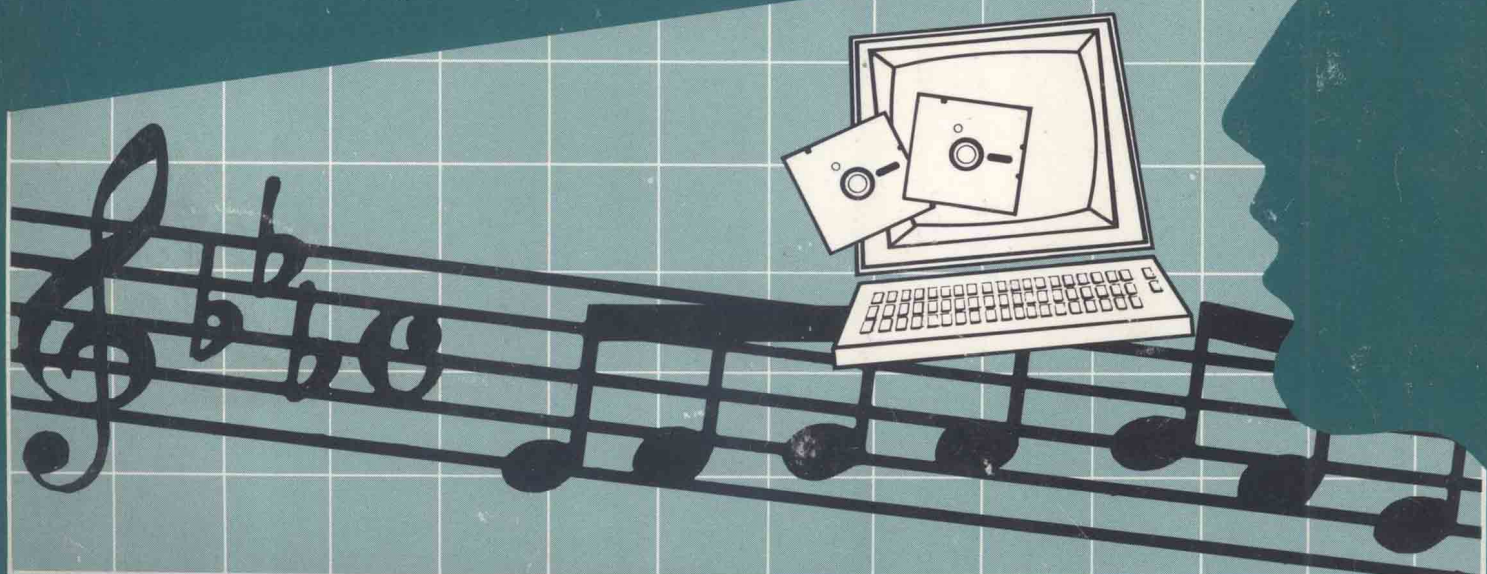


INTRODUCTORY READINGS
FOR

COGNITIVE PSYCHOLOGY

$12 \times 5 = 60$



RICHARD P. HONECK • TAMMY J. S. CASE • MICHAEL J. FIRMENT

INTRODUCTORY READINGS
FOR

COGNITIVE PSYCHOLOGY

Edited, Selected, and with Introductions by

Richard P. Honeck
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The Dushkin Publishing Group, Inc.

*For: Sharon (R.P.H.)
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Preface

This book is specifically designed for the student who is taking a first course in cognitive psychology, and *Introductory Readings for Cognitive Psychology* can be used in conjunction with a textbook or on its own. Students in more advanced courses in cognitive psychology and related disciplines may also find this collection useful.

Our motivation for developing this collection of readings grew out of our sense of frustration with textbooks in cognitive psychology. A few are well written, but many texts leave a great deal to be desired because the excitement and in-depth analysis that are present in original materials generally get filtered out of standard textbooks. Students can find it difficult to relate to texts that treat abstract topics in a colorless fashion. Moreover, texts rarely give students any idea of the methodological and theoretical struggles of researchers in this area. These readings capture the excitement and flow of cognitive psychology, and it is our view that students will benefit from being directly exposed to the pursuits and passions of cognitive psychologists, the questions they grapple with, and the inner workings of their research.

