



COGNITIVE SCIENCE, LITERATURE, AND THE ARTS

A GUIDE FOR HUMANISTS

PATRICK COLM HOGAN

Cognitive Science, Literature, and the Arts

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For my brother

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INTRODUCTION

The Dustheap of History

Why Cognitive Science Now?

In the early 1990s, a committee for the American Comparative Literature Association argued that comparatists had better move from their narrow literary areas into the larger field of culture study or they would be left on the “dustheap of history” (Bernheimer, et al., 5). Literary study has been around for a very long time, not only in the West, but throughout much of the world; the likelihood that literary study will ever be left on the dustheap of history seems slim. Nonetheless, it is clearly shortsighted for literary researchers and other humanists to ignore important trends in other fields that bear directly on the arts. One such trend is culture study. Many anthropologists, sociologists, and historians have moved toward culture study in the past twenty years. They have developed methods and isolated topics that enrich literary and artistic analyses. Literary critics and theorists have responded by developing the study of culture still further, producing work that not only applies culturalist insights, but helps to reshape the field itself.

Yet, if many social scientists have embraced culturalism in recent years, still more linguists, psychologists, neurobiologists, philosophers, even many anthropologists and sociologists, have moved toward cognitivism. It is customary to refer to the development of cognitive science as “the cognitive revolution” (see, for example, Fodor, 3). The expression is not mere rhetoric. Cognitivist methods, topics, and principles have come to dominate what are arguably the most intellectually exciting academic fields today. The astounding proliferation of programs in the field is testimony to the meteoric rise of cognitive science (see, for example, Dawson, 4–5).

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Mark Turner saw the trend more than a decade ago. In *Reading Minds*, he made the almost Foucaultian prediction that “The coming age will be known and remembered, I believe, as the age in which the human mind was discovered. I can think of no equal intellectual achievement” (vii). However, Turner does not draw Foucaultian conclusions from this. Rather, he calls for “a reframing of the study of English so that it comes to be seen as inseparable from the discovery of mind, participating and even leading the way in that discovery” (vii). The discovery to which Turner refers is, of course, cognitive science. Turner goes on to argue that cognitive science will ultimately “require the study” of literature as a crucial product and activity of the human mind. In the past three or four years, cognitive scientists have come increasingly to recognize the truth of Turner’s claim. Neurobiologists, cognitive anthropologists, evolutionary psychologists, and computer scientists have taken up literature and art, investigating their structures and purposes, in order to integrate them into an ongoing research program in cognition. Critics and theorists from the arts and humanities have increasingly turned to cognitive science as well. Some of this work goes back two decades. But it is only within the past three or four years that the cognitive study of literature and art has become widespread, passing beyond a limited circle of researchers to a wide range of readers and writers, across a wide range of disciplines. In a recent interview, Steven Pinker maintained that the “growing” list of “scholars and critics” drawing on cognitive science is part of a general trend. He concludes that “We may be seeing a coming together of the humanities and the science of human nature” (Brockman, 6).

The general convergence is important, to be sure. But to my mind, the crucial phrase in Turner’s call for literary cognitivism is the one that envisions literary study as “leading the way” in “the discovery of mind” (vii). Turner overstates the case here. I doubt that it is either possible or desirable for literary critics to be the dominant figures in an area that encompasses such a wide range of technical scientific fields, such as neuropharmacology. Norman Holland probably speaks for all of us when he explains that “I cannot write intelligently about cholecystokinin” (*The Brain* 13). The important point is that humanists should not think of themselves as simply applying cognitive science to literature, taking up what scientists have taught us in order to glean a few interpretive insights—or, worse still, to generate the next set of books and articles for tenure and promotion, based simply on the novelty of the approach. It is crucial for humanists and scientists to recognize that the arts should not be some marginal area to which cognitive discoveries are imported after they are made elsewhere. Arts are central to our lives. We think of our attention to arts as peripheral for isolable cognitive reasons. Specifically, we have a prototype for attention to the arts. That

