and rigid, this is due to the reductive determinism against which it was conceived. Kant added a notion of predetermined *fortuity* to the mechanistic cosmos, arguing the initial configuration of static atoms had been chosen *so that* future coincidences would be synchronized causing the apparently "chance" effects God had actually intended. This *telos* determines Kundera's *Immortality*. Fourthly, if new more complex systems can emerge as result of the accidental functions they serve, they will seem telic because functionality is an *end* cause. This results in *naturalistic mentalism*, which determines the order in much of Henry James' work. If according to Kant all "new" things were mere permutations of old, in James' universe, ruled by a pragmatic teleology, truly new order is possible. Fifthly, today structural evolutionary theorists, like the 19th century Kantian teleomechanists, seek the "principles of organization" that govern stochastic processes resulting in similarities across species, or *structural archetypes*. Spontaneous organization, as first described by C. S. Peirce, is related to patterns in Pynchon's *The Crying of Lot 49*.

Preface

Although *telos* has been variously interpreted throughout history, I argue that it has consistently involved the concept of chance. To link *telos* with chance goes directly against the grain of contemporary thought that associates teleology with rigidity. Thus, I must ask the reader to be prepared to meet with what will appear at first to be conceptual noise, defying and contradicting what everyone believes to be true. In time, the ideas should become clear. It should also become clear that no *one* definition of *telos* that has been made so far corresponds with the definition that I present here. I analyze a number of different teleologists in light of recent advances in the sciences of complexity and evolutionary theory. In particular, I note that the dual aspects of teleology, namely *directionality* and *originality*, have not been properly considered in the literature. Thus, my perspective makes many important discoveries. The reader should not expect to find the traditional Aristotle, Kant, or Emerson here. What the reader will find, however, is that there are new ways to consider the moments of genius and of folly in traditional teleological arguments.

The first chapter functions as an overture to the entire work. The reader should plow through it without worrying too much about comprehension at first. The same ideas will be repeated in various forms and examples again and again throughout the later

chapters. Since my thesis explores unfamiliar territory for most literature scholars, my strategy has been simply to repeat myself enough times and in a variety of ways that, in the end, the argument will, I hope, seem like an old one.

Part One consists of three chapters that define *telos* and summarize its history according to the two aspects of *telos* that I have identified. The next four chapters, which make up Part Two, each further define and reexamine a different kind of teleology. In each of these chapters, a narrative is analyzed in terms of the teleology it supposes.

All seven chapters begin with an abstract, and the reader may find it helpful to look at each of these before beginning the first chapter. I have not provided a concluding chapter summarizing the work. Instead, I suggest the reader return to the introduction.

I would like to thank the Jewish Foundation for the Education of Women, the Dactyl Foundation for the Arts and Humanities, the Santa Fe Institute, and the Art and Science Laboratory for supporting this research. I would also like to acknowledge Jim Crutchfield for his patience and willingness to work with me, helping me understand the strange new world of deterministic chaos, computational mechanics, and complexity. I also thank Neil Grayson and Michelle and Angus Fletcher, who spent many long hours over the years fleshing out these ideas with me, and especially Joan Richardson, who gave me my first real introduction to science and whose own work confirms my belief that science is indispensable to the study of literature.

Contents

Preface vi

Part One: Theory

What is Teleology? What is Intentionality?

1. Introduction: Abstract 1

Telos in Postmodern Times 2

Considering both Directionality and Originality 17

Emergent Narrative 22

Mentalism versus Nonmentalism 26

Science versus Mental Teleology 33

The Influences of Theories of Causality on Narrative Structures 37

Ontological Emergence 52

An Argument for an Emergent Author 54

2. Analogies and Affinities: Abstract 61

Analogies and Formal Affinities versus Physical Affinities 62

Pushing the Boundaries of the Term "Analogy" 67

Aristotle on Analogical Reasoning 69

Aristotle Christianized 73

Bacon's Empiricism and Kant's Transcendentalism

Make Distinctions Between Analogies and Affinities 75

Argument by Extrinsic Designer 80

Darwin, Analogy, and a New Form of Mentalism 83

Teleological Narratives using Affinities or Analogies 86

Teleology Today 90

James P. Crutchfield's "Intrinsic Emergence" 94

"Extrinsic Emergence": The Use of Analogy 98

Conclusion: On to Literature 102

3. Phenomenal Patterns: Abstract 104

Phenomenal Patterns 105

Aristotle: No *Deus ex Machina* 107

Proof of an External and Capricious Author 115

Peirce's Accidental Third 125

Part Two: Application

Different Teleologies Result in Different Narrative Structures

4. Analogical Determinism: Abstract 128

The Mysterious Ways of Providence 129

Everything Works out for the Best 131

What Causes Patterns in Random Events? 133

Freudian Narratives 135

Linearity 139

Chaos and *Telos* in *The Faerie Queene* 143

20th Century "Nonlinear" Narratives 146

Conclusion 151

5. Deterministic Fortuity: Abstract 152

Kant's Predetermined Synchronicity 153

Dynamical Stability versus Prespecified Form 156

Emerson: Power and Form, Thought and Fate 159

Progressive Evolution 164

Kundera and Deterministic Fortuity 165

Conclusion 169

6. Pragmatism: Abstract 170

Opportunity for Telic Originality 171

Context 176

The Use of Error in the Evolution of Language and Literature 185

Extrinsic Emergence 187

The Emergent Fate of Henry James 194

James' Use of Noise 200

Conclusion: Relative Objectivity 207

7. Spontaneous Organization: Abstract 212

Entropy 213

Spontaneous Organization 216

The Crying of Lot 49 223

The Pacemaker Concept 237

Conclusion 242

Selected Bibliography 245

Part One: Theory

What is Teleology? What is Intentionality?

Chapter One Introduction

Abstract. One of the prime concerns of narrative theory is the issue of agency. A crisis situation has existed in the arts since the time Roland Barthes in "The Death of the Author" (1968) argued that the notion of authorial intentionality in narrative is as untenable as teleology in the natural world. In response, contemporary movements have attempted to promote "non-Aristotelian" or "non-teleological" art. The resultant work may appear less orderly in a formal sense but does not necessarily appear less *intentional*, in the sense of less *willed*. On the one hand, discontinuous narratives or "chance operational" art can seem teleological if coincidental patterns happen to be recognizable, utilizable, or interpretable. Such patterns—because not directly caused by known laws of genre, grammar, convention, and so forth—can seem caused only by the purpose they come to serve in *the end*. On the other hand, extremely orderly predictable works of art may not appear intentional, in the sense of willed by the artist, but determined merely by convention and or natural laws. The following study identifies the properties of art that make it seem teleologically driven. I argue that *telos* involves two distinct mechanisms—which are seldom both noted in traditional

arguments—one for the maintenance of order and one for the discovery of new order, which I refer to as *directionality* and *originality*, respectively. It is here assumed that systems in nature are formed according to mechanistic laws that can arise spontaneously even from quantum indeterminacy. In turn, law-abiding systems come to function in advantageous ways not predicted by those laws. These two aspects, emergent lawfulness and ability to transcend laws opportunistically, make natural systems *telic*, that is, progressive or creatively organized toward goals. Likewise, it is here assumed that art must first of all be a spontaneous activity that synthesizes already existing elements according to traditions, but must also involve unpredictable activity that while using rules can transcend them. In this view, only when activity involves both directionality and originality can it be called *intentional* or, in my view, artistic. With these considerations in mind, I reinvestigate the history of teleology and its influence on narrative aesthetics.

***Telos* in Postmodern Times**

Telos is a concept with a complicated history. A number of distinct species of the term have evolved since Aristotle attempted to describe final causality, the purposes of nature.¹ Under Christianity, *telos* was associated with the mysterious ways of Providence.

¹ Aristotle's natural philosophy identified four causes for the existence of things. I will make use of his terms, modifying the definitions to accommodate the various meanings they have acquired throughout history. The definitions of the four causes as used here are as follows: *Material cause*: the physical properties of matter determine the object. *Efficient cause*: the agent acting on the matter determines the object. *Formal cause*: the preexisting "blueprint" or universal law determines the object. *Final cause*, *telos*, or *reverse cause*: the end state, also known today as the "global" state, determines the object. One might also say that the whole

Under classical determinism, it referred to sequential, mechanistically predetermined design. Under postmodernism, the teleological view of things seemed a mere culturally-induced hallucination. More recently, a new use of *telos*, referring to the phenomenon of spontaneous self-organization, has emerged in the science of nonlinear dynamics. The fact that this single word can refer to several apparently contradictory ideas signals a hidden richness. Dismissed by Francis Bacon, then by Charles Darwin, and then by Jacques Derrida and Roland Barthes, *telos* keeps returning like a misunderstood ghost. It demands a clearer conceptualization, especially considering the fact that contemporary proscriptions against so-called teleological art are based on a limited understanding of the concept.

Postmodernism assumes the objective of teleology is to search for some original external cause, some Designer that sets the whole machinery of the universe in motion. Misunderstood this way, final causality is said to be "linear," consisting in direct cause and effect relationships, predictable, proportional, and reductive. Postmodernism has wrongly assumed that the discovery of the fuzzy nature of the quantum world and the end of classical determinism necessitates the end of teleology. Linear intentionality, or any kind of goal-directed behavior in nature or in human action, is also assumed to be no longer credible.

As I hope to demonstrate in this work, teleology and intentionality are not bound up with the classical notion of causality and "linear" determinism. Teleologists throughout history have typically described *telos* as some sort of internal constraint or

determines the parts. In this respect, final cause is somewhat conflated with formal cause in so far as "end state" may be considered the "universal laws" of structure as a whole (preexisting only abstractly) that, as such, determine the parts. One might also say, less neutrally, that the ultimate utility or purpose that the end state or whole happens to serve determines the parts.

guiding principle, not as the direct effect of the hand of an external agent: that is, final causes are different from efficient causes. Thus, the conception of intentionality is not challenged by quantum mechanics or the nonexistence of an external Platonic form as originary cause.

Since some readers may not be familiar with the history of quantum mechanics as it has been opposed, mistakenly in my view, to determinism and teleology, I will begin with a brief summary of that argument as I find it in the humanities.² In the remainder of the work, however, quantum mechanics does not figure significantly in my discussion. Instead my reinvestigation of teleology will be based upon a more recent scientific focus, that is, nonlinearity, which is appropriate to a discussion of the origins of order and disorder.

According to classical determinism, as more and more data, of increasing accuracy, is collected, uncertainty diminishes. Such confidence is partly due to the assumption in traditional western metaphysics that a subject (an observer) and its object (a thing observed) are ultimately distinct and that immediate and direct experience of reality is theoretically possible. Under this assumption, the (albeit practically impossible)

² The chief sources from which postmodern thought draws its conclusions about science, generally understood, are: firstly, Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), whose argument that the ruling paradigm determines what science considers true has been used to defend radical subjectivity; secondly, various works by Gilles Deleuze, the earliest being, *Logique du sens* (Paris: Editions de Minuit, 1969); and thirdly and significantly Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge*, trans. Geoff Bennington and Brian Massumi (Minneapolis: University of Minnesota Press, 1984); originally published as *La Condition postmoderne: rapport sur le savoir* (Paris: Editions de Minuit, 1979). Lyotard argues, for example, that "Quantum theory and microphysics require a ... radical revision of the idea of a continuous and predictable path. The quest for precision is ... limited ... by the very nature of matter. ... Knowledge ... resolves into a multiplicity of absolutely incompatible statements" (56-57). For a critique of the use of science in the humanities, see Alan Sokal and Jean Bricmont, *Fashionable Nonsense: Postmodern Intellectual's Abuse of Science* (Picador: New York, 1998).

goal of empirical science is to define and describe objects as separate and distinct entities, as things-in-themselves, irrespective of our experience of them. Thus, true knowledge would capture the nature of reality when no one is looking.

In the 1920s, physicist Werner Heisenberg found that the more accurately we attempt to fix the position of a particle, the less accurate become our measurements of the rate of change of its position along a line with respect to time. Position and velocity are conjugate: when one becomes more determined, uncertainty in the other increases. Some of Heisenberg's comments on quantum uncertainty have suggested to postmodern theorists that the act of "looking" has an effect on the object under observation. The following is particularly misleading:

The atom of modern physics can only be symbolized by a partial differential equation in an abstract multidimensional space. Only the experiment of an observer forces the atom to indicate a position *All* qualities of the atom of modern physics are derived, it has no *immediate and direct* physical properties at all, i.e., every type of visual conception we might wish to design is, *eo ipso*, faulty.³

Drawing on the philosophy of Johann Gottlieb Fichte, Heisenberg further remarks that "in every act of perception we select one of the infinite number of possibilities and thus we also limit the number of possibilities for the future."⁴

Heisenberg's work and commentary supplied the context in which postmodernists assumed they could argue that reality is "radically indeterminate." Radical indeterminacy is said to exist because the *choice* of what one measures, say position, seems to determine the position while making the velocity indeterminate. And if one measures velocity

³ From a lecture delivered at the Academy of Sciences of Saxony, September 19, 1932. Collected in *Philosophical Problems of Quantum Physics* (Woodbridge, CT: Ox Box Press, 1979), 38.

⁴ *Ibid.*, 28.

instead, this seems to determine the velocity while making the position indeterminate. The observer, then, seems to be able to arbitrarily determine natural processes.⁵

If we take a pragmatic view of the situation we see that these conclusions are a mistake: the Uncertainty Principle only says that position and velocity are conjugate, and that the object with which one measures another object helps to produce the effect that is measured. Effects always involve interaction and relation: things do not have effects as separate stable entities in and of themselves. Nevertheless, the *relationship* is not radically indeterminate, and the object used to measure (or produce an effect with) another object does not have the power to determine that object arbitrarily. In fact, the trade-off in conjugate uncertainties is a determining law. Postmodernists seem to dismiss this pragmatic notion of relative objectivity, that things are known in terms of their relations to other things, in favor of a notion of radical subjectivity, that things are not knowable because the observer's relationship to the thing obscures what it is.

Certain aspects of postmodernism may be understood by contrasting it to pragmatism as I have done. But postmodernism is perhaps more clearly defined against modernist thought, according to which there *is* an objective *static* reality that will forever elude our descriptions of it. The idea that there exists a separate thing-in-itself that is unknowable is reminiscent of mysticism, the assumption being that uncertainty is a veil covering certainty.⁶ Postmodern thought critiques such an interpretation,⁷ suggesting

⁵ According to Mara Beller, Heisenberg's obscure philosophizing makes him responsible for the nonsensical applications of theoretical physics. See Mara Beller, "The Sokal Hoax: At Whom are We Laughing?" *Physics Today* 51 (1998): 29-35.

⁶ See Richard Rorty, "Nineteenth-Century Idealism and Twentieth-Century Textualism," *Consequences of Pragmatism* (Minneapolis: University of Minnesota Press, 1982), 139-160.

⁷ For example, according to Hayden White, the New Critics, representing modernist thought, sought to be objective in their critiques of literature, which "meant to treat the artwork as a thing-

that if the veil could ever be lifted (though it cannot), no separate, stable, definable thing would be there. Hence, the old notion of an external *metaphysical presence*, of a thing-in-itself, is completely exploded. Postmodernism then goes on to suppose that, since there is no presence, no stable origin of meaning to which models of it may refer, all interpretations of "objects" are radically subjective.

Throughout his work, Jacques Derrida has applied this type of analysis of the subject/object dichotomy to what he considers traditional metaphysical reading practices.⁸ First he claims, quite rightly I believe, that metaphysical originary meaning does not exist. But he also supposes that *telos* or the existence of any true meaning depends upon the notion of a metaphysical originary meaning or "center." This, I believe, is an incorrect assumption. Furthermore, he claims that interpretations, because ungrounded, are radically subjective. A number of faulty conclusions follow: The author is not the true source of meaning because it is the observer's interaction with the text that is actually determining the part that seems intelligible and is, at the same time, randomizing the part that seems unintelligible. The author's original intentions are not only unknowable but never existed as such because a clear distinction between a thinker as a subject and an idea as an object cannot be made. Therefore, there can be no originary intention in the author's mind that directly causes meaning. Instead of seeking the author's meaning or intention, the reader is left to construct his or her own narrative (i.e.,

in-itself ... ultimately governed by its own autotelic principles." See Hayden White, "The Absurdist Moment," in *Tropics of Discourse: Essays in Cultural Criticism* (Baltimore: Johns Hopkins University Press, 1978), 274.

⁸ See, for example, *Of Grammatology*, trans. Gayatri Spivak (1967; Baltimore: Johns Hopkins University Press, 1976). Derrida sought to replace essentialism with deconstruction, arguing that a concept does not derive from *telos*, which he equates with a knowable stable reality, *arche*, or ground.

explanation, description) about the text. Accordingly, there are as many legitimate interpretations of a text as there are readers.

Postmodern interpretive practices have carried this argument to the extreme. Every object is considered to be a "text" interpreted or, more precisely, "*written*" by a radically subjective reader. All explanations --scientific, historical, and religious--are subjective narratives with equal degrees of legitimacy.

To summarize then, generally speaking, postmodern theories (e.g., post-structuralism and deconstruction) assert that ontological indeterminacy (the nonexistence of any essentialist or Platonic reality as originary cause) removes the basis for conceiving of a coherent thinking subject driven by ideas as coherent objects and thus also removes the basis for conceiving of human agency and artistic agency. Subsequently, the long-running efforts to remove teleological language from biological and historical discourses,⁹ were extended into the aesthetic discourses.

To put it another way, by the same logic that argues against the existence of an Author of the universe, it is supposed that there is no Author of a work of fiction. Nowadays, cultural theorists try to avoid discussing the function, utility, end, intention, or logical reasons for various aspects of visual, narrative, or poetic language. The most enlightened director, painter, or writer, according to many institutions that now support

⁹ Those who continue to use secular teleological arguments in biology (and history) are following the Kantian notion that *telos* should be used as a heuristic device to understand organic processes. Kant argued that every animal organ (indeed every animal cell) must be understood in terms of its functional relationship to the whole organism. Nevertheless, he warned, teleological explanations are not empirically valid. For an analysis of the use of teleology as it arises in religious narratives see Frank Kermode, *The Sense of an Ending: Studies in the Theory of Fiction* (New York: Oxford University Press, 1966); as it arises in historical narratives see Hayden White, *Metahistory: the Historical Imagination in Nineteenth-century Europe* (Baltimore, Johns Hopkins University Press, 1973), and Dominick LaCapra, "Trauma, Absence, Loss," in *Writing History, Writing Trauma* (Baltimore: Johns Hopkins UP, 2001), 43-85.

the arts, does not pursue a "teleological" final product, but instead attempts to represent "life as process" of ever changing interpretations.¹⁰ Teleological explanations are said to be "linear" and, as such, artistically inferior. It is assumed that *telos* should be expunged from a true work of art, since it would represent an attempt to impose an external, artificial, and subjective principle upon reality.

Such a rejection of teleology shows that contemporary critics are unfamiliar with the practices of teleology. Historically, teleologists have represented their explanations with a reflexive series, parts $\leftrightarrow$ whole $\leftrightarrow$ parts, or a cyclical series, $A \rightarrow B \rightarrow C \rightarrow A$, not by a linear causal chain, $A \rightarrow B \rightarrow C \rightarrow D$. Or, to be more precise, in teleology, A is thought to be one of a number of *indirect* causes of C, but A, as such, cannot exist independently of C because C determines the function of A. Because A is a part of C, it owes its existence to C as the whole. Organisms, for example, are telic in the sense that their individual cells and organs owe their existences to the animal as a functional whole. Many teleologists have thought of *telos* as a product of feedback, not as a cause separate from or in the future of the process it guides. In addition, in most teleological accounts of causation, a telic state C is, in some sense, an inevitable result of the *random* interactions of its parts. The importance of chance in teleological explanations is something that has been generally ignored, if not denied. This is true of the many contemporary arguments against teleology that confuse nonlinear telic causality with linear material causality.

Literary and cultural critics such as Derrida are not the only ones who have given teleology a bad name. Generally speaking, 20th century philosophers of science have tended to misunderstand intentionality this way: an agent does A in order to do B in order

¹⁰ See, for example, the New York State Council for the Arts' year 2000 grant guidelines.

to accomplish the final goal of C, assuming that A and B would not have occurred without the will toward C.¹¹ The problem these philosophers continually run aground on is the idea that *their* conception of C, as a static goal, can never have any real existence, as such, until it is reached. C, as described in these analyses, is just another point in a linear sequence, not something wholly different from what came before. Upon reviewing this literature, I find none makes a valid argument for the *necessity* of nonreductive teleological explanations.¹² Most of these arguments try to "naturalize" teleology by making it conform to classical determinism. They tend to do so without considering the effects of the dynamics, and they tend to conclude that C is the end of a linear, if complicated, sequence of actions that could have been predicted had one had sufficient knowledge of the initial conditions.

In general these philosophers resort to focusing on the way As and Bs are defined as means to an end, C, and they do not properly address the deeper question, *What is the basis for conceiving of intentionality in the first place? Why teleology?*

The question I will examine here is: Can an end state C emerge that *cannot* be reduced to the sum of the states that precede it? And does this emergent property, C, therefore, require that some *internal constraints* be posited to guide the *irreducible*

¹¹ For a broad sample of this literature, see Frederick Adams, "A Goal-State Theory of Function Attributions," *Canadian Journal of Philosophy* 9 (1979): 493-518; C. J. Ducasse, "Explanation, Mechanism and Teleology," *The Journal of Philosophy* 22 (1925): 150-155; Douglas Ehring, "Goal-Directed Processes," *Southwest Philosophical Studies* 9 (1983): 39-47; David Papineau, "Representation and Explanation," *Philosophy of Science* 51 (1984): 550-572; Charles Taylor, *The Explanation of Behavior* (New York: Humanities Press, 1964); William Wimsatt, "Teleology and the Logical Structure of Functional Statements," *Studies in History and Philosophy of Science* 3 (1972): 1-80; Andrew Woodfield, *Teleology* (Cambridge: Cambridge University Press, 1976); and Larry Wright, "Explanation and Teleology," *Philosophy of Science* 39 (1972): 204-218.

¹² The same conclusion, more or less, was reached by Lowell Nissen. See his *Teleological Language in the Life Sciences* (New York: Rowan & Littlefield, 1997).

interactions of all that contribute to C? Posed this way, I avoid psychologizing the problem: I do not ask who does what *for the sake* of what. When I ask the question, Are humans intentional beings? I am asking whether or not humans are capable of emergent (and thus free) organized and directed behavior that cannot be described reductively. My answer is yes. I also argue that, in this limited sense, the natural world is intentional as well. Human intentionality is thus treated as a subcategory of cosmic teleology.

In reconsidering *telos* in terms of emergence, I also avoid the problem of *reverse* cause. (How can the *end* affect the beginning?) In regard to literature, I think an author's meaning and intention are one in the same. Therefore, one cannot come before the other or cause the other. I think causes other than final causes, for example, the effects of interacting As and Bs, help create the ground of possibility for intentional meaning. But that meaning cannot be reduced to the individual properties of those elements.

Intentional meaning in this sense may be somewhat rare: I reserve the term to describe what I consider "art." To an extent, I can agree with Barthes that usually an author is a mere automaton, and the forces of language, culture, and literary convention merely interact in him or her producing various textual effects.¹³ According to Barthes a text is "a multi-dimensional space in which a variety of writings, none of them original, blend and clash. The text is a tissue of quotations drawn from the innumerable centres of culture" (146). I depart from Barthes in my argument that multi-dimensional spaces can be constrained in such a way that they tend to arrive at relatively few end states. I also depart from Barthes in my belief that original writings are possible. Sometimes the normal forces that compel language use can interact in an unexpected way and this

¹³ "Cause" here is used in the sense of *probabilistic necessity*, which I will define in detail below.

creates a new linguistic effect. The recognition or use of this effect *causes* it, or brings it into existence.

To summarize then, C is a whole or an effect that cannot be reduced to the sum of its parts or its antecedents. The whole is meaning could not have been predicted by examining the individual parts in isolation. The whole, in turn, has an effect on the individual parts by providing a changed context. Stated this way, my argument is very like the Kantian argument for teleology in so much as it is nonreductive. However, I do not think of *telos* as a divine force but as an aesthetic force. And when I use the word "force" I am thinking more of American pragmatist philosopher C. S. Peirce's notion of the ordering tendencies of contingencies and iteration (described below) or the way nature processes information than of a "cause" in a palatable sense. Intention *emerges* from such forces.

How is the emergence of *telos* from chaos to be explained? To answer this, I turn to Peirce, as I will do quite often in this work. Peirce seems to me to be an important precursor to those studying nonlinear dynamics today. His theory of self-organization anticipated, to some degree, both quantum mechanics and nonlinear dynamics, but it is expressed without mathematics. Thus, his descriptions of self-organization and emergence of meaning are intuitively accessible. He provided many concrete illustrations to explain his theories, which I will use throughout. I will refer to his position as *indeterminism*, which I contrast to the view of French deconstruction and poststructuralism or *radical indeterminism*.¹⁴

¹⁴ John K. Sheriff makes a similar distinction. He argues that Peirce sees meaning as a fluid phenomenon, but his theory is unlike deconstruction's process of endless deferral, which assumes meaning always remains just beyond understanding. See *The Fate of Meaning: Charles Peirce*.

According to indeterminists, quantum states are supposed to be a matter of *objective chance*, that is, quantum states are not directly determined by past states.¹⁵

Objective chance is not based on the ignorance of the observer; it is inherent in the physical condition. This is opposed to the classical conception of chance, still held by determinists, which arises from incomplete knowledge of the initial state of the system.

In "A Guess at the Riddle" (1887-88), Peirce describes objective chance as chaos that, while "real," cannot be experienced. It is pure potential that has not yet had an effect.

The existence of things exists in their regular behavior. If an atom had no regular attractions and repulsions, if its mass was at one instant nothing, at another a ton, at another a negative quantity, if its motion instead of being continuous, consisted in a series of leaps from one place to another without passing through any intervening places, and if there were no definite relations between its different positions, velocities and directions of displacement, if it were at one time in one place and at another time in a dozen, such a disjointed plurality of phenomena would not make up any existing thing. Not only substances, but events, too, are constituted by regularities. The flow of time, for example, is itself a regularity. The original chaos, therefore, where there was no regularity, was in effect a state of mere indeterminacy, in which nothing existed or really happened. (278)¹⁶

However, within this multi-dimensional and discontinuous reality, continues Peirce's argument, some coincidentally regular patterns may occur, resulting in the "existence of things." Although chaos, by Peirce's definition, is that which is utterly homogeneous in its lack of structure, chaos does not have any rules to govern its behavior or to make it continue to behave in an ideally random (non-repeating) way. Thus, even chaos can produce coincidental regularity, a pattern, or a piece of "primal matter." As soon as

Structuralism, and Literature (Princeton: Princeton University Press, 1989).

¹⁵ See Abner Shimony, "Conceptual Foundations of Quantum Mechanics," *The New Physics*, ed. Paul Davies (Cambridge: Cambridge University Press, 1989), 373-395.

¹⁶ All quotes by Peirce are from *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Indianapolis: Indiana University Press, 1992).

primal matter (also called the *arche*) is put into relationship to chaos or a different kind of primal matter, there is a sense of change, or "polarity," or differentiation. If this polarity is self-reinforcing or persists (through a kind of selection process), it has begun to "take habit." The original chaos has become predictable. This is the effect of *telos*, for the cosmos has begun to spontaneously organize itself. It moves from a state of high entropy to a state in which some structure, differentiation, and heterogeneity exists.¹⁷

Peirce used an analogy with gambling to illustrate how differentiation, structure, and habits could emerge through chance. If we think of indeterminate states as the outcomes of throwing of a single die, a sequence of two throws would more often produce a sum of seven than two. Seven is more common because it can result from a variety of combinations: one and six, six and one, two and five, five and two, three and four, and four and three. Peirce also imagines that through feedback processes nature builds upon the past: thus, his die, like natural process, are not ideal, that is, they would have memory and would tend to repeat what has gone before, further increasing the chance occurrence of sequences totaling seven. In this scenario, over time indeterminacy would result in deterministic probability (habit-taking), which *would be* part of human experience because it would result in regular predictable events, the structure of which we would be able to grasp.

Peirce's nesting of probabilistic determinism within indeterminism is to assert that order can spontaneously arise out of disorder. Unlike the radical indeterminists who focused on the idea that objective chance means that individual events are unpredictable,

¹⁷ Peirce refers to indeterminacy as "Firstness," to primal matter as "Secondness," and to the way primal matter may be grasped as differentiation as "Thirdness." Thirdness may also be described as the "law" that governs "habit taking."

Peirce recognized that the very unpredictability of objective or "absolute chance," as he called it, leads to the most predictable kinds of statistical regularities in time.¹⁸ Although this claim may at first seem counter-intuitive, the logic becomes clear if one considers the kind of systems that exhibit the greatest degree of statistical regularity. For example, although no one can predict exactly when a person will meet his or her end, insurance companies can predict the average age of death with remarkable accuracy. Life expectancy statistics are predictable *because* the individual events that contribute to the average are uncorrelated.¹⁹ We can arrive at a useful macroscopic description only if there is microscopic uncorrelatedness that can be averaged out. If deaths *were* causally connected, that is, if the result of the first death had an effect on the occurrence of the second, and the second on the third and so on, it would be much more difficult to predict the outcomes (one would have to rely on nonlinear analyses). It would be a little more like trying to predict the stock market where earlier trades have an effect on later trades. Similarly, the various states of an atom that has "no regular attractions and repulsions," whose mass may be "at one instant nothing, at another a ton, at another a negative quantity," and whose "motion instead of being continuous, consisted in a series of leaps from one place to another without passing through any intervening places" would be

¹⁸ See "One, Two, Three: Kantian Categories," *ibid.*, 245-279. Peirce's sense of probabilities stems from a long tradition, which is described by Ian Hacking in *The Emergence of Probability: a Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference* (Cambridge: Cambridge University Press, 1975).

¹⁹ Nonlinear effects prevent prediction based solely on statistical mechanics. It may be that quantum mechanical systems also have nonlinear properties, but at the moment these properties, if they exist, are unknown, and probabilistic descriptions (e.g., the *linear* Schrödinger equation) seem to work perfectly well to describe the long-term behavior of quantum mechanical systems. If Peirce's intuitions are correct, absolute chance has no past, and, therefore, the present (primal matter) cannot be correlated to past events. This is how he explains the purely statistical regularities that an "original chaos" would eventually produce.

radically uncorrelated. The average of a large number of atomic states would consequently exhibit strict statistical regularities, as they indeed do.

Beyond the quantum level, events begin to be correlated: the past affects the future. According to Peirce, then, causality at our level of experience is probabilistic. Out of the original chaos emerges *probabilistic necessity*, our physical laws. And as Edward Lorenz demonstrated in 1963, in addition to these physical laws, the way nature processes information also allows for the emergence of *deterministic chaos*.²⁰ Necessity describes predictable processes that appear strictly deterministic because any rare events (like twos in a sequence of throws of a die) in a system are dampened by emergent tendencies. The system's behavior is so regular that any small fluctuations can be ignored without affecting one's ability to predict the future states of the system. Chaotic processes, in contrast, are unpredictable over the long term even though the separate causal states are each determined by the ones that went before. There is predictability in the short term, but rare events within the system are not dampened and may accumulate until they affect distant outcomes.

The chance we experience in particular events is not completely indeterminate: it is affected by past events; it is biased. The necessity we experience is not prespecified because it arises out of quantum fuzziness. If we accept these assumptions, we may disregard the argument that the absence of a deterministic ontic reality, which quantum uncertainties seem to imply, precludes a notion of intentionality, the ability to act in a

²⁰ Peirce did not have a conception of deterministic chaos, which was not well defined until the late 20th century. Thus, he imagined the ultimate fate of the cosmos would be a kind of reverse entropy situation in which everything would be so completely ordered as to be static and unchanging. This argument directly contrasted with the then prevailing view supported by the second law of thermodynamics, which says that entropy always increases.

free *and* directed manner. The pragmatic view of causality allows for plasticity and stability, *original* behavior and *directional* behavior, and it is their combined effects that, I argue, define intentional behavior. These observations, I believe, necessitate a reexamination of contemporary aesthetic proscriptions against so-called teleological art as representing reality in a way that is inconsistent with the findings of quantum mechanics.

Considering both Directionality and Originality

The misinformed prejudice against "teleological art" is unfortunate because teleology is actually a useful and extremely subtle tool for exploring what it means to create something truly new and yet meaningful, a "C," if you will. In particular, teleology has shown that the concept of intentionality is inhabited by two distinct kinds of behavior. The first is associated with *directionality*, or the mechanisms for maintaining order. The second is associated with *originality*, or the discovery of wholly new functions. As I argue in Chapter Two, teleologists, from Aristotle, to Immanuel Kant, to Henri Bergson, have noted that the mechanistic laws of nature seem to develop in a more limited *direction* toward forms with increased functionality than the laws themselves imply. There seems to be an internal force or mechanism that guides development, in biology for example, both in the individual and in species adaptation. This *directional*-internalist theory of change suggests that intrinsic factors drive evolution in predetermined directions.²¹ Teleologists have also noted that nature seems goal directed because it often creates *original* systems that seem to anticipate unpredictable *future*

²¹ See Stephen J. Gould, "Eternal Metaphors of Paleontology," *Patterns of Evolution, as Illustrated by the Fossil Record*, ed. A. Hallam (New York: Elsevier, 1977), 1-26.

needs by reinterpreting old forms for new uses. That is, species seem to be able to plan for the future; they adapt to their environments, often becoming more sophisticated.

In the early 19th century, teleologist Richard Owen conceived of two principles: one, which he considered directional, brings about stability and similarity or "a vegetative repetition of structure"; the other, which he called simply teleological, brings about change and diversity by shaping a system according to its function. He claimed the former is illustrated in the conception of a *groundplan* or *archetype* and in the mathematical symmetry of some organisms and crystals. The latter is illustrated in the conceptions of adaptation and progress. Owen argued that directionality results from a "polarizing force," which produces similarity of forms across species, while originality results from an adaptive "special generalizing force," which produces the diversity of organic forms.

Owen's distinction between directionality and originality is perhaps partially derived from Kant's conceptions of the aesthetic and the teleological judgments, which informed the arguments between transcendental morphologists (for form) and Kantian teleomechanists (for function).²² We will return to this dialogue between formal causality (involving a governing *eidos* as rational principle) and final causality (involving a governing *eidos* as purpose) throughout. It is also noted that Aristotle's notion of final cause cannot be clearly separated from his notion of formal cause. As Aristotle explains,

²² See Richard Owen, *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals* (London: Longman, Brown, Green, and Longmans, 1843). Similarly, C. B. Reichert makes a distinction between "class" and "functional" modifications in the structures of biological organisms. While Reichert could not explain the cause of the former, he argued that the latter occurred in response to the environment. See *Vergleichende Entwicklungsgeschichte des Kopfes der nackten Amphibien* (Königsberg, quarto, 1838).

If then it is both by nature and for an end that ... plants grow leaves for the sake of the fruit ..., it is plain that this kind of cause is operative in things which come to be and are by nature. And since "nature" means two things, the matter and the form, of which the latter is the end, and since all the rest is for the sake of the end, the form must be the cause in the sense of "that for the sake of which."²³

As used here, *formal cause* is the preexisting universal law that determines an object. *Final cause* is the end state ("perfection" to Aristotle) that determines the object. One might also say that final causality consists in the way the whole determines the parts. In this respect, final cause is somewhat conflated with formal cause, in so far as the "end state" may be considered the "universal laws" of structure as a whole (preexisting only abstractly) that, through feedback, determine the parts. This describes the aspect of telic directionality. One might also say, less neutrally, that the ultimate utility or purpose that the end state or whole happens to serve (a purpose other than that of merely maintaining itself as a whole) determines the parts. This describes the aspect of telic originality. Although some teleologists, like Owen, have considered only original changes telic, originality can only occur against a background of directionality.

19th century teleology was mostly concerned to account for the differences and relationships between species. The transcendental morphologists were concerned with structures as such, not with the meaning or purpose of structure. They were interested in directionality, in the neutral interrelations between parts and wholes, in how, for example, the increase in size in one organ might be correlated with a decrease in size in another organ. They believed that the direction of evolution was predetermined by *intrinsic* factors. They argued that there exist archetypes from which the forms of animals are derived. They thought that original (Platonic) forms were varied according to

²³ *Physics* Bk. 2, Pt.8, trans., R. P. Hardie and R. K. (Cambridge: The Internet Classics Archive, 1994-2000).

mathematical laws that govern species differentiation. (They did not consider why change might occur in response to the way a particular structure *functions* in an environment. Thus, they were not, like other teleologists, interested in what I call originality.)

Although the transcendental morphologists' claims were rejected after Darwin, research in phenomena involving directionality has made a recent comeback. Nonlinear dynamics theorists now argue that there *are* relatively few archetypical kinds of behaviors and patterns that result from self-organizing feedback processes. This leads to the appearance in nature of what transcendental morphologist-teleologists have called "variations on a theme." For example, similar classes of chemical reaction-diffusion processes are responsible for stripes on a tiger and stripes on a tiger swallowtail butterfly.²⁴ Similar laws guiding biological development produce "gills" on mammal embryos as well as gills on fish. The idea of variations on a theme is further explored in terms of its use in literature in Chapter Five.

While the transcendental morphologists were primarily interested in similarities between species (how individuals conform to an ideal), other teleologists were interested in the differences between species (why individuals depart from an ideal). These teleologists also considered the role of function in determining the morphological changes in animals. They were interested in the *original* aspect of *telos*, which consists in how an organized whole or neutral pattern (produced by directionality) of one system is *used* by another system to its advantage. The end use determines what the object is in so much as it determines its function. Work in this field was, of course, taken over by Darwinian evolution.

²⁴ See H. Meinhardt, *Models of Biological Pattern Formation* (New York: Academic Press, 1982).

The original aspect is apparent when *extrinsic* factors (e.g., environmental pressures) drive evolution in new directions, which are not predetermined but *are* constrained by available patterns. Patterns that were not formed according to predetermined purposes come to seem intentional after a use is found for them. Spontaneously formed "eye-spots" on a butterfly wing scare off a predator that mistakes them for owl's eyes. This usage by a predator may be considered a form of *interpretation* because it makes the systems being used (i.e., the butterfly's "eye-spots") function in a way that that they could never have functioned on their own.

In both cases, involving directionality or originality, the resulting extremely fortunate function or behavior may seem, in retrospect, predetermined or intentionally designed for an ultimate purpose. In this way, products of nature seem like works of art.

If a work were merely directional, like genre fiction,²⁵ it would be too predictable and conventional to be considered art. If, however, a work were completely original, like a dream, eschewing the use of any (or any known) pre-existing structures, it would be unintelligible. Therefore, art must be both directional and original if it is to be perceived as communicating a new message, having an intention. This may be an obvious statement within the discourse of aesthetic theory, and it should be as obvious within the context of the freewill debate, but it is not. Though the notion of human agency (of behaving in a directed but free manner) should include descriptions of both directional and original behavior, most theories of agency tend to argue for one type of behavior at the expense of the other. This insensitivity to the different aspects of intentionality—directionality and

²⁵ Genres are directional phenomena in so much as they emerge out of the interactions of various writers, all of whom follow their own local rules that they believe define the genre, without a single standardized set of rules to guide them.

originality—is pervasive throughout discussions of teleology. The two distinct aspects of telic behavior that I have identified are frequently collapsed into the single term *telos* and used in a confused manner. It is time, then, to look again at the history of teleological arguments with these two aspects in mind. If we do this, we will find that the field is actually much richer than we ever suspected.

Emergent Narrative

Although Aristotle's *telos* was long ago rejected as a scientific principle, and, more recently, as the postmodernists have argued, the legitimacy of narrative itself has been put into question by the essential disconnectedness in the quantum world, it cannot be denied that out of this supposed indeterminacy there has emerged the narrative of humankind, which, as physicist Paul Davies has gravely remarked, "seems almost contrived."²⁶

Some believe that story-like organization cannot arise spontaneously in a world that is governed by chance and necessity alone. Thus, when lucky accidents occur, they suppose that some other force is at work, limiting or guiding chance and putting the fix in on physical laws to suit purposes. Jacques Monod, in *Chance and Necessity* (1972), claims this is not the case. According to Monod, there is no explanation for the fact that the universe is more organized than seems probable.²⁷ He insists that our existence is simply as lucky as winning a lottery.

²⁶ "The Intelligibility of Nature," *Quantum Cosmology*, ed. Robert John Russell et. al. (Vatican: Vatican Observatory Foundation, 1996), 152.

²⁷ (New York: Knopf, 1972).

In Laws of the Game: How the Principles of Nature Govern Chance (1975).

Manfred Eigen and Ruthild Winkler object to Monod, arguing,

it is not a matter of hitting the jackpot right off.... The competitive behavior inherent in the laws of selection and evolution limited the number of blanks [nonwinning numbers] and prevented the majority of them from even getting into the game in the first place.²⁸

The fact that organization and complexity arise through selection is not as surprising as Monod claims.

Today the goal of structural evolutionary theorists, like that of some 19th century secular morphologist-teleologists, is to elucidate the "principles of organization" that result in the repeated appearance of similar biological structures. They study the energetic, mechanical, morphogenetic constraints that limit the kinds of biological structures that nature can produce. As noted above, like teleologists, the structuralists contend that these constraints result in a relatively small number of structural archetypes considering the multi-dimensional space in which they evolve. Thus, if there were a film version of Earth's evolution that could be rewound and run again, many of the forms we know today would reappear.²⁹ Structural archetypes occur throughout nature, at the microscopic as well as macroscopic level. Also called *structural attractors*, they are sometimes compared to Platonic forms because they exist, as concepts, *prior to* the process of natural selection.³⁰ It turns out that evolutionary forms are not as deeply contingent upon external agents and environmental pressures as Darwinists have argued.

²⁸ (Princeton University Press, 1981), 169.

²⁹ See W. Fontana and L. Buss, "What Would be Conserved if the Tape were Played Twice?" *Proc. Nat. Acad. Sci. USA* 91 (1994), 757-761.

³⁰ Such comparisons can be misleading, since they might imply that a structural attractor has a metaphysical presence. The term "attractor" may also be incorrectly interpreted to mean a pre-existing physical form that draws natural processes toward it. As these concepts find wider applications, it will be important to point out improper uses of teleological language.

The task of the biologist today, then, is to discover which forms are likely to appear. Only then is it worth asking which of them will be selected by environmental conditions.

Monod was wrong about our luck. The odds are stacked in our favor. No teleologist was ever able to discover the mechanisms that result in this telic directionality. But today we know that the nonlinear relationships of elements in dynamical stochastic systems can produce order spontaneously. That is, more order arises than a simple probabilistic calculation would have predicted from the initial and boundary conditions.

Nonlinear dynamics has provided firmer grounding to some elemental mathematical ideas; therefore, it will be useful to clarify some terms before continuing.

The term *stochastic* means random. One might think of molecules in thermal motion, bouncing around in unpredictable ways because their movements are caused either by quantum fluctuations, information flowing into the system from the outside, or by intrinsically generated deterministic chaos. If these molecules bond to each other in different ways, depending on whether or not, say, their shapes are complementary, then their resulting configuration depends on chance. We would say their organization would be the result of a stochastic process. In Chapter Seven, I illustrate how, under certain conditions, even though these processes are random, an overall structured organization can emerge. As a simple example, if a certain four chemicals are poured into a petri dish, they do not, as expected, mix together in the most probabilistic way, according to the second law of thermodynamics, producing a homogenous mix. Instead, they form spiral waves or concentric rings.

Spontaneous means intrinsically caused. Molecules in thermal motion form configurations all on their own without any help from a director or predetermined detailed plan. Spontaneous does not mean uncaused.

These terms can be used to describe other patterns besides those made by molecules in chemical systems. Individuals trading in a stock market, for instance, collectively establish a coherent notion of value. Their individual actions are relatively random because not directly synchronized or organized by a central agency, such as Adam Smith's invisible hand. As anyone who has invested money in the stock market knows, the overall organization of the market cannot be predicted from the initial and boundary conditions. This is due to the nonlinear relations that exist in the system, which make it both unpredictable and typically stable within wide margins. While linear systems can be said to act according to the same rule as they pass from one state to the next, as nonlinear systems pass from one state to the next, they also do so according to rule, but each new state can have attached a different rule. (Linear systems, in some sense, have the same rule attached to each state.) It is due to strong interactions between components that nonlinear stochastic systems can spontaneously self-organize and have the possibility of being adaptive, more plastic, or more robust.

Thus to conclude this section, an emergent narrative may be produced by a nonlinear system, that is, meaningful organization can arise out of stochastic interactions of various elements. Firstly, regarding directionality, the same kind of organization can arise from a number of initial conditions. Thus, one can also expect that various readers with various interests and experiences can arrive at essentially the same meaning of a

text. Secondly, regarding originality, an author's intention can be said to be original in so far as it is emergent, not reducible to the sum of its parts.

What others have identified as telic order is seen here as a relatively objective phenomenon determined by the global effect of local *stochastic* interactions over time within a single system (directionality) or by the way a singular coincidence between two separately evolved systems is interpreted or used by one or the other (originality). The former focuses on the phenomena of *spontaneous* self-organization, the latter on adaptive evolution.³¹ This twofold view of *telos* does not assume emergent order is inevitable or necessarily progressive, but the fact that it appears so *retrospectively* is what defines the telic aspect as such.

Mentalism versus Nonmentalism

Teleology's twin aspects of directionality and originality involve a complex contest between structure and randomness, causality and chance, mechanism and agency. It is not surprising then, that while some argue intentional behavior is compatible only with determinism,³² there are equal numbers who argue that it is only possible if there is some degree of indeterminism.³³ These contradictory views have long since been part of

³¹ I refer not just to biological evolution but to a Peircean notion of evolution which, he believed, produced all the forms, structures, and laws found in nature.

³² For example, Jacques Monod, in *Chance and Necessity*, trans. Austryn Wainhouse, 2nd ed. (New York: Knopf, 1972) and Daniel C. Dennet, in *The Intentional Stance* (Cambridge: MIT Press, 1987) argue that a person's physical state in interaction with the environment determines actions that are theoretically predictable even though complete knowledge of the state and the environment is not practically possible.

³³ For example, in "Will," William James argues that, if our efforts to think are "indeterminate [and] our future acts are ambiguous or unpredestinate [then] in common parlance, *our wills are free*. If the amount of effort be not indeterminate, but be related in a fixed manner to the objects [of thought] themselves, ... and compel from us the exact effort, ... then our wills are not free.

the paradox surrounding the notion of *telos*. The contradictions were unknowingly planted by Aristotle in *Physics* with his argument that *telos* guides events that are *probable*, which for him seems to have meant both morally sensible³⁴ and aesthetically pleasing and, what we would now call, statistically likely. Aristotle's twofold sense of probability contained an unarticulated connection between utility, determinism, and chance that has variously expressed itself over the years. The "sensible" side of *telos* is here associated with originality, willfulness, and the reasons *why* things are the way they are. The "statistically likely" side of *telos* is here associated with directionality, physical necessity, and descriptions of *how* things become the way they are.

There are a number of distinct versions of teleology—each corresponds roughly to a different theory of causality—which I group into five broad categories: Aristotelian, analogical determinism, deterministic fortuity, pragmatism, and self-organization. (There are also the theories of causality associated with mechanistic determinism and radical indeterminacy, which do not have a teleology attached.) I explain these distinctions in detail below. But first, I would like to note that upholders of teleological positions can be parsed into two main schools. Some, which I call the *mentalists*, were concerned with

and all our acts are foreordained." See *Principles of Psychology* (New York: Dover, 1950), 571; C. S. Peirce recognizes both the disordering and ordering tendencies of chance that result in telic behavior. He writes, "Chance is indeterminacy, is freedom. But the action of freedom issues in the strictest rule of law." See "Design and Chance," *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Indianapolis: Indiana University Press, 1992), 222. According to Angus Fletcher, in medieval and Renaissance literature mechanistic behavior is characteristically "demonic," not perceived as free. See *Allegory: Theory of a Symbolic Mode* (Ithaca: Cornell, 1964). Also see Henri Bergson, *Creative Evolution*, trans. Arthur Mitchell (Mineola, New York: Dover Publications, 1998); Karl Popper, *The Open Universe: An Argument for Indeterminacy* (Cambridge: Routledge, 1982), xix; and Ilya Prigogine, *The End of Certainty* (New York: Free Press, 1997).

³⁴ This ancient double sense of "probable" appears in English as well. As late as the 1700s, one might say that one lived in a "probable," in the sense of "respectable," house. See Ian Hacking, *The Emergence of Probability: a Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference* (Cambridge: Cambridge University Press, 1975), 18.

originality; and others, which I call the *nonmentalists*, were concerned with directionality.