In selecting articles for *Introductory Readings for Cognitive Psychology*, we attempted to keep students' concerns uppermost in our minds. One precondition for an article's inclusion was that it had to be written by an expert. Once that was established, we then used the following questions to guide our work:

- Is the article appropriate to the knowledge level of students taking a first course in cognitive psychology?
- Is it well written, interesting, not too long, not a rehash of material inevitably covered in depth in textbooks?
- Is it informative about methodological problems?

We also wanted the readings to cover a variety of topics, including a fair number on practical applications. Finally, except for the paper by A. M. Turing and the one by Paul Rozin, Susan Poritsky, and Raina Sotsky, we purposely avoided "classic" readings, both because they tend to be written for a professional audience only and because they are treated in the textbooks. Of necessity, some topics were left out, but given the vast number of topics from which we could choose, that was inevitable.

The arrangement of the selections in *Introductory Readings for Cognitive Psychology* follows a sequence typical of textbooks in cogni-

tive psychology—foundations, memory, thought, language, and applications. Each part opens with an introduction that reviews why cognitive psychologists study the area addressed by the articles and previews each of the articles in the section. There is also an introduction to the volume, which addresses the question, What is cognitive psychology? (See pages xiv–xvii.)

Supplement An *Instructor's Manual with Test Questions* is available from the publisher. It contains article synopses, suggestions for generating in-class discussions of the articles, and multiple-choice and essay questions.

Acknowledgements There are several people who have helped us put this collection together. Dan Berch, William Dember, and Joel Warm at the University of Cincinnati made interesting and useful suggestions. Virginia A. Diehl of Western Illinois University and David E. Irwin of Michigan State University were generous with their advice. Mimi Egan, program manager for The Dushkin Publishing Group, was, from beginning to end, efficient and encouraging in her handling of the project. And Shirley Doxsey typed a reference section for one of the articles. To all of these people, our hearty thanks. To our families, who waited out a rather long-term project and a lot of complaining, we extend our thanks for their patience and understanding.

Finally, it is our hope that *Introductory Readings for Cognitive Psychology* will stimulate students' interests, help them to see the relevance of the study of cognition to their everyday lives, and encourage them to explore further the general area.

R. P. H.
T. J. S. C.
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What Is Cognitive Psychology?

Cognitive psychology is generally acknowledged to be a part of cognitive science, which is an interdisciplinary enterprise that focuses on phenomena, issues, and theories concerned with the acquisition and use of knowledge. Cognitive science therefore includes some aspects of computer science, philosophy, linguistics, anthropology, sociology, and, of course, psychology.

But what *is* cognitive psychology? It is the study of perception, learning, memory, reasoning, problem solving, decision-making, and the like. This definition of cognitive psychology is certainly serviceable enough; however, it does gloss over questions about whether a particular set of assumptions, methods, and theories—a paradigm—characterizes the field. It is probably fair to say that, at this point in time, no such paradigm exists. Cognitive psychology can be thought of more as an undulating mass rather than as a fixed target. Nevertheless, cognitive psychologists typically ask certain kinds of questions, such as the following general ones:

- What happens to an environmental stimulus when it is first received by the senses?
- Does knowledge affect perception of a stimulus?
- What is memory? Are there different memory systems?
- What form does memory/knowledge take?
- What facilitates or hinders remembering?
- How is language understood?
- How do people reason?
- How do people recognize patterns and categorize things?
- What factors influence problem solving?
- Are cognition and emotion separable systems?
- What happens when people read?
- Are people aware of what their minds do?

Even though there are no overarching, all-encompassing theories in cognitive psychology, there are many specific theories about a restricted range of phenomena—for example, short-term memory, categorization, syllogistic reasoning, and the like. There are “mini-theories” about particular phenomena—for example, there are theories about the “belief bias effect,” which explain how people’s judgments about the validity of a logical argument are influenced by their beliefs about the content of the argument. There are also mini-theories to explain why recall is generally different than recognition, how people discover analogies between things, why people tend to overlook misspelling of the word *the*, why pictures tend to be remembered better than words, how mental

images are constructed, what makes for an expert in physics, what young infants tend to notice, and so on. If anything, this set of mini-theories, the phenomena they address, the methods used to study the phenomena, and the assumptions brought to bear, is what characterizes the field.