prototype overstresses distinctive features. So, when we think of “attention to the arts,” we think of, say, a trip to the ballet or to an art museum. We don’t think of watching TV. But watching TV, reading novels, reading stories, going to movies, listening to pop music—these are all “attention to the arts.” For most of us, attention to the arts takes up far more of our free time than, say, sex or eating, which all cognitivists recognize as pretty central human activities. For many people, attention to the arts even takes up more time than personal interactions. Moreover, many of our personal interactions include features (e.g., story telling) that are closely related to the arts. In short, the arts are not marginal for understanding the human mind. They are not even one somewhat significant area. They are absolutely central. Put differently, if you have a theory of the human mind that does not explain the arts, you have a very poor theory of the human mind. Indeed, I would go so far as to say that literary study is likely to survive anything, though it will be impoverished (not to mention boring) if it ignores important intellectual developments. However, cognitive science cannot afford to ignore literature and the arts. If cognitive science fails to address this crucial part of our everyday lives, then cognitive science will be left on the dustheap of history.

In connection with this, I believe that Turner is correct that humanists must at least be among the leaders in the cognitive revolution. Literature and the arts pose specific problems for cognitive study; they raise specific issues; they present specific challenges. Humanists who have studied the arts intensively for a long period are in the best position to address these problems, issues, and challenges. A neurobiologist who turns briefly to literature as a side issue is unlikely to do it justice. Of course, humanists have the converse problem. They need to achieve familiarity with cognitive methods and principles. Some writers have proposed collaboration between humanists and scientists (e.g., coauthorship) as a solution to this problem. That is certainly one possibility. However, it is not always practicable. Moreover, even collaboration requires that both parties know quite a bit about both areas.

All this leads to my reasons for undertaking the present volume. The purpose of this book is to provide adequate background for readers to participate in and contribute to a research program in cognitive science and the arts, either individually or collaboratively. The book is aimed primarily at humanists in the sense that I do not give detailed explanations of basic literary history or film technique. I do, however, devote a chapter to introducing the basic principles of cognitive architecture. On the other hand, I believe cognitive scientists will benefit from the treatment of literature, film, music, and painting.¹ They may even find the discussion of cognitive architecture to contain one or two points of interest.

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In keeping with its main purpose, this book is not intended as an overview of all the work in the field. Rather, it is a selection of topics and principles designed to allow a reader to take up, understand, develop, and critique other work in cognition, literature, and the arts, and to pursue such work on his or her own. Cognitive science is a vast field. Cognitive theorists might refer to engineering principles, recent debates in the philosophy of language, or research in pharmacology. But most of this is simply not currently relevant for research in the arts. Thus I have sought to define the basic concepts, outline the basic methods, and explore some exemplary instances of cognitive work as these bear on the study of the arts. In connection with this, I also do not try to survey all individual books and essays on cognition and the arts. Instead, I concentrate on one or two theorists or one or two approaches in each chapter. Again, my aim is to introduce the basic ideas of cognitive science and to discuss some of the most important research and theorization in cognition and the arts. It would make no sense to try to cover everything, just as it would make no sense for a guide to psychoanalysis and the arts to try to cover every book and article in the field, even every important book and article.

On the other hand, there is one significant difference between a psychoanalytic guide of this sort and a cognitive guide. The psychoanalytic study of the arts extends back over a century and has been a topic of deep interest to psychoanalysts since Freud himself. Research in cognition and the arts has developed more recently and, for the most part, less systematically. In consequence, some potentially important areas remain largely unexplored. For this reason, the following pages not only present a critical analysis of significant and influential research that has been done in the field. They also explore in a preliminary way some problems and issues that have received too little attention. In other words, the following chapters not only look to past research and theorization. They also point to future possibilities.