³⁵ We may say that the first speaks more to the interests of art, the second to science. We may further say that the mentalists tend to posit an actual extrinsic agent as efficient cause of telic phenomena. The nonmentalists tend to argue *telos* is an intrinsic rational principle, not an efficient cause or a physical agent.

A simple analogy will help to illustrate the distinction between nonmentalism and mentalism. The sequence 3, 6, 9, 12, 15, 18, 21, 24, 27 is governed by a rule. That rule can be discovered by examining the sequence itself: the rule is, each number is increased by 3. This roughly illustrates an inherent principle of organization or rule (which tells one how the sequence might be continued) such as is found in nonmental telic phenomena. I also note that the rule is rational and therefore seems like something produced by intelligence. One might also say the rule is Platonic since the order of in the sequence of numbers multiplied by three exists, as a concept, prior to its expression. The sequence 14, 23, 28, 33, 42, 51, 59, 68, 77, 86 is also governed by a rule, but its rule cannot be discovered by examining the sequence itself: the numbers represent stops on the Lexington Avenue subway line in New York City.³⁶ The rule for this sequence is imposed on the sequence from without.

In the *nonmental* view, teleological phenomena are analogous to, *though categorically different from*, products made intentionally by human artisans. Thinking of telic phenomena in the natural world *as if* they were created by an intentional being or organizing intelligence helps one to understand them as designed objects that have

³⁵ See Mark Bedau, "Against Mentalism in Teleology," *American Philosophical Quarterly* 27 (1990): 61-70.

³⁶ This analogy was adapted from Murray Gell-Mann's example in *The Quark and the Jaguar: Adventures in the Simple and the Complex* (New York: Freeman and Company, 1994).

rational functions. Kant's teleology, for example, distinguished between works of art and organisms. Art implies an extrinsic cause "distinct from the matter, or parts." Organisms "combine of themselves into the unity of a whole." Art is designed. Animals are not. "We only *read* this conception *into* the facts as a guide to judgement."³⁷

In the *mentalist* view, as developed largely by Christian philosophers, such as St. Augustine and St. Thomas Aquinas, everything is caused by the (sometimes strange) logic of divine will. God exists outside of human time. He experiences eternity in an instant, while human beings experience sequential time. Because God is not constrained by time or space, He can make causal connections that do not conform to the physical laws in human existence. This kind of teleology is referred to as mentalism, because telic phenomena are controlled by the thought of an external supernatural agent, an efficient cause. A nonmental version of Christian teleology is also possible if God is considered to be an immanent nonphysical intrinsic force rather than an external agent.

Another kind of *externalized* telic cause needs also be mentioned. Although Kant argued that telic forces were given in the *interactions* of the individual parts of a system, a few of his followers in biology began to look for an actual physical source of the "principle of organization" in a germ cell or a seed. In this view, teleological phenomena are set in motion by a physically well-defined initial condition. A seed unfolds its already determined future. However, this just begs the question of what caused the seed. Again, one would have to posit some external intelligence.

³⁷ *The Critique of Judgement*, trans. J. C. Meredith (Oxford: Clarendon Press, 1980), 53.

Derrida makes a similar mistake in supposing *telos* is *paradoxically* the "very thing within a structure which governs the structure, while escaping structurality" (960).³⁸ Derrida refers to the concept of a "center," which, he claims, may be described "as readily as *arché* as *telos*." This statement shows confusion between efficient cause (an originary *arché* or originary center) and final cause (960). His critique of *telos* as paradoxical stems from an inability to conceive of a final cause that does not have an a priori existence, like a seed. If (directional) *telos* is understood as the *emergent* universal laws governing complex nonlinear processes, the paradox of *telos*, as that which governs the structure without having a preexisting structure itself, disappears. The concept of telic structure does not depend, as Derrida argues, on the existence of "a linked chain of determinations of the center" (960). Quite the opposite. *Telic* structures arise from nonlinear processes.

It may be true that there were a few so-called teleologists who sought a fixed, stable source for the organizing principle, but generally, only those making arguments *against* teleology tend to characterize it this way. Genuine teleology seeks to escape reductive analyses. It seeks, in addition to material causes, evidence for an emergent vital force *immanent* in the process itself. It seeks internal final causes not external efficient causes. As vitalist Bergson writes in 1907, predetermined teleology

implies that things and beings merely realize a programme previously arranged ... As in the mechanistic hypothesis, here again it is supposed that *all is given*. Finalism thus understood is only inverted mechanism.³⁹

³⁸ All quotes by Derrida in this paragraph are from a lecture delivered in 1966, published as "Structure, Sign, and Play in the Discourse of the Human Sciences," trans. Richard Macksey and Eugenio Donato in *The Critical Tradition: Classic Texts and Contemporary Trends*, ed. David H. Richter (Boston: Bedford Book, 1989), 959-971.

³⁹ See *Creative Evolution*, trans. Arthur Mitchell (Mineola, New York: Dover Publications, 1998), 39.

Another example of a predetermined mechanistic form of teleology would be Monod's notion of *telemony*. Monod attributes the telemonic character of all living things to the fact that the structures of molecules allow only one kind of behavior in a particular situation. These powers of "discrimination" result in limiting factors and an orientation toward invariance of molecular behavior and, subsequently, in an organism's ability to maintain homeostasis and produce offspring like itself. Furthermore, in Monod's reductive view of self-determination, a so-called "agent" is compelled to act in a specific way by virtue of its physical constitution. Thus, he sees a type of telic "predetermination" in biological organisms.⁴⁰ However, the power of "choice" that Monod attributes to molecular activities is really no choice at all for the laws of physics, chemistry, and so forth compel the behavior. Monod's agents are essentially automata.

To reiterate then, the weakest kinds of teleologies are those that posit either a metaphysical presence, or an actual physical agent or a physical "seed" that determines telic behavior. This begs the question of what is the cause of the metaphysical presence, the telic agent, or the seed. To explain such things one may feel compelled to posit an *Author or Designer*. Strong teleologies require no further explanation of final cause; it is an emergent phenomenon, given in the interactions of the individual parts of a system. In my opinion, weak teleologies are not true teleologies at all.

Furthermore, it is argued here that the weakest forms of teleology preclude a notion of human agency. Agency cannot exist in a timeless Christian universe where everything has always already occurred. This is the point of difficulty with all religious systems that espouse an omniscient and beneficent god who determines all things from

⁴⁰ See *Chance and Necessity*, trans. Austryn Wainhouse, 2nd ed. (New York: Knopf, 1972).

the outside.⁴¹ Likewise, agency cannot exist in a classical mechanistic universe where every event is essentially the direct result of the sum of what went before. There is no room for a theory of human agency in Monod's model (in which there is a direct relationship between a gene and its product) any more than there would be in the Christian model (in which all is directly determined by God). In a classical determinist universe, presumably, one could predict how an agent would react to new situations, as long as one has sufficient information. In so far as this strong deterministic view holds, actions as well as natural events, then, would be automatic, neither creative nor free.

Opposed to the deterministic model of agency is the equally dubious model of agency based on indeterminacy. The "Action Painters" of the 20th century, for example, believed that an act of will must be freely executed, not inevitably determined by convention, past experiences, or habit, or otherwise compelled by any external cause. But when this view is taken to its logical conclusion by postmodernists, all actions are considered essentially arbitrary and undetermined and do not seem any more telic than completely predictable actions do. Without recourse to an a priori notion of a self, this notion of intentional behavior is shown to be an illusion. The lesson to be learned here is that neither completely determined nor completely undetermined actions constitute intentional behavior.

Radical indeterminism and radical freedom of action seem as opposed to intentionality as physical predeterminism and predetermined action are. What both views

⁴¹ See arguments for and against in, for example, Boethius, *Consolation of Philosophy*, trans. Victor Watts (London: Penguin, 1999); St. Augustine of Hippo, Bk. 5 in *The City of God*, trans. Marcus Dods (New York: Modern Library, 1950); Jean Calvin, *Concerning the Eternal Predestination of God*, trans. J.K.S. Reid (London: James Clarke, 1961); and R. W. Emerson, "Fate" in *Emerson: Essays and Lectures*, ed. Joel Porte (1860; New York: Library of America, 1983), 941-968.

lack is a conception of how probabilistic necessity and deterministic chaos work *together*, providing direction and creativity. Although Monod has argued that "chance *alone* is at the source of every innovation, of all creation in the biosphere" and that predeterminism is transcended when a new mutation, resulting ultimately from "quantum perturbations," allows for adaptability and the apparently progressive nature of evolution,⁴² Monod claims the concept of chance is opposed to the notion of agency. Thus, we may say that his view of agency, which is mainly directional, excludes the possibility of innovation, creativity, and originality.

Science versus Mental Teleology

Because the meaning of agency, on the human or cosmic scale, seems (to most) to require the transcendence of reductive determinism, in the absence of a theory of emergence and spontaneous organization, the task of explaining telic phenomena has been left in the past primarily to artists, spiritualists, and madmen who have credited special genius, gods, or conspiracy, respectively. Aristotle argued vehemently against this move, nevertheless it may also be said that he invited it by basing his definition of the probability of a telic event partly on its reasonableness (as noted above, Aristotle's use of "probable" included the notion of morally sensible), which derives from an analogy with purposeful human behavior. Because his concern with the sensibility of an event fits well with the Christian idea of a divine creator, Aristotle is mostly remembered in western civilization for the analogy he made between *telos* and nature's purpose for creation. (Aristotle probably intended the analogy as merely a heuristic device.) As I

⁴² *Chance and Necessity*, trans. Austryn Wainhouse. 2nd ed. (New York: Knopf, 1972), 112.

show in Chapter Two, ironically, Aristotle's nonmentalistic teleology was colonized by a thoroughly mentalistic one.

In the 17th century, around the time of Francis Bacon, father of empiricism, science and teleology were separated into different discourses. Investigations of agency and originality were left to teleology, but investigations of directionality were reassigned to science. Henceforth, science would describe *how* events occur, physically speaking, while teleology would seek to explain *why* they occur, irrespective of physical conditions. Empirical science would describe, for example, the rules of morphology that give rise to insects that happen to look like leaves or sticks. Teleology would attempt to explain *why* some butterflies look like dead leaves or *why* praying mantises look like twigs: *in order* to help them hide from predators, as if the utility were determined by a creator before selection had the opportunity to act on it.

A distinction similar to that which exists between science and mentalistic teleology exists in literary studies. A scientific brand of literary criticism would describe the historical precedents of the Polonius character in Shakespeare's version of *Hamlet*; whereas teleological criticism would explain why Shakespeare chose a name for the king's counselor (whom Hamlet kills) that sounds like Poland (which Fortinbras conquers), e.g., *in order* to link Hamlet to Fortinbras. The verbal echo seems to mean something. It seems intended to inform us about the way we are supposed to view the hero's actions. There does not appear to be any other reason for it. No critic has found a historical "cause" for the pattern, that is, the country of Poland does not figure into any of the sources for the play, and there is no record of the name "Polonius" before Shakespeare used it. One can suppose that either he contrived this pattern for some

sensible reason or it is an unintended coincidence.⁴³ One can never be certain since patterns formed strictly by chance, divine intervention, and artistry are empirically unpredictable and, as such, appear equally whimsical, enigmatic, or poetic.

As I show in Chapter Three, literary critics have been trained to discover and to interpret pseudo-logical patterns of this kind. When they do so, they might as well be following the old tradition of hermeneutics conventionalized by the early church fathers in their readings of scripture. In the fifth century, St. Augustine saw foreshadowings of Christ all throughout the Old Testament. When Abraham extended his arms in a gesture that happened to resemble a cross, the act was meant, argues St. Augustine in *City of God*, to predict Christ's crucifixion. St. Augustine's God had strong symbolic and poetic leanings.

Christian teleology typically makes God the author of nature's book, whose intention manifests itself acausally through coincidences. Providence can behave predictably, in the sense that everything will work out for the best, but *how* this is supposed to be an inevitable process does not lend itself to empirical description. Retrospectively, we may patch together a sequence of events, but accidental functions can only be described after an effect is produced; they cannot be predicted. Furthermore, this concept of *telos* as an interceding mechanism of Providence is not sufficiently complex since it equates *telos* exclusively with originality and disassociates it from directionality. We may recall that Aristotle had argued that only regular predictable

⁴³ See Victoria N. Alexander, "Polonius and Poland, a Coincidence?" *English Language Notes* 36 (1999), 8-13; and J. Madison Davis and A. Daniel Frankforter, *The Shakespeare Name Dictionary* (New York: Garland, 1995). Davis and Frankforter firmly dismiss any meaningful Polonius-Poland correlation. According to them, Shakespeare often chose names in a "peremptory manner," and the similarity in sound "signifies nothing" (382).

events that occur "always or usually" have purpose;⁴⁴ this excludes accidents and coincidences. Christian teleology, in stark contrast, often argues that especially fortunate or unfortunate accidents are caused by (or at least justified by) *telos* alone. This distortion is also reflected in other contemporary manifestations of *telos*, for example in novelist Thomas Pynchon's understanding of a telic event as "a Hollywood distortion in probability," which might implausibly delay the death of a character *so that* he can make a farewell speech.⁴⁵

In this view, an agent (a writer or God) external to the sphere of action arbitrarily determines events. It would be a mistake to associate this kind of *telos* with linearity, or predictable, proportional cause and effect. Nevertheless, the association is common in contemporary literary theory. In *Ariadne's Thread: Story Lines*, for example, J. Hillis Miller claims a linear narrative "tends to organize itself or to be organized in a causal chain" and follows "inevitable sequence," according to a "*telos, arche, or ground*."⁴⁶ At first blush, Miller's description would seem to be more appropriate for a reductive or mechanistic view of teleology, such as found, for example, in Monod. He, like Derrida, does not distinguish between an originary cause, like the *arche*, and an emergent cause, like *telos*.

Angus Fletcher explains what is meant (or should be meant) by "linear" by critics such as Miller. He notes that history in terms of a story with a well-defined plot involving creation, fall, redemption, and judgment is "somewhat misleadingly called 'linear.'" In this type of teleological narrative,

⁴⁴ *Physics* 2.5, trans. Robin Waterfield (New York: Oxford University Press, 1996), 52.

⁴⁵ *The Crying of Lot 49* (1966; New York: HarperCollins, 1999), 12.

⁴⁶ J. Hillis Miller, *Ariadne's Thread: Stories Lines* (New Haven: Yale University Press, 1992), 18.

[s]eeming chaotic and unrelated events are shown to have a progressive character: history appears to move in a certain direction. Because wandering bulks large in this story, the form of history in this tradition should be called "linear" only with the express understanding that with it the line is not a very straight line. ...

... By showing that the wanderings of the chosen ones are momentarily linked to the all-known but veiled design, the prophet "straightens" the twisting, labyrinthine shapes of profane time. When the children are lost, he unveils his prophetic gift, an inspired sense of direction.⁴⁷

Fletcher shows that there are two different ways of thinking of "linearity" that must be kept distinct. As I further show in Chapter Three, one involves a deterministic chain of events such as is found in the world governed by physical laws. The other involves a linking together of unrelated events and associations in the mind by someone outside the system who is not constrained by space or time.

The Influences of Theories of Causality on Narrative Structures

In addition to the broad categorization I make between mental and nonmental teleologies, a number of subtler distinctions can also be made. Each distinct type of teleology is a function of a different theory of causality. As mentioned above, I group teleologies into five broad categories: Aristotelian, analogical determinism, deterministic fortuity, pragmatism, and self-organization. (I also briefly mention mechanistic determinism and radical indeterminacy, to provide contrasts to teleology.) It will be instructive to revisit these teleological arguments with the distinctions between directionality and originality in mind. Though my portraits of these teleologies may be painted with rather broad strokes, my intention is to bring out their differences with respect to their stances on directionality and originality, nonmentalism and mentalism.

⁴⁷ *The Prophetic Moment: An Essay on Spenser* (Chicago: University of Chicago Press, 1971), 41-42.

Though I give them below in an apparently chronological order, some may exist, in one form or another, throughout history. Sometimes the worldview describes the common one, sometimes the one held by an intellectual elite.

The doctrine of creation *ex nihilo* is, like *telos*, also associated with Aristotle, and he developed this concept as a way of avoiding the problem of having to provide causal explanations that infinitely regress. In *Metaphysics*, he argues the universe began with a First Cause, which, as Waterfield has noted, may be considered a pure form of telic originality or motivation and does not require a further explanation in the way that material and efficient causes do.⁴⁸ With the exception of this metaphysical digression, Aristotle confines himself to a more or less organic-telemonic description of final cause that I have described above as nonmentalism. Aristotle's nonmentalism is further explored in Chapter Three.

According to the teleology of what I call in Chapter Four *analogical determinism*, the universe also has a supernatural beginning in time. Analogical determinism contrasts sharply with Aristotelian teleology in that, from that point on, all matter and all events can be related in a fashion that transcends space and time. Events are not connected by physical causal chains so much as through resemblances.

In this view, things are the way they are because of their ultimate ends; therefore, in a sense, the future determines the past. This makes perfect sense if there is a supernatural being controlling events who exists beyond time. Analogical determinism is distinguished from predeterminism, since time is irrelevant to a creator who experiences the past, present, and future all at once. (It is also important to remember this distinction

⁴⁸ See Robin Waterfield, trans. *Physics* by Aristotle (New York: Oxford University Press, 1996), ix.

with regard to telic order in a fictional world, which is also created by an author outside of the narrative time.) In this supernatural view of *telos*, the reasons for events are the primary consideration. Only as a secondary consequence of final cause are events related materially or mechanically in a continuous fashion in space and time.

Although there is supposed to be no such thing as chance in this view, human beings, existing within time, have little power to make predictions⁴⁹ because utility-determined events do not necessarily follow from physical laws. They are determined by divine mind. One can only recognize the reasons for events after the fact. An empiricist who has complete knowledge of the example of Abraham's attempted sacrifice of Isaac is powerless to predict that God would sacrifice his own son. However, this is exactly the kind of causality that exists in a universe determined by analogies. Only prophets and literary critics are in the position to read events this way. Ordinary folk generally recognize the prophetic purposes of events after the fact. Interpreting "chance" events, then, becomes a way of discovering divine intention.

If *mechanical determinism* includes a notion of divinity it is associated with orderliness and is equated with physical laws, which simply are out of necessity, and are not accounted for by utility. Utility is more or less a convenient (if not divine) side effect. There is, arguably, no place for telic originality in this view. In a mechanically determined universe, all matter acts in a physically continuous series, and each event is entirely predictable. As in an analogically determined universe, time is here again irrelevant since the future is already given in the present, and the appearance of chance events is due to lack of knowledge of causal factors. The defining moment for this

⁴⁹ See Boethius, *Consolation of Philosophy*, trans. V. E. Watts (New York: Penguin, 1969) and St. Augustine, *Confessions* (New York: Oxford University Press, 1992).

philosophy came when Pierre-Simon Laplace asserted that any one who had knowledge of the forces in nature and position of every thing in the universe could predict all future behavior.⁵⁰

However, if everything is determined, sequential, continuous, and predictable, one is faced with the impossibility of explaining, scientifically, how everything began in the first place. Such a unique event that, unlike all that follow, has no "before" and is inexplicable in terms of classical determinism, which says that every effect has a cause. The origin of the universe would have to be explained by a singularity or a miracle (which both defy the laws of classical physics). Or it might be supposed that the universe has always existed and always will. None of these explanations is particularly satisfying. Therefore, *telos* has been brought into the mechanical deterministic view to explain the very beginning (as Aristotle had found it necessary to do), if nothing else. Proponents of material determinism would include Isaac Newton, many of the 18th century *philosophes*, and even Albert Einstein, whose theory of relativity leads up to the edge of classical determinism.

Analogical determinism and mechanical determinism are two extreme theories of causality, and, in the literary domain, they can be associated with poetic and realistic fiction, respectively. If a narrator represents an analogical deterministic view, verbal coincidences and other poetic resemblances may provide the key to understanding the meaning of events. In a narrative written within a material deterministic view, in contrast, the plot will tend to be motivated by physical causality and will be perfectly linear, in the sense that each event will follow inevitably from the last.

⁵⁰ See Pierre-Simon Laplace, *Philosophical Essay on Probabilities*, trans. Andrew Dale (1825; reprint, New York: Springer-Verlag, 1995).

The various philosophies that I group in Chapter Five under the term *deterministic fortuity* accept the tenants of material determinism, but have used the concept of fortuity to argue for human, or even cosmic, agency. Fortuity involves the coming together of *unrelated* factors that together result in a particular state. For instance, various genetic *and* environmental factors determine one's height. *Telos* is what actively and continuously causes the various factors to be present in the right proportions so that the correct state, say five foot two inches, will result.

According to a postmodern representation, the *telos* of deterministic fortuity may be compared to the running of a computer program. In this extreme version of deterministic fortuity, the common cause of two coincidental events, the genetic sequence for femur length and a diet containing a certain amount of calcium, would be *physically inscribed* in the initial conditions of the universe, but the separate causal chains (ending in a particular gene and a particular diet) that ultimately converge to produce a specific height would have unfolded according to a finely-tuned plan. Though the "decision" at each fork along the way (1 or 0) might involve some degree of chance, the odds are actually biased in favor of the design of the original program, which has the inevitable ending encoded in the beginning. Narratives written under this paradigm would *not* make use of magical coincidences, as in analogical deterministic narratives. However, predetermined coincidences, synchronized according a prespecified design, would be used to further the action. In retrospect, once all the necessary information had been revealed, one would be able to decipher the end in the beginning. Unlike in the analogical deterministic narrative however, the causal chains here would be caused by

describable physical constraints. In general, many Victorian novels follow this scheme, in so much as they are more empirical than analogical.

The ideas behind deterministic fortuity may be traced back to Kant, although the computer program metaphor falls short of his conception of teleology, for he would *not* have accepted the idea of an actual physically inscribed program as initial cause. Instead, he imagined that limiting principles, inherent in ongoing natural processes themselves, guided events. According to Alicia Juarrero Roqué, "Kant's emphasis on recursive causality, wherein the parts are both cause and effect, precludes the existence of a preexisting whole" (113).⁵¹ And as Ernst Cassirer explains, the Kantian whole is "contained in them [the parts] as a guiding principle."⁵² In Kant *telos* is emergent, given in the interactions between parts and the whole.

It was the fact that fortuitous events can collectively result in the existence of sentient beings, the artistry of nature, and the apparently progressive character of history that seemed to Kant to require a guiding force. As he writes,

...it may be held that from an Epicurean concourse of causes in action it is to be expected that the States, like little particles of matter, will try by their fortuitous conjunctions all sorts of formations, which will be again destroyed by new collisions, till at last some one constitution will by chance succeed in preserving itself in its proper form,—a lucky accident which will hardly ever come about!"⁵³

Teleologists who believe in deterministic fortuity usually do not believe that God is supposed to exist beyond time, external to the human world. Instead, a nonphysical cosmic intention is believed to be immanent in physical events themselves. The role of

⁵¹ "Self-organization: Kant's Concept of Teleology and Modern Chemistry," *The Review of Metaphysics* 39 (September 1985): 107-135.

⁵² *Kant's Life and Thought*, trans. James Haden (New Haven: Yale University Press, 1981), 335.

⁵³ "Idea of a Universal History from a Cosmopolitan Point of View," *Theories of History*, ed. Patrick Gardiner (Glencoe: Free Press, 1959), 29.

telos is to balance the odds; its medium is statistics. Proponents of variations of deterministic fortuity would include, in addition to Kant,⁵⁴ Charles Bell,⁵⁵ William Paley,⁵⁶ Ralph Waldo Emerson,⁵⁷ and, with certain qualifications, Karl Marx.⁵⁸

As I show in Chapter Six, a teleology based on *pragmatism* characterizes the period of modernism in literature. Teleology in this view inherits most aspects of the 19th century deterministic fortuity version, sketched above; however, it is changed somewhat by the fact that positivism had started to give way to probabilism.⁵⁹ The new century began with the introduction of quantum mechanics. The notion of *telos* as consisting in the order and arrangement of the original configuration of well-defined particulate matter was no longer tenable. Thus, *telos* and selfhood could not be exactly prespecified and had to be reconceived as the *emergent* products of contextualized interactions.⁶⁰ Early pragmatism offered a way of making sense of the way matter now appeared to be

⁵⁴ See *Critique of Judgement*, trans. J.H. Bernard. (1790; reprint, New York: Hafner Press, 1951).

⁵⁵ See *The Hand: its Mechanism and Vital Endowments, as Evincing Design and Illustrating the Power, Wisdom, and Goodness of God* (London: G. Bell & Sons, 1877).

⁵⁶ See *Natural Theology: Or Evidences of the Existence and Attributes of the Deity Collected from the Appearance of Nature* (1802; London, C. Knight & Co., 1845).

⁵⁷ See "Experience" and "Fate," in *Emerson: Essays and Lectures*, ed. Joel Porte (1844; New York: Library of America, 1983), 469-492 and 941-968.

⁵⁸ See "The Materialist Conception of History," in *Theories of History*, ed. Patrick Gardiner (1840s; reprint, Glencoe: Free Press, 1959).

⁵⁹ See Paul Jerome Croce, *Science and Religion in the Era of William James: The Eclipse of Certainty 1820-1880* (Chapel Hill: University of North Carolina Press, 1995). Positivists believed that as more and more data is collected, uncertainty diminishes, and they hoped that objective truth was at least theoretically knowable.

⁶⁰ See William James, *Pragmatism* (New York: Longmans, Green, and Co., 1907).

"Conceptions, 'kinds,' are teleological instruments. No abstract concept can be a valid substitute for a concrete reality except with reference to a particular interest in the conceiver" (24). "The theory of evolution is beginning to do very good service by its reduction of all mentality to the [practical] type of reflex action. ... In the lower forms of life no one will pretend that cognition is anything more than a guide to appropriate action. ... We are acquainted with a thing as soon as we have learned how to behave towards it, or how to meet the behaviour which we expect from it. Up to that point it is still 'strange' to us" (24-35).

information defined by use or by the effect produced from interactions with other matter. In doing so, pragmatism modified Aristotle's original teleological argument that what a thing is and its function are one.⁶¹ But the help this philosophy offered was misunderstood. The interpretation of information does not imply a conscious interpreter, any more than natural selection implies a conscious selector; however, pragmatism was subsumed by the postmodern notion of radical subjectivity. The idea of the effective "observer" began to haunt science.

Although one should resist the impulse to personify nature, it is true that, in some sense, nature does perform simple kinds of interpretations. For example, an inanimate system can react to another system following the rule, if A then B: if water temperature goes below 32°F, then water freezes. Such outcomes are usually well defined and predictable. However, a situation may arise in which one system sees an 'A' in another system that is not an 'A' in the usual sense but only coincidentally functions as an 'A.' For example, a few mutations can result in a butterfly that looks almost exactly like a dead leaf from a certain angle. (It is apparently not a gradual adaptation shaped by selection, but simply the sudden result of a very lucky mutation.)⁶² Would-be predators pass the dead-leaf butterfly by because they interpret it according to the rule: if it looks like a leaf, then do not try to eat it. Such outcomes are *not* well defined and predictable. Nevertheless, these kinds of misinterpretations can have a significant effect on the direction of evolution by causing a new useful mutation to proliferate.

⁶¹ *Physics* 2, Robin Waterfield, trans. (New York: Oxford University Press, 1996), 49.

⁶² See F. Söffert, "Zur vergleichende Analyse der Schmetterlingszeichnung," *Biologisches Zentralblatt* 47 (1927): 385-413, and Victoria N. Alexander, "Neutral Evolution and Aesthetics: Vladimir Nabokov and Insect Mimicry," *Working Papers Series* 01-10-057 (Santa Fe: Santa Fe Institute, 2001).

A coincidental resemblance between a butterfly and a dead leaf might be called a *stochastic resonance*, an important concept in literary modernism⁶³ as well as in numerous areas of contemporary science. An illustration will help clarify the concept of stochastic resonance. Someone several feet away from you on a crowded street is saying, "Hey, you in the blue shirt. Stop." However, you cannot quite hear the entire sentence, so it just sounds like noise to you. Someone nearer to you coincidentally says (to someone else) the words "blue shirt" at exactly the right moment, completing the other, partially inaudible sentence, thereby making it intelligible. You stop and avoid stepping in front of a speeding car.

Sometimes a coincidental pattern or a side effect is found to be useful in a given context. Many elements in these late 20th Century ideas can be traced through Peirce,⁶⁴ William James,⁶⁵ and Bergson,⁶⁶ whose philosophies derive from evolutionary theory, generalizing it and making it applicable to all domains, not just the biological domain. Narratives written under this paradigm would include the notion that the use (or misinterpretation) of noise or error can lead to the creation of what had not existed before and, as I hope to show in Chapter Six, even what *could not* have existed before.

Intentionality, according to a teleology that incorporates pragmatism, is not innate in the thinker, as Kant would have it, but, rather, the ability to think freely is an evolved "gift," as it were, compliments of the thinker's dynamic situation. In this view of agency, making an interpretation may not be the result of conscious choice. The opportunity to

⁶³ See Wai Chee Dimock, "A Theory of Resonance," *PMLA* 10 (1997): 1046-59.

⁶⁴ See *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1, (Indianapolis: Indiana University Press, 1992).

⁶⁵ See *Principles of Psychology* (New York: Dover, 1950).

⁶⁶ See *Creative Evolution*, trans. Arthur Mitchell (Mineola, New York: Dover Publications, 1998).

(mis)perceive a pattern according to a particular frame is merely due to the fact that, as neural biologist Jean-Pierre Changeux notes, the brain is constantly and randomly switching and evolving frames. The instance of the brain resting in one particular frame and therein-determining action does not require any special cause or explanation.⁶⁷ Such actions are not realizations of predetermined goals. Nevertheless, over time there may emerge an identifiable tendency to choose that gives meaning to the notion of a teleological self. Because mind and intentionality are emergent phenomena here, there is no need to search for an underlying efficient or material cause of a final cause.

Not all modernist writers fit this description. For instance, I would be inclined to associate James Joyce's *Ulysses* (1922) with the teleology of analogical determinism. Puns and analogies are important to the structure of Joyce's work, but the analogies have to be made by the reader who is *outside* the narrative system. As Vladimir Nabokov has noted, the main protagonists in *Ulysses*, Stephen and Bloom, have similar dreams (vaguely involving Bloom's wife figured as a prostitute and a man—presumably Bloom—acting as her pimp). The coincidentally similar dreams make it seem *to the reader* as if Stephen and Bloom are destined to meet the following evening so that Bloom

⁶⁷ See Jean-Pierre Changeux, *Neuronal Man*, trans. Laurence Garey (Princeton: Princeton University Press, 1997). Changeux explains that electrical impulses in the brain spontaneously generate regular oscillatory behavior. That is, neurons switch on and off in accordance to their own internal states. Even though individual neurons may be switching on and off in a manner that is not directly correlated with the entire collection of neurons, a dynamically stable condition, call it consciousness, can emerge. In order to maintain this consciousness—an ability to frame things, an ability to note difference between structure and randomness—the organism need only maintain this dynamical stability. This might also be described as a form of homeostasis, which is to be out of equilibrium (having a measure of entropy that is more ordered than its environment) but in a stable state. An organism in homeostasis is a *dissipative structure*: nonlinear relationships exist between forces and flux, maintaining a "feedback" coupling.

can facilitate a relationship between Stephen and Mrs. Bloom.⁶⁸ Stephen and Bloom are never aware of the fact that they had similar dreams. Therefore, the fact that the dreams seem to come true cannot be attributed to the characters' own beliefs in the supernatural significance of a stochastic resonance between their two dreams. The separate, simultaneous dreams cannot be causally connected in a physical sense (i.e., there is no physical transmission of dream messages). They can only be meaningfully related to each other by some omniscient intelligence whose experience of cause and effect does not have to respect the narrative's linear time or physical constraints. Thus, the dreams seem prophetic of the intentions of an author external to the sphere of narrative action.

In contrast, when Henry James, whom I do categorize as a pragmatist, uses coincidences to structure his narratives, he makes the characters, rather than the reader, perform the interpretations, or make use of the coincidental similarities. In *The Golden Bowl* (1909), for example, a Prince and his lover visit an antique shop in order to buy the Prince's fiancé a wedding gift. They consider buying a gilded bowl that has a hidden fault but do not. Years later, the Princess happens to walk into the same shop and buys the bowl herself. The antique dealer remembers the Prince and his lover and tells the Princess. She is struck by the coincidence that she and the Prince both visited the same shop and looked at the same bowl, thinking it appears almost contrived by Someone who wants her to find out about the Prince's secret lover. Such overvaluing of coincidence leads her to see the cracked bowl as a prophetic symbol of the Prince's infidelity, of an apparently perfect marriage that is actually severely flawed. In James, it is a character who invests a coincidence with meaning. This act, in turn, affects future actions and

⁶⁸ See Vladimir Nabokov, "James Joyce: *Ulysses*," *Lectures on Literature*, ed. Fredson Bowers (Ithaca: Cornell University Press, 1982), 285-370.

guides the plot. In this case, the coincidental event seems, to the Princess, *as if* it were intended by a meta-author.

To paraphrase William James, in this view subjectivism affects destiny. Pragmatism's argument for intentionality does not depend upon a notion of predetermined meaning. Instead, an emergent tendency arises in time.

Radical indeterminacy is a hallmark of postmodernism. It either disposes of the idea of agency altogether or thoroughly embraces radical subjectivity. All teleological order is seen as a form of hallucination, given the essential discontinuity between individual quantum states. In this, I believe mistaken, interpretation of the significance of objective chance, unpredictability does not result in a sense of freedom and agency but in a sense of a lack of control; consequently, postmodernism takes on a negative tone similar to fatalism.

It is debatable whether or not there are any real practitioners or proponents of this particularly extreme worldview. For the most part, it seems to be a pose both assumed and tacitly questioned by postmodern artists and writers. Thomas Pynchon is an author whose attitude toward *telos* is tentative. Oedipa, his heroine in *The Crying of Lot 49* (1966), notices some strange coincidences (misprints on postage stamps and trashcans that look like mailboxes) and begins to suspect the existence of an alternative postal system called WASTE. Although WASTE appears to be run by a mysterious supernatural organization called Tristero, it is actually an anarchic group. It has no central directing agency. Oedipa's belief in the existence of Tristero is based on some dubious analogies. Thus, it appears to be an imagined intentional force of evil. Often the belief in *telos* is shown to be a form of paranoia in the postmodern novel.

All the above teleologies tend to be concerned exclusively with either originality or directionality but not both. *Analogical determinism* posits an unpredictable type of *telos*, resulting mainly in originality. Every discovery of a new function is a singular event because it is determined, miraculously, by an agent outside the system.

Deterministic fortuity is concerned only with directionality or intrinsic *telos* that arises probabilistically within a universe that is conceived as a single system. Apparently self-directed phenomena in this view consist in the sum of the interactions of the individual parts within the system *plus* the biases imposed by the initial design. *Pragmatism* provides a natural explanation for the aspect of telic originality by showing how inanimate nature performs simple kinds of computation. Pragmatism also shows how interpretations of stochastic resonances are sources of originality and can over time result in more complex patterns. *Radical indeterminacy* supposes that all teleologies are analogically determined; it rejects the notion of originality as well as directionality. And finally, the yet-to-be-discussed teleology associated with *spontaneous organization* deals with the notion of directionality.

I noted at the beginning of this section that all teleologies are interested in the *end* as cause, and they were developed because absolute *beginnings* are impossible to define in purely reductive terms: every effect requires a cause. It is not surprising then that the theory of spontaneous organization has been applied in quantum cosmology. According to Stephen Hawking,

small departures from uniform density in the early universe ... caused the formation first of galaxies, then of stars, and finally of us. The uncertainty principle implies that the early universe cannot have been completely uniform because there must have been some uncertainties or fluctuations in the positions and velocities of the particles. ... the universe must in fact have started off with just the minimum possible nonuniformity allowed by the uncertainty principle.

The universe would have then undergone a period of rapid expansion, as in the [chaotic] inflationary models [due mainly to Linde]. During this period, the initial nonuniformities would have been amplified until they were big enough to explain the origin of the structures we observe around us.⁶⁹

In a Peircean manner, this theory disposes of the need to find an explanation for final cause: order arises naturally out of disorder. From that point on, probabilistic necessity and deterministic chaos create the order and diversity that we find in the natural world.

Reflecting on the relevance of spontaneous organization in the biological sciences, Keller notes,

What was appealing about this view was that it offered a way out of the infinite regress into which thinking about the development of biological structure so often falls. That is, it did not presuppose the existence of a prior pattern, or difference [in the sense of structure or nonhomogeneity], out of which the observed structure could form. Instead, it offered a mechanism for self-organization in which structure could emerge spontaneously from homogeneity.⁷⁰

Notably there is no original "seed" in the first instant that causes patterns to unfold.

Likewise there is no central pacemaker or director controlling the timing of events. In this view, the future is not entirely predictable; nevertheless, order does emerge naturalistically, that is, in conformance to universal laws guiding nonlinear processes.

Some believe that there are special philosophical implications in the fact that interactions of local stochastic processes can result in a relatively objective principle of

⁶⁹ See *A Brief History of Time: From the Big Bang to Black Holes* (New York: Bantam Books, 1988), 114. In subtle contrast to Hawking, nonlinear dynamics theorists tend to stress that, independent of whether or not the universe began in a completely uniform state, something (functions and context) unaccounted for in the measure of the energy in the universe is later *generated* by the dynamics.

⁷⁰ Evelyn Fox Keller, "The Force of the Pacemaker Conception: Theories of Aggregation in Cellular Slime Mold," *Reflections on Gender and Science* (New Haven: Yale UP, 1985), 150-151.

organization or overall "wholeness" that is not inscribed in the initial conditions.⁷¹ That wholeness, in turn, appears to determine, to some extent, the parts, as if the *end* (which we should actually think of as merely the context in which the parts behave) could determine the beginning. Such observations quite clearly do recall the concerns of the Kantian teleomechanists.⁷² As historian of science Timothy Lenoir describes their project, they sought to investigate how a

functional whole gets assembled and why it is organized in one way rather than another ... [They believed] the whole determines the organization of the parts, [but] in so doing it never violates physical laws. On the contrary, the very existence of the [whole system] depends on the most efficient organization of the parts. The end ... determines organization ... by establishing the parameters of possible physical solutions.⁷³

Roqué was the first to compare "Kant's views on teleology as self-organization and the concepts he associates with it (such as non-linear causality and evolution)" with late 20th century complexity sciences.⁷⁴ The similarities in objectives of the teleomechanists and those studying self-organization might easily allow some backsliding into old-fashioned Kantian teleology. But Roqué notes, in contrast to Kantian thought, it is now supposed that the discovery of self-organized wholes or structural archetypes does not authorize the

⁷¹ See Grégoire Nicolis and Ilya Prigogine, *Exploring Complexity* (New York: Freeman, 1989).

⁷² The leaders in teleomechanism were Karl Ernst von Baer and Johannes Müller. Their most successful students were Carl Bergmann and Lotze Leuchart, whose *Übersicht des Tierreichs* was published in 1852. The teleomechanists are to be distinguished from the Romantic natural philosophers. Étienne Geoffroy Saint-Hilaire in France and Friedrich Schelling in Germany led the Romantics in transcendental morphology, which relied on mathematical mysticism and sharply contrasted with teleomechanists, who investigated how forces, interrelated processes, and pattern formation contributed to the formation of animal types. See Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth Century German Biology* (Chicago: University of Chicago Press, 1989), 147.

⁷³ *Ibid.*, 179.

⁷⁴ "Self-organization: Kant's Concept of Teleology and Modern Chemistry," *The Review of Metaphysics* 39 (September 1985): 107-135.

reflective judgment any more than it does the *determinate judgment* (Kant's terms) to posit a supernatural agent who has preconceived the archetypes or the end states.

In the last chapter I revisit Thomas Pynchon's *The Crying of Lot 49* with *all* of these kinds of teleology in mind. Once we have learned to distinguish between the different ways of thinking about teleological order, we find that Pynchon too is questioning each kind in turn. It may also be the case that he was aware of C. S. Peirce's theory of self-organization and uses it in the novel to interrogate a purely mechanistic reductive view of causality.

Ontological Emergence

These days numerous areas of science—including physics, evolutionary and molecular biology, neuroscience and computation-based mind sciences—are interested to know how an organizing "self" *emerges* out of random interactions of individual parts of a system. Examples from the life sciences include: 1. Flocks of bird seem to fly in formation and change direction simultaneously, even though there is no one leader in the flock nor any kind of instantaneous communication among the entire flock. 2. Individual free-roaming slime-mold cells will suddenly aggregate when food resources are scarce, forming concentric rings, and initiating collective behavior that one might call social: some cells pile up forming stalks and die *for the sake of* others on the top of the stalks that eventually release spores *in order to* start a new population. 3. Many genetically unrelated species appear to have been formed according to the same general ground plan: for example, many species of mammals have four limbs and their major organs have relatively similar distribution schemes, even though they *do not* share a common

ancestor. Each of these three examples involves phenomena that appear to be guided by an outside observer who has a global view of the situation or who can anticipate the future. Yet no such central agency exists. The behavior that appears at some level to be organized is determined at a lower level by the individual birds, free-roaming cells, or separate species, which are not capable of knowing they are part of an organized group, part of a geometric pattern, or a variation on a theme.

As I argue in Chapter Seven, it is not an observer, like Pynchon's Oedipa, who, having some pre-existing notion of pattern, projects her understanding onto the system. Theoretical physicist James P. Crutchfield claims it is possible to analyze organized wholes quantitatively rather than qualitatively. Crutchfield was one of the original investigators of deterministic chaos some twenty years ago, and he has now begun to formulate the first theory of pattern discovery and emergence. Instead of interpreting a *data* stream according to a given model, Crutchfield suggests that scientists might look at a *model* stream. The regularities found in the way a model improves with learning can become the basis of conceiving universal laws regulating how complexity arises from the interplay of disorder and order.⁷⁵ In this way, emergence of an organized or organizing self is defined by the process itself not an observer.

Although the study of "emergence" has had much critical attention in science and philosophy in the last decade or so, most cases have not gone beyond epistemological emergence.⁷⁶ Epistemological emergence is based on the fact that it appears to be

⁷⁵ See "Is Anything Ever New? Considering Emergence," in *Integrated Themes, Santa Fe Institute Studies in the Sciences of Complexity XIX* (Addison-Wesley: Reading MA, 1994), 479-497.

⁷⁶ For example, R. Penrose and S. Hameroff, "What 'Gaps'?" *Journal of Consciousness Studies* 2 (1996): 98-111; A. Scott *Stairway to Mind* (New York: Copernicus, 1995); and J. Searle *The*

impossible to understand the "global" behavior of a complex system by analyzing the "local" behavior of the individual parts. Thus, complexity scientists study and compare the qualitative behaviors of different dynamical systems.⁷⁷ The qualitative approach, I argue, is not essentially different from the nonreductive approach of teleologists who also argued that qualitative assessments were both unavoidable and informative. *Ontological* emergence requires a *quantitative* definition of emergent properties.

This is not to say that literary critics ought to begin building computational models of literary texts. What Crutchfield's theory of ontological emergence does provide is a strong objection to those that argue *any* kind of emergence is an impossibility. Such claims have been the basis of deconstructive and poststructural critiques of authorial intentionality. Crutchfield's work will be further explored in Chapters Two and Six.

An Argument for an Emergent Author

When Barthes entitled his critique of intentionality, "The Death of the Author," after Friedrich Nietzsche's "The Death of God," he suggested that a metaphysical presence, such as God, is analogous to the historical presence of an author. There may be good reason to reject the notion of an external Author of the cosmos. But the same objection would not apply to an actual human author who *is* outside of narrative time and *can* manipulate events so that they satisfy his or her desires.

Darwinian evolutionary theory, quantum uncertainties, and deterministic chaos may have been blows to religion and inspired "chance-operational art," discontinuous

Rediscovery of the Mind (Cambridge: MIT Press, 1992).

⁷⁷ Michael Silberstein and John McGeever, "The Search for Ontological Emergence," *Philosophical Quarterly* 49 (1999): 182-200.

"non-narratives," and "radically indeterminate" poetry, but the fact of an a priori indeterminacy in the quantum world would not prevent the emergence of *telos* at the macroscopic, human level. Neither objective chance nor deterministic chaos falsifies the notion of agency. In fact, just the opposite may be true. In the seminal essay "Chaos," nonlinear dynamics theorists have offered a model for what is "perceived to be the exercise of will" in the orderly way microscopic fluctuations are brought up to macroscopic expression.⁷⁸ Taking their cue from nonlinear dynamics, many cognitive scientists today equate intentionality and original creativity with the local structuring of random changes, which is to say intentionality manifests itself (at least in part) in the peculiar and dynamically stable way a person recognizes and uses patterns in otherwise noisy information.⁷⁹ The stability of a self results *because* neurochemical changes and changes in neuro-configurations are continuous. This is referred to as *dynamical autonomy*⁸⁰ and is aligned with ideas about order as arising out of disorder that are necessarily part of a post-evolutionary, post-quantum mechanical understanding of natural processes.

According to Derrida, traditional metaphysics argues that one's identity is coherent and without internal difference. Derrida argues that all natural categories and concepts of identity and meaning are in reality constructed by language, and these

⁷⁸ James P. Crutchfield, J. Doyne Farmer, Norman Packard, and Robert Shaw, "Chaos," *Scientific American* 255 (1986): 46-57.

⁷⁹ See Margaret Boden, "What is Creativity?" and David N. Perkins, "Creativity: Beyond the Darwinian Paradigm" in *The Dimensions of Creativity*, ed. Margaret Boden (Cambridge: MIT Press, 1996), 75-117; and James W. Garson, "Cognition Poised at the Edge of Chaos: A Complex Alternative to a Symbolic Mind," *Philosophical Psychology* 9 (1996), 301-321.

⁸⁰ See W. Wimsatt, "The Ontology of Complex Systems," *Canadian Journal of Philosophy* 20 (1995): 564-590.

linguistic conventions conceal differences within the presumably identical entities.⁸¹ My argument that *telos* is emergent and *dynamically stable* (i.e., resulting from stochastic interactions), avoids the pitfalls of traditional metaphysics as described by Derrida without succumbing to a notion of radical subjectivity.

Derrida argues that a reader, as an observer of a text, cannot but affect the meaning of the text. The author's meaning remains unknowable. I argue that if reader and text interact, after some period of time, the reader's interpretation will begin to reveal some of the intentions of the author. Naturally, some discrepancy between the author's intention and the reader's interpretation will always remain, but if the quality and the duration of the interaction are sufficient, this discrepancy can be trivial.

Derrida has referred to emergent meaning as a mere *trace*, a mere phantasm or illusion. Following Derrida, some postmodern writers have struggled to remove the possibility for meaning's emergence, which would be a mere illusion. Typical postmodern narratives tend to distrust the Aristotelian rule that one should include details only for some purpose, for example, to hint, to illustrate, to inform, or to further action.⁸² These "non-narratives" prefer to represent merely discontinuous slices-of-life; they resist an explicit statement of an ending; they are repetitious and circular not linear. For example, in *Lost in the Funhouse* (1967) by John Barth there is no progress or development, only repetition with variation.⁸³ Martin Amis adds superfluous detail⁸⁴ in

⁸¹ See Mark Lilla, *The Reckless Mind: Intellectuals in Politics* (New York: New York Review Books, 2001), 177.

⁸² See Aristotle, *Poetics*, trans. Stephen Halliwell (Cambridge: Harvard University Press, 1995).

⁸³ (1967; reprint, New York: Anchor, 1988).

⁸⁴ In an interview Amis claimed, "In *Money*, I stopped worrying too much about form. In the introduction to *Augie March*, Bellow talks about having an inclusive, catch-if-catch-can attitude. I tried to learn from that, to relax and sound-off really, not be too worried about the decor of the

Money: A Suicide Note (1984).⁸⁵ In Paul Auster's "The Locked Room" (1984), the narrator says he likes to include everything because "everything counts" given that "life is no more than the sum of its contingent facts" and life's "random events that divulge nothing of their own purpose."⁸⁶ Milan Kundera includes characters and events that are gratuitous to the main action of his novel *Immortality* (1990).⁸⁷

Nevertheless, their readers can still see patterns, even in the most "random" of narratives. One cannot eliminate the telic sense that things happen for reasons in narrative by eschewing selection principles and relying instead on chance because *telos* is linked to chance.

According to Mihály Szegedy-Maszák, it is commonly held that the "desire to give a random ordering of bits of plot became especially strong" in reaction to Nietzschean doubt and the idea of eternal recurrence. Before the 20th century, "the structure of most works of narrative fiction was based on some kind of teleology" then Nietzsche began to "undermine belief in linear succession" (274).⁸⁸ According to Nietzsche, "The belief in causes collapses if the belief in end is lost."⁸⁹ Nietzsche argued that all causality is linked to a sense of purpose, which drives the preservation of a sense of self, community, and religion. If these end-values disappear, then a belief in causality may be lost as a consequence. As I have argued extensively above, equating teleology

novel, the formal decoration." See Victoria N. Alexander, "Martin Amis: Between the Influences of Bellow and Nabokov," *Antioch Review* 52 (1994), 78-83.