STILL, THE MINI-THEORY PHENOMENON IS UNSETTLING. One would hope for a more coherent, organized picture of the field. To some extent this organization is provided by a particular point of view, the so-called *information processing view*. This is the predominant view among cognitive psychologists and the one that is almost exclusively represented in *Introductory Readings for Cognitive Psychology*. The central assumption of this view is that people recode information received from their environment; that is, the senses take in stimuli and change them in various ways. A simple example is that the letter *A* is processed not simply as a physical mark on a page but as having a certain sound associated with it, as the first letter of the alphabet, as the kind of grade someone might want to receive on a test, as a best friend's middle initial, and so on. In other words, recoding involves changing the stimulus, often with the result that the physical stimulus is imbued with some sort of symbolic significance. The information "in" the stimulus is not "in" the recoded form but is simply an initiating event. In this sense, the information processing view forces the conclusion that the mind is different from the environment, shaped and constrained by it, but not a pale reflection of it. Needless to say, this view comports with, indeed, is aided and abetted by, the computer revolution. Just as is the case with computers, humans are seen as systematically taking in, operating on, and outputting information by means of complex structures (e.g., long-term memory; short-term memory) and processes (e.g., putting auditory events into a phonetic form, holding the form for a short time, and then matching it with information in long-term memory). The mind is seen as a fancy symbol-manipulating device and, as such, can be imitated (simulated) by a computer program. The ultimate form of this argument is that there is nothing special about the human mind—its

activity is, in principle, capable of being made explicit, and therefore its activity can be simulated.

WHILE THE INFORMATION PROCESSING VIEW CURRENTLY prevails in cognitive psychology, it is not the only view. There are at least two other, less widely held positions. The first, the *ecological view*, contrasts sharply with the information processing view. The ecological view, which is built on the writings of psychologist James J. Gibson, holds that much of perception, and therefore much of cognition, occurs in a "direct" way. That is, perception is caused by information in the stimulus. Of course, perceptual systems have been "tuned" by millions of years of evolution to "pick up" certain information in the stimulus. The important implication is that perception is not due to "mediating" factors—expectations, schemas, motives, mind sets, and the like. To use current jargon, there are no "top-down" components to perception in the ecological view. The organism's knowledge does not somehow meet the stimulus halfway and jointly produce a perception. The stimulus dictates the perception. Thus, perception is "bottom-up." This axiom obviously contradicts the central axiom of the information processing view, the recoding axiom. For the ecological psychologist, the environment is mirrored in the mind; indeed, the mind is simply part of the environment. And things that go on in the mind are perception-like. Some psychologists who take this view maintain that memory is "in the stimulus." Organisms learn, but learning is generally seen as an "education of attention," such that successively finer discriminations of stimulus features are made. The ecological view is a radical view, one that most cognitivists either reject or feel uncomfortable with. Nevertheless, research within this framework has generated a host of findings about perception, and its advocates are a viable and vocal part of the community of cognitive psychologists.

ANOTHER MINORITY, BUT FAST-GROWING, POSITION is represented by connectionism, also sometimes called the *parallel distributed processing view*. Connectionism is essentially a modern,

formally sophisticated form of associationism. As such, it is quite complicated, and here we will only provide a simple overview. A basic assumption of this view is that behavior is a product of the strength of connections between input and output elements. Such connections constitute the knowledge that an individual has. Connectionism acknowledges that even simple behaviors are due to simultaneous (parallel) processing in a number of elements or units. From a neurophysiological perspective, such massive parallel processing is a virtual certainty. Thousands or millions of neurons may be responsible for a seemingly simple act. Like the information processing view, connectionism allows for recoding of the stimulus, but, unlike that view, it is less likely to describe outputs as being due to a series of information processing stages in which formal rules are applied to inputs. Connectionists see behavior as exhibiting regularities, but these are explained in terms of the correlations between huge numbers of elements. Thus, behavior is some probabilistic function of inputs that have been transformed by “hidden units,” whose outputs are combined to yield a final, total output. Much, if not all, of this activity is seen as occurring outside the awareness of the individual. People are aware of symbols, which are brought about by “subsymbolic” connections.

Thus, connectionism is similar to the information processing view in that it assumes that inputs are successively recoded. But, unlike the information processing view, it attempts to specify the (presumably) more continuous, correlational nature of the relationship between inputs and their recoded forms, and it pays more respect to the environment than does the information processing view. Connectionists have begun to do some exciting work on various topics, including speech recognition, speech recognition of text, and text recognition.

THE INFORMATION PROCESSING VIEW IS THE MAINSTREAM view—its adherents have defined the problems and phenomena to be studied, and they have generated the bulk of the models and theories. Therefore, the articles presented in *Introductory Readings for Cognitive Psychology* are largely consistent with this view.