The organization of the book is fairly straightforward. The first chapter gives a taste of a cognitive scientific analysis, an illustration of the way a cognitive approach to art may work itself out in a particular case. Specifically, this chapter treats the way a listener cognitively processes music. The discussion is framed by a traditional quandary in aesthetics: Why are we engaged by certain pieces of music while being bored or irritated by others? The second chapter moves from the particular to the general, presenting an overview of cognitive theory. It begins with a broad discussion of what defines the field methodologically and turns from there to summaries of the two major "schools" of cognitivism—representational and connectionist. This chapter examines a range of essential, technical concepts from schemas, prototypes, and working memory (in representationalism) to connection strengths and activation thresholds (in connectionism). The next four chapters are

organized around a simple division among author or creator (one chapter), text (two chapters), and reader or viewer (one chapter). In each case, I take up some specific issue that has been important in cognitive study. The third chapter (on the author) examines cognitive research on creativity, isolating some principles of basic creativity (which characterizes most remembered works in any given tradition) and some principles of “radical” creativity (which is associated with works that change the direction of a tradition). This chapter particularly emphasizes the work of Howard Gardner, on the one hand, and the “creative cognition” theorists, on the other. The following chapter examines metaphor, probably the most widely discussed literary topic in cognitive science. It concentrates on the influential theory of conceptual metaphor put forth by George Lakoff and Mark Turner, but also considers alternative views, primarily that of Andrew Ortony and Amos Tversky. The chapter concludes with a discussion of Mark Turner’s more recent theory of “conceptual blending,” integrating Turner’s account with standard principles of representationalism. Chapter 5 takes up some of David Bordwell’s ideas to consider the ways in which the viewer cognitively reconstructs the story from the “discourse” or presentation of that story in film. The second part of this chapter turns to the topic of literary universals, treating my own work on universal story structures. Chapter 6, drawing primarily on Keith Oatley’s writings, focuses on emotive response to literature as a specifically cognitive phenomenon. It addresses two sources of emotive response—first, the work’s narrative structure; second, the reader’s individual memories. Chapter 7 reconsiders literary emotion through recent work in neurobiology—a crucial component of cognitive science today. This chapter sets out to reply to another traditional quandary of aesthetics: Why are we moved by the experiences of characters whom we know to be fictional? In the concluding chapter, I turn to evolutionary psychology, the most common system used to explain the development of cognitive and neurocognitive structures and processes. On the one hand, evolutionary study is clearly crucial for understanding human cognition. On the other hand, the field has been marred by methodological laxity. This chapter considers some problems with evolutionary psychology today and suggests some possibilities for its future development.

When appropriate, chapters include an illustrative application of the theory to a particular work. Chapter 1 (music) and chapter 3 (creativity) treat John Coltrane’s “My Favorite Things.” Chapters 3 (creativity) and 6 (emotional response) consider Pablo Picasso’s *Les Femmes d’Alger (O. J. R. Version O)*. Chapters 2 (connectionism), 4 (conceptual blending), and 5 (story structure), and 7 (emotion and the brain) examine aspects of Shakespeare’s *King Lear*. Chapters 4 (metaphor) and 5 (story structure) take up Percy Shelley’s “Triumph of Life.” Chapters 5 (narrative reconstruction) and 6 (emotional

response) consider James Cameron's *Titanic*. There are also briefer references to other works (by John Ford, Anita Desai, Arnold Schoenberg, James Joyce, and others). I have chosen different media, with different modes of composition and production, and different levels of popular reception, in order to give the analyses greater breadth of cultural application.²