⁸⁵ (London: Cape, 1984).

⁸⁶ *The New York Trilogy* (New York: Penguin, 1990), 257.

⁸⁷ *Immortality*, trans. Peter Kussi (New York: Grove, 1991).

⁸⁸ All quotes by Szegedy-Maszák are from "Nonteleological Narration," *International Postmodernism Theory and Literary Practice*, eds. Hans Bertens and Douwe Fokkema (Philadelphia: Benjamin, 1997), 273-282.

⁸⁹ Quoted in Szegedy-Maszák, *ibid.*, 275.

with linearity or mechanistic causality is a mistake: empirical science since Bacon has been dedicated to exploring deterministic mechanisms without any reference whatsoever to purpose.⁹⁰ Nevertheless, as Szegedy-Maszák further notes, it is a "wildly held assumption" that postmodernism expresses the idea that "all causality is lost" and with it teleology.

Ironically, however, randomly ordered narratives often result in dream-like fiction that seems intensely teleological or intentional—in the sense Aristotle regarded as superstitious and which I have described here within the category of analogical determinism. Szegedy-Maszák gives the example of *Naked Lunch* (1959), in which the narrator insists that he describes "what is in front of his sense at the moment of writing.... I do not presume to impose 'story,' 'plot,' or 'continuity.'"⁹¹ However, readers have made *Naked Lunch* "teleological, a negative parable about the destruction of the soul, an attack upon addiction, the loss of personality, and brainwashing" (275). The question is then, What are the mechanisms that make a teleological reading of a disordered narrative possible?

In a disordered system, a relatively large number of useful coincidences may appear among meaningless details. The reader who notices this chance order amid the chaos may be tempted to try to interpret it. Whatever structure these narratives have tends to have a willed aspect because the structure is based subjectively on analogies, coincidences, or puns. It is useful to recall here that Kant argued that sublime or chaotic events display "nothing purposive in nature itself, but only in the possible use of our

⁹⁰ Nietzsche's account of teleology requires a much more detailed analysis than I am able to give in this work, and I intend to deal with it a separate monograph.

⁹¹ Quoted in Szegedy-Maszák, *ibid.*, 274.

intuitions of [them] by which there is produced in us a feeling of purposiveness quite independent of nature."⁹² Mikhail Bahktin, writing about medieval Romance, similarly claims the narrative about chaotic life on the road seems "to provide an opening for the intrusion of nonhuman forces—fate, gods."⁹³

As I argue in Chapter Three, this is exactly what Aristotle had in mind when he tried to construct a rugged nonmental teleology that did not value the role of interpretations of accidental functionality. He did this by trying to eliminate the need to consider chance, which he claims, was not a true cause. The term "chance," he explains in *Physics*, usually denotes a coincidence that happens to serve a purpose, such as when a debtee by chance runs into his debtor at an opportune moment. Aristotle warns that superstitious people may suppose the event has the purpose of retrieving the money because it is the sort of thing "intelligence would have caused."⁹⁴ Aristotle's teleology had no place for the *Deus ex Machina*, the miracle, the contrived resolution.

Postmodern devices fail to create nonteleological narratives because *telos* appears as the functional, interpretable patterns that cannot be explained by mechanical, efficient, or formal causes alone. The "random" narrative, while not teleological in Aristotle's sense, can be very teleological in the popular or religious sense, which Aristotle fought against. But in either mental or nonmental teleologies, telic patterns are those that require a final-cause explanation because they elude reductive scientific descriptions.

Teleological patterns are those that seem willed. It is true that telic patterns of analogical

⁹² See *Critique of Judgement*, trans. J.H. Bernard (1790; reprint, New York: Hafner Press, 1951), 84.

⁹³ Mikhail Bahktin, "Forms of Time and Chronotope in the Novel," *The Dialogic Imagination* (Austin: University of Texas Press, 1981), 95.

⁹⁴ *Physics* Bk. 2, Pts. 4-5, trans. Robin Waterfield (New York: Oxford University Press, 1996), 48.

determinism may be willed only by the reader, not the writer. Without recourse to the author's mind, there is no way to establish the absolute validity of the reader's interpretation. The fact that exact intentions of the writer cannot be proved does not, however, have any bearing on whether or not those intentions actually exist.

It is often assumed, by superstitious thinkers, that random systems should show no regularity at all. Therefore, if any kind of pattern is detected, it seems unable to have arisen by chance. It is further assumed that patterns without any other cause must have a pattern-maker. This situation, I would like to suggest, has caused a peculiar postmodern discomfort, which is not merely the product of nostalgia for the time when we really believed events could be indicative of divine intention. When we find story-like order in the world, we should not suppose it is evidence of a supernatural purpose; however, when we find coincidental order in narratives, we actually do have grounds to wonder. The conflation of chance, final cause, fate, intentionality, and Providence has a long history. When Darwin found patterns he could not explain simply in terms of fitness selection, even he called them "whimsical" correlations—as if some Joker were responsible.⁹⁵ When spontaneously formed self-organized patterns or stochastic resonances are interpreted as useful, they seem motivated by a prescient entity. I believe it is the suggestion of such intentions that gives any work of art or natural object an inexplicable power to engage. After thirty-odd years of interment, the author returns to haunt the text.

⁹⁵ *On the Origin of Species* (New York: Appleton, 1882), 177.

Chapter Two Analogies and Affinities

Abstract: This chapter explores how, on the one hand, there is a relationship between drawing analogies, mentalistic teleology, and the association of *telos* with an extrinsic cause (e.g., a divine creator); and, on the other hand, between identifying affinities, nonmentalistic teleology, and *telos* as an intrinsic cause (e.g., as a guiding principle). These distinctions have not been properly made in the literature; therefore, I present a concise overview of the history of teleological explanations in philosophy, religion, and biology that highlights the conception of mentalism versus nonmentalism. I describe how the nonmentalists, for example, Aristotle, Kant, and 20th century structural evolutionary biologists, critique the use of analogy in teleology by mentalists, such as Aquinas, Paley, and Bell. I show, however, that a clear distinction between analogies and affinities cannot always be made. The accumulative effect of coincidentally similar but causally unrelated circumstances (with analogous resemblances) can result in an affinity. I provide examples of the ways these two types of teleological narratives differ in plot structure. Nonmentalism involves the accumulation of chance events over time; mentalism involves a use of a singular chance event. The final section of this

chapter summarizes Crutchfield's notion of *intrinsic emergence*, which objectifies telic directionality as defined by nonmental teleology. He locates the source of the organizational plan within the system itself, not in the eye of an external beholder. Then I describe how a theory of *extrinsic emergence* might explain some telic behavior as defined by mental teleology. This theory would show how the use of analogies, involving *stochastic resonance* and *accidental functionality*, relates to adaptation and to telic originality.

Analogies and Formal Affinities versus Physical Affinities

If there is only an analogy between the big and little dippers, there is an affinity between spiral galaxies. An analogy is here defined as a specious comparison between two physically unrelated things. An affinity is here defined as a resemblance in structural organization between, for example, cloud formations, biological groups or languages, implying either a common origin, similar histories of functioning, or reliance on similar developmental principles. To confuse an analogy with an affinity is not sound reasoning or good science, according to most philosophers since the early modern period.

Whenever what we believe is a mere analogy begins to appear to have some actual affinity, it seems absurd or uncanny. As Freud remarked, the uncanny often refers to the feeling that previously surmounted animistic views of the world—views that mere thoughts have the magical power of linking physically unrelated things—begin to seem feasible again.⁹⁶ That the stripes of a tiger swallowtail butterfly and the stripes of a tiger might be more than a mere chance resemblance is almost unthinkable. However, it turns

⁹⁶ "The Uncanny," *Works* 17, trans. James Strachey (1919; London: Hogarth Press, 1953-1974), 249.

out that they *are* related. Both stripe patterns result from similar reaction-diffusion processes.⁹⁷ Might it also be reasonable to imagine then, as Nabokov once did, that after death we might find the true meaning of transcendental has something to do with dentistry?⁹⁸ It does not: the Latin *scendent*, present participle of *scendere*, (to climb) is unrelated to the Latin *dent* (teeth). That both words, transcendental and dental, coincidentally contain the sequence of letters d, e, n, t, a, l does not imply common semantics. The difference between stripe formation and Nabokov's pun shows a clear difference between affinity and analogy. In many cases, however, the difference is not so easy to see.

A primary criticism of teleology is that its method of reasoning is analogical, comparing the way nature creates plants and animals to the way humans create tools and works of art. Nature cannot think, after all. Nature cannot plan ahead. Nature cannot recognize poetic coincidences and puns. Even if the ecosystem as a whole does seem organized, it still cannot be compared to a person who has a localized center (a brain) that can direct and control actions. Nature cannot be said to have anything like a centralized brain to direct its actions.

However, what if it turned out that we were wrong in thinking that humans have localized centers that direct and control actions? What if it turned out that intentional human behavior is not very different from self-organized behavior that occurs in nature? Would the doctrine of teleology be worth looking into again? As Albert Einstein once said, If at first the idea is not absurd, then there is no hope for it.

⁹⁷ See Philip Ball, *The Self-Made Tapestry: Pattern Formation in Nature* (New York: Oxford University Press, 1999).

⁹⁸ In his short story "Ultima Thule," in *The Stories of Vladimir Nabokov*, ed. Dimitri Nabokov (1942; reprint, New York: Knopf, 1995), 496-518.

Some affinities may arise out of similar histories of functioning. Similar biological structures can evolve out of similar circumstances, as is the case with winged bats and winged birds. Is this similarity merely analogous? In biology, characteristics shared between different species that are *inherited* are known as homologies, which I consider a kind of affinity. Characteristics shared between species that are the result of similar *adaptations* to similar environments were considered to be mere analogies by 19th century biologists. Birds and bats do not have a common ancestor that bequeathed them both nascent wings, therefore, their forelimbs do not have the same kind of affinity that the forelimbs of chimpanzees and humans do.

However, the resemblance between bat wings and bird wings is not just some dubious comparison. It may have been wrong to consider the similarity a mere analogy. Both bats and birds are subject to the laws of physics that dictate the kinds of structures that allow for flight. In *On Growth and Form*, written in 1917, D'Arcy Wentworth Thompson points out that the same external constraints are the common cause of the structural dimensions of any winged species.

In order to balance its weight ... momentum must ... be proportional to the cube of the bird's linear dimensions; therefore the bird's necessary speed, such as enables it to maintain level flight, must be proportional to the square root of its linear dimensions, and the whole work done must be proportional to the power $3\frac{1}{2}$ of the said linear dimensions.⁹⁹

Perhaps it would be appropriate to call shared characteristics that result from similar histories of functioning a *formal* affinity, as distinct from a *physical* affinity that is directly inherited.

⁹⁹ *On Growth and Form* (Cambridge: Cambridge University Press, 1917), 41.

In addition to the *external* constraints imposed upon skeletal structures by the laws of physics, which either allow for flight or do not, there are also *internal* constraints imposed upon developing skeletal structures. Internal processes, guided by the laws of pattern formation, also contribute to the similarity in bird and bat wings.

Contemporary evolutionary biologists have found, for example, that the fact that many animals have four limbs instead of, say, five or three is neither a coincidence nor necessarily the product of fitness selection. Neither is it indicative of common ancestry. Four limbs represent a common configuration among mammals and birds because the laws of pattern formation have the tendency to produce tetrapods. As Brian Goodwin writes,

Tetrapod limbs are defined as the set of possible forms generated by the rules of focal condensation, branching bifurcation, and segmentation in the morphogenetic field of the limb bud. ... The idea of a common ancestral form as a special structure occupying a unique branch point on the tree of life ceases to have taxonomic significance. Now tetrapod limbs could have arisen many times independently...¹⁰⁰

Nineteenth century teleologists have been harshly criticized for believing that, for example, various tetrapod forms were variations on an ideal theme or structural archetype. The very rich and rigorous teleological sciences of comparative morphology and theoretical morphology were all but completely abandoned after the publication of *On the Origin of Species* (1859), which argued that these kinds of similarities between species were inherited.¹⁰¹

¹⁰⁰ *How the Leopard Changed its Spots: The Evolution of Complexity* (New York: Scribner, 1994), 155.

¹⁰¹ For a complete review of the 19th century literature on this subject, see E. S. Russell, *Form and Function: A Contribution to the History of Animal Morphology* (1916, reprint: Chicago: University of Chicago Press, 1982).

Although early in the 20th century, Thompson finally rekindled some interest in the former concerns of the teleologists, his work was also largely ignored. Thompson, like his intellectual heir Goodwin, also criticized Darwinian naturalists for their tendency to view pattern and regularities in animal forms and behaviors as inherited qualities or adaptive behaviors.

When he meets with a simple geometric construction, for instance in the honeycomb, he would fain refer it to psychical instinct, or to skill and ingenuity, rather than to the operation of physical forces or mathematical laws.¹⁰²

Thompson proposed that the hexagon chambers of the honeycomb form spontaneously according to the same laws of surface tension that dictate hexagon shapes in soap bubbles. If so, no special bee fitness would need to be posited. However, as Philip Ball in *The Self-Made Tapestry: Pattern Formation in Nature* (1999) warns, "we should not too readily assume that any regularity in nature is the result of symmetric physical forces."¹⁰³ According to Ball, bees have evolved organs for making accurate measurements and actually do manipulate the shape of the hexagonal walls instinctively. Their behavior, then, *is* a Darwinian adaptation. Therefore Thompson's observation that honeycombs resemble soap bubbles in shape is a mere analogy.

To repeat, analogies that cannot be said to have an affinity are those with merely a coincidental logical similarity, such as the Scorpio constellation and an actual scorpion. The shapes may be similar, but they do not share a common physical origin, nor is the process by which they were created describable by similar mathematical models. Therefore, the resemblance can only be attributed to the subjective intention of the

¹⁰² *On Growth and Form* (Cambridge: Cambridge University Press, 1917), 3.

¹⁰³ *The Self-Made Tapestry: Pattern Formation in Nature* (New York: Oxford University Press, 1999), 49.

observer. The burden of empirical science has been to make clear distinctions between affinities and analogies.

Pushing the Boundaries of the Term "Analogy"

Merely analogical resemblances can be significant to the interests of science if they occur in nature time and time again. For example, if an animal coincidentally looks like its environment and thereby tends to escape predation, its chances of having the opportunity to reproduce organisms like itself are increased. Over time, animal camouflage has developed a physical, ancestral affinity with its environment as genetic information is passed on to the offspring. The affinity develops because a number of would-be predators draw similar analogies between similar animals and their environments. A mutation that results in a coincidental resemblance between a leaf and a bug is a *singular* coincidence. The resemblance is merely subjective; however, objective patterns can develop over time through *repeated* coincidences. Then the resemblance becomes an inherited adaptation. The discovery of the new function has the aspect of originality; the maintenance of the newly functional structure has the aspect of directionality. We might also say that directionality is an affinity or a *habit* that develops with the passing of coincidentally analogous events.

If we wish to consider the issue abstractly, we may recall the illustration of the dice game mentioned in Chapter One in regards to Peirce's generalized theory of evolution. In a hundred throws of a pair of dice, the chance that seven will turn up is higher than, say, two. This is because what might be called an analogy is drawn between the combinations of one and six, six and one, two and five, five and two, three and four,

and four and three. There are six ways that a total of seven will turn up, while there are only two ways that a total of two will turn up. It may be that some forms in nature are selected, not because they are more functional than others but because they recur more frequently. If we compare throws of the dice to individual acts of natural selection, we can think of adaptive evolution as a sum of analogous but causally unconnected events that eventually become a statistical law.

This leads us to ask whether or not all observed regularities might be due to chance similarities that time "sees" as analogous. If so, then the remarkable power of statistical physics models for discovering underlying mechanisms of natural law becomes more intelligible. When Erwin Schrödinger, who helped lay the foundation of our current understanding of quantum mechanics, turned his attention to biology in the 1940s, he did so with the assumption that statistical physics models might be applicable there as well. As he remarks in his 1944 lecture, "What is Natural Law?"

Research in physics has shown beyond the shadow of a doubt that in the overwhelming majority of phenomena whose regularity and invariability have led to the formulation of the postulate of causality, the common element underlying the consistency observed is chance.¹⁰⁴

Einstein, one might recall, thought that the chancy character of quantum mechanics was absurd. As he famously declared, "God does not play dice."¹⁰⁵

The *ordering* tendencies of chance have tended, in Western history, to be attributed to a supernatural being or to *telos*. The *disordering* tendencies of chance have tended to be understood simply as the disordering tendencies of chance, as if chance were always a destructive force. In the present analysis, teleological phenomena *are*

¹⁰⁴ See *What is Life? The Physical Aspect of the Living Cell* (Oxford, UK: Oxford University Press, 1946).

¹⁰⁵ Quoted in Werner Heisenberg, *Physics and Beyond* (New York: Harper & Row, 1971).

understood as the ordering tendencies of chance in some respects as I have described above, not some other force. Discoveries made by nonlinear dynamics theorists studying the phenomenon of self-organization compel us to believe that chance is as responsible for stasis as well as change.

Directionality (involving repeated coincidences) is associated with the notion of affinity and is found in *useful predictable* processes, such as thermoregulation and self-reproduction. Originality (involving a singular coincidence) is associated with the notion of analogy and is found in *useful unpredictable* processes, such as the adaptive evolution of species. Both processes seem oriented toward goals because they happen to be useful for survival even though they derive ultimately from the ordering tendencies of chance. Because they derive ultimately from the ordering tendencies of chance they seem uncaused in some respect, or if one is of a superstitious frame of mind, they seem caused by an external will that is not subject to physical laws. These processes are properly considered, therefore, spontaneous and self-organizing. These processes describe what is meant by agency.

Aristotle on Analogical Reasoning

Based on the arguments given above, we may say that teleological phenomena can be attributed to the analogical reasoning that nature and time seem to perform through the process of selection (neutral or based on differential fitness), which result in either formal or ancestral affinities. From our perspective where we can recognize the ordering tendencies that result in telic phenomena, it is ironic that in *Physics*, Aristotle tried to disassociate chance from his teleology. He argues that coincidence and chance are

not to be reckoned among causes because they do not happen always or usually. He adds that although a coincidence might lead to effects, any one particular occasional effect would not come to much. And it is true that the singular coincidence tends to go unnoticed, and all that is obvious is one or another apparently static "law" that has emerged over a period of time.

Aristotle was a nonmentalist. He disapproved of the use of a particular kind of analogy in regards to evaluating teleological phenomena. As an example, he describes how a man went to the market for the purposes of earning money and happened to run into someone who owed him money. Because the chance event happened to fulfill his purpose, the man interpreted the coincidence as being teleological, that is, motivated or caused by the purpose it served. The man's bit of luck does seem, Aristotle noted, like the kind of thing that intelligence would have caused. But Aristotle insisted that *accidental functionality* (originality in my terms) should not be confused with *predetermined functionality* (directionality in my terms).¹⁰⁶

It is true, however, that Aristotle did make an analogy between the way nature creates and the way humans create:

If artificial products have some purpose, then, natural things obviously do too, since in both cases the relation between the latter stages and the earlier stages is the same.¹⁰⁷

Aristotle's teleology has been considered an anthropomorphization of nature because he made this analogy between cosmic final cause and the way an artisan makes a

¹⁰⁶ Immanuel Kant, also a nonmentalist, made a similar distinction between *extrinsic physical ends* (e.g., rain happens to be good for plants) and *intrinsic physical ends* (e.g., a tree grows by means of its own photosynthesis and is both cause and effect of itself) that demonstrate recursive causality.

¹⁰⁷ *Physics* 2.8, trans., Robin Waterfield, (New York: Oxford UP, 1996), 51.

statue or a bed.¹⁰⁸ This seems to contradict the argument that he was a nonmentalist and therefore requires careful analysis.

It may not be necessary to assume this analogy makes an appeal to mentalism if Aristotle's notion of craftmaking, like his teleology, was also nonmental. The assumption that natural processes cannot be compared to human traditions belies a belief that the development of human culture is not a natural process. On the contrary, it seems clear that similar evolutionary mechanisms drive the development of artificial products as well as natural products. The study of the evolution of human language was, after all, the intellectual precursor to Darwin's theory of biological evolution.¹⁰⁹ A number of theorists today have described the development of crafts and social institutions in terms of the development of biological species.¹¹⁰ What works survives to work again for the next generation. Crafts, in this view, are somewhat arbitrary conventions, handed down and altered by each generation through trial and error. Individual intentions (acts of originality, mentalism) are only significant in so far as they are like others and accumulate to the point of popularity. The forces of culture, like the forces of nature, make analogies; they link together physically unrelated things by the process of natural

¹⁰⁸ See *Metaphysics* 1.3.

¹⁰⁹ John Horne Tooke's etymological studies, *The Diversions of Purley* (London: Printed for J. Johnson, 1786), for example, influenced Darwin. Tooke saw language as a fossil record one could read in an attempt to trace the origins of language. Sir William Jones, in his journal *Asiatick Researches* (1788), argues that language is an organism with mechanical elements whose function is determined by use and linguistic evolution. Also see William Barnes *A Philological Grammar, Grounded upon English, and Formed from a Comparison of More than Sixty Languages* (London: J. R. Smith, 1854); Max Müller *Lectures in the Science of Language* (1863-64; reprint, New York: Scribner, 1869); and Hans Aarleff, *The Study of Language in England 1780-1860* (Princeton: Princeton University Press, 1966).

¹¹⁰ See for example, Ekkehart Schlicht, "Aestheticism in the Theory of Custom," in *Journal des Economistes et des Etudes Humaines* 10 (2000): 33-51.

selection. Frequency performs the function of memory/recognition and rarity the function of forgetfulness/nonrecognition. Darwin himself compared evolution to human invention:

We must look at every complicated mechanism and instinct as the summary of a long history of useful contrivances much like a work of art.¹¹¹

Therefore, it is not necessarily an improper use of analogy to compare natural processes to craftmaking. However, I must note one caveat in regard to this interpretation of Aristotle's notion of an artisan's traditions. In a manner that is consistent with his physics, Aristotle appears to assume the methodology natural and proper to any craft is determined by atemporal static formal principles, rather than by the accumulation of like events over time. His argument that nature was directed in its processes is more similar to Thompson's or Goodwin's than to Darwin's. Aristotle was interested in internal constraints and laws of biological form. Therefore, he would also be interested in the laws of form, harmony, and proportion. I stated above, he does not consider the role of accidental functionality in the development of a craft. The role of accidental functionality was Darwin's great insight: variations (which we now know to be caused by chance genetics mutations) can confer an advantage and increase the complexity and/or improve the functionality of an individual. In so far as Aristotle's notion of craftmaking excludes the role of accidental functionality it cannot be a creative activity. And the notion of mentalism does not necessarily inhabit the notion of craftmaking.

¹¹¹ *The Foundations of the Origin of Species, a Sketch written in 1842*, ed. F. Darwin (Cambridge, 1909).

Aristotle Christianized

Somewhat unjustly perhaps then, Aristotle's teleology is remembered for anthropomorphizing natural processes. This mis-association made possible the co-opting of Aristotle's teleology by Christian mentalist teleologists who believed the analogy of nature to human products was not merely heuristic and that teleological phenomena were indicative of a singular divine artist.

St. Thomas Aquinas in particular was instrumental in translating Aristotelian nonmental teleology into Christian mental teleology. Aristotle argued that the finality observed in the world inevitably leads to the conclusion that there must be intrinsic guiding principles that result in self-organization. Aristotle's *telos* is non-physical, but should not be understood, therefore, as spiritual or supernatural. One might think of a nonmental telic principle as a range of possibilities that limit and direct development, maintain order, and balance proportions. Based on this, it is possible to make the argument that what we now refer to as nonlinear dynamics and the ordering tendencies of chance were simply known to Aristotle by the term *telos*. Granted, this view of Aristotle's teleology is made possible by the hindsight supplied by contemporary physics. Yet it makes better sense of Aristotelian teleology than does the Christian interpretation, which simply hypostatized *telos*. If one accepts my argument, then it is clear why Aristotle's teleology did not require an external agent actively responsible for the control and direction of the guiding principle.

Over time stochastic processes may naturally drift in particular directions, but a single stochastic event is, by definition, not directed. Early Christian doctrine says that all chance events *are* directed. Aquinas' teleology, therefore, requires a supernatural agent to

direct each and every chance event personally. This direction would contribute to a larger order that humans could not perceive. Self-organization in nature led him to posit not a system of generative rules that emerge over time (as contemporary sciences do) but an *internal nature* that guides processes and is (unlike Aristotle's) placed there and controlled from the outside by God. In Aquinas' view, man's—or any natural system's—internal nature is derived from without, imposed by an external agent, God. In *Summa Theologica*, Aquinas (1225?-1274) writes,

The natural necessity inherent in things that are determined to one effect is impressed on them by the Divine power which directs them to their end, just as the necessity which directs the arrow to the target is impressed on it by the archer, and does not come from the arrow itself. There is this difference, however, that what creatures receive from God is their nature, whereas the direction imparted by man to natural things beyond what is natural to them is a kind of violence. Hence, as the forced necessity of the arrow shows the direction intended by the archer, so the natural determinism of creatures is a sign of the government of Divine Providence.¹¹²

This kind of abuse of final causes inspired critiques from Francis Bacon, René Descartes, and Spinoza. The attribution of final cause to an external agent led to the discrediting of teleology as a science.

Medieval and Renaissance teleology-biology is largely associated with the work of a follower of Aristotle, a Greek biologist named Galen born in 130. His major works, *Natural Faculties* and *Uses of the Parts*, were also Christianized by translators. Galen maintained that the human body was governed by the faculties of "Nature," which physiologists attempted to define. According to Galen, the individual parts of a body act as a whole and are perfectly designed for the functions they serve, and therefore changes to the parts can harm the whole. Galen draws upon Aristotle's statement that "Nature does

¹¹² *The Summa Theologica of St. Thomas Aquinas* I:103:1 ad 3um, trans. Fathers of the English Dominican Province (London: Burns, Oates & Washbourne, 1913-1942).

nothing in vain." According to Galen, "Aristotle is right when he maintains that all animals have been fitly equipped with the best possible bodies."¹¹³ Galen's Christian followers assumed that the evidence of design necessarily implied a designer.

In *L'homme* (1664), René Descartes thought he was eliminating teleology from the life sciences, established for the most part by Galen, by showing that biological matter's capacities derive from various complex organizations of ordinary physical particles; yet this conception of biological form and activity being determined by a non-material intrinsic system of organization is more or less consistent with Aristotle's teleology before Aquinas. Both Aquinas and Descartes misinterpret teleology in attributing a condition of thingness to final cause, making it into a divinely, arbitrarily, and *externally* determined codescript or nature. Final cause is better understood as an *intrinsically* determined set of relations (defined and altered by context), involving limiting factors, and resulting in order, proportion, and harmony.

Bacon's Empiricism and Kant's Transcendentalism Make Distinctions Between Analogies and Affinities

The mentalist doctrine of teleology severely prevented advances in science. In 1620, Francis Bacon attempted to distinguish between affinities and analogies and thereby to eliminate mentalistic teleology from science. Such distinctions became the essence of the empirical method. In Book II Aphorism 27, Bacon proposed that science should be directed toward

¹¹³ *Galen on the Usefulness of the Parts of the Body*, trans. Margaret Tallmadge May, vol. 1 (Ithaca: Cornell University Press, 1968), 108.

investigating and noting the similarities and analogies of things But there is here a strict and serious caution to be observed, that we should only accept as Conforming and Proportionate Instances those that mark out physical similarities ... that is, necessary and essential ones, grounded in Nature, not contingent and apparent.¹¹⁴

It is important to note that Bacon did not attempt to eliminate the concept of design in nature; he rather argued that science should only be directly concerned with design and only indirectly concerned with the concept of external designer. Using methods of inquiry similar to those used later by his 19th and 20th century successors – e.g., the teleomechanists and other biologists interested in the laws of biological form – he sought governing principles intrinsic to the physical system. Bacon recognized "a similar nature" between "the structure of the ear and places that return an echo [e.g., a cave]," between "the roots and branches of plants," and between "teeth in animals and beaks in birds" (193). He argued that study of their similarities might provide general knowledge regarding the physical laws of their construction.

Bacon rejected the scientific value of teleology because he had inherited a thoroughly mentalistic account through the Christian church, which relied heavily on analogy and Christianized translations of Galen. Consequently, Bacon thought *telos* was based strictly on a specious analogy with human artisans and designers. "Final causes," writes Bacon, "have relation entirely to human nature rather than to the universe, and have thus corrupted philosophy to an extraordinary degree" (59). Under Bacon's direction, the objective of empirical science was to understand how nature is designed; however, the search for proof of the existence of a supernatural designer fell outside the province of science.

¹¹⁴ *Novum Organum*, trans. Peter Urbach and John Gibson (Chicago: Open Court, 1994), 194. All quotations are from this edition.

In *Dialogues Concerning Natural Religion* (1779), David Hume illustrates how the attitude toward teleology developed over the succeeding century. Hume's argument is presented in the form of a dramatic dialogue. One speaker states that apparently teleological phenomena may indeed be caused either by chance (a term which, as noted above, was associated only with disordering tendencies of chance) or by *telos* (a term which I claim should be associated with the ordering tendencies of chance). He furthermore adds that one cannot know *a priori* which of the two possibilities might be the true cause. As the argument continues, the speaker develops the theory that the *experience* of acting intentionally gives humans the insight into understanding natural processes as intentional by analogy with human intentionality:

order, arrangement, or the adjustment of final causes, is not of itself any proof of design; but only so far as it has been experienced to proceed from that principle. For aught we can know *a priori*, matter may contain the source or spring of order originally within itself, as well as mind does; and there is no more difficulty in conceiving, that the several elements, from an internal unknown cause, may fall into the most exquisite arrangement, than to conceive that their ideas, in the great universal mind, from a like internal unknown cause, fall into that arrangement. The equal possibility of both these suppositions is allowed. But, by experience, we find ... that there is a difference between them. Throw several pieces of steel together, without shape or form; they will never arrange themselves so as to compose a watch. Stone, and mortar, and wood, without an architect, never erect a house. But the ideas in a human mind, we see, by an unknown, inexplicable economy, arrange themselves so as to form the plan of a watch or house. Experience, therefore, proves, that there is an original principle of order in mind, not in matter. From similar effects we infer similar causes. The adjustment of means to ends is alike in the universe, as in a machine of human contrivance. The causes, therefore, must be resembling.¹¹⁵

Here Hume critiques "natural religion," a system of belief that supposes knowledge of God can be derived from experience of design in nature. Since humans cannot experience divine attributes and operations, humans cannot have a conception of

¹¹⁵ *Dialogues Concerning Natural Religion* pt. 2 (London: T. Scott, 1875).

divine attributes. Hume indicates that the argument is based on analogy, and as such possibly flawed. Nevertheless, he noted, biological processes exhibited self-organizing tendencies that could not be explained reductively.

Very soon after the publication of Hume's work, Immanuel Kant picked up the argument that a divine creator cannot be inferred from experience. According to Kantian philosophy, the concept of a divine being is an object of transcendental understanding and as such beyond the limits of all possible experience.

In "Critique of the Teleological Judgment" (1790) Kant attempts to reinstate *nonmental* teleology by making a clear distinction between affinity and analogy.¹¹⁶ He insists that there is only a speculative analogy between the organization and functionality of human artifacts and organization and functionality of natural processes. Therefore, one cannot infer intention in nature as one might infer intention in another human being. There may be an affinity between the minds of two human beings, but there is only an analogy between human purpose and cosmic *telos*. Nevertheless, Kant maintained that the analogy was useful as a heuristic device for understanding organic processes and self-organization—as long as the important distinction was maintained that these processes were determined by a cause intrinsic to the system itself while human artifacts were determined by actual external agents who acted on the object from the outside. Kant's nonmentalism may be compared to Aristotle's in this regard: an agent responsible for conceiving of the telic principle is not necessarily implied by the principle itself. Kant did argue, however, that an external designer could be posited by the *reflective judgment* if

¹¹⁶ Unless otherwise indicated, all quotes by Kant are from *Critique of Judgment*, trans. J.H. Bernard (New York: Hafner Press, 1951).

not the *determinate judgment*. In this way, the validity of reasoning by analogy re-enters Kantian philosophy through a backdoor.

In the early 19th century, Kantians divided into two main camps: the teleomechanists and the Romantic natural philosophers. The Romantics, led by Étienne Geoffroy Saint-Hilaire in France and Friedrich Schelling¹¹⁷ in Germany, held that as living beings, humans have direct access to an intuitive understanding of life as an activity. Their primary method of investigation was speculation, drawing analogies, and finding symmetries. For instance, they argued that because monkeys are analogous to humans, an understanding of these animals would be possible by thinking of them as lesser variations on a theme. The teleomechanists, in contrast, were more inclined to seek underlying rational mechanisms defined by the laws of physics to explain similarities between species. They sought affinities, not analogies. Led by Karl Ernst von Baer, Johannes Müller, Carl Bergmann, and Lotze Leuchart, the teleomechanists made a distinction between merely "analogous" biological structures, whose similarities are determined by an observer, and "homologous"¹¹⁸ structures, whose similarities are *intrinsically* determined by the laws of biological form and pattern formation.¹¹⁹ Von Baer and Müller in particular stressed the fact that final cause was neither an external agent nor an efficient cause; they argued that final cause was nonphysical; it was immanent in the dynamics of organic processes. They hoped to understand the

¹¹⁷ See *System of Transcendental Idealism*, trans. Peter Heath (Charlottesville: University Press of Virginia, 1978).

¹¹⁸ The term "homologous" has two meanings: a similarity often attributable to common origin; and a likeness in structure between parts of different organisms due to evolutionary differentiation from the same or a corresponding part of a remote ancestor. For this reason I prefer to use "affinity," which can refer to either a formal or ancestral relation.

¹¹⁹ See Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth-Century German Biology* (Chicago: University of Chicago Press, 1989), 54.

teleological principles (the functional relationships of the parts to the whole) that guided morphogenesis, often making animals of entirely different species appear to have been produced by the same general ground plan. As von Baer argued, telic principles limited and guided morphogenesis, and this, he felt, explained why early stages of ontogeny resist evolutionary change.¹²⁰ This, he also felt, resulted in the appearance of directedness in nature. While the Romantic philosophy led to mysticism, teleomechanism eventually led to structural evolutionary theory and an understanding of the mechanisms behind the maintenance of order in teleological phenomena.

Argument by Extrinsic Designer

While Continental teleologists divided into two main groups, teleomechanists and Romantics, in England teleologists tended to continue the tradition of natural religion. According to Hume's description, which was carried through several works, in organic processes there exists

sympathy of parts to their common end, and ... they bear to each other, the reciprocal relation of cause and effect in all their actions and operations. This is the case with all animals and vegetables; where not only the several parts have a reference to some general purpose, but also a mutual dependence on, and connexion with each other. The effect of so strong a relation is, that tho' every one must allow, that in a very few years both vegetables and animals endure a total change, yet we still attribute identity to them, while their form, size, and substance are entirely alter'd. An oak, that grows from a small plant to a large tree, is still the same oak; tho' there be not one particle of matter, or figure of its parts the same. An infant becomes a man-, and is sometimes fat, sometimes lean, without any change in his identity.¹²¹

Thus, it would seem to those who believe in natural religion that

¹²⁰ See Karl Ernst von Baer, *Entwicklungsgeschichte der Tiere* (Königsberg: Bornträger, 1828).

¹²¹ "Of Personal Identity" in *A Treatise of Human Nature*, eds. T. H. Green and T. H. Grose, vol. 1 (1739; London: Longmans, Green, and Co., 1878)

The order and arrangement of nature, the curious adjustment of final causes, the plain use and intention of every part and organ; all these bespeak in the clearest language an intelligent cause or author. The heavens and the earth join in the same testimony: The whole chorus of Nature raises one hymn to the praises of its Creator.¹²²

Nevertheless, as Hume further explores this view in *Dialogues Concerning Natural Religion*, it is noted that "the whole adjustment of means to ends in a house and in the universe" is a "slight resemblance."

Steps of a stair are plainly contrived, that human legs may use them in mounting; and this inference is certain and infallible. Human legs are also contrived for walking and mounting; and this inference, I allow, is not altogether so certain.¹²³

The argument of natural religion ends with an appeal to experience, which instructed one to believe that chance tended only toward disorder; therefore, *telos* must be brought in to explain the tendency to order.

It is important to remember that the objective of mentalistic teleology was to prove the existence of a divine being by citing teleological phenomena. Nonmentalists, in contrast, simply wanted to understand the design principles of organic form. Every teleomechanist dreamt of being the Newton of biology. He wanted to discover a law of biological form that was as impersonal as the law of gravity. He wanted to define the vital force in terms similar to gravitational force; he did not seek to personify this force. Vitalism, as a form of teleology, is linked to the idea of spontaneity and to intrinsic causation. In stark contrast, the mentalist position was based on the assumption that there is a divine force, and mentalists only used teleology in order to prove this assumption.

¹²² *Dialogues Concerning Natural Religion* pt. 4 (London: T. Scott, 1875).

¹²³ *Ibid.*, pt 2.

British teleology was continued by theologians whose numerous so-called "Argument from Design" depended upon analogy between humanly created tools and artifacts. William Paley's *Natural Theology: Or Evidences of the Existence and Attributes of the Deity Collected from the Appearance of Nature* (1802) and *The Bridgewater Treatises* (1833-1836) attest to the belief that nature is the unimprovable product of divine design. Sir Charles Bell, in *Animal Mechanics, or Proofs of Design in the Animal Frame* (1827), argues that the architecture of an organism is too well suited to its purposes not to have been preplanned. Typical of mentalists, these teleologists did not seek to discover physical laws or formal affinities that might actually cause the resemblance. Instead they sought to compare nature to an artist so as to prove the existence of a divine creator.

Paley's analogy of the divine creator as divine watchmaker is well known. He pointed out that we do not wonder how, say, a stone has come to be if we find it lying in a field, but if we were to find a watch instead, a watch with parts obviously organized to serve the purpose of keeping track of time, we would be bound to infer that it is a product of intention. By analogy then, a living organism is obviously organized to serve the purpose of its own survival; thus, so argues Paley, we are also bound to infer an intentional creator.

Paley's arguments, as well as Bell's investigations of the operations and functions of the human hand, highlighted the ways in which function plays an organizational role in biological structure. This insight helped pave the way for Charles Darwin.

Darwin, Analogy, and a New Form of Mentalism

One may consider the adaptation of species in terms of mentalism in one of two ways: as a Darwinist or as a creationist. On the one hand, adaptation requires interpretation of one system (e.g., an animal with a new mutation resulting in its achieving a camouflage coloring) by another causally unconnected system (e.g., a would-be predator). Thus, some degree of mentalism survives in Darwinism in so much as it involves interpretation. On the other hand, creationists who work with the theory of natural selection maintain that since a mutation and its evaluation are not causally linked, a mutation's having accidental functionality is improbable. Therefore, creationists posit an additional causal agency, which would cause the right mutation and the right evaluation occur often enough to matter.

Given the arguments made by Paley and Bell, or even Galen before them, there could be little doubt that functionality played a key role in the organization of nature. Darwin's theory did not disturb this aspect of mentalistic teleology. He merely sought to replace the theory of special creation with natural selection. Special creation supposed each individual species was created at a specific point in time for a specific purpose. Natural selection supposed that individual species had adapted to their environments over time because the more functional organisms survived while the less functional did not. Although Darwin did away with Paley's idea of the *divine* watchmaker,¹²⁴ as Richard Dawkins has noted, natural selection takes on the role of Creator as the *blind*

¹²⁴ The divine watchmaker idea is associated with William Paley. See *Natural Theology: Or Evidence of the Existence and Attributes of the Deity Collected from the Appearance of Nature* (1802; Oxford, Vincent, 1826).

watchmaker.¹²⁵ In this sense, Darwinism actually encourages teleology as a mode of biological explanation. Nature fulfills, not God's design, but it still fulfills a design decided by function. A kind of mentalism inhabits the idea that a mutation (e.g., a bug that is flat and green) must be interpreted (e.g., as a leaf) if the mutation can be said to have a utility (e.g., predator evasion) that will cause the mutation to be preferentially selected.

It should also be noted that Darwin began his investigations because he recognized analogical resemblances between members of different species. He looked for a principle to make sense of the likeness between, for example, chimpanzees and humans, but he would not settle on a merely analogical principle such as the "great chain of being" used by the Romantics, which held that humans and other primates were variations on an abstract theme. In contrast also to the teleomechanists, who sought a *formal* affinity, Darwin sought to establish *physical* affinity, that is, *common descent*.

Because Darwin's theory of natural selection did rely on analogy, as Gillian Beer has argued, it did not fit well with the empirical tradition.¹²⁶ Darwin could not use the experimental methods of Bacon to test his theory. The laboratory was nature, which worked too slowly for a human scientist to observe changes.¹²⁷ An advantageous variation does not occur more frequently because it has a higher probability of being selected. Advantageous variations occur by chance. Darwin could not empirically prove

¹²⁵ See Richard Dawkins, *The Blind Watchmaker* (Harlow: Longmans, 1986).

¹²⁶ See Gillian Beer, *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot, and Nineteenth-Century Fiction* (Boston: Routledge & Kegan Paul, 1983).

¹²⁷ Now, however, new techniques for the study of bacterial evolution allow for sufficiently short replication times. Consequently, evolution can be observed in detail over thousands of generations. See R. E. Lenski, "Evolution in Experimental Populations of Bacteria" in *Population Genetics of Bacteria* (Cambridge, UK: Cambridge University Press, 1974), 193-215.

physical affinity by common descent, for to do so he would have to trace many fortuitous events, many instances of accidentally functionality.

Darwin began his argument by comparing the practices of animal husbandry with the mechanisms of natural selection. He noted that humans select certain qualities they find useful or suited to their desires and, through repeated controlled breeding, certain traits become more and more pronounced. In this case, it is clear that Darwin's use of analogy (comparing evolution to husbandry) helped further the advances of science. As Gillian Beer writes in *Darwin's Plots*

Once a *single order* is proposed—whether it be that of God the Designer, community of descent, or "a single physical basis of life"—analogy can stabilise. It can take its place as an instrument of perception which allows latent but actual corollaries to become visible.¹²⁸

The analogy between a human animal breeder and natural selection is not perfect. The role performed by a single intentional breeder becomes, in the theory of natural selection, distributed among various actors (in the form of conditions) throughout time, which favor similar kinds of animals with similar traits. In order to illustrate his point, Darwin reconstructs possible scenarios, in which the function of a structure plays a role in increasing the animal's chances of reproducing. A white rabbit survives a snowy winter while its drab relatives are all eaten by hawks. In the spring, the white rabbit produces a number of white offspring. The same scenario repeats itself until white rabbits outnumber drab rabbits. As Beer remarks,

Origin is in a very precise sense a narrative, because what it describes cannot be correctly described except through the medium of time.¹²⁹

¹²⁸ Gillian Beer, *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot, and Nineteenth-Century Fiction* (Boston: Routledge & Kegan Paul, 1983), 85.

¹²⁹ *Ibid.*, 65.

Darwin had to invent a different story about each species. Moreover, each trait possessed by the animal had its own story to tell, as it were. Such narratives are limited by their particularity; they offer no general law of adaptation. They have little or no predictive power since one cannot guess what the next mutation will be, nor can one guess how that might be useful in a given context. *The Origin of Species* tells the story of singular coincidental events, like roles of the dice, each one in itself unpredictable, random, but if compounded become significant in determining improved or differential functioning of a species.

Teleological Narratives using Affinities or Analogies

Above I have given a brief historical account of the uses of analogies in teleology. I have shown that sometimes analogies can provide insight into understanding natural forms of organization. I have furthered argued that instances involving the interpretation of analogies can lead to phenomena that can be said to result in a causal affinity, for example, organized biological behavior and predictable laws. I would now like to present two different kinds of narrative structure that illustrate nonmentalism and mentalism.

The first teleological narrative concerns events involving affinities that develop from repeated coincidences, which, though not inevitable, are somewhat probable. This kind of teleological narrative tends to follow predictable patterns that are based on physical affinities. In the second example, also a teleological narrative but of a different kind, the plot turns on analogies.

An affine¹³⁰ teleological narrative might describe how two boys, with very different genetic backgrounds, live in the same city and are exposed to many of the same cultural forms and mores. Though they do not know one another, coincidentally, their experiences are similar. When they reach a certain age, they each buy a pit bull and name it "Killer." The choosing of the same breed of dog and same name is a somewhat probable coincidence; however, a similar environment is the underlying cause. The boys have a cultural affinity.

In biology this is known as *convergence*. To give an example, there is a species of moth that looks very much like a hummingbird. It exploits the same niche as the hummingbird, drawing nectar from flowers, and consequently over time its body, posture, and style of maneuvering have been shaped by the same environmental pressures. The resemblance then is due both to similar histories of functioning and pressures from physical laws, such as Thompson described in his explanation of the similarities between all winged animals.

Quite differently, an analogical teleological narrative revolves around what I call a phenomenal pattern (defined in detail in Chapter Three), or a singular, very improbable, coincidence that turns out to be functional. This kind of narrative might describe how twin boys, separated at birth and growing up in very different cultural situations, each buy a rare breed of dog called a "chin." Three years later, they meet at an international chin dog show. The singular coincidence here involves the fact that both boys who bought a rare dog happen to be twins. This made it more probable that they might meet some day. An analogical reading of this phenomenal pattern might suppose that the

¹³⁰ "Affine" is used here as an adjective form of "affinity" to mean "related by law."

choice of dog is caused by a supposed spiritual affinity that is inheritable *similarly to* the way genetic traits are.¹³¹ These kinds teleological readings are used when no other cause can be found for the coincidence, and a supernatural one must be offered instead, if it is to be taken as meaningful.¹³² In this story, the "purpose" of choosing the chin dogs, or rather, the effect that the choices have, is to unite the twins.

These examples describe the difference between teleological narratives based on affinities and analogies at the level of plot structure. At the sentence level, the difference can also be described. Here we consider the differences in terms of a distinction between directionality and originality, which, as I noted above, are associated with affinity and analogy, respectively.

Directionality may be observed in near-transparent communication within a language. Imagine a novel that begins, "Call me Ishamel," which is both intended and taken literally and can only mean one thing: the speaker is to be identified as "Ishamel," an arbitrary designation that simply distinguishes the first-person narrator from other people who are not named Ishamel. The writer and reader of these words may not pronounce them in exactly the same way; their previous uses of these words might be insignificantly different; nevertheless, pronunciation and previous use are close enough

¹³¹ If one tried to establish an affinity by supposing that the point of this story was to argue that the type of dog that one is given to select is an inheritable genetic trait like eye color, then one would be using a false analogy that is easily disproved.

¹³² According to Persi Diaconis, the cause of this type of coincidence may be attributed to the "law of truly large numbers, which says that when enormous numbers of events and people and their interactions cumulate over time, almost any outrageous event is bound to occur." In order to assess the probability of this event, one would have to consider the total number of unusual choices any two people make over their lifetimes compared to the number of unusual choices that coincide. No doubt the average will be the same for randomly paired couples as it is for twins. Only if twins often made similar unusual choices would one be justified in seeking some hidden cause. See Persi Diaconis and Fredrick Mosteller, "Methods for Studying Coincidences," *Journal of American Statistical Association* 84 (1989): 853-861.

that the essential function of the words is communicated. There is an affinity. The received meaning may not be exact, but it is a good approximation.

Originality is the distortion of linguistic rules, which result in novel meaning. Imagine the writer has just written the words, "Call me Ishamel" with a vague intention of a sailor he once knew by that name. However, later the writer recalls the Biblical figure named Ishamel, Abraham's illegitimate son, father to the Arab nation, whose descendants are not included among the Chosen people. Thus, Ishamel becomes a symbol of an outsider. This interpretation is based on an analogy between two causally unconnected systems, a coincidental similarity between the fictional character's more or less arbitrarily-selected name and a Biblical figure's name. However, if the writer's having conceived of the analogy once, even if in passing, leads to his/her noticing other coincidental similarities to the Biblical character and emphasizing them, then what began as an analogy begins to determine the way the character functions. The distinction between analogy and affinity becomes blurred because the one making the analogy (the author) is located within the very system being interpreted (the story), and, during the writing process, reinforcing feedback eventually results in directional behavior, the development of a meaningful coherent character.

In sum, affinity and analogy can also be conflated in order to formulate a bridge between the two aspects of intentional behavior. Directionality involves coincidental similarities (analogies) within a single system, which accumulate in time, resulting in statistical regularities, a stable species, transparent communication, or an affinity. Originality involves a singular coincidental similarity between two separate systems, resulting in a new mutation, a new function, or an analogy.