The articles are divided into five sections: foundations, memory, thought, language, and applications. The foundations section attempts to provide a sense of how cognitive psychology came about as well as a taste of the assumptions and research that have flowed from the computer metaphor that underlies much of the information processing view. We have chosen to emphasize the computer because the impact of the computer is immense in cognitive psychology. Few students realize this until they enter a course on the topic. We therefore felt that it was necessary to deal with this reality from the start. Students, though, may be more familiar with the behavioral views of B. F. Skinner, so we have also included a paper by him that compares and contrasts his views with those that are typical in cognitive science today.

The section on memory provides a wide-ranging set of articles on our mental lifeblood—our memory system. The section starts with a basic question about the neuroanatomical basis of memory, in particular its representation on one side of the brain or the other. Other articles document the role of long-term memory in improving short-term memory skills, in the generation of images, in facilitating the perceptual process, in comprehending text that describes spatial layouts in the environment, and in affecting the emotionality of minimally processed stimuli. The final article in the memory section addresses the question of whether information in long-term memory is permanent or subject to blending and distortion.

The section on thought considers a number of different topics. The theme of the section concerns how people develop a deep understanding of the world. People are not at the mercy of the physical features of their environment. Indeed, people develop concepts, categories, hypotheses, views, theories, and world views that enable them not only to survive, but also to function effectively in a complex physical and social world. Of course, different people develop different levels and degrees of understanding of things, and several articles concern expertise and the extent of its generalizability. If, for example, you are good at chess, will you also be good at reasoning about social issues? How can your skill at chess be

characterized, and are these skills usable in other areas?

Language, the topic of the next section, is intimately tied to cognition. In fact, there is probably no such thing as language without cognition. And while the converse is not true, there is no question that language has a powerful impact on our private mental and social lives. Moreover, all the great theoretical issues are played out on the stage of language. Questions about innateness, the separateness or modularity of a psychological system, the purposefulness of behavior, reasoning abilities, and so on, have all appealed to language as the primary arbiter. Because of its practical and theoretical salience, then, we have included a section on language, a section that focuses on the innateness, species uniqueness, and influence of language on reasoning and thought in general.

The final section on applications reflects the current emphasis on this topic. Psychologists have "taken to the streets" for several reasons—everyday behavior and thought is a rich source of hypotheses; it is a testing ground for more laboratory-based ideas; it is interesting and deserving of study in its own right; and it satisfies a demand for "relevance" that comes from many segments of society, including cognitive scientists. It is probably fair to say that no aspect of our lives goes untouched by our cognition, whether it is reading, dreaming, bird watching, listening to music, playing tennis, sex, or our emotions. A psychology that has nothing to say about such things is empty. Thus, we have a rather long section on applications. However, the reader will find that many of the articles in this section show a nice balance and interaction between practical interest and theoretical relevance.

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<p>■ 2. A. M. Turing, from "Computing Machinery and Intelligence," <i>Mind</i> (October 1950)</p> <p>In this classic article, Turing defines the mechanistic view of the mind, which now predominates in cognitive science and psychology, and he addresses the question, "Can machines think?"</p>	15
<p>■ 3. M. Mitchell Waldrop, from "Machinations of Thought," <i>Science</i> 85 (March 1985)</p> <p>Waldrop provides a wide-ranging introduction to artificial intelligence (AI) and explores its implications for cognitive science. He discusses issues such as the unconscious nature of knowledge, self-awareness, and the thinking capacity of machines.</p>	25
<p>■ 4. B. F. Skinner, from "Cognitive Science and Behaviourism," <i>British Journal of Psychology</i> (1985)</p> <p>Skinner describes his opposition to present-day cognitive science and challenges the cognitivists' mentalistic explanations of behavior. He maintains that the central fault of cognitive scientists is their assumption that individuals act upon the environment and not the reverse.</p>	33

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- 5. **Sally P. Springer and Georg Deutsch**, from *Left Brain/Right Brain* (W. H. Freeman, 1989) 50

Springer and Deutsch describe the results of tests conducted on split-brain patients, and the experiences they relate tie into a discussion on issues of hemispheric asymmetries.