Predicting the future is not something that anyone does well. I have no special talent in the area. However, all the signs seem to be that cognitive science will become increasingly important over the next few years—across the biological sciences, the social sciences, and the humanities. Like anything else, this could be done well or it could be done badly. Humanists can contribute to the positive development of cognitive science in at least three ways. Most obviously, they can apply and extend cognitive theories in the arts. Second, they can use the arts to challenge cognitive theories and ideas. Again, literary study and related forms of scholarship and analysis can not only benefit from cognitive study. They can contribute to, and even radically alter, research programs in cognitive science. Literature and the arts raise issues about cognition that are not raised in the experimental research. They pose potential problems. They suggest counterexamples. Ultimately, they allow the possibility of more encompassing, more illuminating, and more valid theories of the human mind. Finally, humanists can engage in the sort of political analysis and criticism that is necessary for any discipline. There is nothing uniquely humanistic about this. Political analysis and criticism are part of being human, not of being a humanist. But, historically, humanists have had a particular interest in the political implications and consequences of theories. I have not always agreed with common views on these issues in the humanities. However, awareness of political issues and engagement with those issues has been deeply important in literary study over the past several decades. Given the clear social consequences of many topics treated by cognitive science—especially in the area of evolutionary psychology—such awareness and engagement should be deeply important in this field as well.

CHAPTER 1

“My Favorite Things”

Thinking Jazz

What happens when we listen to music? It is clearly not just a matter of experiencing sequences of sound, for we count some sequences as music and other sequences as noise. This, then, leads us to an apparently prior question: What happens when we distinguish music from noise? In fact, the two questions are inseparable, and they are largely cognitive questions. In the past, a number of theorists have proposed answers to both questions, and to related questions in other arts. Though no response has proven definitive, perhaps the most suggestive and promising responses have come from theorists who were precursors of cognitivism. The best example of this sort is that paragon of modern epistemology, Immanuel Kant. Kant, arguably the greatest philosopher of the modern period, set out an account of the human mind that anticipates cognitivism in many particulars. As Cynthia Freeland put it, he is one of the major “antecedents of the current enterprise of cognitive science” (65; see also Holland *The Brain* 10). His influential treatment of aesthetics clearly includes many important insights and many points of direct relevance for cognitive research in the field. Yet his development of those insights is often obscure. That obscurity may, to some extent, be dissipated by recent cognitive developments.

Specifically, it has been a commonplace since Kant that a feeling of aesthetic pleasure results when we can form the chaos of sensation into some unity—but only when that forming is not habitual. Music is a standard instance. As to unification, W. Jay Dowling (a prominent cognitive theorist of music) actually defines “listening to music” as “perceiving pattern

invariants in musical events” (126). To hear a melody, then, is to hear a structure. Of course, this is only in part a matter of the sounds themselves. A melody may be so complex that we do not recognize or “hear” it. The “melody,” in this case, strikes us as a random sequence of sounds, thus as noise. At the same time, perceiving patterns does not guarantee a positive aesthetic judgment. After all, merely hearing a melody does not mean that we enjoy it. Some patterns are just too simple. Though most of us have some intuitive sense of the relation between aesthetic experience and nonhabitual pattern-recognition, it has been very difficult to develop the point further. Indeed, even pattern-recognition alone has not been easy to explain. Kant maintained that the mental faculty of imagination synthesizes the set of incoming sensations before they are subsumed under categories of understanding. But it is difficult to say just what this synthesis involves, and just what it means for something to be conformable to the understanding.

Bring the Noise

Intuitively, we might further specify the Kantian idea by distinguishing two aspects of our experience of sound:

1. The intrinsic quality of the sound. Any note on a tuned piano strikes us as musical. A pot dropping to the floor, or a note on an untuned piano, strikes us as unmusical. Our experience and judgment in these cases seem to be based largely on the physics of sound (i.e., the physics of sound as it bears on human ears and brains; for an informative treatment of this topic, see chapter 2 and 100–105 of Jourdain).
2. The structural organization or patterning of different sounds. This aspect is more obviously psychological—and, indeed, cognitive.