Teleology Today

The best argument that I can make for the need to revisit the notion of teleology is the fact that the concerns of many nonmental teleologists have lately been reborn in 20th and 21st century science. The formal study of spontaneous pattern formation in contemporary developmental biology began with Alan M. Turing in the 1950s¹³³ and continues today by theoretical physicists, such as Arthur Winfree, and structural evolutionary biologists, such as Brian Goodwin. However, the original investigators of the phenomenon of self-organization and the laws of biological form were teleologists, beginning, somewhat naïvely perhaps, with Aristotle and culminating with the late work of von Baer. Today, the goal of evolutionary theorists, like that of the 19th century teleomechanists, is to elucidate the "principles of organization" that result in the appearance of similar biological structures. According to Goodwin, the traditional atomistic-reductive 20th century approach to the study of organisms has made

claims that understanding genes and their activities is enough to explain the properties of organisms. I argue that this is simply wrong. My arguments are founded on basic physics as well as on biology, and I shall use mathematics and computer modeling to illustrate the argument.... organisms cannot be reduced to the properties of their genes, and must be understood as dynamical systems with distinctive properties that characterize the living state.... organisms live in their own space, characterized by a particular type of organization. This is not a new idea...but it gets clothed in a new garb of ideas that have emerged recently in physics and mathematics, as well as in biology itself.¹³⁴

Winfree, Goodwin, and company study the energetic, mechanical, morphogenetic constraints that limit the kinds of forms that nature can produce. Like the teleologists,

¹³³ See A. M. Turing, "The Chemical Basis of Morphogenesis," *Collected Works of A. M. Turing*, ed. P. T. Saunders (New York: Elsevier Science Pub. Co., 1992), 37-72.

¹³⁴ *How the Leopard Changed its Spots: The Evolution of Complexity* (New York: Scribner, 1994), 3.

they contend that these constraints result in a limited number of structural archetypes. Goodwin notes that teleologist St. George Jackson Mivart argued in favor of theoretical morphology against natural selection. As Mivart pointed out in the late 19th century, nature has certain forms it tends to produce. For example, although marsupials of Australia have evolved separately from European placental mammals under different environmental conditions, there are marsupials that are strikingly similar to wolves, cats, mice, and squirrels.¹³⁵ Are the similarities between a marsupial mouse-like animal and a mouse merely analogous? Or are the similarities due to similar self-organizing processes and laws of pattern formation? Variations on a theme?

Goodwin also describes other remarkable phenomena involving similarities between the self-organizing processes of very different natural systems.

chemical reactions, aggregating slime mold amoebas, heart cells, neurons, and ants in a colony ... all show similar types of dynamical activity—rhythms, waves that propagate in concentric circles or spirals ... The important properties of these complex systems are found less in what they are made of than in the way the parts are related to the whole—their relational order.... [Furthermore] the patterns cannot be predicted from a knowledge of the properties of the component parts in isolation.¹³⁶

Among the most informative recent experimental studies in biochemistry have been done by Peter Schuster and colleagues on RNA sequences, the evolution of which is simulated by computer.¹³⁷ The study is also important because it shows self-organization occurring at a basic level of biological form. One must imagine that similar kinds of self-organization occur at various levels of the natural hierarchy: protein, membrane, cell.

¹³⁵ Ibid., 23.

¹³⁶ Ibid., 77.

¹³⁷ See Peter Schuster, "Molecular Insights into Evolution of Phenotypes," *Evolutionary Dynamics: Exploring the Interplay of Selection, Neutrality, Accident, and Function*, eds. James P. Crutchfield and Peter Schuster (New York: Oxford University Press, 2002), 163-220.

organ, etc. Schuster's experiment starts with a homogeneous initial population. After replications involving mutations, a number of what he calls *final structures* evolve from the initial sequences. Typically, there emerge relatively few different kinds of common structures and a wide diversity of rare ones. However, the total number of common structures drastically outnumbers the rare. In one series of experiments, for example, more than 93% of all RNA sequences folded into common structures that represented only 10.4% of all structures. Overall, the most common structures were of comparable frequency and usually closely related to the parent structure, while the distribution of the rare structures was random and fulfilled a power law distribution. The common structures were found again and again, in numerous experimental runs. Although the path to the final structure in each case may be unique and stochastic, the final structure itself is predictable.

Three conditions determine the move from stochastic activity to predictable orderly behavior: the uncorrelatedness of mutations, the large size of the sample that allows the system to explore the entire range of possible mutations, and the lapse of sufficient time to test the entire range. Such conditions may be said to define some "principles of biological form," and, one might further say, they are telic forces. The governing behavior of statistics turns a stochastic system into a deterministic one.

Based on numerous experiments of this kind, structural evolutionary theorists have determined that there exist relatively few archetypes. Thus, natural selection does not have to work on so large a pool as was once thought.

Structural archetypes or final structures are also known as *structural attractors*¹³⁸ and have been compared (perhaps recklessly) to Platonic solids in so much as they exist, as concepts, prior to the process of natural selection. Structural evolutionary theorists seek to uncover affinities that are *formal* (relating to the structure, relationships, or arrangement of elements regardless of content) rather than *ancestral* (relating to inheritance of specific genetic content). For this reason, structural evolutionary theory seems more Kantian than Darwinian.

Though contemporary structural evolutionary theory has many things in common with nonmental teleology, it would be a mistake to characterize the relationship in terms of a seamless intellectual development. Indeed, many structuralists believe that they are hammering in the last nails on the coffin of teleology.¹³⁹ Their rejection of teleology may be due to the fact that so many contemporary scientists only know of teleology as the doctrine that attempts to prove the existence of a divine creator by appealing to the appearance of design in nature. Above I indicated that this view of teleology is a Christian reinterpretation, known as mentalism. Nonmental teleology, of the Kantian teleomechanists, for example, does not posit an external creator, and, like 21st century

¹³⁸ Attractor is a term, which, as a noun, implies a kind of thingness and imbues the concept with the sense of an actual independent force, and which I find to be every bit as misleading as any Thomist term for a telic principle.

¹³⁹ For example, A. M. Turing writes, in a letter to a friend, that his study of spontaneous pattern formation was "intended to defeat the argument from design." Saunders supposes the comment was directed against William Paley's work that "originally put forth as a scientific proof of the existence of God." Apparently, neither Turing nor Saunders were familiar with the more important work of say, Kant, who argued for the that the existence of teleological design did not necessarily imply a designer. Turing's remark is quoted in Saunder's preface to "The Chemical Basis of Morphogenesis," *Collected Works of A. M. Turing*, ed. P. T. Saunders (New York: Elsevier Science Pub. Co., 1992), xii.

structural evolutionary science, it locates the origins of archetypal patterns and overall organized behavior in the interactions of the individual elements at the local level.

The failure of teleology as a science in the late 19th century may be attributed to the tendency (even among some teleologists themselves) to misconstrue final cause as an efficient cause. Again as noted above, Christian philosophers in particular tended to equate *telos* with divine action. Some secular teleologists were equally guilty of attributing the effect of *telos* to a physical cause. Teleomechanist Hermann Lotze critiqued what had become a bad habit among his predecessors, particularly Carl Friedrich Kielmeyer and Ernst Heinrich Weber. They tended to lapse into language which characterized the *Lebenskraft*, (their term for telic principle) as an independent force existing like any ordinary material object.¹⁴⁰ Teleology also became confused with the search for an actual physical blueprint in the germ substance. (Which only begs the question of the origin and author of a blueprint.) Such objectives contradicted those of Kant, who argued that final cause was to be found in the *dynamics* of organic *processes*, which were *self-organizing*.

James Crutchfield's "Intrinsic Emergence"

The interests of teleologists have now been vindicated by decades of research in nonlinear dynamics, which examines some of the same self-organizing phenomena that captivated Kant, Paley, Bell, von Baer, and Müller, among others. It is now accepted as fact that organizational properties can emerge that are not directly describable by the system's defining constraints and instantaneous forces.

¹⁴⁰ See Herman Lotze, "Lebenskraft," in *Handwörterbuch der Physiologie*, ed. Rudolph Wagner (Göttingen, 1842), 1: xv-xvi.

Even though today the emergence of previously unexpressed structural complexity (i.e., novel organization) in nonlinear systems is no longer disputed, as it was between mechanists and teleologists in former days, there remained until very recently the problem of attribution. Generally, emergent self-organized features were identified by an observer: it was the teleologist or the scientist studying the system who noticed a pattern of behavior that could not be explicitly represented in the equations of motion or in the initial and boundary conditions. It seemed that this observer actually affected what was observed by imposing a paradigm upon the data. Thus, the objectivity of the pattern appeared to be questionable. Since the late eighties, theoretical physicist James Crutchfield has been investigating the questions that surround the notion of *pattern discovery*. In "Is Anything Ever New? Considering Emergence," he writes,

The problem is that the 'newness' in the emergence of pattern is always referred outside the system to some observer that anticipates the structures via a fixed palette of possible regularities.¹⁴¹

The observer recognizes a pattern that is merely *analogous* to something else unrelated to the system: for example, certain chemical mixtures produce dynamical "spiral waves"; slime-mold cells form "concentric rings"; and marsupial mice and mammal mice resemble each other.

On what basis can one say that organized behaviors or recurrent forms reflect a causal affinity among the constituent parts rather than a mere analogy imposed from without? Crutchfield suggests that this question can be addressed by analyzing structural archetypes in terms of the way they process information. The entropy rate and degree of

¹⁴¹ See "Is Anything Ever New? Considering Emergence," *Integrated Themes, Santa Fe Institute Studies in the Sciences of Complexity XIX* (Addison-Wesley: Reading MA, 1994), 479.

structural complexity¹⁴² interact in rule-governed ways. Once these rules or significant regularities are discovered, one can use them to form quantitative descriptions of complex systems. Accordingly, "emergence" is defined by the process itself. As Crutchfield argues,

emergence without this closure leads to an infinite regress of observers detecting patterns of observers detecting patterns This is not a satisfactory definition, since it is not finite. The regress must be folded into the system, it must be immanent in the dynamics. When this happens complexity and structure are no longer referred outside, no longer relative and arbitrary; they take on internal meaning and functionality. (10)

Nonmental teleologists had also recognized that *telos* was not a satisfactory explanation for self-organization unless it required no further cause of itself. They too argued that *telos* was immanent in the dynamics. Christians, in contrast, supplied an inexplicable divine creator to account for *telos*, and thus ended the search. Crutchfield addresses this dilemma by regarding the observer, the one who recognizes the pattern, as part of the system itself.

In his view, a system may be regarded as that which is composed of many observers. "Observer" can refer to an ensemble of molecules, cells, ants, etc., any group of *interacting* individuals whose collective behavior exhibits increased structural complexity (mixing predictability with unpredictability). The activity of every individual within any system is influenced by its local interaction with other individuals in the same system. The interaction is referred to as *feedback*. After sufficient interaction has occurred within a sufficient span of time, the behaviors of the individual observers can come to strongly reinforce one another until, without an external director, the group

¹⁴² See Chapter Six for a description of Crutchfield's notion of "structural complexity," the regularities that balance predictability and unpredictability.

begins behaving in a self-organized fashion. Although no individual observer "knows" the whole pattern, Crutchfield argues that there is evidence that the pattern has been indirectly communicated to the local level because there is a change in the observers' behaviors, which become a *model* of the whole. Thus, the principle of organization of the whole may be inferred from the local behavior of an ensemble.

Henry James expresses a similar idea in "The Art of Fiction" (1884),¹⁴³ wherein he claims partial impressions can reveal a truth about the whole of reality. The "cluster of gifts" that "constitute experience" gives one the "power to guess the unseen from the seen, to trace the implication of things, to judge the whole piece by the pattern" (53). Knowledge of the whole, or "the condition of feeling life in general so completely," in turn, allows one to begin to know "any particular corner of it" (53).

James argues that truth can be known through the accumulation of impressions (or models), which it is the realist novelist's duty to record. Furthermore, it is the interaction of impressions that count. The meaning of the work can never be reduced to the sum of its parts:

the idea permeates and penetrates it [the work], informs and animates it, so that every word and every punctuation-point contribute directly to the expression, ... the story ... [is not] a blade which may be drawn more or less out of its sheath (60).

According to James, there is a final cause of the pattern that is found in the *dynamical* nature of the process itself. Similarly, Crutchfield's notion of *intrinsic emergence* allows one to attribute relative objectivity to the global pattern that emerges from local stochastic interactions. As Jeffery Goldstein puts it, Crutchfield's

¹⁴³ "The Art of Fiction," *Literary Criticism: Essays on Literature, American Writers, English Writers*, ed. Leon Edel (New York: Library of America, 1984): 44-65.

tactic in addressing the epistemological status of emergence is to examine the *intrinsic* computational capacity effectuated by emergent phenomena, which renders complex systems adaptive. However, defining emergence in terms of an intrinsic computational capacity raises all sorts of scientific and philosophical issues, such as the philosopher John Searle's (1994) contention that computational capacity always contains an external connection so that it is not really totally an intrinsic property. Crutchfield's postulation, nevertheless ... points to how emergence has the potential of generating self-maintaining mechanisms that serve to distinguish it from subjective impressions, serendipitous novelty, or merely epiphenomenal activity.¹⁴⁴

The importance of Crutchfield's finding in terms of the long tradition of nonmental teleology cannot be overstated. He has completed the work on directionality begun by Aristotle and continued by the Kantian teleomechanists by solving the problem of causal explanations that infinitely regress.

Extrinsic Emergence: The Use of Analogy

In Crutchfield's more recent work, he has begun to investigate the mechanisms underlying the aspect of telic originality. The basic idea is Darwinian, but here it becomes formalized, that is, the naturalized mentalism that survives in the theory of natural selection is analyzed in ways that allow one to quantify and categorize the transition from one level of structural complexity to another. Darwin, as noted above, had to invent a different story for each particular adaptation. Crutchfield, in contrast, seeks to provide a testable theory of adaptation.

Above I have used the term *directionality* to describe the maintenance of order (i.e., spontaneous pattern formation, canalization of biological form),¹⁴⁵ and predictable

¹⁴⁴ Jeffrey Goldstein "Emergence as a Construct: History and Issues," *Emergence* 1 (1999): 64.

¹⁴⁵ The term "canalization" was introduced into biology by C. H. Waddington, who borrowed the concept from Alfred North Whitehead. It refers to developmental reactions that "are adjusted so as to bring about one definite end result regardless of minor variations in conditions during the

growth. I have used the term *originality* to describe the discovery of new functions. I associate originality with the mechanisms for change. Directionality may be associated with Crutchfield's notion of intrinsic emergence, and originality may be associated with his notion of *extrinsic emergence*.

The process of intrinsic emergence can involve the occurrence of neutral changes in structure (a new structural archetype). Only when that new structure is evaluated by an observer can it acquire greater functionality or higher fitness. In "When Evolution is Revolution: Origins of Innovation," Crutchfield analyzes the mechanisms for both stasis and change underlying what he calls "epochal evolution," that is, a long period of species stability followed by a sudden change in fitness, resulting in an evolutionary adaptation.¹⁴⁶

Small changes in the parameter values (e.g., frequency of the interactions of individual parts and the number and spacing of the parts) of a self-organizing system may have no effect in the resultant structure. A number of different parameter values can make the system fall into the same *attractor basin*. This situation gives rise to the phenomenon of directionality.¹⁴⁷ If the number and/or degree of changes in parameter values are large enough, there may be a sudden jump to a new structural archetype (without moving through intermediary stages). As Crutchfield stresses,

course of the reaction." See "Canalization of Development and the Inheritance of Acquired Characters," *Nature* 150 (1942): 563-565.

¹⁴⁶ See James P. Crutchfield, "When Evolution is Revolution: Origins of Innovation," *Evolutionary Dynamics—Exploring the Interplay of Selection, Neutrality, Accident, and Function*, eds. James P. Crutchfield and Peter Schuster (New York: Oxford University Press, 2002), 101-134.

¹⁴⁷ According to M. Silberstein and J. McGeever, multi-realizability is also the best argument for a "functionalist" philosophy of mind, which one might call a theory of dynamical autonomy. See "The Search for Ontological Emergence," *Philosophical Quarterly* 49 (1999): 182-200.

long periods of stasis and sudden change need not be driven by external forces. They are the product of the many-to-one mappings from genotype [i.e., parameter values] to phenotype [i.e., resultant structure] and phenotype to fitness.¹⁴⁸

Once a new structural archetype has been produced, it can then be evaluated by natural selection. In some cases, different attractors can have the same fitness. In other cases, a new structure may be found by an observer to have a higher fitness or greater functionality. This results in extrinsic emergence.

To review then, directionality occurs when the individual elements of a *single* system each becomes synchronized with its immediate neighbors, collectively producing organized behavior. The overall organization is the whole of which the elements are a part. If we want to analyze originality, in contrast, we must think in terms of *two* systems, of how one system is used by another. Originality may be a singular discovery that does not lead to adaptation or, if the useful pattern becomes part of the systems' daily interactions, it may lead to adaptation—synchronization between the two separate systems, resulting in one with a complexity greater than the sum of the two parts.

It is with the concept of originality and extrinsic emergence that the notion of *analogy* enters the discussion on evolutionary mechanics in a very significant way.

In *The Major Evolutionary Transitions* (1995), John Maynard-Smith and Eörs Szathmari describe the origin of complex eukaryote cells (cells that contain nuclei and organelles) in terms of (re)interpretation of existing structures by means of analogy. Eukaryote is a term for all organisms included in the kingdoms Protista, Plantae, Fungae, and Animalia. It is argued that the little organs, or the "organelles," within eukaryote

¹⁴⁸ James P. Crutchfield, "When Evolution is Revolution: Origins of Innovation."

cells, were once free-living organisms, known as prokaryotes, that were consumed by a larger prokaryote. Today organelles are merely part of the eukaryote system.¹⁴⁹

The moment of first contact between a proto-organelle prokaryote and its host (also some sort of prokaryote) must have occurred as a result of a coincidental meeting and the discovery of an accidental function. Although Maynard-Smith and Szathmary's theory is unavoidably speculative, the narrative that may be constructed to illustrate the theory is plausible. The story begins with a prokaryote whose round shape became invaginated. (This was probably the result of some law of biological form, having to do with the way surface tension maintains a spherical enclosure. Beyond a certain size threshold, the outer layer of cells caved in creating a mouth-like area.) Prokaryotes "digest" food by releasing enzymes into the immediate environment. When food got caught in the newly created "mouth," enzymes were used more efficiently because they did not float away so easily. The next major development in the plot of this story would come when another prokaryote got caught in another prokaryotes "mouth."

One might say that when the two distinct organisms met, one engulfed the other when it misinterpreted it as some known food source. The second, now inside the first, found itself in a chemical environment that fitted its model for a food source. The second survived more easily because it received a constant supply of what it considered food. The first also benefited from the chemical by-products of the second, which improved the internal processes of the first. After time, they adapted to each other, as any two

¹⁴⁹ See John Maynard-Smith and Eörs Szathmary, *The Major Evolutionary Transitions* (New York: Oxford, 1999). Also see M. W. Gray, "The Evolutionary Origins of Organelles," *Trends in Genetics* 5 (1989): 294-99; L. Margulis, *Origin of Eukaryotic Cells* (New Haven: Yale University Press, 1970); and C. Mereschowsky, "Theorie der Zwei Pflanzenarten als Grundlage der Symbiogenese, einer neuen Lehre der Entstehung der Organismen," *Biologisches Zentralblatt* 30 (1910): 278-303, 321-47, 353-367.

organisms will that are coupled. Eventually, their cell divisions became synchronized and they became one functional unit. These complex cells became the building blocks of all eukaryote organisms, including you and me.

Extrinsic emergence involves functional reinterpretations and creative misinterpretations of one system's structure by another system. The second prokaryote's model for food resembled the chemical environment of the first prokaryote's "mouth." After time the newly created composite system stabilized and the meaning of the chemical environment was no longer merely analogical, no longer misinterpreted. In this case, the accidental functionality discovered by the engulfed prokaryote becomes a cause for the composite system's continued existence. A *fortuitous benefit* became a *genuine adaptation*.

Conclusion: On to Literature

I began this chapter noting that a primary criticism of teleology is that its method of reasoning is analogical, comparing natural processes to intentional acts, even though the similarity between the two is merely coincidental and superficial. I have shown how mere analogies might actually have an effect on the direction of evolution. This illustrates how an aspect of mentalism can enter into natural processes and why the theory of natural selection still retains a hint of teleology.

In the next chapter, I further investigate the process of discovery of new functions by means of a notion of *phenomenal pattern*, which designates some coincidental fit between one system's model and another's accidental features or between one system's model and patterns in its environment. However, as the next chapter will be dealing more

with literary theory than evolutionary theory, the vocabulary must shift. Systems become readers; environments become texts; but the basic concepts remain the same. If a coincidental fit between a reader's model and the author's model is reinforced through repeated exposure to textual information, then the reader can begin to assert that there is a true affinity between the text's meaning and the reader's interpretation, initially conceived as a mere analogy. In this way, we might hope to move away from the radical subjectivity theory of interpretation and move toward a notion of relatively objective interpretation.

Chapter Three Phenomenal Patterns

Abstract: In this chapter, I define a new term, the *phenomenal pattern*, which, I argue, is what must be used if new functions are to be created. The use of a phenomenal pattern discovers telic meaning, and it is associated with originality. Having isolated this concept, I am then able to point out other instances of theorists making use of the same concept under various names. Some of these previous sightings of phenomenal patterns are related. I show that the relationship between phenomenal patterns and intentionality is first noted by Aristotle in *Physics* and *Poetics*. He criticizes the interpretation of patterns that, he believed, irrationally posit an *external* agent. I cite literary critics, Erich Auerbach, James L. Kugel, and Frank Kermode, who each describe a part of Biblical exegesis as relating to phenomenal patterns and external authorship. I also look at Sigmund Freud's description of this type of logic as "animism." Literary critic E. M. Forster describes phenomenal patterns as that which give a work of art its "prophetic" power. Like Kugel and Kermode, Forster notes that it is the apparently meaningless coincidence that can be most suggestive of an external intention. Likewise, Tzvetan Todorov suggests that phenomenal patterns in

fictional narratives weaken the reality. If any cause is to be attributed to it, it must be supernatural. Finally, Peirce's notion of an "accidental third" is related to phenomenal patterns and a "synthesizing I think" to an external author.

Phenomenal Patterns

The term *phenomenon* is used in ordinary language to refer to a brute fact—simple, indisputable, requiring no further explanation—and also to a marvel, a thing of wonder and amazement. I consider this a useful linguistic ambiguity, however. It enables one to conceive of a key concept in teleology, which I call a *phenomenal pattern* and define as *ordinary unrelated facts that, when put into relation, can be interpreted in extraordinary ways*. The principle of organization on which the interpretation is based can, but does not necessarily, imply a conscious interpreter. A phenomenal pattern can be interpreted by an observer who finds the meaning useful to him or herself, but a phenomenal pattern can also be "interpreted" if, through the interaction of its own parts, it produces an unexpected effect that is functional. (The former is associated with mentalism, the latter with nonmentalism.)

The product of a phenomenal pattern is more than the sum of its parts because organization is itself a factor. The separate elements of the pattern each lend themselves to reductive explanation, but together these elements take on a function that could not have been predicted if one had considered the parts in isolation. I argue that the emergence of a new *function* is a defining moment of intentionality. For it is here that it seems as if a free choice of direction has been made with a view to an end. The pattern is not determined by causes intrinsic to the individual elements in isolation but by their

interaction—or their interaction plus an observer. Thus, we may say pattern as a pattern consists in the way it can be used or the effect it can have. This is why we speak of *telos* as a *reverse* cause. The *end* conditions seem to be the cause.

In the previous chapter, I focused, for the most part, on a description of intrinsic emergence in terms of more or less probable analogies, that are interpreted, in the sense of used, by the parts of the pattern itself. In this chapter, I focus more heavily on extrinsic emergence, phenomenal patterns that are meaningful to an observer. If the last chapter speaks more to science, this one speaks more to art. The following is a brief history of some of those who have consciously analyzed their own or someone else's interpretations of phenomenal patterns. In section two of this chapter, I first examine several diverse forms of literature, including: early biblical interpretation, which focused on the poetic and prophetic qualities of scriptural language that imply a single ahistorical Author. Secondly, I briefly look at medieval alchemists' theories, which sought evidence for *telos* in analogous structures found in the "*book of nature*." Thirdly, I recall Freud's psychological analysis of animism, which he argues, "is the transfer of the structural relations of one's own psyche to the outer world";¹⁵⁰ and finally, I examine a number of structuralist narrative theorists, who have sought to locate authorial intentionality in the effect of poetics and textual relations. All of these areas, biblical exegesis, alchemy, animism, and structuralism have in common the tendency to posit an *external* agent responsible for the unexpected meanings found in phenomenal patterns.

However, before embarking on this wider survey, I will focus here, in section one of this chapter, on an analysis of Aristotelian teleology. I do so because the formal study

¹⁵⁰ "Animism, Magic and the Omnipotence of Thought" in *The Basic Writings of Freud*, ed. A. A. Brill (New York: Modern Library, 1995), 841.

of phenomenal patterns and their relationship to intentionality began in Western literature with Aristotle's *Physics* and *Poetics*. In these works, Aristotle criticizes the kinds of teleological ascriptions described above which, he believed, irrationally posit an *external* agent. According to Aristotle, phenomenal patterns are chance events that may appear to have been "caused" by an external "intelligence" but are not.¹⁵¹

The rightful heirs of his teleology are only those forms of nonmental teleologies, such as *teleomechanism* and *vitalism*, not mental teleologies, such as *divine Providence*. In nonmental teleologies the cause of organization is not to be sought in any physical agent or seed. Organization emerges from the interaction of individual parts of a system. Telic constraints guide interaction without the help of a meddlesome external supernatural force.

Aristotle: No Deus ex Machina

The fact that Aristotle deals with teleology in both *Physics* and *Poetics* gives us some indication of a natural relationship between one's theories of causality and of proper plot structure. The key to understanding Aristotle's natural philosophy as well as his aesthetics lies in his *nonmental* approach to teleology. He claimed a teleological system is structured in such a way as to function appropriately for its purposes: the universe has the characteristics of a designed system, but no external rational designer is posited. In Aristotle's metaphysics, rational purpose is determined at the beginning of time by First Cause, which is an abstract notion of goodness. Although any notion of what is "good" may seem to presuppose a mind to conceive it, Aristotle instead thought the universe was

¹⁵¹ I refer to the stories of the debtee running into his debtor in *Physics* Bk. 2 Pt. 5 and of the falling stature of Mity in *Poetics* Sec. 1 Pt. 5. See more below.

itself rational. In his nonmental approach, as Mark Bedau has noted, Aristotle radically departed from Plato and differed as well from many predecessors.¹⁵² Plato could only link final cause with external mind. In *Timaeus*, he argues that final causes "work with intelligence to produce what is good and desirable," and they are to be distinguished from efficient causes, which "being destitute of reason, produce their sundry effect at random and without order." Likewise Descartes assumed all teleologies were mental: "I cannot conceive [natural] inclinations in things which lack understanding." Hobbes also supposed that a "final cause has no place but in such things as have sense and will."¹⁵³

Aristotelian teleology, as found in his *Physics*, attempts to explain stability, or how and why a system maintains itself without any *external* directing agent or principle. Aristotle's physics did not posit a supernatural agent (at least not an anthropomorphic one) external to the sphere of action who occasionally intervened, creating new regularities that went above and beyond usual law-like events. Rather, he argued that an already existing inherent principle of organization permitted physical processes to run a determinate course. (If "already existing," this principle might be considered supernatural, or at least beyond the physical world.) Aristotle's picture of the universe is best described as an immense interrelated organic machine that had been set in motion, once and for all time, by the "Idea of ideas," the First Cause. Whether or not such a principle ultimately requires an external supernatural intelligence is debatable; I argue it does not necessarily follow; Peirce, for example, has a notion of "Firstness" that does not require a supernatural intelligence as cause. I believe it is significant that Aristotle's

¹⁵² Mark Bedau, "Against Mentalism in Teleology" *American Philosophical Quarterly* 27 (1990): 61-70.

¹⁵³ Quoted in Bedau, *Ibid.*

Physics does not attempt to explain the *origin* of a system's purpose. He left his discussion of First Cause to *Metaphysics*, in which he explored such things that, he thought, could not be explained in terms of intrinsic physical cause and effect relationships.

In *Physics*, Aristotle confines himself almost exclusively to the consideration of only one part of the twofold mechanism that creates teleological behavior. He was concerned with directionality and the maintenance of order (i.e., dispositions that result in behavior with a previously determined function).¹⁵⁴ Thus, tendencies, and habits are apparently purposeful behaviors that can be explained within his deterministic paradigm.

The phenomenal pattern mechanism explains the process of discovery of new functions or what appears to be intentional behavior without resorting to mentalism. Aristotle's efforts as a natural philosopher were devoted to arguing against a notion of an external agent responsible for *accidental functionality*.¹⁵⁵ on which some phenomenal patterns depend for their effect. In philosophy a frequently used, if banal, example of accidental functionality is that of a rock that accidentally drops on one's desk, preventing one's papers from blowing away, thereby functioning as a paperweight.¹⁵⁶ According to

¹⁵⁴ Attempts have been made to define teleological behavior in terms of dispositions. See for example, Larry Wright, *Teleological Explanations* (Berkeley: University of California Press, 1976). For a refutation of Wright's argument, see Alicia Juarrero Roqué, "Dispositions, Teleology, and Reductionism" *Philosophical Topics* 12 (1981): 153-65. As Roqué argues, "all dispositional, and indeed all behavioral analyses of teleology rely on identifications of *patterns* of behavior that *persist through time*. This characteristic, however, is neither necessary nor sufficient for teleological behavior. ... Dispositional criteria are always inadequate as *explanantia* of unique situations or uncharacteristic behavior [which satisfy some goal] because unique or uncharacteristic behavior does not conform to a pattern and dispositions necessarily imply the existence of a pattern." Roqué appears to privilege originality in telic behavior over directionality.

¹⁵⁵ See Douglas Ehring, "Accidental Functions," *Philosophical Inquiry* 7 (1986): 74-81.

¹⁵⁶ More compelling examples also exist, such as that of a mutant form of a species in the process of discovering a higher fitness than the rest of the population. If, however, selection

Aristotle, one looks for an external intentional agent behind phenomenal patterns that confer an accidental functionality, when the likelihood of the pattern coming into existence seems a little too improbable and too perfect to be merely coincidental. In *Poetics*, Aristotle refers to the story of a man named Mityls who goes to festival and is killed by a falling statue as he is looking at it. This event initially seems like pure accident; however, as it turns out, the statue is of a man whom Mityls had killed. By reading this tale backward in time, the apparent accident seems to be "caused," as narrative theorist Wallace Martin puts it, "by the logic of the ethical dimension."¹⁵⁷ In *Physics* Aristotle also noted that the lucky usefulness of such events seems like the sort of thing that results from intelligent deliberation because they serve a purpose (Bk. 2 Pt. 5).¹⁵⁸ He claimed that a sense that events are supernaturally authored derives from a tendency to interpret *chance* events as intentionally useful. He did not advocate such superstitious beliefs.

Aristotle's aesthetic principles were very much influenced by his notion of causality. In *Poetics*, he criticizes the randomness of the episodic narrative, and, as noted above, he generally did not care for accidental events in a narrative.

Of all plots and actions the episodic are the worst. I call a plot 'episodic' in which the episodes or acts succeed one another without probable or necessary sequence.¹⁵⁹

causes this mutant form to increase in numbers and persist in the population—and the mutant would *not* have increased in numbers under selectively neutral conditions—then its functionality can no longer be considered accidental. If a genuine adaptation has occurred, function then becomes an actual *cause* of the new structure's existence. Of course, Aristotle did not consider how the accidental functionality of a phenomenal pattern might, through the mechanism of natural selection, have a significant effect on the order of nature.

¹⁵⁷ Wallace Martin, *Recent Theories of Narrative* (Ithaca: Cornell University Press, 1986), 128.

¹⁵⁸ All quotations from *Physics* are from Robin Waterfield, trans. (New York: Oxford University Press, 1996).

¹⁵⁹ All quotations from *Poetics* are from S. H. Butcher, trans. (New York: Hill and Wang,

If a playwright chose to include a coincidental event like the story of Mityls, its only virtue would be that it at least seemed "to have an air of design" (Sec. 1 Pt. 4). Aristotle insinuated that, although less sophisticated audiences that might be awed by such a tale because it suggests the intervention of gods, more sophisticated audiences would see the coincidence as contrived. *They* would see that it only revealed the personal intention of the author, not the gods. Aristotle preferred authors whose plot structures were consistent with nonmental telic causality. One might say that Aristotle's idea of "poetry" is closer to our notion of "science" than of "fiction":

The true difference [between the historian and the poet] is that one relates what has happened, the other what may happen. Poetry, therefore, is a more philosophical and a higher thing than history: for poetry tends to express the universal, history the particular. By the universal I mean ... according to the law of probability or necessity. (Sec. 1 Pt. 9)

In *Physics*, however, Aristotle does note that thought could initiate change that would not directly follow as a result of necessity, and in *Poetics* he did analyze how the mechanism of recognition, what he calls *anagnorisis*, can change the course of events. Nevertheless, both animal thought and recognition are fitted within his nonmental teleology.

Anagnorisis is a point of discovery that leads to a reversal of fortune, catastrophic in tragedy, happily resolved in comedy. In *Poetics*, he analyzes how the protagonist comes to know what has previously been hidden: in *Oedipus Rex*, Oedipus learns that it is he who killed the king, who, it turns out, is Oedipus' own father. Following this recognition is a sharp change in the direction of events, known as *peripeteia*. The change is the result of a contextual shift that makes a new reading of previously known facts

1961).

possible. It is important to note, however, that the information does not come to Oedipus accidentally. He conducts a formal investigation. He learns the truth from witness and informants. No external agent is responsible for the change in context. As Aristotle explains,

the unraveling of the plot, no less than the complication, must arise out of the plot itself, it must not be brought about by the *Deus ex Machina*. (Sec. 2 Pt. 15)

The facts of Oedipus' story are admittedly of an extraordinary nature. Unless one is given to killing everyone one meets at the crossroads, it is unlikely that one might unknowingly kill one's own father. It is furthermore less likely that the same man might also randomly meet and marry his own mother, the dead man's wife. Moreover, the chances that a prediction as specific as "Oedipus shall kill his father and marry his mother" will come to pass are extremely low, unless Oedipus' knowledge of the prediction contributes to its realization. In Oedipus' case, the course of events seemed to have followed some inevitable design. As noted above, this made a story worthy of telling, according to Aristotle. However, it is important not to overlook the fact that, while incredible coincidences may have initiated Oedipus' story, coincidences do occur in nature. As long as the way the story was resolved is not incredible or based on coincidental events, then it might still be considered legitimate within a nonmental teleological view.

In retrospect *peripeteia*, the unexpected turn of events or solution to a problem, makes sense, even though it may have been unpredictable when only the initial stages of the story had been described. To say that knowledge of the final state helps to explain what has happened is not to say that events were *predictable*. According to Frank Kermode, *peripeteia* is a

disconfirmation followed by a consonance: the interest of having our expectations falsified is obviously related to our wish to reach the discovery or recognition in an unexpected or instructive route.¹⁶⁰

Kermode claims *peripeteia* is a function of the end-determined narrative. Such statements, he notes, can only be made in retrospect.

It is only superficially ironic then that *Oedipus Rex*, Aristotle's favorite drama, is motivated by a phenomenal pattern that seems to imply the intervention of external forces, namely the Fates. The separate causal chains that led Oedipus and his biological father to the same crossroads at the same time are both perfectly describable in terms of physical causes. The psychological factors that prompted their fight might also lend themselves to empirical description. The victory of the younger man is also predictable. What defies reductive explanation, however, is the interpretation that can be made of this event. It seems to have been contrived by Fate so that Oedipus would kill his father in order to marry his mother according to prophecy. The meeting seems too coincidental to be a coincidence.

Aristotle would have to invent an aesthetic argument that would necessitate or excuse these violations against his theory of causality. This is indeed what he did. He argued that the proper narrative structure had a beginning, middle, and an end. He defined a beginning as "that which does not itself follow anything by causal necessity, but after which something naturally is or comes to be" (Sec. 1 Pt. 7). Therefore, his aesthetic almost requires phenomenal patterns, since meaningful coincidences are the only means by which new causal chains may be said to begin not of necessity. So that the author would not seem guilty of contrivance, however, he advised that such coincidences

¹⁶⁰ *The Sense of an Ending: Studies in the Theory of Fiction* (New York: Oxford University Press, 1966), 18.

be placed outside the play's action. This is in fact how Sophocles handles the phenomenal pattern in the story of *Oedipus Rex*. Oedipus has already killed his father and married his mother when the play opens. Thus, Aristotle's favorite play does not offend, too severely, his sense that poets as well as natural philosophers should be concerned with events that occur according to the "law of probability" (Sec. 1 Pt. 7).

In *Poetics*, Aristotle allowed that in narratives things "probable though impossible" should be preferred to the possible but implausible (Sec. 3 Pt. 25). Given Aristotle's sense of "probable" as morally sensible (see Chapter One), we can assume that "probable" here refers to outcomes that might be described as poetically just but physically impossible. In view of his physics and his nonmental teleology, this allowance seems somewhat contradictory. However, we may suppose he recommends that, if the best option, the probable and possible option, is *not* taken, then events that are physically impossible though logically defensible or just (e.g., miraculous coincidences that resolve a conflict) should be preferred to events that are physically possible but not just or not properly motivated.¹⁶¹ Although Aristotle contradicts his physics here by allowing the occasional use of phenomenal patterns that might seem to posit an external agent, he is only doing so for the sake of illustrating what he believed was proper human behavior. And furthermore, as noted above, even in a deterministic universe, coincidences do happen after all, and people do tend to interpret them. So they might be included in a realistic drama. Ideally however, he argued, "As in the structure of the plot, so too in the portraiture of character, the poet should always aim either at the necessary or the

¹⁶¹ Postmodern works tend to prefer the latter, e.g., random murders, unmotivated crimes, gratuitous events and actions, and etc. Martin Amis' *Night Train* (London: Jonathan Cape, 1997) is one example.

probable"(Sec. 2 Pt. 15). He also somewhat condescendingly claimed that use of impossibilities, such as meaningful phenomenal patterns, answered to poetic needs or to popular belief (Sec. 3 Pt. 25).

With rare exceptions then, phenomenal patterns were to be avoided in what Aristotle considered "good tragedy." Most phenomenal patterns, he believed, are instruments of *deus ex machina* plots, like that of Euripides' *Medea*. Aristotle complained that Euripides contrived that a god should descend to tidy up the mess of events that had been set in motion.

The Deus ex Machina should be employed only for events external to the drama- for antecedent or subsequent events, which lie beyond the range of human knowledge, and which require to be reported or foretold; for to the gods we ascribe the power of seeing all things. Within the action there must be nothing irrational. (Sec. 2 Pt. 15)

Since the purpose of sacred histories *would be* to posit an external agent, a god in a machine, they would, like Euripides, tend to violate Aristotle's sense of aesthetics. Therefore, as we turn now to an examination of sacred histories, and also works of art, we will find that phenomenal patterns have a primary place in interpretation.

Proof of an External and Capricious Author

Erich Auerbach, James L. Kugel, and Frank Kermode each describe a part of Biblical exegesis, a method of reading (and in Kermode's case, writing as well), which deals specifically with phenomenal patterns and their relationship to intentionality. The Hebrew priests and early Christian fathers relied heavily on verbal, visual, or situational coincidences to expound their theological theories. Moreover, they thought everything in a sacred text had to be intentional. Nothing could be the mere product of historical

causes. Thus, if they were not immediately struck by a sense of suggestiveness, the church fathers actively forced textual elements into phenomenal patterns. "Seemingly petty details," writes Kugel, were especially tempting for interpreters:

the names of unfamiliar persons or places, narratives that seemed to have no overriding theme or message, or laws that were entirely too occupied with mundane matters. These cried out ... for some additional, overarching significance or simply seemed to suggest, in view of both their curious details and the lofty provenance attributed to them, that some *other meaning* beyond the obvious one had been the author's intention. (81)¹⁶²

Arguing along similar lines, Frank Kermode writes in *Genesis of Secrecy*.

Interpretation abhors the random, which is one reason why, in the most modern school of criticism, it has become a dirty word, a term of censure. Interpretation seeks relations.... It will find, in some secondary world of magic and ritual, an explanation for the lucky.... It may go on to provide this fiction with mythical structure, a satisfying spiritual order, instead of the trivial carnal order of the primary narrative. (10)¹⁶³

Frank Kermode's term for a phenomenal pattern is an "occult structure," which he claims is formed by the act of interpretation. He distinguishes *interpretation* from ordinary historical *description*, which can be pointless and random. Interpretation does not allow for randomness because it derives from a philosophy of analogical determinism. In this view, there is an ahistorical agent—seeing past, present and future at once—that always mentally links physically unrelated events. For example, any sacrifice mentioned in the Old Testament could be an "image" predicting Christ's crucifixion.

Auerbach's term for this kind of phenomenal pattern is a "vertically linked figure."

¹⁶² "Early Interpretation: The Background of Later Forms of Biblical Exegesis" in *Early Biblical Interpretation* (Philadelphia: Westminster Press, 1986), 13-106.

¹⁶³ *The Genesis of Secrecy: On the Interpretation of Narrative* (Cambridge: Harvard University Press, 1979).

[A] connection is established between two events, which are linked neither temporally nor causally—a connection, which it is impossible to establish by reason in the horizontal [empirical] dimension ... It can be established only if both occurrences are vertically linked to Divine Providence, which alone is able to devise such a plan of history and supply the key to its understanding ... This conception of history is magnificent in its homogeneity ... earthly relations of place, time, and cause had ceased to matter, as soon as a vertical connection, ascending from all that happens, converging in God, alone became significant. (74ff)

Homogeneity is a special characteristic of analogical determinism. Each part of space and time is integrally related to every other part, so that each can be understood as a "sign" of the whole. If the reader knows the whole, the principle on which everything exists, then he or she can read the meaning of every sign, and every sign says essentially the same thing.

According to Kermode, such interpretive practices were fully established in the early Hebraic tradition and were extremely influential for the Gospel writers. St. Mark, in particular, strove to assign meaning to certain facts that other saints had left uninterpreted. For example, Mark dovetails two unrelated stories, the first involving a young girl known as Jairus' daughter, who is raised from her bed, and the second involving a woman who is cured of a hemorrhage when she touches Jesus' robe (5:21-43). These two events are only coincidentally related: while Jesus is on his way to Jairus' house, he happens to pass the woman who touches his robe.

In *Mark* the age of girl is given as twelve. None of the other Gospels mentions her age. Mark also indicates that the woman with the hemorrhage had been ill for *twelve* years. According to Kermode, this "chiming" has been dismissed as a coincidence by scholars who have insisted "that's just the way it really was" or who believe that the word

for "twelve" is simply a vague denotation meaning a dozen or so. In this way, the pattern can be explained away. But Kermode objects to such dismissals:

in matters of this kind there is really no such thing as nonsignificant coincidence, and we are entitled to consider that this coincidence signifies a narrative relation of some kind between the woman and the girl. (132)

Kermode guesses that Mark is "saying something about sexuality" by opposing menstruation with pre-pubescence, but he adds that his task is "not so much to offer interpretations as to speak of their modes, their possibilities, and their disappointments" (133). Kermode has identified a special property of narrative language, which, despite or because of its dubiety, functions as a portal to another level of meaning.

Kermode's reading of *Mark* is feasible because Mark could very well have manipulated the details to create some kind of resonance that would encourage another layer of interpretation. In contrast, interpretations that argue, for example, that Christ's crucifixion is foreshadowed in the Old Testament are not feasible. The Old Testament writers could not have known the future nor would they have predicted that the Jewish "savior" would be put to death. The fact that they *seem to* allowed Christian scholars to argue for the existence of a meta-author who knew the future of the narrative and could design early images that would foreshadow later events. The very improbability that an accidental function could have been achieved through normal causality seemed to imply an intentional author that could help things along.

As the interpretation of sacred histories flourished during the age of radical Rationalism during the Middle Ages, so did the practice of interpreting the "book" of nature. The work of alchemist Paracelsus (1493-1541) illustrates the belief that the world was literally composed of "signs" that could be read like the language of a teleological

narrative. Divine speech was conspicuously audible in coincidences. Nature, argues Paracelsus,

made liverwort and kidneywort with leaves in the shape of the parts she can cure [...] Do not the leaves of the thistle prick like needles? Thanks to this sign the art of magic discovered that there is no better herb against internal prickling.¹⁶⁴

Alchemists believed that coincidental similarities in Nature were indicative of purpose. Again, this belief derives from a deterministic philosophy that rejects the notion of chance altogether. All order is thought to have some cause, if not mechanistic, then intentional.

Paracelsus' Nature is not a mechanic at all, but a poet and a riddler. Paracelsus knew that mercury could cure syphilis. He reasoned, in what we would now consider perfectly Joycean style, that this is so because the name of the cure, "mercury," from "mercer," whence also "merchant," was etymologically related to the place in which the disease was most often contracted, that is, in the "market place," so to speak.

Alchemy and Biblical exegesis both assume the natural world and its history are as works of art, manipulated by an agent above and beyond normal causality and temporal constraints. Sigmund Freud has described this type of logic as "Animism, Magic and the Omnipotence of Thought" in an essay bearing that title. "Animism," he writes, "is the transfer of the structural relations of one's own psyche to the outer world."¹⁶⁵ While there is no such thing as cosmic intentionality, through an act of interpretation,

¹⁶⁴ *Werke XIII*, quoted in Ian Hacking, *The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference* (Cambridge: Cambridge University Press, 1975), 42.

¹⁶⁵ "Animism, Magic and the Omnipotence of Thought," in *The Basic Writings of Freud*, ed. A. A. Brill (New York: Modern Library, 1995), 841.

human intentionality can connect things that are spatially and temporally far removed. Animism assumes this subjective phenomenon is part of the objective world.

A phenomenal pattern has a limited relationship to a Freudian "uncanny" pattern. Freud argues that the uncomfortable feeling associated with the uncanny is a repulsion for fatal determinism.¹⁶⁶ The uncanny is awe-inspiring (or fearful) because, like a phenomenal pattern, its accidental functionality can only be explained (if not written off to chance) by an unpredictable fatal mechanism—an analogical determinism that is not subject to physical laws. According to Freud, when one encounters the uncanny, one tends to recall primitive animistic beliefs that one had previously surmounted. The uncanny seems to give these rejected beliefs new credibility.

Freud gives an example from his own experience. He describes how, when he had lost his way in an unfamiliar city, he repeatedly returned by accident to a bad section of town, a place he wished to avoid. He thought it could not be merely chance that directed him to that spot. It seemed he was being directed there so that he would go with one of the women who accosted him. Against his better judgment, he began to fear that some cosmic purpose was at work.

But Freud later decided that such a superstitious way of thinking was ridiculous because the natural world is not purposeful in the way that an intentionally created work of art is. He recognized that this teleological sense of events was appropriate only for works of art. An uncanny pattern in a fictional narrative could very well be intentional, indicative of poetic relationships, unconstrained by time and space. As Freud writes,

¹⁶⁶ "The Uncanny," in *Works* 17, trans. James Strachey (1919; London: Hogarth Press, 1953-1974), 249.

We rightly speak of the magic of art and compare the artist with the magician. But this comparison is perhaps more important than it claims to be. Art, which certainly did not begin as art for art's sake, originally served tendencies which today have for the greater part ceased to exist. Among these we may suspect various magic intentions.¹⁶⁷

Freud's theory that art has its origins in magic is corroborated by that fact that early Biblical and alchemic interpreters often claimed to be inspired mediums or magicians, though "artists" seems a much more appropriate label.

Indeed, when the institutionalized study of fictional narrative began in universities around 1900, it adopted the interpretative practices that had been used by Biblical scholars, alchemists, and animists because, not coincidentally, they are appropriate to the study of artistic intention.

In "Prophecy," E.M. Forster describes a phenomenal pattern in *Moby Dick*, which, he claims, gives the work "prophetic" power.¹⁶⁸ Like Kugel and Kermode, Forster notes that it is the apparently meaningless coincidence that can be most suggestive of a higher level of intention.

At the beginning of the narrative, Melville includes a long sermon, during which the preacher makes the following statement: "Delight is to him whose strong arms yet support him when the ship of this base treacherous world has gone down beneath him." Forster then argues that

it is not a coincidence that the last ship we encounter ... before the final catastrophe should be called the *Delight*; a vessel of ill omen who has herself ... been shattered by him [*Moby Dick*]. But what the connection was in the prophet's [Melville's] mind I cannot say, nor could he tell us. Immediately after the sermon, Ishmael makes a passionate alliance with ... Queequeg ... Towards the end he falls

¹⁶⁷ "Animism, Magic and the Omnipotence of Thought," in *The Basic Writings of Freud*, ed. A. A. Brill (New York: Modern Library, 1995), 845.