- 6. **Andrew W. Young and Edward H. F. De Haan**, from "Neuropsychological Impairments of Face Recognition," *Proceedings of the Second International Conference on Practical Aspects of Memory* (Wiley, 1987) 61

Young and De Haan discuss problems in face recognition caused by neurological impairment. Their study of dissociative mechanisms—the ability to read and identify everyday objects with a simultaneous inability to recognize faces—leads to a distinction between the operation of face recognition mechanisms and consciousness of recognition.

- 7. **Hans Wallach and Virginia Slaughter**, from "The Role of Memory in Perceiving Subjective Contours," *Perception & Psychophysics* (1988) 66

Wallach and Slaughter discuss the visualization of subjective contours, or contours that are not physically in a stimulus but are nevertheless perceived within containing patterns, and the influence memory has on a subject's ability to do so. The authors report two experiments that demonstrate how pre-exposure to the fitting shape helps to induce the subjective contour phenomenon, which suggests that knowledge helps to shape perception.

- 8. **K. Anders Ericsson, William G. Chase, and Steve Faloan**, "Acquisition of a Memory Skill," *Science* (June 6, 1980) 75

Ericsson et al. introduce "chunking" as an organizational strategy that can allow an individual to overcome usual short-term memory limitations. Reporting on one case subject, they demonstrate how an otherwise average individual, with practice and an appropriate mnemonic system, dramatically increased his memory performance.

- 9. **Roger N. Shepard**, from "The Mental Image," *American Psychologist* (February 1978) 79

Shepard discusses questions about how important mental imagery is to scientific creativity and literature, whether the processes responsible for imagery are similar to those responsible for perception, and how imagery should be studied. He presents mental rotation data as well as empirical results to demonstrate that real and imagined stimuli produce similar performance.

- 10. **Gordon H. Bower and Daniel G. Morrow**, from "Mental Models in Narrative Comprehension," *Science* (January 5, 1990) 95

Bower and Morrow examine how readers understand narrative stories by using a "mental models" construct. By examining narrative components, major and minor characters, memory access, and intermediate locations, Bower and Morrow sketch the process readers go through to understand narratives, then generalize their theory to include real-life situations.

- 11. **William Raft Kunst-Wilson and R. B. Zajonc**, from "Affective Discrimination of Stimuli That Cannot Be Recognized," *Science* (February 1, 1980) 104
 Kunst-Wilson and Zajonc, using empirical research in the area of unconscious detection, demonstrate that subjects can develop strong preferences for stimuli that have become familiar through repeated exposures and, further, that preferences can occur without conscious identification of the stimuli. While the problem of nonreplicability is a disadvantage, the study provides a new interpretation of the term "affective."
- 12. **Elizabeth F. Loftus and Geoffrey R. Loftus**, from "On the Permanence of Stored Information in the Human Brain," *American Psychologist* (May 1980) 108
 Loftus and Loftus criticize the popular belief that all memories are permanent and thus potentially recoverable. Analyzing memory retrieval data from experiments and from work involving hypnosis, psychoanalysis, and electrical stimulation of the brain, they conclude that stored information may be permanently destroyed or even distorted through the incorporation of misleading information.

Part • Three

THOUGHT: CATEGORIZATION, EXPERTISE, AND REASONING 123

Introduction 124

- 13. **Susan A. Gelman**, from "Children's Expectations Concerning Natural Kind Categories," *Human Development* (1988) 127
 Gelman challenges the view that the categories that children use to classify things are based on simple perceptual attributes. She presents research that demonstrates that children expect objects in the same category to be intrinsically—not just perceptually—similar. She also dismisses the assumption that children cannot form mature categorical concepts, and affirms that, by allowing and encouraging children to extend their knowledge beyond the obvious, categories serve as a mechanism for information acquisition.
- 14. **Mary Kister Kaiser, John Jonides, and Joanne Alexander**, from "Intuitive Reasoning About Abstract and Familiar Physics Problems," *Memory & Cognition* (1986) 133
 Based on their studies, Kaiser, Jonides, and Alexander believe that people draw from specific experiences rather than formal principles when reasoning about everyday life. Their paper treats the question of people's intuitive understanding of the physical world, specifically, properties of motion.
- 15. **Richard P. Honeck, Michael Firment, and Tammy J. S. Case**, from "Expertise and Categorization," *Bulletin of the Psychonomic Society* (1987) 141
 Honeck et al. lay out several ways in which experts' categorization differs from that of novices. They compare several current psychological views of categorization in terms of their ability to address these differences in order to determine which, if any, of these views adequately explains expert categorization.