In connection with these two aspects of our experience, there are three broad types of displeasure that we experience in relation to sounds that we listen to as music (in contrast with sounds that just happen in the background, that we listen to for information, etc.). The first, of course, concerns intrinsic quality of the sound. We simply find some sounds displeasing. On the other hand, displeasing sounds may have isolable internal structures and they may occur in structured sequences. As such, we may incorporate them in contexts where the displeasure contributes to pleasing effects. In these cases, we refer to the noise as “dissonance.” Indeed, in these cases we do not feel that it is noise at all. We hear it as part of a larger, organized whole.

This leads us to the second sort of displeasure. It occurs when we are unable to recognize structural organization. We know that what we are hearing is not random sound—that is why we listen to it. (Random series of sounds

occur in ordinary life all the time and we are unperturbed by them, except when they are both obtrusive and intrinsically unpleasurable.) But we hear it as random, thus as noise. This leads to frustration, sometimes even anger—as in those famous incidents when disgruntled patrons marched out of the concert hall cursing Beethoven, Stravinsky, John Cage, or whatever new and innovative composer they have just heard premier an experimental work. On the other hand, sometimes this frustration may lead, not to anger, but to boredom. Sometimes after a short period of annoyance, the frustration dissipates and all the classic features of boredom appear—wandering attention, fidgeting, drowsiness, and so on.

The final type of dissatisfaction is the reverse of this. We have just been discussing music that is too hard. We also experience displeasure when listening to music that is too easy. Here the problem is evidently that there is no challenge whatsoever in synthesizing the relevant unity. Needless to say, judgments of both excessive difficulty and excessive simplicity vary from person to person, and for different ages. Some people take great joy in "Raindrops Keep Falling on My Head," while others find it insufferable. The same point could be made about, say, Arnold Schoenberg's *Second Quartet*, if for the opposite reason. Children seem able to listen endlessly to "I Love You; You Love Me," sung by Barney the Dinosaur, while adults are frequently intolerant of its repetition. In the case of excessively simple music, the sequence of response seems to be almost the exact opposite of that in the case of excessively difficult music. Specifically, we begin with boredom, then become frustrated and even angry. (A few years ago, when the "I Love You" song was at the height of its popularity, a number of adult comedy shows had skits involving violence against Barney the Dinosaur, explicitly as comic punishment for his singing.)

Again, Kant and others give us some basic sense of what is going on here. When we find music too hard, we are unable to isolate patterns. When we find it too easy, that isolation has become habitual. But why is either of these a problem, and why do these problems give rise to the specific patterns just described? Cognitive science gives us a way of beginning to explain these phenomena in much greater detail.

To consider these issues, we need first to note a basic fact about our cognitive make-up. Perceptual novelty produces stimulation and draws attentional focus. Our brains become more active when faced with novel stimuli. Specifically, brain arousal is a function of the transmission of electrochemical impulses among brain cells. This transmission involves *axons*, or fibers extending out from the cells, and chemical *neurotransmitters*. As LeDoux explains, "In the presence of novel or otherwise significant stimuli the axon terminals release neurotransmitters and 'arouse' cortical cells, making them especially receptive to incoming signals" (Emotional 289).

With a low degree of stimulation, our attention wanders; we are dreamy and unfocused. Sleep is, for the most part, a period of low arousal in the *cortex* or outer layer of the brain. Our sense of boredom is, first of all, a matter of low cortical stimulation in a situation where dozing off is inappropriate and where attentional focus is important. Thus we become bored when listening to someone go on and on with the same sort of information. Jones is always complaining. Smith is always obsessing. Yah-dah, yah-dah, yah-dah. The displeasure here is not the result of low cortical stimulation alone. Rather, it is the result of conflict between the level of cortical stimulation and the need for attentional focus. The sameness of the person's speech leads to low cortical stimulation. But the context demands that we pay attention to the details of that speech. Boredom is what follows. If we experience low cortical stimulation when we lie down to sleep, that does not produce boredom because the necessity for attentional focus and engagement is absent. The situation is the same with boring music as with boring speech. The Barney song or "Raindrops Keep Falling On My Head" strikes us as the same thing over and over. The sameness leads to low cortical stimulation. If we can just doze off, that is not a problem. However, if that is not an option, the low cortical stimulation and the necessity of attentional focus, engagement, and so on, lead to boredom.