¹⁶⁸ "Prophecy" in *Aspects of the Novel* (1927; reprint, New York: Harcourt Brace, 1955), 125-147.

ill and a coffin is made for him, which he does not occupy, as he recovers. It is this coffin, serving as a life-buoy, that saves Ishmael..., and *this again is no coincidence, but an unformulated connection that sprang up in Melville's mind....* It is wrong to turn the *Delight* or the coffin into symbols, because even if the symbolism is correct, it silences the book (140) (emphasis added).

The "non" coincidence here Forster recognizes as being indicative of the author, or to put it another way, of the final cause of the text. Forster resists assigning a symbolic significance to the coincidence: however, he implies some association between destruction, salvation, delight, and homosexuality. He cannot prove the argument because the association is a singular event. If one looked elsewhere in Melville's work and found the same pattern of associations recurring, only then could one begin to make an argument that the pattern has relative objectivity as an intentional pattern. However, Forster's task is, like Kermode's, not to offer *the* correct interpretation, so much as to explore interpretive modes, possibilities, and disappointments.

Inconsequential and consequential details are initially indistinguishable. They are only interpretable, if at all, in the light of some overarching principle that may not be apparent till the end.

In *Recent Theories of Narrative*, Wallace Martin uses Roland Barthes' terms "index" and "informant" to describe the process of distinguishing between clues and random details.¹⁶⁹ His project is to discover one of the many possible teleological meanings of the events. Using Katherine Mansfield's short story "Bliss" as an illustration, Martin first gives an example of an informant:

There is a fire burning in the nursery, and Bertha lights one in the drawing room (informants: it is spring, and the story takes place before houses were centrally heated). (123)

¹⁶⁹ All quotations by Wallace Martin are from *Recent Theories of Narrative* (Ithaca: Cornell University Press, 1986).

Martin draws our attention to the fact that Mansfield then adds a rather curious statement: "she [Bertha] hardly dared to breathe for fear of fanning it higher." Just as Kugel has noted that Biblical scholars often felt the need to interpret information whose inclusion seemed curious or illogical, so does Martin. He supposes that there is also "a fire burning in Bertha's bosom" because he sees no reason why Bertha would not want the fire in the fireplace to burn higher. Martin argues that the apparently meaningless detail of the way in which Bertha regards the fire is actually an index to another level of meaning. We discover later that Bertha is harboring a secret passion, thus Martin's suspicions are given some credibility.

His term for this phenomenal pattern is "odd textual conjunctions." He realizes that "to make such connections is to presuppose a purpose," but he argues that he is somewhat justified in doing so because "by accident and design the text was produced by a writer" (123).

Martin is also aware that he may be reading too much into these informants. "At times we may wonder if odd textual conjunctions were planned." He moreover wonders whether or not one should associate Bertha, who "was so tired she could not drag herself upstairs" with her cat, which is earlier described as "dragging its belly." (123) The descriptions have in common "drag," but is it a meaningless coincidence? Martin's conjecture about the "fire" in Bertha's bosom is confirmed as the story unfolds. The fire in the fireplace does come to have a prophetic aspect, but "drag" never does. Only in the light of the end do we know which of the possible indexes are merely informants. As we read, we think we see hints of the future, and as we reflect back on the work, we are able to distinguish between real clues and false ones. This process, of constantly looking both

forward and backward while reading, is called "double reading" by Jonathan Culler.¹⁷⁰ As Martin remarks,

Assumptions about causality lead to conjectures about the future; . . . We read events forward (the beginning will cause the end) and meaning backward (the end, once known, causes us to identify its beginning). (127)

The double reader is trying to discover what the events in a narrative *mean*; he wants to know the author's ultimate purpose in relating this or that fact. As he is reading, he is not necessarily concerned about being able predict what will happen, for *what* happens and *how* it happens is not as important as *why*.

In his study of structural poetics, Tzvetan Todorov suggests that "gnoseological" is the term to describe narratives that are more concerned with the purpose or meaning of the events than how events happen.¹⁷¹ In agnoseological narrative, coherence is poetic, not historical, and it is based on phenomenal patterns. For example, Todorov argues that the coincidental resemblance of two dreams of different characters in Novalis' *Henry von Ofterdingen* weakens the reality. A coincidental resemblance is not caused by physical laws. The resemblance can only be noticed by an omniscient intelligence, and this suggests that there are supernatural forces controlling the content of dreams.

Furthermore, none of the events in *Henry von Ofterdingen* has any consequence, as in a dream. According to Todorov, coincidences that do not advance the plot seem to signal intentional meaning. They function as "indices, and oblige us to set out on an interpretive track that is independent of the principal semantic line" (58). This reminds us

¹⁷⁰ "Story and Discourse in the Analysis of Narrative," in *The Pursuit of Signs: Semiotics, Literature, Deconstruction* (Ithaca: Cornell University Press, 1981), 169-87.

¹⁷¹ *Genres in Discourse* (New York: Cambridge University Press, 1990).

again of Kugel and Kermode's argument that apparently random details seem to "cry out" for interpretation.

Analogical-teleological narratives, as I have described them, are not predictable. Instead, one might say they appear prophetic. And as Oedipus discovered, the interpretation of a prophetic message is always a slippery business. The meaning is only intelligible after the fact. The concept of a phenomenal pattern describes how new meanings or accidental functions are discovered and provides the basic mechanism of a *telos* that is neither a reverse cause nor a predetermined one, but a coincident cause, retrospectively realized.

Peirce's Accidental Third

In Chapter One, we have already looked at Peirce's conception of indeterminacy, which he referred to as "Firstness." He describes indeterminacy as discontinuity, where one event does not follow from another. "The original chaos, therefore, where there was no regularity, was in effect a state of mere indeterminacy, in which nothing existed or really happened."¹⁷² "Secondness" is found in some coincidentally regular pattern that occurs, resulting in the "existence of things." Secondness is a brutal fact that has not yet been defined in relationship to another. It has a sense of "thisness," nothing more. Then Peirce asks the reader to imagine after the "thisness" of a first single note, a second note follows. In that instant one becomes aware of change, and one is on the way to a concept of "Thirdness," which is the law that makes brute facts intelligible. Peirce makes a distinction between two kinds of thirds, which is relevant to the discussion here.

¹⁷² "A Guess at the Riddle," in *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Indianapolis: Indiana University Press, 1992), 278.

He refers to a "real third" and an "accidental third." The former results from statistical laws, as I describe in Chapter Two in terms of *affinities*. The latter I refer to as a phenomenal pattern. Peirce describes how useful "noise" is interpreted, resulting in an accidental third. He gives the example of an old fable about a falling brick that hits a passerby.

'How did I slay thy son?' asked the merchant, and the genie replied, 'When thou throwest away the date-stone, it smote my son who was passing at the time, on the breast, and he died forthright.' Here there were two independent facts, first that the merchant threw away the date-stone, and second that the date-stone struck and killed the genie's son. Had it been aimed at him, the case would have been different; for then there would have been a relation of aiming which would have connected together the aimer, the thing aimed, and the object aimed at, in one fact. (254)

Peirce explains that when a pattern is found in an accidental third a "synthetising 'I think' introduces an idea not contained in the data, which gives connections, which they would not otherwise have had" (261). The father is the "synthetising 'I think' in this instance.

I reiterate, a real third, in contrast to an accidental third, is the result of intelligible laws of nature. A real third might also be considered a form of nonmental *telos*, and an accidental third might be considered a form of mental *telos*.

This chapter concludes Part One of this work in which I have described the twin aspects of teleology: stasis and change, the maintenance of order and the discovery of new order, directionality and originality, nonmentalism and mentalism, affinity and analogy. The point being that one cannot have a coin with only one side; the two aspects are thoroughly entangled, however much they may be analyzed separately. With these basic distinctions and complications in mind, I will now consider teleologies grouped

according to four broad categories: analogical determinism, deterministic fortuity, pragmatism, and self-organization.

Part Two: Application
Different Teleologies Result in Different Narrative Structures

Chapter Four
Analogical Determinism

Abstract Teleological narratives are not always very orderly and restricted stories, free of digressions and apparently gratuitous detail. A teleological narrative can be any description of more or less random events that eventually *work out* in some useful way. They may appear to work themselves out in accordance with the laws of nature, or they may appear to be helped along by some external force. It is the latter effect that interests us in this chapter. Specifically, we explore coincident physically unrelated events that seem to be linked only by virtue of the *idea* they serve. Thus, this kind of *telos* has a mental aspect. The mechanism underlying such teleological events is referred to as *analogical determinism*. This *telos* transcends materialist notions of linear progression: it can move discontinuously in any direction in time and space. Examples range from Christian narratives, to Romance narratives, to Freudian narratives, and to 20th century "nonlinear" narratives. Each of these apparently very different kinds of narratives falls into a category Bakhtin calls "adventure time narratives." Each illustrates a *telos* that is *prophetic* rather than *predictable* because it is analogically rather than materially determined.

The Mysterious Ways of Providence

The Christian teleology that developed during the Dark Ages, in stark contrast to Aristotelian teleology, tended to argue that especially fortunate or unfortunate accidents are caused by (or at least justified by) *telos* alone. These Christians did not accept Aristotle's view that *only* regular events are purposeful.

Whereas Aristotelian teleology was rational, like the laws of physics, Christian teleology, which became known as the Ways of Providence, often appear unintelligible to humans. Only retrospectively could a medieval Christian begin to understand the purposes of divine actions. (A great many Christians continue in this type of belief today.) According to medieval Christian doctrine, codified primarily by St. Augustine in the fourth and fifth centuries, Providence is initially unintelligible because human beings and God experience time in different ways.¹⁷³ Eternity occurs in an instant to God. He exists outside of time and all events occur simultaneously for Him. Cause and effect are not ordered in a linear fashion; thus, the end (*telos*) can affect the beginning. In fact, everything can affect everything else at once. God's conception of reality is holistic in the purest sense.

Humans, however, exist within time and experience events in a sequential manner. Events often appear unjust, incomprehensible, and senseless because human cannot guess how the future will fulfill God's intentions. Nevertheless, it is a Christian's duty to attempt to decipher God's will as symbolized in the *book* of nature and in historical events, as well as in the Bible.

¹⁷³ See Augustine, *Confessions* 11.11.13.

Augustine had a way of shaming the purely literal-minded reader, whose failure to sense the ultimate divine meaning he considered "folly and insanity" (106), "mad impiety" (183) and "mad contention" (240).¹⁷⁴ Augustine insisted on both the literal *and* the figurative readings of any material fact. He pointed out that

the Scripture itself, even when, in treating in order of [sic] the kings and of their deeds and the events of their reigns, it seems to be occupied in narrating as with historical diligence the affairs transacted, will be found, if the things handled by it are considered with the aid of the Spirit of God, either more, or certainly not less, intent on foretelling things to come than on relating things past. (569)

Resemblances, analogies, and metaphors provided the clues necessary to interpret divine will that might be encoded in apparently meaningless details:

For, in the manner of prophecy, figurative and literal expression are mingled, so that a serious mind may, by useful and salutary effort, reach the spiritual sense; but carnal sluggishness, or the slowness of an uneducated and undisciplined mind, rests in the superficial letter, and thinks there is nothing beneath it to be looked for. (744)

Augustine's theological doctrine provided the frame with which he could make sense of apparently meaningless information. Under the pressure of Augustine's reading, the Old Testament predicts, and authenticates thereby, Christ's incarnation and the Church's power. Every sacrifice described in the Old Testament is interpreted as a foreshadowing as Christ's sacrifice. Physically unrelated events (e.g., various sacrificial offerings) are linked only by virtue of the *idea* they reflect. Thus, this kind of *telos* has a mental aspect. The underlying mechanism here is *analogical determinism*.

Analogical determinism can adapt to any particulars; it can distort, manipulate, and reinterpret virtually anything in order to make it fit a preconceived idea. The rules that govern interpretation are not specified beforehand; any interpretation is valid as long

¹⁷⁴ Unless otherwise indicated, all quotes by Augustine below are from *The City of God*, trans. Marcus Dods (New York: Modern Library, 1950).

as it fits the Christian doctrine and is internally self-consistent.

Everything Works out for the Best

Medieval Christians were, presumably, consoled by the idea that everything is just and intelligible, even though it does not appear to be so. Tragic accidents and catastrophic events were common amid the political instability and poor health conditions of the Middle Ages. Adopting a stoic attitude, believing that behind the apparent disorder is order, might have helped some people endure all sorts of injustices and abuses (and might have helped other people continue to inflict them as well).

Medieval author Boethius takes up the stoic attitude in his book *Consolation of Philosophy* (524?), which he wrote in prison while awaiting horrible torture and death for the "crime" of being on the wrong side of politics. As he describes himself, Boethius was actually a very altruistic man of the senate. When he was unfairly sentenced to death, he could not understand the apparent injustice that had befallen him. He consoled himself with the philosophy of stoicism that taught him how to rationalize all apparent evil. Stoicism showed how everything ultimately serves divine purpose. In the end, he welcomed his death because he believed it would fulfill divine Providence.

Geoffrey Chaucer started writing the *Canterbury Tales* (14th C) shortly after translating Boethius' *Consolation of Philosophy*. The narrative structure of the Knight's Tale reflects the notion that apparently random events are actually caused intentionally, by a divine being, in order to achieve some end. If every event serves some ultimate purpose, then the poet who is trying to construct a narrative might have some difficulty deciding what is crucial to the story.

The Knight begins his tale with a digression. He mentions a famous duke Theseus and his new bride Hippolyta. Then he explains how on his way home from the wedding, Theseus meets some women who have lost their husbands at the hand of a tyrant named Creon. It is then related how Theseus goes to fight Creon, and after battle, Theseus stumbles upon a couple of injured knights, and it is these knights who are the real protagonists of the story. The story finally begins.

Unlike in an Aristotelian narrative, which would have begun with the knights, in this narrative, anything and everything may be causally connected in God's ultimate plot. This is perhaps why the narrator has difficulty knowing what to include, what to leave out, and where to begin. The knight's descriptions end up being too detailed and his tale is too crowded with characters. Some characters turn out to be instrumental to the plot. Others do not. Furthermore, the plot is driven, for the most part, by chance meetings and instances of luck. The knight claims it is pointless to say whether some event comes about "by accident or destiny. . . For as events are shaped they have to be."¹⁷⁵ Providence is thus indistinguishable from chance. The knight, like Boethius, is a stoic. His tale is concerned to show that ultimately all suffering is preordained and serves a divine plan. Unlike Boethius' story, the Knight's Tale should be seen, I think, as rather funny.

In 1759 Voltaire wrote *Candide* as a comic critique of this extreme brand of "everything works out for the best" teleology. In Voltaire's tale, Dr. Pangloss (whose name means "interprets all") attempts to rationalize even the most awful tragedies. He claims all events—from gratuitous murder to natural disasters—ultimately serve divine purpose.

¹⁷⁵ Geoffrey Chaucer, *The Canterbury Tales*, trans. Nevill Coghill (New York: Penguin, 1977).

What Causes Patterns in Random Events?

With few exceptions—most notably perhaps during the 18th century, when divine action was associated with predictable regularity and the laws of physics—evidence for supernatural purpose is usually located in apparently improbable events, good or bad luck, miracles, and even funny coincidences. When the ancient Greeks wanted to determine the will of the gods, they looked for chance patterns: they drew lots, examined animal guts, listened to sibyls babble incoherently, or studied flocks of birds passing overhead. Today fortunes are still told with randomly dealt cards and Yaro sticks.

Random samples can exhibit coincidental regularities that are entirely consistent with the laws of probability. Nevertheless, notes mathematician Persi Diaconis, "our intuitive grasp of the odds is far off. We are often surprised by things that turn out to be fairly likely occurrences."¹⁷⁶ That surprise, in turn, tends to exaggerate the significance of the coincidence. A standard example of a "surprising" regularity is epitomized by the so-called birthday problem. In a group of twenty-three people, there is a fifty percent chance that two will share the same birthday. People tend to guess that the probability would be less than twenty percent based on the reasoning that 23 is less than twenty percent of 365, the number of days in a year. But calculating probabilities is more complicated and, as Diaconis points out, counterintuitive. What many people fail to consider when attempting to solve the birthday problem is that the matching birthday is *not specified beforehand*. The probability that two people in a group of twenty-three will share *any*

¹⁷⁶ See Persi Diaconis and Fredrick Mosteller, "Methods for Studying Coincidences," *Journal of American Statistical Association* 84 (1989): 854. Diaconis is Professor of Mathematics at Stanford University and a professional magician who debunks the apparently magical abilities of fraudulent psychics.

birthday is much higher than the probability that two people will share, say, the birthday April 23rd. Throughout this chapter we will return to the idea that coincidences that are not specified beforehand are not surprising, except, of course, when they happen to you.

A birthday match may not be a particularly interesting coincidence. When a coincidence is interesting, or useful, or appears just, it is more difficult to accept the meaningless probability of the event. As G. K. Chesterton writes in "The Blue Cross," apparently meaningful coincidences do happen, and they get our attention:

A few clouds in heaven do come together into the staring shape of one human eye. A tree does stand up in the landscape of a doubtful journey in the exact and elaborate shape of a note of interrogation. I have seen both these things myself within the last few days. Nelson does die in the instant of victory; and a man named Williams does quite accidentally murder a man named Williamson; it sounds like a sort of infanticide. In short, there is in life an element of elfin coincidence which people reckoning on the prosaic may perpetually miss.¹⁷⁷

Even though coincidental regularities may be easily explained away by the laws of probability, the temptation to believe that they are contrived (Chesterton calls these coincidences "miracles") is hard to resist, as born out by this passage. Significantly, however, the coincidences mentioned here, like the birthday match, are not prespecified. That is, the speaker does not predict that the particular shape that the clouds will form nor does he predict the apparent infanticide. He only notes them after the fact. Any recognizable shape or coincidence will do, and the number is vast. Extending what one learns from analyzing the birthday problem, we realize that the probability that *any* interesting resonance will occur on a given day to *any* person can be high. Nevertheless,

¹⁷⁷"The Blue Cross," in *The Innocence of Father Brown* (Grand Rapids, MI: Christian Classics Ethereal Library, 1997. [Cited 17 November 2001]). Available at www.ccel.org/c/chesterton/innocence/title.html.

when *you* are the one to which the coincidence is relevant, it is striking. As Chesterton emphasizes, "I have seen both these things myself within the last few days."

Chance may be seen as a *vehicle* used to act out the desires of some intelligent force. Or chance itself may be seen as an intentional force. The latter was implied by C. G. Jung when he argued that synchronicity is "a hypothetical factor equal in rank to causality as a principle of explanation."¹⁷⁸ The former has been implied by numerous religions that have posited supernatural causes for coincidences or that have, like Augustinian interpretation, found resemblances to be analogously determined by a unifying theme.

Freudian Narratives

Any chance event that is said to occur *because of* its effect can be considered end-directed or teleological. The landscape presenting a doubtful tree in the Chesterton passage seems to express the speaker's emotions. Since the tree was there before the speaker arrived on the scene, its shape seems predetermined and fated for the accidental function it comes to serve.

Sigmund Freud argued that coincidentally useful events in the outer world *are not* caused by cosmic intentionality. Coincidentally useful or telling events in one's inner world, however, *are* caused by the Unconscious, over which one may have no knowledge or control. Freud theorized that the Greek notion of fate was often a projection of these internal intentional mechanisms onto the external world. Unconscious actions express a person's hidden emotions by symbolizing a repressed state. For example, compulsively

¹⁷⁸ *Synchronicity: An Acausal Connecting Principle*, trans. R.F.C. Hull (Princeton: Princeton University Press, 1973), 19.

washing one's hands may indicate that one has feelings of guilt. Guilt here is assumed to be equal to feeling unclean. Even though this action may appear only coincidentally analogous to one's feelings, as in the case of Chesterton's doubtful tree, according to Freud, the telling act is actually being driven by the Unconscious. The Unconscious is a purposeful force in so much as it does things for the sake of alleviating the pains of repression or expressing hidden desires.

I find Freud's interpretations as dubious as Augustine's or Chesterton's. He too could not leave coincidental resemblances alone. He felt that chance patterns must in fact be directly caused for the sake of the function they serve or the meaning that they have. The similarity between Freud's and Augustine's interpretive strategies is most obvious in an essay in which Freud argues that (what I consider coincidental) order found in arbitrarily chosen names or numbers revealed, not the will of gods, but of the Unconscious.

In "Determinism—Chance—And Superstitious Beliefs," Freud gives an example of the workings of the Unconscious from his own experience. He argues that unconscious intentional order can be discovered in apparently random events. He relates the story of how, in a letter to a friend, he wrote that he would not make any further changes to a particular manuscript, even if it contained "2,467 mistakes."¹⁷⁹ This was a number he chose completely at random. Later, however, upon reflection, he decided to look for an underlying principle to explain the choice of that particular number, because he believed, "There is nothing arbitrary or undetermined in the psychic life." Once he had decided that

¹⁷⁹ All quotations are from "Determinism—Chance—And Superstitious Beliefs" in *The Basic Writings of Sigmund Freud*, trans. A. A. Brill (1938; reprint, New York, The Modern library, 1995), 118-146.

the number might not have been arbitrarily chosen after all, he remembered that prior to writing the letter he had been speaking to his wife about a man he had not seen in 17 or so years. He then remembered that he had been 24 at the time he had last seen the man; therefore, Freud realized that he had underestimated: it had actually been 19 years since he had not seen him. Adding 24 to his then current age of 43, he came up with 67. Given that the number of mistakes that he had randomly specified as 2,467, Freud supposed his Unconscious was expressing his annoyance that, in the time since he had seen this particular man, he had not accomplished much. This was his "mistake," he reasoned, thereby providing a direct "cause" for what had seemed to be an apparently randomly chosen number.

C. S. Peirce, Freud's early contemporary writing in 1878, explains how patterns drawn from arbitrary samples can be infinite if the rules are not decided beforehand. Freud allowed himself to use virtually any situation that might supply the number 2,467 with meaning. To illustrate how easily coincidental order may be found in random numbers, Peirce takes the first five poets listed in Wheeler's *Biographical Dictionary* and lists the age at which each died:

Aagard, 48.
 Abeille, 70.
 Abulola, 84.
 Abunowas, 48.
 Accords, 45.

Because Peirce allowed himself the freedom of finding any pattern at all among these random numbers, he was able to find a remarkable triad:

1. The difference of the two digits composing the number, divided by three, leaves a remainder of *one*.

2. The first digit raised to the power indicated by the second, and divided by three, leaves a remainder of *one*.
3. The sum of the prime factors of each age, including one, is divisible by three.

Peirce concludes: "It is easy to see that the number of accidental agreements of this sort would be quite endless."¹⁸⁰ Freud easily found accidental agreement between the number 2,467 and the idea of a "mistake" because he allowed himself to use any kind of rule. Instead of considering the number as a whole, he arbitrarily parsed it into 24 and 67, not, say, 2 and 467. Then he made 67 meaningful by *adding* his former age 24 to his current age 43. Any kind of manipulation (addition, subtraction, multiplication) to any combination of numbers would have been justified by Freud as long as the answer it provided seemed to make a kind of sense. Similarly, Augustine claimed that any figurative interpretation of historical events was true so long as it fitted with Christian doctrine. Freud also allowed himself the freedom of drawing meaning from a circumstance (in this case, a conversation he had had with his wife) that was not related to the actual letter in which he had arbitrarily designated the number of mistakes as "2,467." In contrast to Peirce who believed that accidental agreements were merely accidental, Freud concludes, "The analysis of chance numbers ... readily demonstrates the existence of highly organized thinking processes, of which consciousness has no knowledge" (123).

In Freud's narrative, order discovered in a randomly chosen number seems to have a telic aspect, that is, it seems determined by the interpretive effect it has or the function it serves. Rather than dismiss the coincidental agreement found between the number and

¹⁸⁰ "Order in Nature," *The Essential Pierce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Bloomington: Houser and Kloesel, 1992), 176-177.

repressed feelings. Freud supposed there was an agent of some kind responsible for the pattern. Like Augustine, Freud thought coincidences were actually intentionally determined. Freud posited the Unconscious, rather than Providence, to account for the pattern.

Linearity

The Unconscious—like thinking, planning person--seems to be able to anticipate the future. This results in apparently goal-directed behavior. *Telos* provides the interpretive principle by which random events may be unified into a narrative.

The "linearity" that might attend the description of an analogically determined teleological narrative is imposed from without, unlike the natural linearity of a deterministic sequence. As J. Hillis Miller notes in *Ariadne's Thread*, a teleological principle can turn a random sequence of events, a purely "metonymic line," into a causal chain, the logic of which is only apparent retrospectively.

the line image ... tends to be logocentric, monological. The model of the line is a powerful part of traditional metaphysical terminology. ... Narrative event follows narrative event in a purely metonymic line, but the series tends to organize itself or to be organized in a causal chain. The chase has a beast in view. The end of the story is the retrospective revelation of the law of the whole. That law is an underlying "truth" that ties all together in an inevitable sequence revealing a hitherto hidden figure in the carpet. The image of the line tends always to imply the norm of a single continuous unified structure determined by one external organizing principle. This principle holds the whole line together, gives it its law, controls its progressive extension, curving or straight, with some *arché*, *telos* or ground.¹⁸¹

It is not clear what kind of "causal chain" Miller has in mind, but I would argue that it would have to reflect a theory of analogical, rather than physical, determinism.

¹⁸¹ (New Haven: Yale University Press, 1992), 18.

Miller's use of "causal chain" misleadingly implies predictable proportional cause and effect relationships, as described by classical determinism. Analogical determinism is never predictable by any kind of empirical means. It is true that if one knows the conventions of story-telling then one might be able to predict the outcome of a conventional narrative. But in this case, ideas about the way things *should* work out causes events to occur the way they do. This kind of causal chain is not at all linear in any real physical sense. As I have shown above with Freud's example, the mind in the process of making analogical sense can adapt to any particulars; it can distort, manipulate, and reinterpret virtually anything in order to make it fit a preconceived idea. In contrast, physical determinism and "linearity" in the mathematical domain are constrained by laws.

Freud's narrative, if considered an example of a teleological narrative, can be used to test the appropriateness of Miller's metaphor of *telos* as a law that, as in the classic myth, guides Ariadne out of a labyrinth. In Freud's story, there is definitely a beast in view in so much as Freud has a preconceived idea that "there is nothing arbitrary or undetermined in the psychic life." Thus, he manipulates the facts of the matter however he pleases in order to make sense of the number "2,467." However, unlike Miller's Ariadne, who followed a single thread to find the only way out of the labyrinth, Freud's might have taken any number of parallel routes to arrive at a satisfactory conclusion. Only one is taken in the end.

A connect-the-dots metaphor might be more appropriate in Freud's case than a labyrinth metaphor. The "linearity" of Freud's interpretation results from arbitrarily connecting some of the dots in a nearly infinite field of dots. Which dots Freud chooses to connect and in which order is not predetermined; that is, the dots are not numbered;

they do not, to recall Peirce's illustration, follow prespecified rules. Because Freud did not limit the interpretive possibilities, as argued above, any accidental agreement would have satisfied him—just as any accidental agreement between an image of a sacrifice and Christ's sacrifice would have satisfied Augustine. It is also important to point out that any sense of the "inevitability" that may have seemed to Freud to attend connect-the-dots linearity is entirely subjective. One may easily think of counterarguments to the claim that his interpretation of the 2,467 constitutes proof of "highly organized thinking processes."

If Miller's term "law" is applied to Freudian narratives or Augustinian interpretation, it must be done so very loosely. While the end of Freud's story does pretend to give, in Miller's terms, "the retrospective revelation of the law of the whole," and that law does seem to be "an underlying 'truth' that ties all together," what we actually have here is not a rigid well-defined law but a highly adaptable rule of thumb that can make sense out of anything. Freud's argument that there is nothing random in the psychic life is ultimately based, in the example related above, on a mere and rather weak analogy between *a lack of accomplishments* and *a number of mistakes*, as if a lack of accomplishments were necessarily a subspecies of a mistake.

The way the Unconscious works is comparable to the ways of Christian Providence in the sense that neither is specifically predictable. Repressed persons will accidentally reveal their anxieties and divine justice will be served, but *how* the Unconscious or Providence may accomplish these objectives cannot be predicted according to empirical laws. Retrospectively, Freudians and Christian teleologists may

link coincidental facts and events together, but accidental functions can only be described after an effect is produced, not before.

Freudian narratives, then, belong to a category of narrative that has its roots in the Christian or in the medieval Romance tradition, not the tradition of scientific description. While the narratives of science are descriptions of events that are supposed to be predictive of similar future and repeatable events, Romance narratives describe singular events. These events may appear prophetic in retrospect, but are never predictable in a scientific sense.

As Angus Fletcher has noted, Edmund Spenser's great Romantic poem, *The Faerie Queene* (1596), illustrates a *telos* that is *prophetic* rather than *predictable*. In the poem, the protagonists are subjected to various events, which they have to interpret "through a glass darkly." They cannot predict the future given what they know of the present, but the present does seem to them to promote a sense of vague expectancy. They get the feeling that *something* is about to happen but they cannot say *what*. They recognize coincidental patterns that seem to hint about the future, but they cannot figure out exactly what the clues mean. Because events are analogically determined, the protagonists are not able to decipher them until the end has passed. Romance narratives are unlike empirical narratives, the outcomes of which may be predicted using physical laws.

In *The Prophetic Moment: An Essay on Spenser*, Fletcher argues that history in terms of a story with a well-defined plot involving creation, fall, redemption, and judgment is "somewhat misleadingly called 'linear.'" In this type of teleological narrative,

[s]eeming chaotic and unrelated events are shown to have a progressive character; history appears to move in a certain direction. Because wandering bulks large in

this story, the form of history in this tradition should be called "linear" only with the express understanding that with it the line is not a very straight line. ...

... By showing that the wanderings of the chosen ones are momentarily linked to the all-known but veiled design, the prophet "straightens" the twisting, labyrinthine shapes of profane time. When the children are lost, he unveils his prophetic gift, an inspired sense of direction.¹⁸²

Fletcher reveals that what is key to the kind of teleological narrative that Miller has described is not its lawfulness, *per se*, but its *arbitrariness*, which allows the interpreter to use any analogy or any coincidental resemblance to make sense of a more or less causally unconnected string of events.

Chaos and *Telos* in *The Faerie Queene*

On the surface, there seems to be a high level of randomness in Edmund Spenser's *The Faerie Queene*. In the preface he writes, "But by occasion hereof, many other adventures are intermedled, but rather as Accidents, then intendments."¹⁸³ Nevertheless, the work as a whole *feels* orderly. Poetic resemblances, analogies, and symmetries accumulate and reinforce one another to provide a sense of direction and integration. I argue that it is *due to*, rather than *despite*, its randomness, that *The Faerie Queene* is very much a teleological narrative. Its *telos* is analogically determined.

The various protagonists in Spenser's long poem, including the Redcrosse knight, Britomart, Arthur, Scudamor, are loosely connected by their association to the Faerie Queene—a figure for Spenser's patron, Queen Elizabeth—in whose honor they go on Crusades, journeys, and adventures. Once departed from the stable home environment,

¹⁸² (Chicago: University of Chicago Press, 1971), 41-42.

¹⁸³ All quotes by Edmund Spenser are from *The Faerie Queene* (New York: Penguin, 1987).

they meet with many accidents and random adventures on the road. They have no way to predict whom they may meet at the crossroads, and they have no way to know for certain whether or not they have chosen the correct path. They get lost; they wander; they become confused. Life on the road is tantamount to being in a maze. A knight can never quite tell where he is and he may wander aimlessly. Nevertheless, he may also somehow manage to find the one and only way out of the maze. Since a knight in *The Faerie Queene*, unlike Ariadne, does not have a prefixed thread to guide his way, he must find the right way by pure accident. This makes it seem as if a supernatural force is leading him right.

The Faerie Queene is not a sparse narrative. Like Chaucer's "The Knight's Tale," it contains a plethora of apparently gratuitous descriptions and digressive details that somehow congeal meaningfully in the end. As Fletcher has argued, this is a characteristic of prophetic writing. Prophecy is prolix yet reticent: it is rich in detail but obscure. As Augustine noted too, before prophetic facts are deciphered, they can be virtually indistinguishable from ordinary, noisy, arbitrary, or unmeaning facts.

As mentioned in Chapter Three, Tzvetan Todorov called narratives that are analogically determined "gnoseological" narratives. He noted that in these narratives the perception of the event is more important than the event itself.¹⁸⁴ He also noted thatgnoseological narratives are characterized by magic and prophecy, and that the causality follows the logic of poetry. The same may be said of *The Faerie Queene*. Spenser's narrative is not predictable, but it seems to follow a preconceived design in retrospect.

¹⁸⁴ Tzvetan Todorov, *Genres in Discourse* (New York: Cambridge University Press, 1990.)

verifying Augustine's claim that in a world that is authored by a divine being in the end, "Things that were hidden [will be] sufficiently revealed"(522).

Spenser's poem depends upon accident or sometimes even the violation of natural causality to move the plot forward. The protagonists must be saved, not by their own actions nor according to cause and effect, but by grace. Because miracles defy causal explanation, so Augustine argued, they are the only real proof of God's existence (besides faith itself). *Natural mechanistic order is not as strong an argument for the existence of God as is a miraculous and meaningful order that requires a will to affect it.* When accidents start to seem to follow some kind of logic, or seem to serve some purpose, it begins to seem as if a divine intention is revealing itself.

It could be said that Augustine's (and others') insistence on the prophetic possibilities of apparently meaningless facts in historical narrative encourage superstitious interpretive practices. This may be an inappropriate attitude to have toward historical events, but it is not an inappropriate attitude to have toward events in a poetic narrative. A superstitious attitude toward a text makes an insightful interpreter; he sees everywhere the figures to support his peculiar reading of the text. To our sensibilities, Augustine seems guilty of interpreter's folly when he argues that the "fragrance" of Christ's name "is now everywhere perceived" in the Old Testament (522) since the Old Testament writers could not predict the future. However, it is perfectly tenable to suppose that the fragrance of the Faerie Queene might be found throughout Spenser's poem. Because an author exists outside of the narrative he or she creates, it is not subject to temporal laws or spatial laws the way that history is; thus, a reader must allow that resemblances might be meaningfully linked.

20th Century "Nonlinear" Narratives

Though analogically determined narratives may not be predictable in the empirical sense, they derive a special consistency and unity from coincidences, resemblances, and puns. Novelists, who try to write nonteleological "slice-of-life" narratives by preferring to string together random unconnected events and to include a lot of meaningless detail, sometimes find that an uncanny sense of orderliness emerges from unintended coincidental resemblances in the text. This may lead writers to suspect the existence and influence of a muse.

According to Viktor Shklovsky, "art distorts ... a correspondence in accordance with its own laws." These laws are formed by chance, by habits of mind, and by awareness of literary conventions. They emerge suddenly in poetic resemblances and chance patterns. "Not surprisingly, the author himself may have a hard time recognizing his own work." That is, the author may be surprised to find an intention forming in his work that he did not know he had intended. According to Shklovsky, this is what the Russian writer Alexander Blok experienced in 1918 in the course of composing *The Twelve*:

Blok...began *The Twelve* with street talk and racy doggerel and ended up with the figure of Christ.... The "Christ" finale serves as a kind of closing epigraph [gnome], in which the riddle of the poem is unexpectedly solved.

"I don't like the ending of *the Twelve* either," said Blok. "I wanted a different ending. After finishing it, I was myself astonished and wondered: Why Christ, after all? ... Yet, the more I looked at it, the more clearly I saw Christ...."

Shklovsky describes how Blok's Christ was motivated idiosyncratically in response to some irrelevant details Blok had by chance included in the initial draft of the narrative.

Blok was describing people walking down a street forming a procession and the wind blowing in their banners.

The wind rips the banners. The wind in turn calls forth the flag, and the flag, finally, calls forth someone enormous bearing a certain relationship to it. It is precisely at this point that Christ appears on the scene. ...he was called forth by the compositional pattern of these images. (172)

In the way same that an author might suppose that he is being led by a muse to explore a particular theme, a reader of a text that contains coincidental patterns may be led to suspect that these patterns are indicative of the author's intentions.

A similar situation may exist in painting as well. Visual artist Neil Grayson has described original intention in terms of the "employment of chaos," which is illustrated by the story of the creation of a painting called *Man Being Led Away* (1994), depicting two male figures in the midst of a narrative. As Grayson describes the painting, "One figure stands gaping at something.... His fist is clenched.... The second figure is trying to get him to snap out of it, I guess." The story was recorded in an interview. In the following excerpt, Grayson responds to a question about whether or not he believes he is ever inspired by a muse or the unconscious.

I didn't have a meaning in mind when I painted it. It just sort of happened accidentally.... I had originally painted a single figure, but one of his arms didn't seem to belong to him somehow and I painted in the second figure. A few weeks later, I was telling ... a story about my father. We weren't thinking about the painting at all.... My father was one of the first Jews ever to be admitted to West Point. ... That was 1942. My father was hazed and beaten.... Finally, my father had had enough... He tried to kill [a] guy. They had to drag him off, and when my father saw ... his head bleeding ... he couldn't believe what he'd done. He couldn't unclench his fist....¹⁸⁵

¹⁸⁵ Quoted in Victoria N. Alexander, "Navigating Grayson." (Cited 23 April 2002) available at www.neilgrayson.com/articles/intro.htm.

Only later did Grayson connect the episode at West Point to the painting. Like Blok, he notes that in retrospect, it seemed as if he had painted the two figures for the purpose of illustrating his father's trauma. The "employment" of apparently random patterns or "chaos" that in retrospect seem purposeful, he claims, is the mark of an artist's drive.

Another example is found in Louis Begley's novel *The Man Who was Late* (1992). The hero Ben happens to be in Geneva, walking along a river in which a character in a book he is then reading commits suicide. This coincidence makes him imagine a parallel between his life and fiction. He then imitates that character as if the parallel were an instructive sign from his "Author." Ben cannot keep analogies from influencing the way he makes sense of the world. Begley explained that Geneva is "Calvin's city. Of course, Calvinism has quite a lot to do with predestination. It all comes together."¹⁸⁶ Begley happened to be in Geneva while writing that part of the novel. He explained that "an incident that occurred" there suggested the providential ending to him. Since many readers have noted that Begley's novels seem somewhat autobiographical, I asked him if he, like Ben, imposed order on his own life. He said, "I do it all the time, don't you? Everybody who's alive does. It is the ordering function of intelligence."¹⁸⁷

Many late 20th century novelists attempted to write nonteleological narratives by including random details, working against patterns that might spontaneously appear and provide a teleological aspect. In "The Locked Room" Paul Auster's narrator says,

I tend to think that everything counts. In the end, each life is no more than the sum of its contingent facts, a chronicle of chance intersections, of flukes, of random events that divulge nothing of their own purpose.¹⁸⁸

¹⁸⁶ Quoted in Victoria N. Alexander, "Louis Begley: Trying to Make Sense of It," *Antioch Review* 55 (1997): 292-304.

¹⁸⁷ *Ibid.*

¹⁸⁸ *New York Trilogy* (1984; reprint, New York: Penguin, 1990), 257.

Nevertheless, Auster's works in general tend to be obsessed with the fact that a strange order does arise out of random events. Both his characters and readers are forced to play the role of decipherer of phenomenal patterns.

In "Lost in the Funhouse" John Barth critiques Aristotle's recommendation that narrative design should limit itself to a single purpose and concern only a single causal chain. Barth's narrator, like Chaucer's knight, has trouble sticking to the relevant facts. He has gone on for a considerable amount of time describing apparently irrelevant facts associated with the drive *to* the funhouse. Then finally he reflects:

The function of the *beginning* ... is to introduce the principal characters, ... set the scene, ... plant motifs and foreshadowings..., and initiate the first complication.... the details of the drive to Ocean City don't seem especially relevant. The *beginning* should recount the events between Ambrose's first sight of the funhouse...and his entering it.... The *middle* would narrate all relevant events from the time he goes in to the time he loses his way.... Then the *ending* would tell what Ambrose does while he's lost, how he finally finds his way out, and what everybody makes of the experience. So far there's been no real dialogue, very little sensory detail, and nothing in the way of a *theme*. And a long time has gone by already without anything happening.... We haven't even reached Ocean City yet: we will never get out of the funhouse.¹⁸⁹

Because postmodern narratives tend to include a lot of random detail, they are often surprisingly reminiscent of the very teleological medieval knight's journey, which, as in Spenser's *The Faerie Queene*, is basically a string of surprise meetings. Mikhail Bahktin claims, in "Forms of Time: Chronotope and the Novel," that "adventure time" narratives about chaotic life on the road seem "to provide an opening for the intrusion of

¹⁸⁹ (1967; reprint, New York: Anchor, 1988), 77.

nonhuman forces—fate, gods."¹⁹⁰ This is because coincidental resemblances seem intentional.

Martin Amis is a postmodern novelist who has explicitly dealt with this issue. In *The Moronic Inferno*,¹⁹¹ he claims coincidences make life feel "like a short story" that has an author above and beyond narrative time who controls events. As an example, Amis recalls a visit to Chicago to meet novelist Saul Bellow at the Chicago Arts Club. The visit seemed thematically organized. An artist materials store just outside Amis' motel window bore a sign: "for the artist in everyone" (199). Back at his motel after a day of discussing the nature of art with Bellow, he notes, "the black, bent, bald shoeshiner who slicked my boots with his fingers (he had his name on his breast, in capitals) was called ART" (207). Amis' world, like Chesterton's, seems analogically determined.

When Amis began to write his novel *Money: A Suicide Note*,¹⁹² he tried, like Auster, to include gratuitous descriptions and random details. He adopted "an inclusive, catch-if-catch-can attitude."¹⁹³ Nevertheless, admitted Amis, the protagonist John Self began to feel like he was in a novel when he, like his author, noticed ominous coincidences. Self says,

something is waiting to happen to me. I can tell. Recently my life feels like a bloodcurdling joke. Recently my life has taken on *form*. Something is waiting. I am waiting. Soon, it will stop waiting—any day now. (9)

Amis includes himself as a character in his own novel. When Self chances to meet his author on the street he gets "the creeps" (61), but cannot quite figure out why.

¹⁹⁰ "Forms of Time and Chronotope in the Novel" in *Dialogic Imagination* (Austin: University of Texas Press, 1996), 95.

¹⁹¹ *The Moronic Inferno: and Other Visits to America* (New York: Penguin, 1986).

¹⁹² Unless otherwise indicated, all quotations are from *Money: A Suicide Note* (New York: Penguin, 1984).

¹⁹³ Martin Amis, interview by Victoria N. Alexander, 8 May 1993.

Throughout the novel, Self intuitively refers to people on the streets of New York as "bit players," "extras" and "actors," as if life were controlled by an omniscient movie director. At the end of the novel, Self escapes the control of his author. Although Amis had planned to have Self commit suicide in the end, Self does not die. As (the real) Amis explained,

Self has escaped the novel. He's escaped control of the author figure, me. That's why that last section is in italics because it is, in a way, outside the novel. He really was meant to kill himself, but he screwed it up, as he screwed everything up. So, he's in a poorer but more controllable kind of existence. He feels that it's poorer because it is without form. It is more random, but that does suit him more or less. At least he's not being manipulated.¹⁹⁴

As Amis shows in *Money*, in the postmodern era, the sense that there is an author controlling events simply gives one "the creeps" (61). However, the sense can be as powerful and provocative as it is in medieval Romance narratives.

Conclusion

In this chapter, we have found disorderly narratives about chaotic life on the road readily appear teleological if coincidental resemblances are interpreted as reflecting a particular theme. A teleological narrative can be any description of more or less random events that eventually *work out* in some useful way. In an analogically determined teleological narrative, events do not work themselves out in accordance with the laws of nature. Instead, because they are not materially determined, they appear to be helped along by some external force.

¹⁹⁴ Ibid.

Chapter Five Deterministic Fortuity

Abstract. In this chapter, I describe how the concept of predetermined fortuity is introduced into classic determinism in order to make an argument for telic activity. In this view, it is argued that a divine agency precisely chose the initial configuration of atoms in the universe so that the timing of coincidental events in the distant future will be perfectly synchronized causing apparently "chance" effects that were originally intended. The whole effect, then, has organizational properties that are not necessarily given in the individual parts in isolation; thus, the whole is greater than the sum of the parts. Kant's transcendentalism is analyzed within this framework. Allowing for some qualifications, Emerson's view of the role of fortuity in progressive evolution is analyzed according to this view as well. A brief look at Herbert Spencer's reinterpretation of Darwinian evolution as necessarily progressive is briefly reviewed and related to the prominent Victorian disposition toward ideals of social and moral progress. Finally, a detailed analysis of Milan Kundera's novel *Immortality* is presented as an example of a teleological narrative based on deterministic fortuity.

Kant's Predetermined Synchronicity

Telos was supernatural in ancient, early Christian, and early modern times. In the 1700s, however, *telos* lost the supernatural aspect it had in what Bahktin calls "adventure-time" narratives. The new *telos* no longer transcends spacetime so radically. Its actions become bound up with normal cause and effect.

Near the close of the 18th century, Immanuel Kant imagined a new description of teleological activity that fitted with classical determinism developed during the age of Newton. The teleologists who followed Kant fully accepted Pierre Laplace's vision of a strict mechanistically determined universe. Laplace asserted that any one who had knowledge of the forces in nature and positions of every thing in the universe could predict all future events.¹⁹⁵ Everything was determined. Although the 19th century teleologists were, in some sense, mechanists, they were not reductionists. They also believed there was something more. They believed that, to use a favorite phrase, *the whole is more than the mere sum of its parts*.

From our perspective 19th century teleology looks rigid; it is often characterized as linear and predetermined. But these qualities are related to the classical determinism against which teleologists tried to create a new way of imagining teleological activity. What the 19th century teleologists added to the strictly materialistic view of the cosmos was a notion of predetermined *fortuity*. While each event, each separate causal chain, may be mechanistically determined, various causal chains interrelate fortuitously. For example, the way the weather affects one's plans to walk to work is a fortuitous relation.

¹⁹⁵ See Pierre-Simon Laplace, *Philosophical Essay on Probabilities*, trans. Andrew Dale (1825; New York: Springer-Verlag, 1995).

One could imagine, however, that God had precisely chosen the initial configuration of atoms so that the timing of coincidental events in the distant future would be perfectly synchronized causing the apparently "chance" effects that He had actually intended. One decides to use an umbrella and take the shorter route. The effect of a fortuitous relationship is, later, a cause. The umbrella blocks one's line of vision and one is killed by a speeding car.

It turns out that on any given rainy day in a city of a certain size a certain number of people are killed crossing the street because their lines of vision are blocked by their umbrellas. Although the individual deaths are unpredictable the overall number of deaths is statistically fairly certain, and, it would seem, predetermined.

If such order is to be found in the complex external world of innumerable interrelating fortuitous events, deterministic fortuity has to be even more influential within a more constrained system of relations, such as that which exists in an animal body. The behavior of individual cells might each be determined by the laws of chemistry and physics, but their interrelations would be fortuitous. It was the laws of organic form that intrigued most teleologists in the 19th century. Although there were many different varieties of deterministic fortuity, each with its own special interests, in general, suffice it to say that these teleologists thought that the universe should be described and understood in terms of its organic wholeness, not atomistically. They sought to uncover the general, holistic organizational laws that shaped events. (Their interests, like Aristotle's, were mainly in telic *directionality*, not *originality*.) Leo Tolstoy may have summarized the holistic philosophy of deterministic fortuity best when he wrote,

one should be concerned to discover the general laws rather than examine individual causes, which have only relative value in time and space. Attempts to

explain history by analyzing its various parts distorts it. The role of fortuity is the most prominent and important outcome.¹⁹⁶

As discussed in Chapter Two, it was Kant who is most widely known for his holistic teleology based on the belief that there are general laws guiding biological organization and other teleological phenomena. He did not think that intention in nature constituted empirical proof of a constantly intervening Artist. He did not suppose, that is, that God worked like a puppeteer, bringing specific pedestrians and specific speeding carriages together on wet roads. Instead, he thought there was an internal principle that spontaneously guided natural processes so that, on the whole, there emerged a kind of probabilistic order. In this chapter we will be concerned primarily with the directional aspect of *telos*.