The precise opposite is the case with difficult music. Someone who cannot listen to Schoenberg—someone who cannot synthesize the stream of incoming sound—will experience continual cortical arousal because he/she will experience continual novelty. Initially, cortical stimulation is a positive experience. But, as in so much else, excessive cortical stimulation really is too much of a good thing. One cup of coffee wakes you up and gets you thinking. A dozen cups give you the jitters and makes it impossible for you to concentrate. As Anderson points out, "optimal" arousal is not at all the same thing as "maximal" arousal (117). Michael Ellis notes that something experienced as "absolutely novel" leads to "aversively high arousal" (qtd. in Anderson 118). That is not all. Excessive arousal is linked with a particular sort of cognitive frustration as well. Our inability to synthesize the incoming sequence of sounds makes us feel "lost." We cannot "follow along." This is referred to as *cognitive disorientation*. All cognitive processes are goal-oriented. We set out to understand situations and events and respond to them in relation to aims. We think through the situations and events in a series of steps, keeping track of where we have been and where we wish to end up. Cognitive disorientation occurs when we find ourselves unable to pursue any consistent cognitive process that leads from past and ongoing experiences to future goals. Any time we find ourselves interrupted or blocked in this process, we become frustrated. In keeping with this, a continually novel experience is a continually frustrating experience. What

makes the experience continually novel is that we cannot connect preceding experiences with current experiences and with consistent future goals. For example, in continually novel music, we cannot develop expectations about where the melody will lead and how it will resolve. Anger is the result of prolonged or intense frustration of this sort.

This gives us a plausible explanation for boredom with Barney and anger at Arnold Schoenberg. But how do we explain the second stage of each response, the shift from boredom to frustration/anger in one case and from frustration/anger to boredom in the other? It is actually very easy to explain boredom with difficult music. As the novelty continues, it becomes hard to focus one's attention. As our attention becomes distracted, we find it increasingly difficult to concentrate on the novel sounds. That conflict between spontaneous attention and required attention (e.g., in a concert hall) is a central feature of boredom. But why does our attentional focus drift? It does so because, as the music continues, our experience of the novel sounds and sequences is increasingly an experience, not of novelty, but of sameness.

Here, we need to introduce one aspect of cognitive synthesis, a process called *encoding*. We encode any incoming stream of sensations when we provide those sensations with structure. We do not experience the world as it is in itself. We experience a structured version of the world. Certain details, certain properties, certain relations enter our minds while others do not. Technically, some details and the like are encoded, while others are not. When we say that we cannot follow a complex piece of music, we are not saying that we do not encode it at all. We do not encode the sound of a dog whistle—but that means we just don't hear it, not that we find it excessively complex. Rather, when we find a piece of music overly difficult, we find our encoding inadequate. It doesn't give us enough information to work with. The music is “cognitively opaque,” as Lerdahl puts it (231).

Lerdahl distinguishes between two sorts of “musical grammar,” the *compositional grammar* and the *listening grammar*. The former is the set of rules that the composer follows consciously or unconsciously in producing the piece—the principles through which he/she patterns the work. The latter is the set of rules that the listener follows (most often unconsciously) in hearing the piece. In many works there is a “gap” between the two (234). In part, this is a matter of encoding. Sometimes our encoding of the music is too crude for us even to approximate the compositional grammar. As a result, we cannot experience the sequence of sound events as a structured piece of music.

Consider, for example, the avant-garde jazz musician, Cecil Taylor. Though I enjoy his ensemble work, I find his solo piano performances very difficult to listen to. Taylor is known for technically virtuoso performances in which his fingers fly up and down the keyboard at a tremendous rate.