In general, Kant argued that it was the existence of sentient beings, the artistry of nature, and the apparently progressive character of history that seemed to require a plan of action, which had predetermined the precise synchronization of numerous mechanically determined events. If so, coincidental effects, integration, and fortuitous harmony would be intentional. As he writes in an early work,

Matter, which organizes itself according to its general laws, produces ... through a blind mechanical process, good consequences, which appear ... design[ed]... When left to themselves, air, water, and heat produce wind and clouds, rain, and streams, which irrigate lands.... However, they produce these results not through mere ... accident (which could have just as readily resulted in disaster). ...these consequences are limited by natural laws ... to work ... this way. What should we then think of this harmony? How [could] ... things with different natures ... strive to work in cooperation ... unless they recognized a common origin ... in which the essential interrelated construction of everything was planned? If their natures were necessarily isolated and independent, what an astonishing contingency that

¹⁹⁶ Quoted in *Theories of History*, ed. Patrick Gardiner (London: Allen & Unwin, 1959), 275-284.

would be ... how impossible it would be that with their natural efforts they should mesh.... as if an overriding wise selection had united them.¹⁹⁷

What appear to be the elements left to chance combine with mechanistic laws to result in "perfect coordination," a "harmony," and things "with different natures" working in "cooperation." Kant's teleology may be rigid in so far as everything is predetermined by natural laws; nevertheless, the point that I would like to stress again is that Kant inherited predeterminism from the mechanistic hypothesis. The telic part of his theory of causality is the part that concerns the way intentional effects are those that appear to be caused by chance. Accumulative coincidence is the medium through which a god-like hand appears to move.

Dynamical Stability versus Prespecified Form

Kant's teleology was enormously influential. However, some followers distorted his views, developing the notion of a linear end-determinedness that Bergson would later refer to as *inverted mechanism*. Present day understandings of 19th century teleology have been drastically distorted by 20th century metaphors. The comparison between *telos* and a computer program is the most explicit example. To understand Kant's teleology one must *not* imagine that the initial conditions can unfold a fully specified set of detailed instructions step-by-step in time. One must imagine instead that a dynamic set of constraints and general rules become activated through the connectivity and interactivity of the system they guide. (Perhaps newly developing kinds of computing, involving

¹⁹⁷ Preface to *Universal Natural History and Theory of Heaven: An Exploration of the Constitution and the Mechanical Origin of the Entire Structure of the Universe Based on Newtonian Principles*, trans. Ian C. Johnston (Nanaimo, BC: Malaspina University-College, 1998), available at <http://www.mala.bc.ca/~johnstoi/kant2e.htm#preface>.

multi-processing and feedback, will be more appropriate as metaphors for the teleology of deterministic fortuity.)

If Kantian *organic* teleology seemed rigidly deterministic to us in the 20th century, it might also be because our own views of organic development were then linear. As Evelyn Fox Keller has noted in *Century of the Gene*, according to 20th century genomics, the cause of form was thought to reside in the physical structure of DNA.¹⁹⁸ Thus, traits and characters would be in some sense mechanically predetermined. In the 21st century, genetic research is returning to a more holistic understanding of organic development.

The work of 19th century teleomechanists Carl Friedrich Kielmeyer and Ernst Heinrich Weber is one of the earliest examples of the kind of reductive misinterpretation of Kantian teleology that would later turn into genetic determinism. They sought the source of telic activity (the *Lebenskraft*) in a germ substance or similar material object, which was supposed to contain an exact blueprint for organic development.¹⁹⁹ Examples of this kind of thinking persisted into the 1990s among those working on the Human Genome Project, which promised to reveal the blueprint that determines what and who we are. Now that the project is complete, researchers in the field have found that the gene does not, in and of itself, contain an explicit and detailed code for all of development. The secret of life is not to be found in the molecular basis of genetic information, and it is not a simple matter of "decoding" the message of DNA. It turns out that the physical structure of a gene does not necessarily give an indication of what that structure eventually will lead to. The functions of genes *and* of the proteins produced

¹⁹⁸ Evelyn Fox Keller, *Century of the Gene* (Cambridge: Harvard University Press, 2000).

¹⁹⁹ See Herman Lotze, "Lebenskraft," in *Handwörterbuch der Physiologie*, ed. Rudolph Wagner, vol. 1 (Göttingen, 1842), xv-xvi.

through the process of genetic transcription depend on context. The transcription process itself is largely determined by the chemical environment of the cell in which it occurs. Consequently, there is no simple relationship between gene structure and protein, and there is no simple direct linear relation between any given protein structure and its function. The stability of traits through generations, as Keller has noted, is no longer attributed to a gene as "an inherently stable, potentially immortal, unit that ... [is] transferred intact through generations."²⁰⁰ The *stability* we once attributed to the physical object known as a "gene" has now been found to be a product of the *dynamics* of development. The purely reductive mechanistic view of genetics is dead. In its place is developing a holistic approach, which is referred to as "functional genomics" rather than "structural genomics." According to Keller, in light of recent findings, Kant's teleology seems a better description of the process of development than does the reductive view held by genetic determinists.²⁰¹

Instead of supposing that the gene contains a fully specified set of detailed instructions that unfold sequentially in time, we may say that the gene supplies raw materials, and it is the dynamical behavior of the materials that determines the form of the organism. And this is as Kant claimed: in an organism

every part is thought as *owing* its presence to the agency of all the remaining parts, and also as existing *for the sake of others* and of the whole, that is, as an instrument, or organ ... The part must be an organ *producing* the other parts—each, consequently, reciprocally producing the others ... Only under these conditions and upon these terms can such a product be an *organized* and *self-organized being*, and, as such, be called a *physical end*.²⁰²

²⁰⁰ Evelyn Fox Keller, *Century of the Gene* (Cambridge: Harvard University Press, 2000), 14.

²⁰¹ *Ibid.*, 106-110.

²⁰² Immanuel Kant, *Critique of Judgement*, trans. J. C. Meredith (Chicago: Encycl. Britannica, 1993), n. p. Quoted in Keller, *ibid.*, 107.

With hindsight supplied by contemporary genetics, we can have a more concrete understanding Kant's concept of dynamical stability and of dynamical form as an emergent product. Likewise, the concept of a self—both genetically and contextually determined—is understood as a dynamically stable emergent form. Art, too, is now better understood as that which is essentially telic in the manner I have described, having an intentionality that emerges in time. Art—as Joan Richardson points out in a discussion of Emerson's writing, art—"registers and regularizes as form the effects of accidental features encountered by a complex adaptive system, in this case, a human being in the environment of language."²⁰³

Emerson: Power and Form, Thought and Fate

Ralph Waldo Emerson's teleology is, like Kant's, highlighted in interesting ways by twenty-first century research in genetics and nonlinear dynamics. In his essays "Experience"²⁰⁴ and "Fate,"²⁰⁵ Emerson argues against the then accepted positivistic view that human temperament is fixed by exclusively mechanistic laws. Only in the last ten years or so has it become possible to comprehend Emerson's interest in the role of fortuitous interactivity in the emergence of temperament (or selfhood) and cosmic *telos*.

According to the 19th century American transcendentalism of Emerson, an individual particle of matter is constrained and limited by mechanistic laws, but these laws only apply to individual elements *in isolation*. The synchronization of events in their

²⁰³ Joan Richardson, "Emerson's Sound Effects," *Raritan* 16 (1997): 83-101.

²⁰⁴ All quotations from "Experience" are from *Emerson: Essays and Lectures*, ed. Joel Porte (1844; New York: Library of America, 1983), 469-492.

²⁰⁵ All quotations from "Fate" are from *Emerson: Essays and Lectures*, ed. Joel Porte (1860; New York: Library of America, 1983), 941-968.

total relation is not determined by mechanistic laws. Likewise, telic forces do not guide the *individual* life per se; instead they guide the entire collocation of matter according to an unknown and unknowable rational plan. The individual has a kind of divinely bestowed power or agency in so much as he participates in that plan and thereby transcends material causality.

Emerson, like Kant, accepted material determinism as a fact. He also, like Kant, noted a greater order that emerged from fortuitous events. In the 1860 essay, "Fate," writing about "the new Science of Statistics," Emerson observes,

It is a rule that the most casual and extraordinary events-- if the basis of population is broad enough--become matter [sic] of fixed calculation. It would not be safe to say when a captain like Bonaparte, a singer like Jenny Lind, or a navigator like Bowditch would be born in Boston; but, on a population of twenty or two hundred millions, something like accuracy may be had.... (950)

...These are ... hints of the terms by which our life is walled up, and which show a kind of mechanical exactness, as of a loom or mill in what we call casual or fortuitous events. (951)

Although Emerson took some comfort in the belief that order, arising out of so many fortuitous events, enabled the intuition of purpose, he also sought to argue against the loss of human freedom that this "exactness" implies. He accepted the fact that mechanistic determinism resulted in "form," "fate," and "limitation," but he also felt that there was a way to conceive of activity that resulted in "power," original "thought" or agency, and "freedom."

There are at least two ways of conceiving intention within a paradigm of deterministic fortuity. The first that I will present is what I find to be the more or less accepted interpretation of Emerson. The second is William James' theory of agency, which I cannot help but feel is a better, if slightly enlarged, version of Emersonian

teleology. The two views do not necessarily contradict each other, but they do have differences that are worth noting. First of all, what I see as a respite from fatalism, according to Emerson, inheres, at least in part, in the fact that the overall organizational strategy cannot be inferred from mechanistic laws. In his 1844 essay, "Experience" he writes,

How easily, if fate would suffer it, we might ... adjust ourselves, once for all, to the perfect calculation of the kingdom of known cause and effect. ...God delights to ... hide from us the past and the future. (482)

Because this is so, the "results of life are uncalculated and uncalculable" (483). Thus, Emerson was extremely critical of whatever reductive science happened to be the fashion of the day:

I hear the chuckle of the phrenologists...who [knows the law of a man's] being; and by such cheap signboards as the color of his beard or the slope of his occiput, reads the inventory of his fortunes and characters. ("Experience" 475)

He argued that reductionism does not and cannot understand the effect of connectivity. Emerson noted that "the roots of every creature" run far, and he challenged anyone to find

a point where there is no thread of connection. Our life is consentaneous and far-related. This knot of nature is so well tied that nobody was ever cunning enough to find the two ends ("Fate" 961).

Only a divine mind can predict individual fortuitous outcomes. There is a kind of freedom from material causality in this. In ignorance of an overall divine organizational strategy, when humans interpret and take advantage of fortuitous events, they exercise their power of will and decisive action; they participate in transcendence.

As I emphasized above in my analysis of Kantian teleology, Emersonian teleology may appear rigidly deterministic, but what is actually important is the added

focus on fortuity as the means through which divine power may be seen to operate and as the means through which humans may be said to be free agents. Emerson's notion of "power," the complementary aspect of mechanistic "form," is a product of chance, not choice:

Power keeps quite another road than the turnpikes of choice and will: namely the subterranean and invisible tunnels and channels of life.... Life is a series of surprises... ("Experience" 482)

The ultimate transcendental culmination is not intended by the individual: intentionality is conferred upon the individual by means of grace. One might say it is a by-product of cosmic *telos*.

It is noted again, however, that, in this view, human intentionality is in some sense only apparent. Whatever original thought a human being may have, and whatever modicum of agency this would seem to supply, is actually always already prescribed in the divine plan. Thus, "fate slides into freedom and freedom into fate" ("Fate" 961). This is how I interpret freedom of action in Emerson's teleology. William James had an alternative view that allows for more play in human actions; he thought that there was a number of alternative actions that might result in the same divine end. If interpreted in this way, Emerson's teleology, his theory of intentionality, is much less rigid. It is also likely, as Joan Richardson has pointed out to me, that Emerson's interest in Faraday's work on electricity led him to question the notion that things in nature were ultimately made of stable particulate matter.²⁰⁶ One might argue, too, that Emerson's protean

²⁰⁶ As Emerson wrote in "Poetry and Imagination," in *Letters and Social Aims*, "Faraday...taught that when we should arrive at the...primordial elements...we should...find...spherules of force" (vol. 8: 1-76) and in "Perpetual Forces," in *Lectures and Biographical Sketches*, "Faraday said, A grain of water is known to have electric relations equivalent to a very powerful flash of lightning" (vol. 10: 67-88). *The Complete Works of Ralph*

writing style conveys the sense that he believed nothing can be static. Reading Emerson this way, we see that his philosophy starts to loosen itself from the foundations of classical determinism.

Furthermore, in "Fate," Emerson claims humans have a kind of power in so much as they are thinking animals. This is comparable to James' theory of intentionality, in so far as he unpacks a similar notion of subjectivism in his essay "The Dilemma of Determinism." In that essay, he attempts to integrate the concept of chance in a determined universe. James associates chance with freedom of action and subjectivity, and he gives a slightly different version of deterministic fortuity than the one I give above. In his *pluralistic* universe, synchronization is not necessarily so exact. There are a number of ways to arrive at the same conclusion. Another way to put it, emphasizing his indebtedness to Darwin, is to say that there existed "chance variations" within the realm of possible action, and the fittest of these are selected again and again in time. If one assumes this view, he claimed, as did Emerson, that freewill is not incompatible with a belief in Providence.

In James' deterministic universe, he allows both possibilities and actualities. James illustrates his theory by imagining life as a game of chess between the novice man and the expert God:

Suppose two men before a chessboard,—the one a novice, the other an expert player of the game. The expert intends to beat. But he cannot foresee exactly what any one actual move of his adversary may be. He knows, however, all the *possible* moves of the latter; and he knows in advance how to meet each of them by a move of his own which leads in the direction of victory. And the victory

Waldo Emerson, Centenary Edition, 12 vols. (Boston and New York: Houghton Mifflin and Company, 1903-1904).

infallibly arrives, after no matter how devious a course, in the one predestined form of check-mate to the novice's king.²⁰⁷

In James' view then, there are a number of possible fortuitous relationships that might result in the same end. This, by the way, is consistent with what we now know to be true in biology in the case of many-to-one genotype to phenotype mappings and in nonlinear dynamics in the case of the limited number of structural archetypes that arise out of a number of initial configurations. This is also consistent with a theory of the self as a dynamically stable phenomenon.²⁰⁸

Progressive Evolution

Adhering to a notion of progressive evolution, in "Fate" Emerson claimed the providential beauty of man is accomplished by allowing oneself to be evolved by Nature, in the "fittest" way.

The direction of the whole and of the parts is toward benefit, and in proportion to the health.... The first and worse races are dead. The second and imperfect races are dying out.... (960)

The whole circle of animal life -- tooth against tooth, devouring war, war for food, a yelp of pain and a grunt of triumph, until at last the whole menagerie, the whole chemical mass is mellowed and refined for higher use -- pleases at a sufficient perspective. (690-691)

... adaptation is not capricious. The ulterior aim, the purpose beyond itself, the correlation ... will not stop but will work into finer particulars, and from finer to finest. (692)

The idea of inevitable historical progress is not limited specifically to transcendentalism and its various forms. Progress was an idea very much believed and

²⁰⁷ "The Dilemma of Determinism" in *The Will to Believe, and Other Essays in Popular Philosophy* (New York: Longmans, Green, and Co., 1897), 181.

²⁰⁸ As Evelyn Fox Keller has argued, the emergence of a stable identity results from the dynamical interaction of DNA and its product. See *Century of the Gene* (Cambridge: Harvard University Press, 2000).

celebrated in England during the Victorian period. Herbert Spencer was probably the most conspicuous promoter of the belief in evolutionary progress.²⁰⁹ He adapted his 1852 thesis of "survival of the fittest" to Darwin's theory of evolution, arguing that nature is developing toward an equilibrium of optimum interrelated fitness. He also claimed that the apparently random course of evolution is actually predetermined; therefore, it would lead inevitably toward more complex forms until organisms were perfectly adapted to their environments, and the world would exist in harmony. Spencer's idea of evolution fitted well with the Victorian notion of historical progress. And it contributed to the discredit into which teleology fell in the late 20th century.

Kundera and Deterministic Fortuity

In his 1990 novel, *Immortality*, Milan Kundera writes, "All power of decision has been left to chance" (12).²¹⁰ Like the transcendental teleologists, Kundera also brings in the notion of fortuity in order to escape the reductiveness of classical determinism. In accordance with the mechanistic hypothesis, Kundera also attributes unpredictability to human ignorance; behind this *apparent* unpredictability there would exist a calculation so complex as to be beyond our understanding, but to a super scientist, who had knowledge of the initial configuration, it would be wholly determined and predictable.

When considering Kundera's notion of teleology and causality, it is a telling fact that a favorite book of his is Denis Diderot's *Jacques the Fatalist*, written 1771-1773, in

²⁰⁹ See Herbert Spencer, "A Theory of Population, Deduced from the General Law of Animal Fertility," *Westminster and Foreign Quarterly Review* 57 (1852): 457-501.

²¹⁰ All quotations are from *Immortality*, trans. Peter Kussi (New York: Grove, 1991).

the heyday of material determinism.²¹¹ Although Jacques is committed to a belief that all is foreordained, he realizes that life must be lived ignorant of what the inevitable outcome will be. When asked why he decides to act as he does in any given situation, Jacques replies:

Why? My God, I don't know.... Without knowing what is written above, none of us knows what we want or what we are doing, and we follow our whims which we call reason, or our reason which is often nothing but a dangerous whim which sometimes turns out well, sometimes badly. What man is capable of correctly assessing the circumstances in which he finds himself? The calculation which we make in our heads and the one recorded on the register up above are two very different calculations. How many wisely conceived projects have failed and will fail in the future! How many insane projects have succeeded and will succeed!²¹²

Similarly, in *Immortality*, the heroine Agnes refers to *telos* as a "program" in "the Creator's computer," and to her life as

a play of permutations and combinations within [this] general program, which is not prophetic anticipation of the future but merely sets the limits of possibilities within which all power of decision has been left to chance. (11-12)

Unlike the universe determined by analogies, as described in Chapter Four, in Kundera's materially determined universe, one would not have to be "prophetic" in order to predict the future: one would merely have to know the initial conditions, which would give the odds. Though each decision might appear to involve some degree of chance, the cards are actually stacked in favor of the design of the original "program." Though each separate causal chain has unfolded according to a finely-tuned plan, the coincidence occurs on schedule and has its intended effect.²¹³

²¹¹ See Milan Kundera, "An Introduction to a Variation," *New York Times Book Review* 6 January, 1985, Late City Final Edition.

²¹² Denis Diderot, *Jacques the Fatalist and His Master*, trans. Michael Henry (New York: Penguin Books, 1986), 28-29.

²¹³ Evelyn Fox Keller has noted that the computer program as metaphor for Kantian *telos* is somewhat inappropriate unless one has in mind parallel processors, neural networks, distributed

Because Kundera uses the metaphor of the computer program, his teleology has an affinity with that of the genetic determinists critiqued above. It is not clear to me, however, that this is not simple carelessness on Kundera's part, a poor choice of metaphor. Sometimes his teleology seems more like a dynamic set of constraints and general rules that become activated through the connectivity and interactivity of the system; other times it seems like a rigidly predetermined program that unfolds step-by-step in time.

Agnes' view provides for an underlying essentialism *revealed* fortuitously in time. An addendum to Agnes' teleology explicitly reveals a belief, typical of Romantic transcendental teleologists, in an original form from which individuals depart as variations on a theme:

The computer did not plan an Agnes or a Paul, but only a prototype known as a human being, giving rise to a large number of specimens that are based on the original model and haven't any individual essence. (11-12)

We will recall that the teleologies discussed above likewise did not guide the individual *per se*. This is generally consistent with teleomechanism of the 19th century.

Immortality includes a long discourse on the nature of coincidence. The discussion takes place between a character named Avenarius and a textual characterization of the author himself, whom I will refer to as "Kundera." He and Avenarius try to categorize various kinds of coincidences and synchronizations for a book that "Kundera" dreams of writing called *The Theory of Chance*. "Kundera" has an aesthetic prejudice against novels that follow one causal chain without showing how that

networks, and multilayered programs engaged in feedback. See *The Century of the Gene* (Cambridge: Harvard University Press, 2000), 103-111.

chain is inexorably entangled with the whole. "Kundera" criticizes the novel that rushes "toward a goal" in the way that he says Aristotle recommends.

I regret that almost all novels ever written are much too obedient to the rules of unity of action. What I mean to say is that at their core is one single chain of causally related acts and events. These novels are like a narrow street along which someone drives his characters like a whip. Dramatic tension is the real curse of the novel, because it transforms everything, even the most beautiful pages, even the most surprising scenes and observations merely into steps leading to the final resolution, in which the meaning of everything that preceded is concentrated. (238)

As an act of rebellion against Aristotle's unity of action, "Kundera" announces that in part six of *Immortality* he will introduce a character who "causes nothing and leaves no effects" (238). Indeed part six at first appears to be a digression from the main action, describing how a new character named Rubens meets a young girl who dances in such a way that he decides to call her the "lute player." In the course of this digressive tale, it is described how he loses track of her, but thinks about her often. Years later, they meet again by chance and then become occasional lovers for many years.

But this gratuitous figure, Rubens, proves to be significant to the main action after all. In a later chapter, we learn that Agnes is the lute player. Rubens' story actually has a *function*: it provides information that contributed to the main heroine's state of mind, which ultimately leads her to wish for death. The story of Rubens is significant because it appears in a narrative determined by deterministic fortuity: everything counts: everything in life is related to the whole. Furthermore, to Kundera everything is given in the initial condition of the original "program" that is unfolding (not evolving) in time. Life, "Kundera" says,

does not resemble a picaresque in which from one chapter to the next the hero is continually being surprised by new events that have no common denominator. It resembles a composition that musicians call a theme with variations.

and he adds, "you won't escape your life's theme" (275). The way "events are synchronized" insures this (225). Our lives may seem disconnected, merely coincidental, random or episodic (300), but says "Kundera,"

If our lives were endless...the concept of episode would lose its meaning, for in infinity every event, no matter how trivial, would meet up with its consequence and unfold into a story. (305)

Agnes' general theory of causality is consistent with that of 19th century transcendentalists, though her choice of metaphor gives it more of a twentieth-century tone. Milan Kundera may have written in a time of postmodernism, but the teleology as expressed by Agnes resembles more closely a 19th century worldview of deterministic fortuity.

Conclusion

Teleology of the 19th century was predeterministic because it was built on the foundations of material determinism, but *telos* itself consisted in the dynamical interactions of a system and emerged in time. Because these teleologists were primarily interested in the universal laws that guided holistic systems in terms of the functional relationships of the parts to the whole, the kind of telic phenomena they studied tended to have the aspect of what I have referred to in previous chapters as *directionality*. So long as the strong mechanistic hypothesis held, there was no real way to make an argument for the aspect of telic *originality*. The conclusion is unavoidable under classic determinism that everything is always already extant. Nothing is wholly new; rather all things are different permutations of old arrangements or variations on a theme.

Chapter Six Pragmatism

Abstract. A theory of real, not just apparent, telic originality is made possible by the existence of objective chance. New, more complex systems can arise as the result of unpredictable processes, such as uses of side effects and phenomenal patterns, misinterpretations of previously existing structures, and interpretations of noise. Pragmatism becomes important in teleology because subjective interpretations are able to affect real changes. If things are not inherently determined, they can be determined by their accidental functions. As Peirce argued, the meaning and truth of a concept is given in the effects it can have. Both William James and Peirce held unorthodox views of chance (James believed in pluralism, Peirce in objective chance) and so modified Kantian teleology. The universal laws governing telic processes could no longer be uniquely given in an initial static configuration of particulate matter. Instead of considering just the stabilizing effects of a feedback relationship of part to whole, they also considered the innovative effects that result from changes in context. In this chapter, various examples of refunctioning in biology are examined. By mechanisms similar to mutation and adaptation in the biological world, language and literary works are

also able to acquire new meanings when a chance pattern finds a use or an old pattern finds a new use. Several Henry James narratives are used to illustrate how the belief in inherent functions sets up the interpreter to create new meanings. To conclude, I discuss the aspect of telic originality in terms of a form of *extrinsic emergence*.

Opportunity for Telic Originality

According to the deterministic paradigm discussed in the previous chapter, when one acts subjectively, he or she participates in a fortuitous arrangement that has been predetermined by universal laws at the beginning of time. Humans, in this view, are not really free, but their subjective acts help create a harmony that had been peculiarly determined by the arrangement of static, solid matter at the beginning of time. A change in paradigm in the twentieth century, from classical determinism to a quantum mechanical universe and then to one that also includes *deterministic chaos*, gave acts of interpretation real effective power to *create* new things, rather than merely re-synthesize already existing discrete elements.

Pragmatism offered a way of understanding how things in nature are determined by the effects they can have. To say that something is determined by its effects is to speak in terms of *reverse cause*, another term for final cause. In this way, pragmatism may be considered a kind of teleology that naturalizes mentalism.

Though a pragmatic reinterpretation of teleology owes much to William James, he worked within classical determinism; thus, because we are dealing with true originality, the pragmatism discussed here belongs more to C. S. Peirce, whose notion of pragmatism

(or "pragmaticism" as he called it) proceeds from a belief that the initial state of the cosmos was indeterminate. In this chapter, we will be concerned with the interpretation of patterns produce by *noise*, not merely the interpretation of fortuitously assembled patterns. The term noise refers to what Peirce called "absolute chance," which is ontological, not merely epistemological, chance.

In a universe such as Laplace conceived in the late 18th and early 19th centuries, there was no noise. Every particle of matter by nature of its structure had its predetermined reaction to and effect on other particles of matter. No information was created or destroyed, expanded or condensed. This was an atomistic view.

If there does exist noise in the universe (e.g., quantum fluctuations and fluctuations amplified/generated by chaotic mechanism to the level of experience) then things and beings interact with each other in ways that cannot be predicted. Now no one can any longer say, as Spencer did, that every evaluation performed by natural selection is at bottom uniquely determined and could have been predicted at the beginning of time by a Laplacean super scientist.²¹⁴

In addition to the discovery of quantum uncertainty, twentieth-century mathematics and physics have discovered a number of distinct mechanisms that actively generate increased unpredictability that is not only due to the limits of observation and to ignorance of nature's laws, as Laplace would have it, nor to inherent uncertainty, as found in quantum indeterminacy. There are mechanisms intrinsic to processes themselves that amplify various kinds of fluctuations to unpredictable macroscopic behavior. The most

²¹⁴ See Herbert Spencer, "A Theory of Population, Deduced from the General Law of Animal Fertility," *Westminster and Foreign Quarterly Review* 57 (1852): 457-501.

well know manifestation of this sort of randomness is *deterministic chaos*. As Henri

Poincaré, echoing and critiquing Laplace at the same time, noted:

If we knew exactly the laws of nature and the situation of the universe at the initial moment, we could predict exactly the situation of that same universe at a succeeding moment. But even if it were the case that natural laws had no longer any secret for us, we could still only know the initial situation approximately. If that enabled us to predict the succeeding situation with the same approximation, that is all we require, and we should say that the phenomenon had been predicted, that it is governed by laws. But it is not always so; it may happen that small differences in the initial conditions produce very great ones in the final phenomena. A small error in the former will produce an enormous error in the latter. Prediction becomes impossible, and we have the fortuitous phenomenon.²¹⁵

The existence of absolute chance and deterministic chaos establishes the grounds for arguing that subjective interpretations of things, refunctionings of things, do more than just reorder already existing elements. If indeterminate, subjective interpretation makes future outcomes unpredictable, mentalism also returns. Unlike the supernatural mentalism of analogical determinism discussed in Chapter Four, a natural mentalism obeys the laws of (quantum and nonlinear) physics, of time and of space. According to William James, a naturalistic notion of mentalism is possible if the interpretation of a thing is equated with "the way one interacts with it" (24).²¹⁶ In other words, he naturalizes the concept of intentionality by describing it within physiological terms: "The theory of evolution is beginning to do very good service by its reduction of all mentality to the [practical] type of reflex action" (34-35). Simple kinds of interpretation, in this view, could take place in the inanimate world as well. Throughout this work I have been arguing that a theory of intentionality is a subspecies of teleology. The same kinds of

²¹⁵ "Science and Method," *American Scientist* 85 (1903): 488.

²¹⁶ Unless otherwise indicated all quotes from James are from "The Dilemma of Determinism" in *The Will to Believe, and Other Essays in Popular Philosophy* (New York: Longmans, Green, and Co., 1897), 145-183.

self-organizing processes that constrain and direct forms in nature give a person an identity or a tendency. Likewise, as nature discovers new functions by chance (re)interpretations of structures, which previously existed for other or no purposes, people can also usefully interpret their environments in a subjective, or we might say, an indeterminate, manner. This means that the future is undecided, and humans have freewill.

James goes on to note that once we learn how to interact with something, we have constructed a "teleological instrument" for the interpreted thing refers to "a particular interest in the conceiver" (24), and the interaction with it directs the thing in a particular direction, influencing evolution. James argued that one helps create the actuality of the truth one assumes. His pragmatism sought to show how subjectivism directs "destiny."²¹⁷

It may be that James pushed the limits of 19th century teleology, which could not quite accommodate his "pluralistic" view of the cosmos. He thought the divine harmony of fortuitous events might be achieved in any one of several ways (see Chapter Five). Thus, a person had a range of behaviors available to him or her, if not total freedom of action. By allowing some play in one's interaction with the world, James allows subjectivity to affect the actual reality of the world. This provides an opening for the idea of emergent things, which, as I show below, James' friend Peirce seized upon and developed.

As described in Chapters Two and Five, the 19th century nonmental teleologists had good intuitions as to why nature tended in particular directions, why it produced "variations on themes," and why it maintained order. Many of their ideas have recently

²¹⁷ William James, *Pragmatism* (New York: Longmans, Green, and Co., 1907).

been put on strong scientific footing by nonlinear dynamics theorists and structural evolutionary theorists. However, nonmental teleology never offered much in the way of an explanation as to how new hierarchies of emergence are discovered by nature allowing it to become increasingly more *complex*. Explorations of this kind would have to wait for Peirce's evolutionary philosophy, which was not bounded by classical determinism or by Platonic metaphysics.

In the 1880s the foundations of positivism begin to feel the stress of doubt brought on by new discoveries. This is evident in Peirce's reaction to the overthrow of certain geometric axioms. As he writes in 1885,

This is the day for doubting axioms. With mathematicians, the question is settled; there is no reason to believe [the sum of the three angles of a triangle is exactly 180 degrees.] The discrepancy is excessively minute even for the most enormous triangles of astronomy, but the exact value is unknown.²¹⁸

Peirce adds that, because metaphysics is an imitation of geometry, metaphysical axioms must be abandoned along with the geometric axioms. Peirce's philosophy of science departed dramatically from classical determinism. He believed, for example, that

Experience shows us that it [inviolable law] is so to a wonderful degree of approximation, and that is all... We know that when we try to verify any law of nature by experiment, we always find discrepancies...²¹⁹

While a certain amount of order exists in the world, it would seem that the world is not so orderly as it might be, and, [not more than a] world of pure chance would be.²²⁰

Almost all laws present the peculiarity of not being rigidly exact.... It is therefore possible to suppose that not only the laws of chemistry but the other known laws

²¹⁸ Peirce is referring to Karl Friedrich Gauss' work on the investigations of curved surfaces. See Charles Sanders Peirce, "One, Two, Three: Kantian Categories," in *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Indianapolis: Indiana University Press, 1992), 242.

²¹⁹ "A Guess at the Riddle," *ibid.*, 273-274.

²²⁰ "The Order of Nature," *ibid.*, 172.

of matter are statistical results.... Now I will suppose that all known laws are due to chance and so on in an infinite regress, the further we go back the more indefinite being the nature of the laws.²²¹

We must therefore suppose an element of absolute chance, sporting, spontaneity, originality, freedom, in nature.²²²

Peirce's remarks now seem quite prescient. The twentieth century began with the acceptance of Planck's constant and the introduction of quantum mechanics. Planck's discovery, as Niels Bohr writes, "imposes upon individual atomic processes an element of discontinuity quite foreign to the fundamental principles of classical physics."²²³ This means the end of inherent meaning and the beginning of pragmatic meaning. This also means the end of originary meaning and the beginning of telic meaning.

Context

If we consider any individual thing out of its usual context, it becomes apparent that it has no inherent end or function. This is true even in biology, where, presumably, things have developed in certain ways because of the survival function they have served, leading to increased reproduction. As Ernest Nagel argues, it is misleading to say, for example,

that the function of the white cells in the human blood is to defend the human body against foreign microorganisms. This is undoubtedly *a* function of the leukocytes; and this particular activity may even be said to be the function of these cells from the perspective of the human body. But leukocytes are elements in other systems as well ... of the system composed of some virus colony together with these white cells ... These other systems are also capable of persisting in the "normal" organization and activities only under definite conditions; and, from the

²²¹ "Design and Chance," *ibid.*, 217ff.

²²² "One, Two, Three: Kantian Categories," *ibid.*, 243.

²²³ *Philosophical Writings of Niels Bohr: Atomic Theory and the Description of Nature* (1934; reprint, Woodbridge, CT: Ox Bow Press, 1987), 4.

perspective of the maintenance of these numerous other systems, the leukocytes possess other functions.²²⁴

From Nagel's remarks we see that one system, a virus, can make a very different use of another system, a white blood cell, than the one for which it developed. A viral appropriation of a pre-existing structure vividly describes a way in which originality can arise. The virus makes the white cells function for it by making their activities *mean* something different. I consider this a *creative* act in so far as it involves *error* or a distortion of the rules, and it requires an overcoming of the former ways of understanding facts.

It is noted that there are more benign instances of appropriation. An example is found in the development of eukaryotes mentioned in Chapter Two. Two free-roaming organisms combined to form a *symbiotic* relationship, which eventually led to the emergence of a *new* single, more complex organism.

The notion of *structural complexity* needs to be defined before we can proceed, since I am going to use it to discuss "newness" as something whose increased complexity results in its obtaining a differential function. This term will be used to describe patterns that exist in various kinds of systems, physical, biological, social, and aesthetic, so it will have to be as abstract as possible. Let's suppose we are looking at a system whose state is constantly changing in a fairly predictable way. One, a music box plays notes according to way a turning spindle picks the teeth of a metal fringe. The melody has discernibly distinct parts that repeat. Two, a caterpillar finds itself on a leaf and eats until it feels satisfied, rests and digests, eats again, and then moves on when it runs out of leaf. Three,

²²⁴ Ernest Nagel, "Mechanistic Explanation and Organismic Biology" in *The Structure of Science: Problems in the Logic of Scientific Explanation* (New York: Harcourt, Brace & World, 1961), subhead, "The Structure of Teleological Explanations," 422.

a farm supports a population of egg-eating snakes whose numbers increase when free-range chickens are plentiful, decrease when hawks eat the chickens, increase again when hawks eggs have become plentiful, decrease again when that source is depleted, and then increase when the chicken population has revived because there are not so many hawks around. Four, one person says to another, "Hi. How are you?" The other replies, "I'm fine. Thanks. How are you?" The other in turn says, "Okay. And you?" Then the other gives a fully report on his state (some variation of this dialogue occurs every time these two people meet).

In contrast to these structurally complex processes, a simple process is a fair coin which randomly comes up either heads or tails, or a heating system that is activated/deactivated when its thermostat senses that room temperature goes below/above fifty degrees. We can describe the fair coin in terms of a binary code of 1s and 0s in a random sequence: 0100100010100101.... We can describe the states of the heating system as 10101010101010.... Neither is structurally complex.

We can also translate the regular behavior of one of the more complex systems into binary codes and express it as a sequence of 1s and 0s. A music box melody, even if it involves several different notes, might be expressed in a binary code as 111010111010111010. With such a form of representation, we can consider the patterns in the string abstractly, forgetting about the content. We notice that, for instance, 0s are always followed by a 1, or that either a single 1 comes between two 0s, or three 1s occur together. Based on this understanding of the pattern, if we begin observing somewhere in the middle of the process and we see a 0, we know with certainty that a 1 will be next. Based on the same understanding of the pattern, however, if we see a 1, we are not so

sure what will come next. There is equal probability that we will observe either a 1 or a 0 next. If, then, we see a second 1, however, we can predict with certainty that a 1 will follow.

Reading a 1 here does not always give the same kind of information because the complex process has some historical memory. In just this way, structurally complex processes mix occasional predictability with occasional unpredictability and require more elaborate descriptions than completely unpredictable or completely predictable processes. A random (completely unpredictable) sequence of 1s and 0s is no more complex than a completely predictable sequence of all 0s. When we observe a state in a random sequence, we are unequally uncertain what the next observation will be. When we observe a state in a completely predictable sequence, we are equally certain what the next observation will be. Our ability to predict does not change as we acquire more information in either case. In contrast, we can become more certain the more information we gain about a complex processes, which involves the concept of memory. The complex process determines its next state based on the immediately proceeding state. This is the sense in which a causal state contains a historical summary of past states. This notion of structural complexity has been developed by Crutchfield as a means of *quantifying* and *categorizing* self-organizing processes.²²⁵ I shall return to this idea at the end of this chapter when I reconsider the issue of subjectivity objectivity of emergent patterns.

Now if we take our structurally complex sequence 111010111010111010111010 and replace some of the 1s and 0s with *s that indicate *wildcard* positions, then we have more plasticity. A wildcard can differ from the prescribed 1 or 0 without affecting the

²²⁵ James P. Crutchfield, "Calculi of Emergence: Computation, Dynamics, and Induction," *Physica D* 75 (1994): 11-54.

outcome or the meaning, we might say, of the process. These systems are less rigid than the examples above. Now we have a musician instead of a music box, who respects the notes as prescribed, but can play them in different keys or substitute chords for single notes. We can describe such a process this way: 111*101*1010*1101*111*10. Even though the wildcard positions (where the musician varies the performance within a limited range) seem surprising, we can still understand the essential properties of the process. We recognize the tune. This is the kind of plastic behavior or *pluralism* that William James imagined was possible in a world that was teleological in the sense that it followed a fairly predictable pattern (having the aspect of directionality), but was also open (having, in a limited sense, the aspect of originality) to an agent's subjective interpretations of what might constitute a 1 or a 0. To give some examples of plasticity and pluralism from biology, a range of genetic codes can produce essentially the same wing pattern on different species of butterflies, for example, the monarch and the viceroy (different means produce the same end); or, conversely, a variety of races with different wing patterns might be considered the same species of butterfly (differences are ignored and generalizations made). A system with wildcards is teleological in a pragmatic sense: correctness of the order of things would consist in either what one believed to be correct or in whatever works to achieve a specific end. Allowing for the existence of wildcards means that even if there is noise (error), there can still be order. This is partly why we experience what I have referred to as telic *directionality* in previous chapters. The question we want to look at in this chapter, however, is, What if noise did matter?

According to complexity scientists, organisms that operate with structurally complex models of the world, models, which include wildcards or some degree of noise

or randomness, have more potential to adapt than organisms whose models of the world are simple, rigid and clearly defined. The fittest organisms would be those who are able, not just to act in a regular way, making generalizations despite noise, but those whose generalizations are mistaken and thereby make creative use of noise. Let me give an example of a "correct" generalization first for contrast: a caterpillar starts eating whenever it detects a certain kind of leaf. If it finds itself on a blade of grass instead and still perceives it as a food source, it can make generalizations. Therefore, it can make a wider range of responses to the environment, and it will probably be more reproductively successful than a caterpillar that only eats when it detects a specific kind of leaf.

An agent with *creative* ability and even higher fitness goes a step further. This kind of agent makes a *mistaken* generalization that turns out to be advantageous in an unexpected way. For example, a butterfly mistakes a different species of butterfly for one of its own and mates with it. The union produces a hybrid that is hardier and more reproductively successful. I have described this kind of creative discovery in literature in terms of a *phenomenal pattern* in Chapter Three. As another example, a monkey mistakes a mushroom for food. The mushroom has no nutritional value but acts as an aphrodisiac and results in that monkey's having a higher reproductive fitness. That monkey's descendants observe her eating mushrooms and imitate her, increasing the reproductive fitness of the entire family.

The roles of error, of misinterpretation, of presuming what was not intended are essential to our present-day conceptions of human intention and creativity, according to

Margaret Boden.²²⁶ Boden has refined the definition of freewill based on recent findings in the study of complex systems. As Boden makes clear, intentionality is associated with unpredictability, and it is, apparently, an emergent phenomenon, involving behaviors that are not directly caused by environmental interactions. As Boden writes, autonomy involves "the extent to which response to the environment is not direct (determined only by the present state in the external world) but indirect (mediated by inner mechanisms partly dependent on the creatures' previous history)." ²²⁷

The previous history of an organism constitutes its set of paradigms or models of its world, which it uses to comprehend information it senses. When an agent uses a particular model (to response to something it senses) that it has previously developed in response to the same kind of information in the same (or essentially the same) context, we may say that it is using a "correct" model. Both the calling up of the model and the response may be considered automatic, not original, behavior. The agent, we may say, has learned to predict the exact sequence of 1s and 0s; the process has taught the agent to anticipate and react to the process in a way that *models* the process. In contrast, when an agent uses a model for one environment that it has developed in a different, though slightly analogous, context, then we may say that the agent is, in Boden's view, behaving *intentionally*. ²²⁸

²²⁶ See, for example, Margaret A. Boden, "What is Creativity?" and David N. Perkins, "Creativity: Beyond the Darwinian Paradigm," in *The Dimensions of Creativity*, ed. Margaret A. Boden (Cambridge: MIT Press, 1996), 75-117, 119-142, and Joseph F. Rychlak, *Artificial Intelligence and Human Reason: A Teleological Critique* (New York: Columbia University Press, 1991), 14.

²²⁷ Margaret A. Boden, "Autonomy and Artificiality," in *The Philosophy of Artificial Life* (Oxford: Oxford University Press, 1996), 102.

²²⁸ *Ibid.*

A similar argument is made by David Kirsch. He claims an intention-less agent is only able to anticipate that which is probable given the present state of affairs (253).²²⁹

Such activity could be performed by smart perception-action systems, for example, robots or insects (237). A different kind of relationship to the environment is necessary if

the effectiveness of an action ... depends on the interpretation which other agents impose on it. To take advantage of these dependencies requires knowing the interpretation of others. It presupposes that an agent can understand its opponents or colleagues as systems whose behaviour is a partial function of its current and future environment. ... it [effectiveness of action] will require ... operating in a public domain rather than an egocentric one ... it will require understanding them [other agents] counterfactually. ... [if they were] to do X instead of Y. (254)

Boden and Kirsch's analyses assume that intentionality depends more on originality than directionality. Thus, their descriptions of intentional behavior differ from, say, the 19th century teleomechanists, who defined goal-directed behavior in terms of the maintenance of order, not the discovery of new order.

Telic originality can be further described in terms of the advantageous use of *side effects*. Side effects can occur even in a classical deterministic world, and they belong to a kind of event I have described in the previous chapter as involving *deterministic fortuity*. What I have not considered thus far is whether or not the interpretations of side effects can make the future unpredictable. (Such considerations were not allowed in the classical deterministic paradigm.) If we consider side effects in terms of pragmatism, they can contribute to unpredictable telic originality. Although even side effects are determined by physical laws and are therefore rule-governed and predictable, the creative

²²⁹ All of David Kirsch's quotes are from "Today the Earwig, Tomorrow Man?" *The Philosophy of Artificial Life*, ed. Margaret A. Boden (Oxford: Oxford University Press, 1996), 161-184.

use of side effects constitutes original behavior if the rules are used in such a way as to *distort* them, changing the way they will work in the future.²³⁰

The term, side effect, is itself interesting in terms of teleology because when we use the term we usually have in mind an effect that is not intentional. In *Teleological Language in the Life Sciences*, Lowell Nissen explains that a side effect is not the product of objective chance. He writes,

We say that relieving pain is a function of aspirin but describe stomach irritation as a side effect, and we contrast the function of a machine with its by-products. Terms such as "accidental," "fortuitous," "just happens," "by some quirk," "side effect," and "by-product" in such contexts do not refer to what is random or uncaused, but rather to what is not planned, not intentional.²³¹

As Nissen makes clear, a side effect is defined *as such* by the particular frame through which it is viewed. If we believe a system's function is to produce C, and an effect of the system does not contribute to C, we call that effect a side effect. Perhaps the system can still produce C even when the side effect does not occur. Nevertheless, the "side effect," when it does occur, is a rule-governed, deterministic event. This is what Aristotle meant when he spoke of "chance" events and "incidental" events in *Physics* (Bk. 2 Pt. 5): he was *not* thinking of an absolute chance event but of a side effect. The sound of a heartbeat is a side effect of the heart muscle as a system whose function is to pump blood. The sound of a heartbeat has no given physiological function that we know of. It is, however, clearly a pattern.

²³⁰ I would like to compare this to the way a nonlinear system is deterministic from state to state but each state but have a different rule attached, but I cannot be sure that the differences in domains does not make this a specious comparison.

²³¹ Lowell Nissen, *Teleological Language in the Life Sciences* (New York: Rowan & Littlefield, 1997), 222.

A heartbeat may become functional if a doctor happens to perceive the difference between an irregular beat and a healthy one and acts to save the patient. Hence this side effect, in an era of medicine, can contribute to evolutionary fitness. But one cannot say that the sound pattern is directed toward an end because there is nothing inherent in the sound itself to increase the likelihood of the patient's survival (or, more precisely, the sound's own continuation). An observer is required. A doctor must make use of the sound.

Some useful side effects *may* result in the continuation of the system of which it is a part without the interpretative powers of an outside observer. Shivering due to cold, for example, is a side effect of hypothermia, and the friction produced by shivering happens to help heat the animal suffering from hypothermia. Side effects that are able to contribute to their own likelihood of recurring can come to be viewed as goal directed. The new function (warmth due to friction) seems "caused" by future utility, even though the initial discovery of the advantage was merely fortunate.

The first use of the formerly nonfunctional "side effect" of shivering constitutes an original act. When it is used, we may say it has been "observed" by the body itself. Eventually, observation and functionality become bound up in a long history of a species of which an individual animal is part.

The Use of Error in the Evolution of Language and Literature

Side effects can also be said to play a role in the development of a language system. In *Course in General Linguistics* (1915), Saussure illustrates how the formation of new terms often depends on a coincidental similarity between an unrecognized foreign

word and a native word, if that similarity happens to make sense.²³² As Saussure describes some aspects of language evolution, it partakes in a pragmatic teleology. For example, the speakers tend to "hear" what they already know, and this misunderstanding may happen to acquire reinforcement if a logical concept is ready-at-hand to offer its support. "Chance" wrote Saussure in his notebooks, "becomes the inevitable foundation of everything." Saussure describes how the German "*Sauerkraut*" (sour-cabbage) became "*choucroute*" (cabbage-crust) in French because "*chou*," which sounds not completely dissimilar to "*sauer*" (German for sour), happens to mean "cabbage" in French, and *croute*, which sounds like *kraut* (German for cabbage) happens to mean "crust" in French, which seems to describe the appearance of roasted sauerkraut (175). The changes are not radical; there is still an element of continuity in every change, a likeness in every difference. Nevertheless, as Saussure also said, "speaking of linguistic law in general is like trying to pin down a ghost" (91).

Speakers may or may not be conscious of the logic they are (mis)applying in such instances. In the case of puns, speakers *are* self-conscious of the distortion. If one is sensitive to puns, one pays attention to the noisy possibilities of language. In Saussure's terms we would say that a punster is paying attention to the *diachronic* nature of language (relating to meaning as it changes over time) as well as the *synchronic* (the meaning in the present context.). Making a pun amounts to making a paradigm shift. What is stable and meaningful in the present context can have a different meaning in another. Finding new functions is both a forgetting of differences (when listening to

²³² Unless otherwise indicated, all of Saussure's quotes are from *Course in General Linguistics*, eds. Charles Bally and Albert Sechehaye with Albert Reidlinger, trans. Wade Baskin (London: P. Owen, 1960; reprint, New York: McGraw-Hill, 1966).

imperfect pronunciations or encountering alien ideas, etc.) and a remembering of similarities (making false analogies, etc.), of not seeing what is essential and of seeing what is not essential.

Viktor Shklovsky in *Theory of Prose* (1929) gives an example of such a paradigm shift in Shakespeare's *Macbeth*.²³³ In Act IV scene four, the witches prophesy that Macbeth will not be defeated by any man "of woman born," and their statement seems to mean that he will never be defeated since logic tells us all men are born from women. The statement appears axiomatic, a given truth, a law without exception. But the meaning of "woman" changes based on a different system of logic, whose law adds the requirement: all women must be alive. Macduff's mother died giving birth, and he had to be forcefully removed from the womb. Thus, Macduff was not "of woman born," but "of a dead woman born"; according to a new logic, a dead woman may not be considered a woman per se. Shklovsky argues, sounding like a pragmatist who believes in the effective power of subjectivity, that reality undergoes magical change through puns that distort laws without breaking them. "Countless stories," writes Shklovsky, "are, at bottom, extended puns" (53).

Literariness, *poesis*, and creation, argues Shklovsky, depend upon rule distortion whereby new functions (new meanings) are found for pre-existing patterns.

Extrinsic Emergence

As discussed in the last chapter, the focus of 19th century nonmental teleology was *intrinsic* emergence. Under a holistic paradigm, there was nothing external to the

²³³ All quotes by Viktor Shklovsky are from *Theory of Prose*, trans. B. Sher. (Elmwood Park IL: Dalkey Archive Press, 1990).

system. The merit of nonmental teleology is that it removed the need to posit an external supernatural agent who constantly intervened in order to limit, direct, and guide natural processes: natural processes, it was argued, were self-organizing and self-directing.

In this chapter I have been discussing how interpretations made between two separately developed, causally unconnected systems can result in telic originality. We can refer to this process as *extrinsic* emergence. Although William James and Peirce did not reintroduce a supernatural agent external to the system (as described in Chapter Four) to guide and direct it in a teleological manner, they did reintroduce the notion that something could be external to a system and could affect its behavior. One system might be separated from another at a local level, although at the global level they are still part of the same system. What allows systems to be locally separate is a theory of subjectivity, that is, the idea that agents can act in way that, as Boden and Kirsch have shown above, is not determined by the immediate conditions.

To further clarify the concept of extrinsic emergence, we can imagine an observer who has certain ideas about the world. The observer has developed a repertoire of patterns that he uses to make sense of its world. If he detects one kind of pattern, he thinks he has found food; another kind of pattern, a mate; still another, a safe place to hide. If the observer is a complex agent, he might have a model for detecting the pattern of a "good" English sonnet or a disguised Marxist statement.

Now let's suppose that the observer is a reader, looking at a paragraph of text. The paragraph has fourteen lines as sonnets do. Thus, the reader can *use* the text, that is, he can interact with it or interpret it as if it were a sonnet. It so happens, however, that the text was not intentionally written as a sonnet. It is a grocery list that only incidentally has

fourteen lines. The reader's analogy ignores the grocery list's essential features, and the reader utilizes what one might call, the list's wildcard features instead (i.e., the fact that it has fourteen lines). Another way of putting it would be to say that the reader interprets (makes use of) a side effect of the text. The reader has made use of what I have earlier referred to as a stochastic resonance.

I would also like to note that the discovery of functions and new meaning is a three-part process. First, a new pattern must either emerge with telic directionality (through a process of *self*-organization or intrinsic emergence) or exist already but serve another function. Then the pattern must be evaluated and found to be *useful* (or more useful as the case may be) to whom- or whatever has evaluated it (illustrating *end* determines or extrinsic emergence). Lastly, in order to make it seem patently teleological, the pattern must also serve the purpose of contributing to its own survival (becoming another example of intrinsic emergence).

To give an illustration from biology, if a particular commonly occurring genotype in a population has accumulate enough noise (without altering the phenotype), some of its descendents, whose genotypes contain just a little bit more noise, can suddenly appear as essentially new phenotypes. This is to say that a new attractor is discovered without passing through intermediary forms. Then the new phenotype must be found to have a differential fitness from other phenotypes. Then the new phenotype must proliferate. A more detailed illustration will help clarify how making use of a stochastic resonance can be considered an adaptation or an increase in fitness.

There are four distinct communities of individuals that each reproduce only with other members of their community. Each community is designated by a word, which

represents a string of genetic-like code. The four communities are: **smiles**, **catsup**, **snooze**, and **bolder**. These names will be used abstractly, that is, we are not to think of **smiles**, for example, as having anything to do with smiling. We merely want to use a code that is constrained by some set of rules. Thus, we borrow the rules that govern English words, and we use the words for their structural properties not for their meanings. Although we know these communities by these names, each of the individuals in any community is actually coded for by only a few of the letters in its name. For example, the only thing that is important in defining a **smiles** as such are the third, forth, and fifth, letters, **i**, **l**, and **e**, respectively. The first two letters, **s** and **m**, and the last, **s**, are wildcards. Wildcards are incidental to what is considered the essential nature of the individual, or more neutrally, what that individual has in common with other members of its group. If, for instance, a housing community defines itself by its style of architecture, the **i**, **l**, and **e** determine the structure of the buildings, while the wildcards determine, say, the color of brick, which can vary. Another community might define itself by surface color. In which case, all red houses, say would be considered part of the community regardless of the style of architecture.

If we indicate the defining letters with bold face font, we get **smiles**, **catsup**, **snooze**, and **bolder**.

Random mutations in the incidental wildcard letters over time have added diversity to the **smiles** population. It is now composed of five individuals: **smiles**, **toiler**, **stiles**, **smiles**, and **smiles**. Within the **smiles** community, no one is overly concerned with this diversity. One might think of the **smiles** community as an ideology, like Christianity, that tolerates (ideally speaking) a variety of sects. Protestant, Catholic,

Greek Orthodox, Russian Orthodox, and still retains a basic identity that is shared among the different groups. One might instead think of **smiles** as a community of literary interpreters. All individuals agree that, say, *Hamlet* is about doubt, but they each have a different focus, which may include an interest in metaphysical, political, social, familial, or sexual uncertainties. One might instead think of a particular species, like *Homo sapiens*, which includes a wide diversity of peoples.

Diversity within well defined communities is the norm rather than the exception. However, there are those communities that will not adapt to change. For example, it might be the case that no mutation in the **catsup** community has ever managed to establish itself. **cotgtp**, for example, would not be a viable individual according to the rules of English words. The **catsup** community is not diverse: it is composed of three individuals: **catsup**, **catsup**, and **catsup**. The **snooze** community has managed to incorporate some diversity: **snooze**, **snooze**, **snooze**, **snores**, **snares**, and **snooze**. The **bolder** community has accepted one mutation. It is now made up of **bolder**, **bolder**, **bolder**, and **boiler**.

If we replace each wildcard letter with an *, we can see how members of the same group see each other. When **smiles** looks at either **stiles** or **toiler**, its sees ****ile***. The wildcard option allows for hidden diversity in the **smiles** community. The members are at liberty to experiment with a variety of letters in the wildcard slots. Some catch on. Others do not. But, in general, wildcard options represent a safe arena for play and freedom. What is probably more important, however, is the way that wildcard options also result in a great deal of conformity. At the end of the day, the wildcard differences

are irrelevant to the identity of a community as a species that is separate and distinct from other species.²³⁴

The reproductive rule, "members of a community can only reproduce with their own members," prevents interbreeding between members of different communities. However, one day, **smiles** and **boiler**—from the **smiles** and **bolder** communities, respectively—meet by chance at the crossroads and interbreed, producing **soiler**.

To understand how the reproductive proscription can be transcended, we need to consider the effects that interpretation can have. Members tend to recognize only what they already know. Everything else is noise to them. They do not pay attention to difference. They have no rule by which they can make sense of noise; therefore it goes unnoticed. For example, when a **smiles** looks at a **catsup**, it sees *********, since the third fourth and fifth letters do not match the essential characteristic that a **smiles** recognizes in a community member. When a **smiles** looks at a **snooze**, it sees *********. When a **smiles** looks at a **boiler**, it, however, sees ****ile***.

By the above it is clear that, as far as **smiles** is concerned, **boiler** is also one of its own community. It is a coincidence that **boiler** has an **ile** wildcard configuration that happens to be interpretable by a **smiles**. Although the similarity is meaningful to **smiles**, **smiles** is imposing an analogy upon **boiler**'s noise. No causal laws produced both occurrences of **iles**. In **boiler**'s case **ile** is just a chance mutation, a singular event, which occurred within the **bolder** community. Whereas, **smiles**' letters **ile** are genetically determined.

²³⁴ This may be compared to Motoo Kimura's theory of neutral evolution, which concerns many-to-one genotype to phenotype mappings. See *The Neutral Theory of Molecular Evolution* (Cambridge: Cambridge University Press, 1983).

I remind the reader that this model is just a metaphor. If such a chance similarity in patterns were to actually happen in the biological world, it would be rather improbable instance of what is known as *evolutionary convergence*. As Vladimir Nabokov, who was a lepidopterist as well as a novelist, has explained, convergence is a similarity

attained by essentially different means. Such false resemblances are extremely rare and the number of characters involved is small, and this is as it should be, since such "convergence" depends upon the mathematics of chance.²³⁵

If a platypus could mate with a duck this would exemplify convergence. This, of course, is not possible. But what is possible is convergence between much simpler organisms or organisms with fairly close family ties. For example, one prokaryote might be able to see something useful in another, essentially different, prokaryote. As described in Chapter Two, the meaning between them can represent a kind of convergence, and prokaryote interactions apparently did result in the evolution of a single more complex organism known as the eukaryote.

I also call attention to the fact that, so far as it is concerned, **smiles**, like one of Saussure's language users, is conforming to its own linguistic laws. However, we can see that **smiles'** interpretation actually distorts its own natural linguistic laws. Because **smiles** is blind to the differences in **boiler** that are important to **boiler**, **smiles** has created new meaning and a reproductive advantage over other communities. It can reproduce with more individuals because it is not restricted to its native community. Thus, **smiles** is now considered to have a higher fitness than it did before it discovered this additional way to reproduce.

²³⁵ Nabokov's *Butterflies*, eds. Brian Boyd and Robert Pyle (New York: Beacon Press, 2000), 354.

The union of **smiles** and **boiler** may be considered an example of a natural mentalistic teleological event. It fits William James idea of subjectivity as a pragmatic "teleological instrument" that, driven by desire and blindness, creates. The creation, **soiler**, is not merely subjective; it is a real viable individual. The union of **smiles** and **boiler** is a happy coincidence that, because it turns out to be useful, appears to have been caused or willed by someone above and beyond causality who could see into the unknowable future, caused the mutation in **boiler** and got him to the crossroads at exactly the right time for **smiles'** approach. However, no one could have predicted this successful union. The match was made possible by chance interpretation; it was not compelled by physical causes.

When an agent identifies something meaningful in the random and uses it to increase its own reproductive fitness, a novel function has been discovered. This model illustrates extrinsic, rather than intrinsic emergence, because emergence of greater complexity results from the interaction between two separate systems (rather than interaction between individual parts within the same system). Extrinsic emergence can then lead to intrinsic emergence, which produces a single more complex system (or community) with greater diversity and plasticity than the parent systems.

The Emergent Fate of Henry James

The belief that there is *inherent* meaning in life can lead one to create *new* meaning if one finds coincidentally appropriate patterns. One finds what one looks for. One changes information simply by viewing it according to one's own idiosyncratic paradigm. As William James argued, life can be considered goal-directed, for reality is

altered in the present by one's *ends*. As illustrated by the *smiles* model above, blindness to everything but what one already knows or what one desires can impose (new) functions on perceived patterns. One might say, then, that it is possible to conceive of a *personal telos* determined by the individual in time, though not a *cosmic telos* determined by a being outside of time.

Henry James is a writer whose work reveals an intuitive grasp of the mechanisms behind the evolution of original meaning and the emergence of a tendency that constitutes an intentional self. His notion of fatalism and of character, as illustrated most particularly in his autobiography, recalls his brother's pragmatism. As Henry reflects on his life even as he lived it, he creates his own destiny. But, having what I consider an artistic temperament, Henry was more apt than his brother to be interested in the role of *unconscious* intention--of error, blindness, and luck, not just desire--in the creation of original meaning. Consequently, Henry James' conception of intentionality appears quite complicated. In his fiction, Henry often plays with the way one thinks about fate. He sometimes describes it as predetermined because this is as it seems retrospectively, but he also describes it as arising in time.

In the preface to the New York edition of *The Portrait of a Lady* (1908),²³⁶ James commends Turgenev for his method of creating narrative (4). Turgenev claimed to be able to conceive his characters first, whole and complete, then to allow them to define and direct the plot. We may wonder that James should have admired such an essentialist view of character. James' own characters seem to emerge in the course of the narrative.

²³⁶ First published serially in the *Atlantic* in November 1880-December 1881. All quotations are from the revised edition published in 1908: Henry James, *The Portrait of a Lady* (1908; reprint, New York: Houghton Mifflin, 1963.)

At least this is what can be inferred by comparing the later revisions to the serially published works. The revisions are more teleological than the originals. The novelist, having completed the final chapters, was able to go back and revise earlier ones. The individual parts were adjusted to the end or to the theme as a whole.

For example, during the writing the serial version of *The Portrait of a Lady*, the plot discovered a sinister quality in a character named Madame Merle that James had not initially mapped out in the chapters that had already been published. *The Portrait of a Lady* is about a young heiress, Isabel, who is more or less manipulated by Merle into marrying Osmond, with whom Merle has secretly had a child. When James got the opportunity years later, he remade Merle's first appearance. The revised text foreshadows the revelation of her ultimate role as conspirator in the plot to make Isabel marry Osmond. We can say that the New York edition is prophetic (but not predictable, see Chapter Four) since these added details hint at something Isabel, who is the focal point, could not have guessed at the time. Nevertheless, she very insightfully "recognizes ... in the presence ... of this personage, ... of whom a moment ago she had never so much as heard, a turning point in her life" (14). We can say that the revised version is more teleological (in the sense of end-determined) because the author is outside of narrative time and can manipulate events so that the end influences the beginning. Later events, about which Isabel could not know, influence the way she perceives earlier events.

The question is, When did James first know that Merle would play such a sinister role? It must have become more certain after he wrote the beginning chapters, otherwise he would have made her prophetically sinister in the first (serially published) version. Furthermore, what makes a writer suddenly realize the nature of his characters? My guess

is that, as James wrote, various inessential details accumulated in the descriptions of Merle until he noticed that she was beginning to fit a model of what he perceived to be a sinister and manipulative character. The recognition of this pattern seemed to James to reveal a truth about Merle's essential nature. In effect, he perceived some wildcards as an essential feature. Then later when he went back to revise, he made the plot more directed, less random.

As mentioned in the section above, the discovery of a function or new meaning is a three-part process. First, a new pattern must either emerge (through spontaneous self-organization, which results in a functionally neutral pattern) or a pattern must exist already, but serve another function. The various arbitrary details that James might have assigned to Merle before he knew what he was going to do with her might constitute a functionally neutral pattern. Second, the pattern must then be evaluated and found to be useful (or more useful) to the evaluator. The details indicate Merle's character and helped James decide what her role in the plot would be. Third, the new functional pattern should also be useful for its own survival if it is to be considered telic. Merle became an important character in the plot. In the *smiles* model, I illustrated the second and third parts of the three-part process: evaluation between two systems, and then the subsuming of the used system within the whole of the user system.

When one is trying to look at extrinsic emergence as it occurs in a narrative, it becomes very difficult to identify and separate the two interacting systems. Much evaluation, selection, and reinterpretation can go on during the process of writing itself, not to mention the process of revision. It becomes impossible to talk about an author as separate from the text; they become entangled; they become part of one system of

meaning in which the individual parts relate to a whole. Intrinsic emergence subsumes extrinsic emergence. To talk about extrinsic emergence in a narrative, particularly the emergence of a character's fate, which is what I am attempting to do in this section, one has to think of two separately evolved systems, one misrecognizing and using order in the other.

So then we must accept the fact that when an author and text are engaged in feedback, they are not so separate as to be considered different systems. Nevertheless, there may be singular instances of misrecognition that can be momentarily isolated and analyzed as examples of extrinsic emergence. However, the distinction between the two systems immediately vanishes once the pattern is used and begins to contribute to the organization of the narrative. With this caution in mind, we can further examine the emergence of character in James.

James' method of composition was most Turgenevian when he wrote his autobiography, *A Small Boy and Others* (1913), because he could begin with a considerably evolved image of himself as a writer and an artist.²³⁷ He could use this self-image to define and direct his selection of episodes to relate. In 1912, having completed his last novel, James had reached the peak, as it were, like Dencombe in "The Middle Years" (1893) or like Vereker in "The Figure in the Carpet" (1896), and he was therefore able to see the path his fate had followed to its end.

Throughout *A Small Boy and Others*, James actually refers to writing as his fate. There are about ten explicit occurrences of the word "fate" and many references to destiny, predeterminism, and Providence. In the first few pages, James refers to himself

²³⁷ All quotes are from Henry James, *A Small Boy and Others* (New York: Charles Scribner's and Sons, 1913).

as a young boy as "foredoomed" to go through life merely "wondering," "dawdling," and "gaping," his only function being to receive impressions that could later be used in artistic creation. He declares it was "preordained" that "nature and fortune" dealt him only an imagination and sensibility as his only faculty of application (10). He claims that at a tender age he was "fatalistically aware" of his character and "resigned" to it (25). In general, he describes his childhood in such a way as to make it seem as if he were always a novelist, even before he had begun to consider writing as a career.

Nevertheless, throughout the autobiography he also acknowledges that it is hindsight that allows him to see himself in this light. He reminds himself again and again that at the time he did not appear to be destined for anything in particular.

James' mature forgetfulness of the events in his life that did not contribute significantly to his final state as a successful novelist made all the events that *did* contribute all the more significant. The pattern of James' fate may be straightened up and reinforced by hindsight, but the fact that a pattern can be said to emerge out of random events is precisely what makes a narrative seem fatally determined. Because there exists no physical explanation, an apparently uncaused pattern seems to require a will or fatal force to affect it. In James case, this is precisely what happened: a will affected the direction of events. As James lived his life, he paid attention to certain coincidental patterns that began to appear in the wildcard details of his life. Any thing having to do with the act of being an observer, for instance, James would later consider a proto-novelist kind of behavior. In this way, James implies that a kind of mentalism (formerly perceived as fate or God-given nature) does drive the development of character.

James' Use of Noise

My task throughout this work has been to identify the properties of art *and* natural systems that make them seem teleologically driven, that is, having the aspects of both directionality and originality. The way nature transcends laws has been described above by the use of error and the misrecognition of patterns.

Discovering accidental functions may be nothing but luck, but such luck seems to be an important part of artistic activity. One cannot *try* to discover accidental functions; we usually find them when we are looking for something else. In retrospect, we get the feeling that what we have found is what we wanted or *intended* all along.

Recalling his brother William's work in the role of habit and emotion in determine the truth of a thing, Henry James argues in "The Art of Fiction" (1884) that reality is a function of one's habits and desires. "The characters, the situation, which strike one as real will be those that touch and interest one most" (193). To James, the good novelist is not merely reactive to environment. If he were, he would operate merely as Kirsch's robot does. A good novelist has a sense of direction, a personal teleology.²³⁸

In "The Middle Years," a great author named Dencombe confides in Hugh, a young doctor and his most astute critic, that he had worked according to an unconscious intention all his life, but that while he had worked, everything seemed always to come from trial and error:

What he saw so intensely today...was that only now, at the very last, had he come into possession. His development had been abnormally slow, almost grotesquely gradual. He had been hindered and retarded by experience, he had for long periods only groped his way. (239)²³⁹

²³⁸ Henry James, "The Art of Fiction" in *The Critical Muse: Selected Literary Criticism*, ed. Roger Gard (New York: Penguin, 1987), 186-206.

²³⁹ Henry James, "The Middle Years" in *The Figure in the Carpet and Other Stories*, ed. Frank

Dencombe claims he can now see clearly the thing that he had "intended" all along, and he wants extra time to take advantage of his new insight and write now in a more teleological "new style." Dencombe wants a second chance to bring out his intentions more clearly as James himself was privileged to do when he rewrote his life in his autobiography and when he revised his serial version of *The Portrait of a Lady* for the New York Edition. Like James as autobiographer, Dencombe describes his intention as if it had been there all along, and he had just failed to see it. Dencombe is a Kantian, in contrast to Hugh, whom I describe as a pragmatist below. As a proponent of deterministic fortuity, Dencombe mourns the fact that, at the time, he could not comprehend its "law" and instead had to teach "himself by mistakes" (249).

To recall Saussure's remark about linguistic laws, speaking about literary laws—which function by means of errors, puns, and analogies—is also "like trying to pin down a ghost." It is no wonder that Dencombe could not recognize his intention because all teleological activity is only comprehended retrospectively. Todorov notes this as well in "The Secret of Narrative."²⁴⁰

The Jamesian narrative is always based on *the quest for an absolute and absent cause*...it is absolute: for everything in this narrative ultimately owes its presence to this cause. But the cause... is not only absent but for the most part unknown; what is suspected is its existence.... (145)

Dencombe's "general intention" is aptly described by Todorov's "superpowerful force which sets the whole present machinery of narrative in motion" (145). However, the intention is not "absent" so much as immaterial. Intentionality is the product of the

Kermode (New York: Penguin, 1986), 233-258.

²⁴⁰ In *The Poetics of Prose*, trans. Richard Howard (Ithaca: Cornell University Press, 1977), 141-178. All quotes by Todorov are from this edition.

interrelations of countless stochastic events. "Absent," as distinct from "lost" or "hidden," is simply too strong a word: it implies nonexistence. A divine Author may be absent, yes; but *telos* is not. *Telos* is a real emergent property.

J. Hillis Miller claims James' figure of intention is "necessarily hidden, since anything visible is not it but the sign, signature, or trace of an 'it' which is always absent" and "the figure behind the surface is a phantasm generated by the play of superficial visible elements" (114).²⁴¹ Although Miller's remarks are difficult to understand because written in the vocabulary of deconstruction, they are not complex: they reduce James' notion of intentionality to a binary of conflicting interpretations oscillating back and forth to create a condition of unreadability. In contrast to Miller, James describes intention as an emergent form of self-organization, not reducible to the sum of its stochastically interacting parts yet a dynamically stable product of those parts.

"The Figure in the Carpet" has been used as the site of an interesting argument between structuralism and deconstruction.²⁴² It will be helpful here to analyze the faults of both forms of criticism. Shlomith Rimmon-Kenan and Miller engaged in a debate over this work of James in *Poetics Today*, some twenty years ago, just prior to the emergence of the formalized study of nonlinear dynamics. Miller accused Rimmon-Kenan, a structuralist, of being a scientist-*manqué* (there are no other kinds of scientists in Miller's

²⁴¹ "The Figure in the Carpet," *Poetics Today* 1: 3 (1980): 107-118.

²⁴² Some might say that Miller's sense of deconstruction lacks Derrida's subtlety. Nevertheless, his argument is interesting to examine in so far as it may be considered typical of applications of deconstructive technique. The argument involved Rimmon-Kenan's *The Concept of Ambiguity: The Example of James* (Chicago: Chicago University Press, 1977); Miller's "The Figure in the Carpet," *Poetics Today* 1: 3 (1980): 107-118; Rimmon-Kenan's "Deconstructive Reflections on Deconstruction: In Reply to J. Hillis Miller," *Poetics Today* 2: 1b (1980/81): 185-188; and Miller's "A Guest in the House: Reply to Shlomith Rimmon-Kenan's Reply," *Poetics Today* 2: 1b (1980/81): 189-191.

view), illustrating how "scientific rationality in literary criticism cannot avoid being invaded by the 'alogical' in the literary texts she seeks to reduce."²⁴³ Rimmon-Kenan's scientism does seem to me to be aligned with reductionism in her tendency to classify texts according to strict binary distinctions. As scientific research in the last ten years has shown, classification of complex objects in nature is possible, but the forms that emerge in natural processes are produced not by oscillations between strict binaries but by extremely complicated interactions among countless elements.

Miller suggests that Rimmon-Kenan keep science out of literary criticism lest science's authority be destroyed by the deconstructive tendencies of language, lest its faults be revealed. Nevertheless, their argument persisted through the course of four essays. Structuralism could not be proved wrong by deconstruction. It would take the more sophisticated techniques of nonlinear dynamics to discredit Rimmon-Kenan's work.

Deconstruction is equally guilty of having a too simple notion of causality. Miller laments the fact that a too simple notion of causality is all he has to work with and he believes that this dooms the very enterprise of literary analysis from the start. When Rimmon-Kenan points out to Miller that his reading of James is as reductive as hers, he replies,

My own discourse is necessarily an example of the failure I was trying to identify. Had I succeeded I would have failed. Only by failing could I succeed, which is luck, since, ... like the characters, including the narrator in "The Figure in the Carpet," like Henry James himself, I am certain to lose it.²⁴⁴

²⁴³ Ibid., *Poetics Today* 2: 1b (1980 81): 191.

²⁴⁴ Ibid., 189.

If literary theorists were more receptive to science and its more recent understanding of causality, then we might develop a means of appreciating a degree of success in James.

The effect of James' figure of intentionality, according to Miller, is unreadability, which

names the presence in a text of two or more incompatible or contradictory meanings which imply each other or are intertwined with one another, but which may by no means be felt or named as a unified totality.²⁴⁵ (113)

Clearly, Miller's conclusion results from a limited understanding of causality. Nonlinear dynamics theorists have shown that complexity can result in the emergence of wholes, or unified totalities, albeit dynamic totalities. Emergence of order out of disorder occurs despite postmodernists' naïve expectation that "two or more incompatible" elements will necessarily cancel each other out resulting in aporia.

As noted above, Dencombe's teleology seems one of deterministic fortuity. He feels that a predetermined whole is finally revealed in the end. But his best critic Hugh seems to possess a pragmatic teleology that better describes how intentionality emerges in Dencombe's writing. Hugh realizes that it was Dencombe's belief that his works and his life have a predetermined meaning that made him find (or impose) meaning. He was able to mistake wildcards for essential patterns. Hugh wisely declares, "It's for your mistakes I admire you"(249). Hugh realizes that "the revelation of his [Dencombe's] own slowness ... [made] all stupidity sacred" (251).

In "The Figure in the Carpet" a similar situation is investigated, but this time from the perspective of the reader rather than the writer.²⁴⁶ The belief that a literary work has

²⁴⁵ "The Figure in the Carpet," *Poetics Today* 1: 3 (1980): 107-118.

²⁴⁶ Henry James, "The Figure in the Carpet" in *The Figure in the Carpet and Other Stories*, ed. Frank Kermode (New York: Penguin, 1986), 355-400.

a recoverable intentional meaning drives the reader to transcend his own limitations in order to perceive the meaning that is not at first intelligible.

What is required is a new paradigm through which to view information. In a *Small Boy and Others*, the mature autobiographer discovers a new meaning for the past, which itself has not changed. Similarly, in "The Figure in the Carpe" a new order of reality is revealed to the readers, though the words on the page remain the same as always.

In the story, a young critic learns that his beloved Hugh Vereker's novels contain a hidden meaning. Vereker finds it difficult to explain what his intention is, point to exactly what causes it, or separate it from medium in which it is expressed. Nevertheless, Vereker claims his life's work is governed by a "general intention": "it chooses every word, it dots every i, it places every comma," and only he has recognized it. Corvick, a critic who has analyzed every detail of Vereker's work in a reductive manner, cannot see the *telos*, "the particular thing [Vereker's] written [his] books most for" (365). (Corvick does suspect it, however.) This puts a *young* critic, an employee of Corvick, who is the narrator of the story, in a position similar to that of Biblical interpreter, described in Chapter Three, who believes that there is a hidden message from God contained therein. The reductive young critic sets out to discover the cause of this intention, which he incorrectly supposes must be a kind of *thing*, like a determining seed and an external cause.

David Liss has argued that the narrator-critic's efforts are "teleological" in so far as he pursues an "end product," an objective meaning outside the text. He contrasts the critic's "teleological" or "end-directed" pursuit with Vereker's sense that intention is a

kind of process. Liss notes, "The 'figure' is not a quantifiable thing, it is not an identifiable object, but a process: 'the order, the form, the texture' of the books" (41). In objection to Liss, I argue that Vereker's notion of his "general intention" *is* a teleological notion. The critic is *not* teleological but *reductive* in his search for a direct external cause of the author's intention.²⁴⁷

The young critic enlists the aid of Corvick and his new wife to try to decode the riddle, but their initial pedantic investigations prove fruitless. It is significant that new meaning can only come to the reader by chance. This is precisely what finally happens to Corvick: "when he wasn't thinking, [the words] fell, in all their superb intricacy, into one right combination"(381). What James is describing here is a paradigm shift. As a general rule, one can only recognize what one already knows; novelty appears as noise to the observer who has no frame through which to understand it. As long as no paradigm exists to explain the noise, it remains an anomaly.

In my **smiles** model, I showed how a new paradigm is discovered when **smiles** took advantage of **boiler** at the crossroads. New paradigms become possible when an agent is presented with a variety of information and patterns, much of which might appear as noise, some of which might prove to be coincidentally useful. An excess of information allows the agent to interpret more situations and to make use of a greater number of found patterns.

In "The Figure in the Carpet," traffic with an "other" is shown to be one way of learning to see what was not there before; hence, the story also explores a sexual theme

²⁴⁷ David Liss, "The Fixation of Belief in 'The Figure in the Carpet': Henry James and Peircean Semiotics" *Henry James Review* 16.1 (1995): 36-47. This is an example of the way postmodern critiques of "teleological" interpretations seem to confuse teleology with materialism or consumerism simply because both are said to be interested in "products."

involving Corvick and his bride, who are the first to solve the riddle. The newlyweds spend time in an unfamiliar place, India, which, one assumes, automatically puts them in a position where they interpret what they do not understand in terms of what they do. That is, they automatically misinterpret their surroundings. After some time, however, their surroundings begin to enlarge their internal models of the world. Then later, when they revisit the literary work, they begin to see it from a changed perspective. Things they did not notice before are suddenly clear.

Corvick and his wife developed more structurally complex, and more plastic, models of the world than they apparently had before marriage and before their trip to India. Thus, they were able (that is, they were lucky enough) to find an internal model that coincidentally fitted with the literary work in some significant way.

Conclusion: Relative Objectivity

Those who fault pragmatism say it leads to the conclusion that truth is merely that which seems true to most of the people most of the time. Truth remains a subjective concept. In this way, pragmatism is mistakenly equated with constructivism. Adapting their philosophy from pragmatism, postmodernists claim that meaning is not essentially true, but is constructed by the language of whatever paradigm the observer is using to see the information. According to Derrida, all natural categories are constructed by language and are, as such, radically subjective. We can never grasp categories or "things" in relation to categories because we really only see the linguistic structures that we use to represent those "things."

Current research in theoretical physics has shown that nature itself might be considered a kind of language processing.²⁴⁸ The fact that we use rule-governed systems (i.e., languages) to represent "things" might actually give us a better picture of reality than if we continued to think of it as being composed of "things." Derrida's notion of structure is so entangled with the notion of metaphysical presences, of "things," or rather the lack thereof, that he cannot arrive at a definition of structure that does not involve metaphysical presences. If we could abandon the idea of metaphysical presence altogether, then we might begin to construct a coherent theory of structure.

Crutchfield's research in, what he calls, *computational mechanics* (discussed somewhat already in Chapters One and Two), investigates the way nature computes or processes information. With his new approach, argues Crutchfield, the mode of representation --the language-- used to describe a system under study is defined *by the system itself*. This represents a crucial correction to postmodern theories, which have supposed that, since all models of the world are constructed by language, they are radically subjective.

Before computational mechanics, an emergent pattern (which is used to identify a self-organized system as such) was recognized by an observer who, looking at the data, imposed a preconceived model upon the pattern. We might also say that the observer was able to recognize the pattern only *because* he or she had a ready-made model that happened to fit the data. Thus, one could not say the model of the pattern was objective. This is as Derrida claims. The pattern would be, in some sense, constructed by the observer's model. But Crutchfield's approach is to fold the observer into the system, so to

²⁴⁸ See Tom Siegfried, *The Bit and the Pendulum: From Quantum Computing to M Theory-The New Physics of Information* (New York: John Wiley & Sons, 2000).

speak. Now the "model" of the pattern is found in what is called the "causal architecture" of the dynamical process itself, that is, the procedure that produces the pattern. Scientists now examine how the causal architecture changes in time, and this becomes the model of the process.

To imagine what such a model is like, we recall the discussion given above of structural complexity. An ensemble of parts in a system may behave in a way that can be described by a rule, represented with a string of 1s, 0s, and *s. If we are studying, say, a reaction-diffusion process involving a mixture of chemicals in a petri dish, the rule-governed, dynamical *local* behavior of the molecules might collectively produce a global pattern that looks, for example, like a target. (Such patterns happen to be common in nature. They also occur in slime-mold colonies, prairie-grass growth, and butterfly wing pattern development.) To describe the overall pattern as a "target" is to look past the causal architecture and to see only the whole it produces. Instead of describing the global pattern qualitatively by comparing it to something else (e.g., a target), one could describe the local rule that results in the overall pattern. Crutchfield's approach differs significantly from the approach used by science over the past centuries. He claims that the goal of the scientist of the future will be to extract "from experimental data the linguistic structure of natural processes."²⁴⁹

If telic originality results from a useful misinterpretation by one system of another system's noise, at some future time, we might be able to discuss this kind of event in terms of the *changes* in structural complexity. We might look, for example, at the difference in structural complexity of a sample of ancestors and their mutated and better-

²⁴⁹ "What Lies Between Order and Chaos?" *Art and Complexity* (New York: Oxford University Press, in press).

adapted offspring. (Following the logic of the smiles model, the mutation would be "noise" interpreted by the environment to be more fit.) If we are able to do this, then we will be on our way to a theory of extrinsic emergence or, to put it another way, a quantitative theory of meaning and function. This would provide a strong defense for the effectiveness of subjectivism and the pragmatisms of William and Henry James and C. S. Peirce.

To think in terms of structural complexity, local rules and global patterns, is very like the method behind Kantian investigations of aesthetics, which sought the laws governing how the parts relate to the whole. Crutchfield's approach may find some application in aesthetics. Is the original version of a classical melody better than a particular rock interpretation? This remains an unanswerable question. But we can ask whether or not the interpretation is a more structurally complex performance than a performance of the original version.

In terms of literary studies, we might consider the structural complexity of the literal meaning of, say, the description of a character, compared to that of a figurative meaning of the same character vis-à-vis a character in another text. The inessential details of the first character might take on greater meaning from an expanded perspective. With this approach, there would be many different ways to define and describe the structural complexity of a text, depending on what is being examined and in what context.

I doubt, however, that readers will want to specify exact quantitative readings. Instead, we may rely upon our own complex and richly adaptive linguistic abilities (which have evolved in parallel to the world around us, as Emerson, James, and Peirce would say) to arrive at an intuitive sense or a *feeling* of the structural complexity of any

work of art. Crutchfield himself first envisaged his notion of model building, not by doing mathematical equations, but by examining his own ability to adapt to structurally complex self-organizing visual patterns in video feedback experiments.²⁵⁰ The mind computes like nature computes. After observing for many hours, he began to develop an intuitive sense of the patterns he was seeing. He then set about developing a theory to describe the mechanics behind the process of developing hunches about patterns.

The best interpretations of a literary work would still be the best guesses and representing, as such, the kind of creativity that went into producing the work itself.

²⁵⁰ Personal communication.

Chapter Seven

Spontaneous Organization

Abstract. In this chapter, I discuss interpretations of the second law of thermodynamics (e.g., Norbert Wiener's), which suppose that the universe will inevitably turn into a disordered state. Seeming to go against this law, theories of spontaneous self-organization (e.g., C. S. Peirce's) argue that small fluctuations can produce order. Only in recent years of theories of self-organization been taken seriously. Experiments done in the 1950s showing self-organization in chemical reactions were ignored because they were at variance with the received wisdom on the second law. The significance of certain forms of self-organization in biology was also ignored because biologists preferred to look for an efficient cause of the organization. The favored cause was usually a cell with some kind of centralized control or physically inscribed set of instructions, directly specifying a detailed plan, that it could activate. In other words, it was assumed that structure, which arose despite what it was assumed one would expect according to the second law, must be organized by something—if not someone. I analyze how these issues are explored in Thomas Pynchon's novel *The Crying of Lot 49*.

Entropy

According to (some interpretations of) the second law of thermodynamics, it is very likely that the entire universe will increase in entropy, that is, it will eventually devolve into a homogeneous mixture of particles of matter. No structure, pattern, or regularity will be found anywhere. The second law is called a *law* because the probability that entropy will increase (in a system closed to incoming energy) is so high.

Entropy is the measure of disorder. The idea behind entropy is often illustrated using a pack of cards. If you shuffle a pack of cards thoroughly, then look at each one, one by one, it is possible that they will turn up in some kind of order, which would illustrate a very low entropy (e.g., hearts, then diamonds, clubs, and spades, all ordered numerically). It is much more likely, however, that they will be randomly ordered, having high entropy. There are many different ways for the cards to be out of order and only a few ways for them to be in order. Shuffling will make the disorder in a pack of cards increase till it reaches maximum entropy, and it is very unlikely that shuffling will ever significantly increase order. The general conclusion is drawn, then, that if disorder is more likely than order, then everything in the world around us, being in thermal motion, will eventually shuffle itself to disorder.

In a lecture entitled, "Is the Primordial Soup Done Yet?" theoretical physicist Cosma Shalizi commented on the second law:

It's a common mistake to think that it's a law of nature which says no entropy may ever decrease, and this has led to some really bad books about evolution, economics, the novels of Thomas Pynchon, etc. ... But this is totally wrong.

... you get guaranteed increases only in closed systems, ones which don't interact with the rest of the world. Since the Earth and living things are not closed systems, it really doesn't apply to anything of interest to us....²⁵¹

Shalizi is correct in pointing out that we enjoy temporary, local order; however, there is still the concern that the ultimate fate of the universe is heat death. Entropy may be the kind of worry that only haunts those with a metaphysical turn of mind, people who desire immortality, if not for themselves, then for the human race. But haunt it has since the Victorian period when the law of thermodynamics was first discovered.

In 1852 William Thomson (Lord Kelvin) announced that certain conclusions may be drawn given the dynamical theory of heat.²⁵² Because heat is an effect of mechanical motion, the temperature of a substance is raised by increasing thermal motions of the molecules. Heat from a hot object will be spontaneously transferred to a cooler environment, until object and environment reach an equal temperature, that is, both have the same distribution of fast-moving and slow-moving molecules. A system in equilibrium is not structured, that is, it has on average no regions of distinct temperature differences. Heat from a hot object cannot be transferred to hotter environment because this would be a further segregation of fast-moving molecules from slow-moving ones. Since it is unlikely that molecules will spontaneously segregate themselves, the more likely situation will occur: a random, more or less even distribution of fast- and slow-moving molecules. Environments and objects in environments always tend toward equilibrium. Furthermore, Thomson, noted, the heat that an object emits is the thermal

²⁵¹ Cosma Rohilla Shalizi, Lecture presented at Madison Chaos & Complexity Seminar, 30 April 1996 at UW Madison.

²⁵² William Thomson, "On the Dynamical Theory of Heat," in *Transaction of the Royal Society of Edinburgh* 20 (1853), 261-283.

equivalent of the work done upon it by external forces. Moreover, there is no way to perform work if there is no temperature difference to exploit.

The unstated conclusion given the above facts is that if the universe reaches equilibrium, which under most cosmological theories it eventually will, then there will be no way to create more order or structure. Everything will remain disordered for the rest of eternity.

However, some counter arguments have been made. The entropy of a system, say a container of gas, is only a statistical quantity. Due to fluctuations around equilibrium, even within a highly entropic environment there may be temporary islands of local structure, small subsystems that, completely by chance, are made up of relatively faster molecules than their neighbors. In 1871, James Clerk Maxwell considered this situation. He supposed that if there were some kind of intelligent being that could detect the speed of individual molecules, it could further segregate them, leaving a temperature difference that could be exploited. If so, then the second law could be transcended, or, rather, work could be performed.²⁵³ This being was later dubbed "Maxwell's Demon."

In 1929 Leo Szilard responded to Maxwell's proposal in the negative. According to Szilard, identifying the local islands of structure is itself a form of work. And since the demon is also part of the system as a whole, he uses up energy and increases the overall entropy.²⁵⁴

²⁵³ *The Scientific Papers of James Clerk Maxwell*, ed. W. D. Niven, 2 vols. (Cambridge, England: Cambridge University Press, 1890).

²⁵⁴ See Leo Szilard, "On the Decrease of Entropy in a Thermodynamic System by the Intervention of Intelligent Beings," *Maxwell's Demon: Entropy, Information, Computing*, ed. Harvey Leff and Andrew F. Rex (Princeton: Princeton University Press, 1990), 124-133.

Spontaneous Organization

These are the kinds of discussions about entropy that were being made in the 50s and 60s when Pynchon wrote his short story "Entropy" and his novel *The Crying of Lot 49*. Some, as I will show below, were still investigating the possibilities that a subsystem with an unlikely difference would not have to be recognized as such by an external intelligent being in order for segregation to persist and, perhaps, intensify. However, since mathematical techniques of nonlinear dynamics were not yet widely available, theory of self-organization could not be argued with sufficient force.

If it is true that disorder is more likely than order and the early universe was composed of nothing but quark soup, as many believe, then it is still difficult to imagine how an initial state of complete disorder could have evolved, against all odds, into the fairly orderly universe in which we find ourselves. The near impossibility seems to imply an intelligent creator, or at the very least a Maxwell's demon, who is *outside* the system and who can exploit the structure of sorted molecules without using up energy (increasing disorder) himself.

Creation myths, from the Hebrew *Genesis* to the Japanese *Tales from Kojiki*, are all, in effect, concerned to deny the second law: they contend that order can arise spontaneously from disorder. They do not offer an explanation as to the origins of whatever apparently divine "force" activates the inherent progressiveness that results in increased complexity (i.e., *telos*). In this way, the concept of *telos* has been protected against explication by those who honor it as a sacred mystery.

What did God before He made heaven and earth [before the beginning]?
He was preparing hell for prayers into mysteries.

St. Augustine²⁵⁵

C. S. Peirce defied Augustine. As I have noted already in Chapter One, Peirce attempted to explain the origins of *telos*. In "A Guess at the Riddle," (1887-89) he recalls that the pre-Socratic philosophers supposed that before time there must have been only undifferentiated nothing, high entropy, or a state of absolute chaos. Peirce thought chaos must precede time because that which, for example, "had no regular attractions and repulsions" or "were at one time in one place and at another time in a dozen" would not constitute an existing "thing." He argues that both substances and time must be constituted by regularities. He concludes, therefore, that the original chaos "was in effect a state of mere indeterminacy, in which nothing existed or really happened" (278).²⁵⁶

The pre-Socratics also assumed that while the existence of nothing (undifferentiation, sameness) does not require an explanation, the existence of something (differentiation, variety) does. They thought that the first something, the *arche*, emerged out of nothing. Peirce argued that the *arche*, which he called "primal matter," would be different from chaos in so much as it had some regularity. In his words, "The existence of things exists in their regular behavior" (278).

According to Peirce's description, chaos is *homogeneous*, that is, it is equally structureless anywhere one looks. Peirce also indicates that the activity of chaos is not governed by laws. Therefore, chaos may not always behave in an ideally random (non-repeating) way. There is nothing to prevent a coincidental regularity from appearing

²⁵⁵ *Confessions* 11.12.14, trans. E.B. Pusey (Mount Vernon, NY: Peter Pauper Press, 1945).

²⁵⁶ All quotes by Peirce are from *The Essential Peirce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Indianapolis: Indiana University Press, 1992).

which would be noticeably different from its environment. This would be the kind of structure that a Maxwell's demon might recognize and use to produce further segregation.

But to avoid the confusion that such anthropomorphizations of the segregation process can cause, Peirce thought it better to say that primal matter might be made up of the kind of structures that have subsequent effects that are self-reinforcing. In another essay, "Design and Chance," (1883-84) Peirce illustrates how an even or homogeneous distribution of matter might segregate itself spontaneously. First, he imagines that a million gamblers, with a million silver dollars each, gather to play a game of chance using dice.

Each bets one dollar each time [with] an even chance of winning or losing. Now it is a curious and apparently paradoxical result that although everything is supposed to happen by pure chance yet we know [pretty well] how those million players will stand at the end of a million bets. About ten will have lost \$2,000 or more, no one over \$3,000; and half of them after playing day and night for nearly a fortnight at the rate of one bet a second will stand within \$300 of where they started.

...But now we will suppose that the dice used by the players become worn down in the course of time. Chance changes everything and chance will change that. And we will suppose that they are worn down in such a way that every time a man wins, he has a slightly better chance of winning on subsequent trials. This will make little difference in the first million bets, but its ultimate effect would be to separate the players into two classes those who had gained and those who had lost and these classes would separate themselves faster and faster. (220)

Peirce went very much against tradition in supposing that order is produced by chaos. His work was largely ignored until recently when the idea of "order out of chaos" resurfaced in the complexity sciences.²⁵⁷

²⁵⁷ These ideas were first explored in physics by Lars Onsager. See *The Collected Works of Lars Onsager*, eds. P. C. Hemmer, H. Holden, and S. Kjelstrup Ratkje (Singapore: River Edge, N.J.: World Scientific, 1996). They were first explored in chemistry by Prigogine. See Grégoire Nicolis and Ilya Prigogine, *Exploring Complexity* (New York: Freeman, 1989). See also Hermann Haken, *Synergetics: an Introduction: Nonequilibrium Phase Transitions and Self-*

It is time, then, to reexamine the idea of creation out of nothing. Peirce's theory involves the creation out of, what we would now call, quantum nothingness. Above the level of the quantum world, deterministic physical laws hold and "nothing" or absolute chance, as Peirce himself argued, cannot be directly experienced. Thus, in the rest of this chapter we will be considering order that arises out of disorder, randomness, or anarchy, rather than out of *absolute* chance.

A disordered system is a collection of interacting elements that are not directly correlated in their behavior. We may visualize a disordered system by considering a scene in Thomas Pynchon's novel *The Crying of Lot 49* (1966), which will be the focus of the final sections of this chapter. In this scene, a group of deaf dancers, each following the rhythm in his or her own head, spontaneously produce an organized dance that seems choreographed from above. In a description that is reminiscent of Kantian deterministic fortuity, the heroine of the novel, Oedipa, finds herself in a hotel lobby

full of deaf-mute[s].... They were every one of them drunk.... She tried to struggle out of the silent, gesturing swarm, but was too weak.... They swept her on into the ballroom.... Each couple on the floor danced whatever was in the fellow's head: tango, two-step, bossa nova, slop. But how long, Oedipa thought, could it go on before collisions became a serious hindrance? There would have to be collisions. The only alternative was some unthinkable order of music, many rhythms, all meshed easily, predestined. Something they all heard with an extra sense atrophied in herself. She followed her partner's lead.... She was danced for half an hour before, by mysterious consensus, everybody took a break, without having felt any touch but the touch of her partner...an anarchist miracle. (131-132)

In this section, I will describe how, out of the *stochastic* behavior of uncorrelated dancers or more generally agents, organization emerges spontaneously according to intrinsic laws. As I have argued throughout this work, this kind of self-organization is

Organization in Physics, Chemistry, and Biology (Berlin: New York: Springer, 1983).

precisely what fascinated many *nonmental* teleologists, who thought that inherent constraints somehow guided systems into order *as if* there were direction from the outside (or from a special element on the inside). "Something is self-organizing," according to Shalizi.

if, left to itself, it tends to become more organized. This is an unusual, indeed quite counter-intuitive property: we expect that, left to themselves, things get messy, and that when we encounter a very high degree of order, or an increase in order, something, someone, or at least some peculiar thing, is responsible. (This is the heart of the Argument from Design.) But we now know of many instances where this expectation is simply wrong, of things which can start in a highly random state and, without being shaped from the outside, become more and more organized.²⁵⁸

As explained in Chapter Two, the "Argument from Design" was made by *mental* teleologists who cited self-organizing phenomena in order to argue, not for a *final* cause (which is not a thing or an agent but an internal principle of organization), but for an *efficient* cause, a rational agent outside the system who had dreamt up the principle underlying the organization.

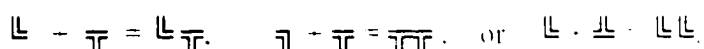
In order to explain further what self-organization is, I will start with a very simple illustration, spontaneous organization in chemical mixtures. According to the second law of thermodynamics, if one pours various chemicals into a petri dish, they will begin to react with one another and will straight away tend to a homogeneous molecular soup. Or so it was held until the 1950s, when Belousov and Zhabotinsky provided one of the earliest experimental demonstrations of self-organizing chemical reactions.

They poured a thin layer of four different kinds of chemical into a petri dish. The molecules did not proceed directly toward a stable homogeneous state. They did not

²⁵⁸ See Cosma Shalizi, "Self-Organization," in *Notebooks* (Cited 24 November 2001) available at www.santafe.edu/~shalizi/notebooks.html.

become more disordered even though they were, like everything, in thermal motion. Instead, the mixture produced concentric and spiral-wave patterns.

What has been labeled the BZ experiment was moderately complicated, involving four chemical reagents, but the basic idea of self-organization can be illustrated using two, which we will simply label molecule type $\mathbb{L}$ and molecule type $\mathbb{T}$, which, when combined can spot patterns. We suppose that $\mathbb{L}$ and $\mathbb{T}$ can react together in one of three ways, depending on their orientation at contact. In each of the three cases, there is a different result. For example,



Because the molecules are always in thermal motion in the dish, the way they happen to meet up is random. The products $\mathbb{L}\mathbb{T}$, $\mathbb{T}\mathbb{T}$, and $\mathbb{L}\mathbb{L}$ are equally likely. One might think that together these reaction scenarios would tend to average out, maintaining the mixture in a steady homogenous state, a random mix of $\mathbb{L}$ and $\mathbb{T}$ s. This is what one expects according to the second law. But this is not what happens. Instead differentiation occurs. If a small clump of $\mathbb{L}$ s happens to form in one area, the $\mathbb{L}$ s in the interior of this clump can only randomly interact with each other. No $\mathbb{T}$ s will be produced there, since a $\mathbb{T}$ is required to produce more $\mathbb{T}$ s. The reaction continues as more $\mathbb{L}$ s (none, as it happens, in the $\mathbb{T}$ orientation) are produced at the edges of the clump when they come in contact with $\mathbb{L}$ s, and the clump grows. When $\mathbb{L}$ s on the edge come in contact with $\mathbb{T}$ s, both types remain unchanged. Eventually, some $\mathbb{T} + \mathbb{T}$ combinations are bound to occur, and this defines the boundaries of the $\mathbb{L}$ clump. What one sees looking down at the petri dish are spot patterns. No matter what the exact initial configuration may be, the result is

always some form of spot patterns, even though the spots never occur in the same place from experiment to experiment.

The self-organizing spots structures are referred to as a type of "attractor," a term which imports the conception of end-directedness into the phenomenon. This shows, yet again, how easy and natural it is to suppose that self-organizing phenomena are determined by a being who can see into the future. When the ordering tendencies of chance produce identifiable structures out of homogeneity, one seems to need to name an end cause that somehow exists always already in the future and somehow affects the present. As mentioned above, creation myths tend to expect us simply to accept spontaneous organization without question, as if sacred and supernatural. Perhaps it is not so surprising then that when Belousov and Zhabotinsky claimed that they had demonstrated this miracle in a petri dish, their findings were met with some resistance.²⁵⁹

Belousov and Zhabotinsky had difficulty publishing their results within the scientific community. Their critics noted that eventually the pattern disappears because, during the reaction process, energy is released in the form of heat and is not replaced. The spontaneous spiral wave pattern, a striking example of order out of chaos, is, alas, transient. They disappear after the energy required to sustain them is dissipated. So patterns emerged out of chaos, so what? Eventually, they die out. Because the pattern eventually starved and vanished, it seemed, to some, to be irrelevant vis-à-vis the big picture, ultimate heat death. One might compare the way this particular form of transient order was trivialized to the way the transient earthly life is trivialized vis-à-vis the Christian afterlife. In both cases, the final state is thought to be all that ultimately matters.

²⁵⁹ See Arthur Winfree, *When Time Breaks Down* (Princeton: Princeton University Press, 1987).

The Crying of Lot 49

In *Crying of Lot 49*, it is suggested that all spontaneous order (if it exists) may be nothing but a meaningless stay against entropy. In this idea, Pynchon follows Norbert Wiener's interest in the way "local enclaves" in a closed universe momentarily oppose the direction of entropy through feedback mechanisms that allow a machine (organic or mechanical) to maintain homeostasis, to maintain a differential organized state with respect to its environment.²⁶⁰ Wiener dubbed this "cybernetics," a term

derived from the Greek word *kubernētēs*, or "steersman," the same Greek word from which we eventually derive our word "governor." (15)²⁶¹

J. Kerry Grant has also noted that Maxwell described his demon as a "pointsman for flying molecules."²⁶² In *The Crying of Lot 49*, Pynchon explores the idea that it is difficult to tell the difference between a self-organized process and one that appears to be governed by an intelligent agent. These days, the process of identifying truly self-organizing systems may, in fact, be characterized as the pursuit of a naturalistic explanation for the demon effect.

In addition to Wiener's influence on Pynchon, it appears that there was also the influence of Peirce, who offered an alternative to Wiener's prediction that

the whole universe around us will die the heat death, in which the world shall be reduced to one vast temperature equilibrium in which nothing really new ever

²⁶⁰ In the introduction to *Slow Learner*, which contains the short story "Entropy," Pynchon claims to have been inspired by Wiener's *The Human Use of Human Beings* (1950). See *Slow Learner* (Little, Brown and Co., 1984), 14.

²⁶¹ All quotes by Wiener are from *The Human Use of Human Beings* (Boston: Houghton Mifflin, 1954).

²⁶² See 1868 letter to William Thomson, quoted in J. Kerry Grant, *A Companion to The Crying of Lot 49*, (Athens: University of Georgia Press, 1994), 81.

happens. There will be nothing left but a drab uniformity out of which we can expect only minor and insignificant local fluctuations. (31)

Peirce argued that local fluctuations *could be* magnified over time. It turns out that Peirce's hypothesis may be closer to the truth than Wiener's. As, for example, Stephen Hawking has recently explained, small fluctuations in the positions and velocities of the particles in the quark soup early universe might have been amplified to a sufficient degree "to explain the origin of the structures we observe around us."²⁶³ Nonlinear dynamics theorists furthermore add that, independent of whether or not the universe began in a completely uniform state, something (functions and context) unaccounted for in the measure of the energy in the universe is later *generated* by the dynamics, leading to spontaneous self-organization. Peirce's work shows that he had a good intuitive grasp of such ideas. As Peirce's influence on Pynchon's novel begins to be explored, a healthy tug against the Wiener influence will be revealed.²⁶⁴

Peirce's idea that nature's dice get worn down in such a way that what has happened once will likely happen again may be compared to Wiener's conception of feedback as part of a learning process, leading to self-organization. However, Peirce thought of self-organization as an *emergent* phenomena; Wiener thought of self-organized order as merely a different permutation of elements that were formerly

²⁶³ See *A Brief History of Time: From the Big Bang to Black Holes* (New York: Bantam Books, 1988), 114.

²⁶⁴ N. Katherine Hayles has argued that Pynchon noted the significance of Claude Shannon's reconceptualization of "information" as a measure of disorder. (Wiener used "information" to mean, roughly, "order.") According to Hayles, Pynchon may have had some sense that the entropy in an organism is what enables it to adapt. See "A Metaphor of God Knew How Many Parts," *New Essays on the Crying of Lot 49* (Cambridge: Cambridge University Press, 1991), 97-125.

disordered.²⁶⁵ Nothing "new" is added to Wiener's universe in the process of self-organization.

It is noted that neither Peirce nor Wiener had at his disposal the late 20th century notion of pattern formation as in the BZ reaction or of *emergent* deterministic chaos, which exaggerates unpredictability even in a classical (non-quantum) world and which enables the development of *structural complexity*, a mixture of predictability and unpredictability. Instead, they both conceived of self-organizing processes as leading from disorder to order. Peirce thought emergent order would ultimately spread to global dimensions. Wiener thought order was always only local and transient and that the ultimate end was entropy.

Wiener believed with Einstein that "God may be subtle, but he isn't plain mean"(188). That is, he believed that nature does not actively "jam" or corrupt its own messages. (I doubt that he would have said this if he knew about deterministic chaos.) In Wiener's view, to believe in a mechanism or force that actively generates disorder was tantamount to following Manichaeian philosophy. In such a view, emergent disorder is looked upon as an *intentional* evil because it does appear to be caused naturally (especially if one supposes that things are not supposed to decay, but remain "perfect"). Wiener thought there was no such thing as malicious Manichaeian disorder, intentionally caused, but only the disordering effects of entropy.

Wiener's idea of Manichaeian evil clearly manifests itself in *The Crying of Lot 49*. It takes the form of "the Trystero," an abstract and never-fully-articulated anthropomorphic disordering force whose objective seems to be to jam messages.

²⁶⁵ See the end of Chapter Five and the beginning of Chapter Six.

Trystero (which Pynchon sometimes spells "Tristero") is blamed for the distortion of texts, misprints, and even the ultimate "dissipation" of most of the men in the story: male characters either go insane, die, or become morally corrupt (163). Pynchon makes it quite clear, however, that Trystero, like Manichaeian evil, may only be a figment of the imagination. In this, he follows Wiener.

Pynchon could not have suspected the existence of deterministic chaos in the early sixties;²⁶⁶ however, the existence of *some* kind of force or mechanism that actively generates chaos has been suspected since the beginning of human history. Just as the existence of *some* kind of force or mechanism that actively generates order has also been suspected. The conceptions of both chaos as devil and *telos* as god are probably often predicated on the observation of *emergent* properties of disorder and order, respectively, that are not given in the initial and boundary conditions. In other words, chaos and *telos* cannot be described reductively – that is, without the mathematical techniques of nonlinear dynamics. Without these tools, it is with good reason that emergence had been attributed to gods, demons, and paranoia.

Pynchon was apparently undecided about which paradigm gave the better description of emergence of chaos and *telos*. He explores a range of paradigms available to him at the time, including what I have labeled analogical determinism, classical determinism, and spontaneous self-organization. Pynchon has two versions of analogical determinism, one for evil, and the other for good. Following Manichaeian philosophy,

²⁶⁶ In a 1984 article, Pynchon revisits his idea of a disordering force, this time describing it in notably "chaotic" terms which were just then becoming known to the public: "What is important here is the amplifying of scale, the multiplication of effect." In this Pynchon has gone beyond Wiener's less sophisticated notion of self-organization through linear feedback. See "Is it O.K. to be a Luddite?" *New York Times Book Review* (28 October 1984): 1, 40-41.

Pynchon characterizes entropy and emergent chaos as an evil disordering force. Trystero. Following a mode of reasoning that I have associated in previous chapters with St. Augustine, Pynchon characterizes emergent order as miraculous, produced in some fashion by "the high magic of low puns" (129). Following Wiener and classical determinism, he dismisses both forms of emergence (disorder or order) as nonexistent or merely epistemological. Following a paradigm of self-organization (possibly due to Peirce), Pynchon considers the idea of ontological emergent order.

Pynchon's novel begins with a homogeneous suburban landscape. Everything is the same everywhere one looks. Driving from city to city, a housewife named Oedipa, finds it is impossible to tell one shopping center from another. Oedipa and her husband Mucho live in the "unvarying gray sickness" (14)²⁶⁷ of recycled products and homogeneous middle-class America, which is Pynchon's metaphor for a state of equilibrium, or maximum entropy, where the creation of new structure and interesting differentiation has become impossible. Nevertheless, Oedipa's task will be to try to discover a way of transcending the second law.

The novel also includes an American businessman, named Pierce, who has found that if there is "difference" within a homogenous environment, that is, if there exist some islands of structure, then these islands can feed off the energy they take from their surroundings and grow. As illustrated by the simplified chemical reaction model given above, an organized island of structure can produce more order like itself when it comes into contact with the environment at its edges if that edge environment provides the right

²⁶⁷ Unless otherwise indicated all quotes by Pynchon are from *The Crying of Lot 49* (1966; New York: HarperCollins, 1999).

resources. Communications between an island of order and its disorderly environment, "keep it bouncing" that is, keep the structure alive (178).

Oedipa is a former girlfriend of Pierce. The story actually begins when she is given the task of acting as executrix of Pierce's will. She sees the will as "Pierce's attempt to leave an organized something behind after his own annihilation" (81). It soon becomes apparent that Pierce was either antagonized by or had dealings with a mysterious organization called Trystero. She is intrigued. During her investigations of his holdings, she notices some strange (perhaps coincidental) patterns or "accidental correlations" (93). She finds a recurring muted postal horn symbol, misprints on postage stamps, suggestive references in random graffiti, and trashcans that look like mailboxes, and she begins to suspect the existence of alternative postal system called W.A.S.T.E. that, apparently, has a history of trying to corrupt the messages of the legitimate postal services, including the U. S. Mail, the Pony Express, and a Renaissance courier service called "Thurn and Taxis."

WASTE is actually an anarchic group. If Pynchon is following Wiener here, it represents the forces of entropy. It has no central agency. The misprints are probably just due to the usual tendencies, as Wiener would say, of messages to become corrupted during reproduction.

However, the misprints do seem to make a kind of perverse sense. Oedipa thinks it is too coincidental that so many people in various marginal groups should be using or displaying the muted post horn symbol. Too many people seem to drop hints that they are in on some secret. One man, a stamp collector, mentions in casual conversation a local cemetery that had been recently relocated. It so happens that a lawyer in connection with

Pierce's estate had also mentioned the same cemetery in the context of a business that harvested human bones for use in filter cigarettes. Coincidentally, a play Oedipa had been to see recently called *The Courier's Tragedy* involved a similar plot using human bones to make ink. Putting all these accidental correlations together, Oedipa begins to formulate a theory of the Tristero.

In Chapter Three, I described Peirce's idea of a mechanism called a "third," which he claimed correlated "brute," or otherwise "unmeaning," facts. It is useful to recall here that he made a distinction between "real thirds" and "accidental thirds." The former results in spontaneous organization as described, for example, in the BZ reaction; the latter results in a phenomenal pattern. To illustrate, Peirce related an old fable about a falling stone that happens to hit a passerby. The event involves "two independent facts": first, one man tosses aside a stone, and second, the stone strikes and kills someone's son accidentally. The father accuses the man who tossed the stone of intentional murder (254). In this, the father connects two the killing to the throwing by supposing an intention. Such suppositions are entirely subjective. Peirce explains that when a pattern is found in an accidental third, it is a "synthetising 'I think' [that] introduces an idea not contained in the data, which gives connections, which they would not otherwise have had" (261).

Since Oedipa cannot really comprehend the Peircean conception of a "real third," the idea that organization can arise spontaneously out of random events, she begins to speculate that WASTE is run by a "synthesizing 'I think'," the godlike, but evil, organization called Tristero or Trystero. Oedipa, like people in general, assumes that every pattern must have a pattern-maker, a governor, or a Maxwell's demon. It is noted

here that Pierce Inverarity is also described as a "miracle" because he was, like "Maxwell's demon ... a linking feature in a coincidence" (120-21). Trystero appears to be an intentional force of the kind imagined by those influenced by a paradigm of analogical determinism. Oedipa's sense of Trystero's intentionality is based on poetic resemblances and analogies rather than material evidence: "What would come to haunt her most ... was the way it fitted, logically, together" (45). And with "coincidences blooming everywhere she looked, she had nothing but a sound, a work, Trystero to hold them together" (107). Consequently, readers are invited to suspect that Oedipa imagines the existence of the Trystero.

Trystero as a product of paranoia derives from Wiener who was a great critic of the idea that the world is controlled by anthropomorphic forces of good and evil. In the fifties, the disordering effects of evil found symbolic expression for Wiener in McCarthyism, which operated on "secrecy, message jamming, and bluff" and which stifled an individual's ability to learn, adapt, and become more self-organized (128). This explains why in *The Crying of Lot 49*, Trystero is linked to the play *The Courier's Tragedy*. The plot of that play fits Wiener's description of the then current political situation as a "cops and robbers" game, like an "old Italian cloak-and-dagger melodrama played on a much larger stage" (112). Wiener thought the Manichaean notion of anthropomorphic evil, like McCarthyism, flourished mainly by means of paranoia.

Toward the end of the narrative, Oedipa begins to think Pierce has set her up:

a plot has been mounted against you, so expensive and elaborate, involving items like the forging of stamps and ancient books, constant surveillance of your movements, planting of post horn images all over San Francisco, bribing of librarians, hiring of professional actors ... Or you are fantasizing some such plot, in which case you are a nut, Oedipa, out of your skull. (170)

The existence of both an emergent active chaos and an emergent active *telos* is questioned in Wiener's work. He wanted the tendencies toward disorder and order to be explained very simply as increased entropy and increased *negentropy*, respectively. But as Pynchon's novel seems to demonstrate, there is something about Wiener's position that may be viewed with irony. As Pynchon writes twenty years after *The Crying of Lot 49*, if we

insist upon fictional violations of the laws of nature — of space, time, thermodynamics, and the big one, mortality itself — then we risk being judged by the literary mainstream as Insufficiently Serious.²⁶⁸

Despite his obvious admiration for Wiener, Pynchon does not seem quite as willing to accept heat death as the ultimate end of the universe and everything in it. It appears to me that in *The Crying of Lot 49*, he reopens the case that Wiener thought closed, looking one more time at Maxwell's demon, but this time the demon as understood by Peirce.

In the course of her quest, Oedipa visits an inventor, Nefastis, who tells her that if there were a demon that could order molecules without expending energy, then the second law could be overcome (105). The demon would sit in watch over a container of gas with a partition separating two chambers. Anytime a slow-moving molecule goes over to one side, he would open a little door and let it go through (vice-versa for fast-moving molecules). Over time, the gas in the container would become segregated, more structured, hot on one side, cool on the other. Work could be performed by exploiting this temperature difference. This is, of course, James Maxwell's famous thought experiment, which Nefastis has taken literally. He has constructed a container with a partition, which he wants Oedipa to try to move telepathically.

²⁶⁸ See "Is it O.K. to be a Luddite?" *New York Times Book Review* (28 October 1984): 1, 40-41.

The important point of Maxwell's experiment is, as has Louis Menand noted, that the demon is not a being per se but a sorting force, much like Darwin's natural selection. Over time, selection sorts by recognizing a sameness among a varied collection of things.

An analogy with Darwin's theory of natural selection is not hard to see. ...the environment (operating like Maxwell's demon) "selects" [a particular] characteristic by making it requisite for survival. . . (198-199)²⁶⁹

Menand further explains that Peirce had interpreted Maxwell's experiment in this manner.

He notes that

If the molecules inside a container are all moving at different velocities, we can only say that they will maintain a uniform temperature *most of the time*. There is always the infinitesimal chance that the molecules will sort themselves out spontaneously in such away that the faster ones will all end up on one side of the container, thus raising the temperature and producing [available] energy [for work] spontaneously. (198)

Peirce's conclusion, then, as Menand puts it, is that "Physical laws are not absolutely precise" (198). Menand makes these observations about Peirce in the context of his discussion of the difference between C. S. Peirce and his father Benjamin Peirce, also a mathematician. The elder Peirce had helped translate Laplace's work on probability theory, which supposes a rigidly deterministic universe. Laplace also had a demon. His demon was a being of super intelligence who, because he knew the state of every atom in the universe, could predict the future at any given point in time. Chance does not play a role in this universe.

The younger Peirce believed in a determinism that was actually probabilistic, not just apparently so to those with insufficient knowledge. The younger Peirce imagined that the physical laws discovered by classical determinism are not given a priori, but arose in

²⁶⁹ All quotes by Louis Menand are from *The Metaphysical Club* (New York: Farrar, Straus and Giroux, 2001).

time through some sort of selection process. (Peirce's idea may not have had the precision of nonlinear dynamics, but it is a theory of *emergence* just the same. Structure arises that could not have been predicted given the initial and boundary conditions.) Menand is quite right in noting that the difference between the two Peirces is a difference between two demons, Laplace's super scientist demon and Maxwell's sorting demon.

It seems to me, then, that Pynchon's character Pierce Inverarity is a figure for C. S. Peirce. Although at first glance these two names may look identical, the "e" and "i" are transposed. "Peirce" is pronounced like "purse" and "Pierce" like the verb "to pierce."

Nevertheless, I do not want to press the possible connection between the businessman Pierce in *The Crying of Lot 49* and C. S. Peirce too forcefully. The verbal visual echo in their names is suggestive, but not conclusive. As I have argued in Chapter Two, a phenomenal pattern of this sort produces the effect of teleological meaning (of the analogical deterministic sort), meaning that is dependent upon an external will to link coincidental similarities together. The pun is not produced by some law of punning that exists within the text itself. Its interpretation cannot be defended in the same way that the meaning of a word can be defended by pointing to semantic laws and context. To recall an example given already in Chapter Two, punning is comparable to the sequence 14, 23, 28, 33, 42, 51, 59, 68, 77, 86, which, I say, is governed by an *external* rule because it represents stops on the Lexington Avenue subway line in New York City. Punning is opposed to the sequence 3, 6, 9, 12, 15, 18, 21, 24, 27, which is governed by an internal rule that is defined in the sequence itself: add three to each

number in the sequence.²⁷⁰ The external will linking the names Pierce/Peirce is, I argue, Pynchon.

This pun, in effect, represents a quantum leap from one order of discourse to another where Pierce takes on a different meaning. Puns make a distorted use of the semantic dimensions; they violate "dictionary meaning." Once a reader "gets" a pun, however, he or she has come to understand it as behaving, not entirely without rule but according to a distorted rule. (No one could understand that which is entirely without rule.) Puns are like C. S. Peirce's conception of *primal matter*, coincidental relationship that, if they take habit, can eventually become law. When puns first come into the literature, however, we feel their idiosyncratic nature. This is what makes the Peirce/Pierce echo seem so much more intentional than a pattern determined by literary or linguistic convention.

Once one makes the connection, however dubious, between Pynchon's Pierce and C. S. Peirce, one cannot fail to note that Peirce's principle essay on spontaneous or emergent organization is entitled "A Guess at the Riddle," referring to the riddle of the sphinx, which was answered by Oedipus. This finally provides a strong clue to the relevance of Oedipa's name.²⁷¹ Moreover, as Tony Tanner has noted, Pierce's last name,

²⁷⁰ This analogy was adapted from Murray Gell-Mann's example in *The Quark and the Jaguar: Adventures in the Simple and the Complex* (New York: Freeman and Company, 1994).

²⁷¹ Most attempts to explicate Oedipa's name have assumed that, to quote Chris Hall, "the name Oedipa comes to signify, albeit paradoxically, postmodern dilemma [sic] ... Oedipa, like Oedipus, is a solver of riddles" in a world unlike Oedipus' "'classically' ordered world, [where] riddles have solutions; for Oedipa ... riddles are posed only in fragmentary and indeterminate terms, and any solution is probably unattainable" (67). See "'Behind the Hieroglyphic Street': Pynchon's Oedipa Maas and the Dialectics of Reading," *Critique* 33 (1991): 63-77. Ironically, Peirce, one of the earliest advocates for indeterminism had no trouble making guesses at riddles. For more postmodern interpretation of Oedipa's name similar to Hall's, see Edward Mendelson, "The Sacred, the Profane, and *The Crying of Lot 49*," *Mindful Pleasures: Essays on Thomas Pynchon*.

Inverarity, sounds likes "in variety."²⁷² C. S. Peirce's argument took its departure from the question, How can variety (difference) come from sameness (entropy)?

But to pursue the Pierce/Peirce link further, a reader must begin to adopt a line of reasoning that, as I have shown in Chapter Four, Peirce himself critiqued. "It is easy to see that the number of accidental agreements of this sort would be quite endless."²⁷³ The rules of the analogy I am making are not specified beforehand.

One might also find evidence of a counter-argument in a parallel between the businessman Pierce Inverarity, who owns shares in the Yoyodyne laboratory, which makes its inventors "perform their little role in a design ritual, already set down for them in some procedures handbook" (88), and Wiener's argument that a businessman should not try to control the employees of his "laboratory" without listening to their feedback or allowing them to develop their own potentials. Wiener claims "variety and possibility" describe what it is to be human (52), and only "greater variety" and "more adaptability" can deal efficiently with the forces of entropy (61). This would seem to make Pierce Inverarity, part owner of the stifling laboratory, an enemy to self-organization.

eds. George Levine and David Leverenz (Boston: Little, 1976): 87-100 and Douglas Mackey, *The Rainbow Quest of Thomas Pynchon* (San Bernadino, CA: Borg, 1980). Joseph Slade argues that Oedipa is like Oedipus, and not ironically so, in *Thomas Pynchon* (New York: Warner Paperback, 1974). Bernd Herzogenrath, in "A Possible Source for the Name Oedipa Maas," *Pynchon Notes* 40-41 (1997): 107-09, suggests that Oedipa's last name, "Maas" derives from Helmholtz's title "*Entropie als das Maass der Unordnung*," which contains an unusual spelling of Maß. He claims Helmholtz made the first explicit prediction of the heat death of the universe. If this is so, then together with my reading, Oedipa's full name pulls in opposite directions. Not incidentally perhaps, it was Helmholtz who made the first really destructive argument against German telemechanism and its theory of self-organization. Helmholtz's argument later proved to be incorrect, but the damage had already been done. See Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth Century German Biology* (Chicago: University of Chicago Press, 1989).

²⁷² "The Crying of Lot 49" in *Thomas Pynchon* (1982) reprinted in *Modern Critical Views: Thomas Pynchon*, ed. Harold Bloom (New York: Chelsea House, 1986), 176.

²⁷³ "Order in Nature," *The Essential Pierce: Selected Philosophical Writings*, eds. Nathan Houser and Christian Kloesel, vol. 1 (Bloomington: Indiana University Press, 1992), 176-177.

Which way the name "Pierce" may point (if it points at all) may be ambiguous; however, I do not dismiss the Peirce Pierce echo simply because it may be subjective. Peirce's criticism, of those who think too much of accidental agreements, is directed at those who think accidental agreements in the *real* world are meaningful. A fictional world is unlike the real world; it does have an organizing intelligence that exists beyond the time of the narrative and is not subject to laws that prevent moving forward or back in time. Therefore, accidental agreements may very well point up some poetic intention. In my opinion, such dubious resemblances are the spaces in which an author's intention can truly be felt, since they are not defensible in terms of the laws that govern social, textual, or biographical influences. *The Crying of Lot 49* is full of such signs of intention and, as such, a more teleological world than the one described in Augustine's Bible. Augustine *imposed* intention on a history of our uncreated world; it really may be there in the created world of a novel.

Much of Pynchon's novel explores the question of subjectivity involved in recognizing patterns. However, it does seem that chance patterns (recognized by a demon or by Oedipa, for example) can lead to effects if the observer uses them. In a way, Maxwell's demon *decreases* the entropy in the container of gas that he is observing because he is *increasing* the available energy (structure) available by *increasing* his knowledge of the state of each of the molecules (sorting them in his mind). Thus, recognizing merely accidental patterns effectively creates them in so far as it makes them usable. Here we may have a gesture towards Peirce's pragmatism: the meaning and truth of a concept is given in the effects it can have.

The demon idea in Pynchon's novel is attended with a feeling of the uncanny, the feeling that a discarded animistic view,—a belief that mere thoughts can link physically unrelated things—begins to seem credible.²⁷⁴ Or to use Peirce's terms instead of Freud's, if two "independent facts" are coincidentally useful, they will seem to have been brought together by a "synthesizing I think." Pynchon seems aware of the fact that most people cannot believe that order can arise spontaneously and instead suppose some kind of intelligent agent.

The Pacemaker Concept

In Pynchon's novel, Maxwell's experiment is described rather absurdly. The one performing the experiment, Nefastis, appears to be insane. But there are other indications that Pynchon had not quite given up on what I believe is a Peircean idea of making use of chance order.

Pynchon's postal carriers are known as the "Thurn and Taxis family." A satisfactory explication of this group's name has never been made. As J. Kerry Grant explains:

It has proved extremely difficult to track down a single plausible source for Pynchon's knowledge about the Thurn and Taxis postal monopoly. One possibility is Alvin F. Harlow's *Old Post Bags*, which devotes a chapter to this 'remarkable family of postmen.' Berthe Delepinne's account of the Thurn and Taxis family's role in the history of Belgian postal services may also have caught Pynchon's eye as he browsed the shelves in the library at Cornell.²⁷⁵

²⁷⁴ See Sigmund Freud, "The Uncanny," *Works* 17, trans. James Strachey (1919; London: Hogarth Press, 1953-1974), 249.

²⁷⁵ See J. Kerry Grant, *A Companion to The Crying of Lot 49*, (Athens: University of Georgia Press, 1994), 59-60.

It may be that critics are looking in the wrong place (postal history) for clues as to how "Thurn and Taxis" functions in the narrative. Before one speculates on *what* might have caught Pynchon's eye, one needs to explain *why* the name, Thurn and Taxis, would have caught his eye in the first place. It could suggest "thermotaxis," a term from biology used to describe the self-organizing movement of an organism in response to a heat source. Pynchon might have liked the poetic ambiguity of the near-miss pun of the postal family (whose function, according to Pynchon's novel, is to sort mail) and the self-sorting process of thermotaxis. The term thermotaxis can also be used synonymously with the term *phototropism*, a turning toward light. Weiner mentions a "tropism machine," which is "phototropic and searches for light."²⁷⁶

The term "tropism" also recalls "*telos*" in a Thomist sense, an innate tendency to react in a definite manner to stimuli, that is, a "natural" inclination. Therefore, it is an interesting coincidence that, as Pynchon critic Joseph Slade has noted, Princess Marie von Thurn and Taxis was Rilke's patroness when he wrote about El Greco's painting of angels called *Ascension*. Rilke claims that the upward movement of the angels toward the light "cannot help itself. This is the physics of Heaven."²⁷⁷ Thus, the historical name "Thurn and Taxis" finds a very surprising accidental correlation with Thomist teleology,²⁷⁸ phototropism, and thermotaxis (in so far as light produces heat).

Thermotaxis, as well as a similar mechanism known as chemotaxis, has been most widely studied in *Dictyostelium discoideum*, an amoeba also known as "slime mold."²⁷⁹

²⁷⁶ *The Human Use of Human Beings* (Boston: Houghton Mifflin, 1954), 165.

²⁷⁷ *Thomas Pynchon* (New York: Warner Paperback Library, 1974), 121.

²⁷⁸ I argue in Chapter Two that Thomist teleology is not a legitimate application of the notion of final causality, which does not necessitate a Divine Designer who plants natures in individuals.

²⁷⁹ See for example, Athanasius F. M. Marede, Alexander V. Panfilov, and Paulien Hogeweg.

(Chemotaxis describes how individual slime-mold cells spontaneously self-organize in response to what appear to be chemical "signals" in the environment.) Although such research may sound obscure to those outside biology, slime-mold studies are in fact numerous, and Pynchon, if he looked into biology at all, would very likely have run across some mention of slime-mold aggregation, which is a standard example of self-organization.²⁸⁰ I hope this justifies my abrupt transition from angels to amoebas.

Working at the same time that Pynchon was writing *The Crying of Lot 49*, mathematical biologist Evelyn Fox Keller, like Pynchon, was interested in the mechanisms underlying self-organization.²⁸¹ She did not seek to prove that the apparent self-organization was actually performed by some unknown cause or agent. However, she was an exception. Many of her peers in biology tended to look for predetermined "founder cells" or special "pacemaker cells," that would govern the organization, just as Oedipa tended to look for Trystero and as Nefastis looked for a demon. Pierce, perhaps not incidentally in this regard, is referred to as a "founding father" in Pynchon's novel (26).

Since the time that Keller worked, we have learned much about the self-organizing mechanism of slime-mold aggregation. It turns out that individual slime-mold cells produce a chemical called acrasin when food sources have become scarce and they

"Migration and Thermotaxis of *Dictyostelium discoideum* Slugs, a Model Study," *Journal of Theoretical Biology* 199 (1999): 297-309.

²⁸⁰ Pynchon is apparently interested in biological self-organization. In a book review article written in 1984, Pynchon insists on the importance of "research and development in artificial intelligence, molecular biology and robotics." See "Is it O.K. to be a Luddite?" *New York Times Book Review*, (28 October 1984): 1, 40-41.

²⁸¹ See Evelyn Fox Keller, "The Force of the Pacemaker Conception Theories of Aggregation in Cellular Slime Mold" in *Reflections on Gender in Science* (New Haven: Yale University Press, 1995), 150-157.

are beginning to starve. Acrasin propagates through the medium in which slime-mold cells are suspended. This propagation is known as diffusion. Because acrasin goes from one cell to another throughout in the medium, we say there is "communication," which touches on another theme in Pynchon's novel.²⁸² ("Communication is the key," cries Nefastis [105].) When other slime-mold cells detect acrasin, they move toward the source. This results in aggregation, that is, organization, which helps the species survive (once aggregated, slime-mold cells spontaneously form stalks, which release spores, which travel to other regions with possibly better food sources).

When a spatial field is evenly distributed it is symmetric, that is, the same degree of disorder order anywhere one looks. When the field becomes differentiated this symmetry breaks. Oedipa, we recall, waits for "a symmetry of choices to break down" (181). When symmetry breaks, a field of evenly distributed slime-mold cells begins to organize into clumps. In other words, the entropy of the field decreases. Just as Peirce thought "primal matter" forms spontaneously, Keller concluded that self-organization could occur, without the direction of a special founder cell, if the initial conditions of the slime-mold cells were not perfectly equal. It is highly unlikely that a random distribution of things would be *perfectly* random (i.e., without some chance regularities, chance structures). Slime-mold cells that happened to have had worst luck in their lives and have reached the point of starvation sooner than others would begin producing acrasin before the others. They might also produce a greater amount sooner than the others.²⁸³ Keller

²⁸² This is linked to Wiener's idea of "communication and control" in machines as well, but his understanding of communication and feed back does not approach the kind of complexity necessary to describe biological processes, which are nonlinear.

²⁸³ Keller notes that this is argued by M. Cohen and P. Hagan in "Diffusion-Induced Morphogenesis in *Dictyostelium*," *Journal of Theoretical Biology* 93 (1981): 881-908.

further speculates, that bad luck for particular cells might not be due to an *inherent* lesser fitness (as a Thomist might argue), but due to the *chance* that they had found themselves relatively close to other cells, and in any high concentration area, the food source would have been exhausted more quickly. Starving cells nearer to each other would clump together more quickly than those lying far away from other cells. A large clump would have the tendency to draw more cells (and even smaller clumps) toward it than a smaller clump would.²⁸⁴

The upshot of this slime-mold study is that it reveals a sorting mechanism that only *seems* to be organized by an intelligent force (i.e., a cell with a special property that allows it to produce intelligible signals drawing other cells toward it). However, this sorting mechanism is attributable to the chance, nonuniform distribution of cells in a field.

Keller's work, published a few years after the publication of *The Crying of Lot 49*, was ignored. Instead

the pacemaker view was embraced with a degree of enthusiasm that suggests that this question was in some sense foreclosed. The assumption of pacemaker cells was felt to be so natural, it so readily explained the phenomena, that the question I had begun with simply disappeared.²⁸⁵

Pynchon's narrative, consciously or unconsciously, explores the same kind of resistance experienced by Keller. People simply refused to accept the idea of truly spontaneous order out of disorder. After all, Szilard had "proved" that any kind of sorting

²⁸⁴ Evelyn Fox Keller and Lee A. Segel, "Initiation of Slime Mold Aggregation Viewed as an Instability," in *Journal of Theoretical Biology* 26 (1970): 399-415.

²⁸⁵ See Evelyn Fox Keller, "The Force of the Pacemaker Conception: Theories of Aggregation in Cellular Slime Mold" in *Reflections on Gender in Science* (New Haven: Yale University Press, 1995), 153.

required work, the expenditure of energy. As Oedipa points out, any postal worker would argue with the claim that "sorting isn't work" (86).

Sometimes Oedipa seems open to the idea that sorting could occur spontaneously. More often, she seems more convinced that there must be a governing agency. As Keller notes about the success of the flawed pacemaker explanation, most people think it is "natural" to look for an efficient cause or an agent for unexplained order:

In our zealous desire for familiar models of explanation, we risk not noticing the discrepancies between our own predispositions and the range of possibilities inherent in natural phenomena. In short, we risk imposing on nature the very stories we like to hear. (157)

The kind of story that classical determinists tend to like to hear is that entropy is the most natural, most realistic, and most inevitable state of nature. Essentialists, of course, like to hear about how a Pacemaker governs the universe. *The Crying of Lot 49* investigates both options, but I think it also (rather tentatively) presents a third, Peirce's option of spontaneous self-organization.

Conclusion

Anarchy, another major theme in Pynchon's novel, has been indirectly described in this chapter in the sections dedicated to explaining stochastic behavior of individual molecules in chemical reactions and slime-mold aggregation. We have learned that stochastic processes can spontaneously produce order. As Oedipa learns from anarchist Jesus Arrabal,

You know what a miracle is? ... revolutions break out spontaneous and leaderless, and the soul's talent for consensus allows the masses to work together without effort, automatic as the body itself. And yet señá, if any of it should ever really happen perfectly, I would have to cry miracle. An anarchist miracle. (120)

The early universe may have been nothing but quark soup, but it has spontaneously evolved into a fairly comfortable place with lots of interesting order and structural complexity. Although we do not know the ultimate fate of the universe, we should not fail to appreciate the present miracle of a universe that appears to be perpetually self-creating. Tanner claims if this is all Pynchon is alluding to, such a miracle would be rather "mundane."²⁸⁶ This would be the kind of "miracle" that Wiener wished for. As Pynchon later commented, the

hope of miracle has now come to reside in the computer's ability to get the right data to those whom the data will do the most good. With the proper deployment of budget and computer time, we will cure cancer, save ourselves from nuclear extinction, grow food for everybody, detoxify the results of industrial greed gone berserk — realize all the wistful pipe dreams of our days.²⁸⁷

This may be all that Pynchon associates with the word miracle, but if the Peircean influence does exist, then one must assume "miracle" points to something more, something not quite captured by reductive paradigms or by digital, nonparallel forms of computing. It must involve coincidence, error, and analogy in some essential way.

The Peircean miracle of chance and accidental correlations may remove the need to posit an external organizing intelligence, however it does posit artful internal mechanisms that naturally and spontaneously produce orderly phenomena. Maybe these mechanisms will keep working forever, who knows?

As I noted at the very beginning of this work, systems in nature are formed according to mechanistic laws that can arise spontaneously even from quantum indeterminacy. In turn, law-abiding systems come to function in advantageous ways not

²⁸⁶ See Tony Tanner, "The Crying of Lot 49" in *Thomas Pynchon* (1982) reprinted in *Modern Critical Views: Thomas Pynchon*, ed. Harold Bloom (New York: Chelsea House, 1986), 187.

²⁸⁷ See "Is it O.K. to be a Luddite?" *New York Times Book Review* (28 October 1984): 1, 40-41.

predicted by those laws. These two aspects, emergent lawfulness and ability to opportunistically transcend laws, makes natural systems seem like works of art, or *telic*, that is, creatively organized toward goals. In this work, I have used recent research in the sciences of complexity, which some consider an anti-reductionist form of science, to show that the cosmos is spontaneous and creative and, as such, intentional. We, as part of the cosmos, may consider ourselves spontaneous and creative beings and, as such, intentional. In conclusion, I would like to express my hope this new conception of what it means to be teleological will lead to a revival of the discussion of authorial intentionality.

Selected Bibliography

Teleology/Philosophy of Science

- Alexander, Victoria N. "Neutral Evolution and Aesthetics: Vladimir Nabokov and Insect Mimicry." In *Working Papers Series* 01-10-057 (Santa Fe: Santa Fe Institute, 2001), 1-26. Available at <http://www.santafe.edu/sfi/publications/Abstracts/01-10-057abs.html>.
- Aristotle. *Physics* 2. Trans. Robin Waterfield. New York: Oxford University Press, 1996.
- Augustine. *The City of God*. Trans. Marcus Dods. New York: Modern Library, 1950.
- Ball, Philip. *The Self-Made Tapestry: Pattern Formation In Nature*. New York: Oxford University Press, 1999.
- Bedau, Mark. "Against Mentalism In Teleology." In *American Philosophical Quarterly* 27 (1990): 61-70.
- Bergson, Henri. *Creative Evolution*. Trans. Arthur Mitchell. Mineola, New York: Dover Publications, 1998.
- Boden, Margaret. "Autonomy and Artificiality." In *The Philosophy of Artificial Life*. Ed. Margaret Boden. Oxford: Oxford University Press, 1996. 95-108.
- . "What is Creativity?" In *The Dimensions of Creativity*. Ed. Margaret Boden. Cambridge: MIT Press, 1996. 75-117.
- Boethius. *Consolation of Philosophy*. Trans Victor Watts. London: Penguin, 1999.
- Crutchfield, James P. "Is Anything Ever New? Considering Emergence." In *Integrated Themes, Santa Fe Institute Studies In the Sciences of Complexity XIX*. Addison-Wesley: Reading MA, 1994. 479-497.
- . "When Evolution is Revolution: Origins of Innovation." In *Evolutionary Dynamics: Exploring the Interplay of Selection, Neutrality, Accident, and Function*. Eds. J. P. Crutchfield and P. Schuster. New York: Oxford University Press, 2002. 101-134.
- Crutchfield, James P., J. Doyne Farmer, Norman Packard, and Robert Shaw. "Chaos." In *Scientific American* 255 (1986): 46-57.
- Darwin, Charles. *On the Origin of Species*. New York: Appleton, 1882.
- Derrida, Jacques. "Structure, Sign, and Play in the Discourse of the Human Sciences." Trans. Richard Macksey and Eugenio Donato. In *The Critical Tradition: Classic*

Texts and Contemporary Trends. Ed. David H. Richter. Boston: Bedford Book, 1989. 959-971.

Diaconis, Persi and Fredrick Mosteller. "Methods for Studying Coincidences." In *Journal of American Statistical Association* 84 (1989): 853-861.

Emerson, Ralph Waldo. "Experience." In *Emerson: Essays and Lectures*. Ed. Joel Porte. 1844; New York: Library of America, 1983. 469-492.

---. "Fate." In *Emerson: Essays and Lectures*. Ed. Joel Porte. 1860; New York: Library of America, 1983. 941-968.

Freud, Sigmund. "The Uncanny." In *Works* 17. Trans. James Strachey. 1919; London: Hogarth Press, 1953-1974. 218-252.

---. "Animism, Magic and the Omnipotence of Thought." In *The Basic Writings of Freud*. Ed. A. A. Brill. New York: Modern Library, 1995. 833-851.

---. "Determinism—Chance—And Superstitious Beliefs." In *The Basic Writings of Freud*. Ed. A. A. Brill. New York: Modern Library, 1995. 118-146.

Goodwin, Brian. *How the Leopard Changed its Spots: The Evolution of Complexity*. New York: Scribner, 1994.

Hacking, Ian. *The Emergence of Probability: a Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference*. Cambridge: Cambridge University Press, 1975.

James, William. "The Dilemma of Determinism." In *The Will to Believe, and Other Essays In Popular Philosophy*. New York: Longmans, Green, and Co., 1897. 145-183.

---. *Pragmatism*. New York: Longmans, Green, and Co., 1907.

---. "Will." In *Principles of Psychology*. Vol. 2. New York: Dover, 1950. 486-592.

Kant, Immanuel. *Critique of Judgement*. Trans. J.H. Bernard. 1790. New York: Hafner Press, 1951.

---. Preface to *Universal Natural History and Theory of Heaven: An Exploration of the Constitution and the Mechanical Origin of the Entire Structure of the Universe Based on Newtonian Principles*. Trans. Ian C. Johnston. Nanaimo, BC: Malaspina University, 1998. Available at www.mala.bc.ca/~johnstoi/kant2e.htm#preface.

Keller, Evelyn Fox. *Century of the Gene*. Cambridge: Harvard University Press, 2000.

---. "The Force of the Pacemaker Conception Theories of Aggregation In Cellular Slime Mold." In *Reflections on Gender and Science*. New Haven: Yale UP, 1985. 150-151.

Laplace, Pierre-Simon. *Philosophical Essay on Probabilities*. Trans. Andrew Dale. 1825. New York: Springer-Verlag, 1995.

- Lenoir, Timothy. *The Strategy of Life: Teleology and Mechanics In Nineteenth Century German Biology*. Chicago: University of Chicago Press, 1989.
- Mayr, Ernst. "The Idea of Teleology." In *Journal of the History of Ideas* 53 (January/March 1992): 117-135.
- Menand, Louis. Part III of *The Metaphysical Club* (New York: Farrar, Straus and Giroux, 2001), 151-232.
- Monod, Jacques. *Chance and Necessity*. Trans. Austryn Wainhouse. 2d ed. (New York: Knopf, 1972).
- Nagel, Ernest. "Mechanistic Explanation and Organismic Biology" In *The Structure of Science: Problems In the Logic of Scientific Explanation*. New York: Harcourt, Brace & World, 1961. Subhead, "The Structure of Teleological Explanations." 401-428.
- Nissen, Lowell. *Teleological Language In the Life Sciences*. New York: Rowan & Littlefield, 1997.
- Peirce, Charles Sander. "Design and Chance." In *The Essential Peirce: Selected Philosophical Writings*. Eds. Nathan Houser and Christian Kloesel. Vol. 1. Indianapolis: Indiana University Press, 1992. 215-224.
- . "A Guess at the Riddle." In *The Essential Peirce: Selected Philosophical Writings*. Eds. Nathan Houser and Christian Kloesel. Vol. 1. Indianapolis: Indiana University Press, 1992. 245-279.
- . "One, Two, Three: Kantian Categories." In *The Essential Peirce: Selected Philosophical Writings*. Eds. Nathan Houser and Christian Kloesel. Vol. 1. Indianapolis: Indiana University Press, 1992. 242-244.
- . "The Order of Nature." In *The Essential Peirce: Selected Philosophical Writings*. Eds. Nathan Houser and Christian Kloesel. Vol. 1. Indianapolis: Indiana University Press, 1992. 170-185.
- Roqué, Alicia Juarrero Alicia Juarrero. "Self-organization: Kant's Concept of Teleology and Modern Chemistry." In *The Review of Metaphysics* 39 (September 1985): 107-135.
- Russell, E. S. *Form and Function: A Contribution to the History of Animal Morphology*. 1916, reprint: Chicago: University of Chicago Press, 1982.
- Turing, A. M. "The Chemical Basis of Morphogenesis" In *Collected Works of A. M. Turing*. Ed. P. T. Saunders. New York: Elsevier Science, 1992. 37-72.

Narrative Theory/Poetics/Literary Criticism

Amis, Martin. *The Moronic Inferno: and Other Visits to America*. New York: Penguin, 1986.

Victoria N. Alexander, "Polonius and Poland, a Coincidence?" In *English Language Notes* 36 (1999): 8-13.

---, "Louis Begley: Trying to Make Sense of It." In *Antioch Review* 55 (1997): 292-304.

---, "Martin Amis: Between the Influences of Bellow and Nabokov." In *Antioch Review* 52 (1994), 78-83.

Aristotle. *Poetics*. S. H. Butcher. Trans (New York: Hill and Wang, 1961.

Bahktin, Mikhail. "Forms of Time and Chronotope In the Novel." In *The Dialogic Imagination*. Austin: University of Texas Press, 1981. 84-258.

Barthes, Roland Barthes. "The Death of the Author." In *Image, Music, Text*. New York: Hill and Wang, 1968. 142-148.

Dimock, Wai Chee. "A Theory of Resonance." In *PMLA* 10 (1997): 1046-59.

Fletcher, Angus. Part II of *The Prophetic Moment: An Essay on Spenser*. Chicago: University of Chicago Press, 1971. 11-56.

Forster, E.M. "Prophecy." In *Aspects of the Novel*. 1927. New York: Harcourt Brace, 1955. 125-147.

James, Henry. "The Art of Fiction." In *The Critical Muse: Selected Literary Criticism*. Ed. Roger Gard. New York: Penguin, 1987. 186-206.

Kermode, Frank. *The Genesis of Secrecy: On the Interpretation of Narrative*. Cambridge: Harvard University Press, 1979.

---, *The Sense of an Ending: Studies In the Theory of Fiction*. New York: Oxford University Press, 1966.

Kugel, James L. "Early Interpretation: The Background of Later Forms of Biblical Exegesis." In *Early Biblical Interpretation*. Philadelphia: Westminster John Knox Press, 1986. 13-106.

LaCapra, Dominick. "Trauma, Absence, Loss." In *Writing History, Writing Trauma*. Baltimore: Johns Hopkins UP, 2001. 43-85

Miller, J. Hillis. *Ariadne's Thread: Stories Lines*. New Haven: Yale University Press, 1992.

Nabokov, Vladimir. "James Joyce: Ulysses." In *Lectures on Literature*. Ed. Fredson Bowers. Ithaca: Cornell University Press, 1982. 285-370.

Pease, Donald E. "Author." In *Critical Terms for Literary Study*. Eds. Frank Lentricchia and Thomas McLaughlin. Chicago: University of Chicago Press, 1990. 105-117.

Richardson, Joan. "Emerson's Sound Effects." In *Raritan* 16 (1997): 83-101.

Sheriff, John K. *The Fate of Meaning: Charles Peirce, Structuralism, and Literature*. Princeton: Princeton University Press, 1989.

Szegedy-Maszák, Mihály. "Nonteleological Narration." In *International Postmodernism Theory and Literary Practice*. Eds. Hans Bertens and Douwe Fokkema. Philadelphia: Benjamin, 1997. 273-282.

Tzvetan Todorov. *Genres In Discourse*. New York: Cambridge University Press, 1990.
---. *Introduction to Poetics*. Minneapolis: University of Minnesota Press, 1981.

Fiction/Literary Works

Amis, Martin. *Money: A Suicide Note*. New York: Penguin, 1984.

Auster, Paul. "The Locked Room." In *The New York Trilogy*. 1984. New York, Penguin, 1990. 233-371.

James, Henry. "The Middle Years." In *The Figure In the Carpet: and Other Stories*. Ed. Frank Kermode. New York: Penguin, 1986. 233-258.

---. "The Figure In the Carpet." In *The Figure In the Carpet: and Other Stories*. Ed. Frank Kermode. New York: Penguin, 1986. 355-400.

---. *The Portrait of a Lady*. 1908. New York: Houghton Mifflin, 1963.

---. *A Small Boy and Others*. New York: Charles Scribner's and Sons, 1913.

Kundera, Milan. *Immortality*. Trans Peter Kussi. New York: Grove, 1991.

Nabokov, Vladimir. "Ultima Thule." In *The Stories of Vladimir Nabokov*. Ed. Dimitri Nabokov. 1942. New York: Knopf, 1995. 496-518.

Pynchon, Thomas. *The Crying of Lot 49*. 1966. New York: HarperCollins, 1999.

Spenser, Edmund. *The Faerie Queene*. 1596. New York: Penguin, 1987.