# Preface

**Cognitive psychology** is the study of the typical, adult human brain and how it interprets sensations, sorts out important inputs from background noise, brings its vast store of knowledge into play to interpret its surroundings, and decides what to do next. Many types of human activity have been studied by cognitive psychologists around the world for over 100 years; yet we are confronted by the fact that the human brain is the single most complicated organ in the known universe, and we cannot hope to understand all of what it can do, even in simple situations. Cognitive psychology has evolved to give us the theoretical and empirical tools necessary to construct models of what the brain does to handle the incredible complexity of its tasks—such as recognizing objects; navigating in a dynamic, three-dimensional world; communicating across space and time; and applying the power of human reason to solving problems that threaten our lives and our planet. The world is growing increasingly complex, and it is a valid question to ask whether technological developments are increasing our ability to deal with this complexity or adding levels to make things worse. In fact, we are at the dawn of an era in which machine intelligence might approach or even surpass our own, perhaps to our ultimate peril.

Kurt Lewin is credited with the simple but profound statement that, "There is nothing so practical as a good theory." A good theory serves the purposes of summarizing a set of observations, explaining what they mean, and predicting future observations. One of the consequences of Einstein's Theory of Relativity was that gravity could bend a beam of light. This prediction could not be tested until sometime after the theory had been published, when the opportunity arose to measure the apparent position of a star as the sun moved to obscure it. Normally the star would be invisible against the sun's brilliance, but photographs taken during a solar eclipse confirmed the predictions of the theory. There was a slight deflection of the star's light when it neared the edge of the sun. The Theory of Relativity is both practical, in that it can summarize and explain many complex physical phenomena, and specific enough so that it could have been proven wrong by the measurement of a path of light as it neared the sun. Theories that are vague can never be refuted by data, and they can never be replaced with better ones, creating a situation in which science does not advance.

In cognitive psychology, theories are constantly being evaluated against data collected in laboratory experiments and in the natural environment. Theories guide our selection of tasks, materials, instructions, response requirements, and the interpretation of results. It is imperative that research be designed to give theories a rigorous test so that weak theories can be rejected and replaced with stronger ones. In that way, theories should become continuously better approximations to reality. From its inception in the late 1950s, cognitive psychology has always benefited from theoretical inputs from other disciplines, including linguistics and computer science. New fields of cognitive ergonomics, psycholinguistics, and artificial intelligence have grown out of these early collaborations. Today we are reaping additional benefits from new methods of measuring brain activity in alert, conscious individuals while they are engaged in various tasks. Computer simulations and artificial intelligence systems that challenge our ideas about what it means to be a conscious, feeling human are also being developed. These efforts produce converging operations that give us different perspectives and approaches to solving common problems about how the mind works. The student of cognitive psychology must be conversant with research and theory in many disciplines, including philosophy, linguistics, computer science, neurophysiology, evolutionary biology, anthropology, and experimental psychology. We must also understand the meaning and limitations of research methods in these different areas. The mind

that tries to understand itself proposes a daunting challenge to our theoretical and experimental efforts. The joint steps of research and theory presented in this book should guide the reader through the beginnings of this process. Certain problems in cognition—such as how we quickly perceive and understand words and objects, how we learn and comprehend language, and how we develop conscious experiences—may not be solved within our lifetimes, but we can never succeed if we do not begin.

## New to the Fifth Edition

The fifth edition of *Cognitive Psychology* has a great deal of new content, including thumbnail sketches of important researchers; new photos, figures, and tables; and many new references. Other significant changes in this new edition include:

### Chapter 1 – Introduction and History

- Expanded coverage in history and paradigms

### Chapter 2 – The Peripheral and Central Nervous Systems: Elementary Cognitive Neuroscience

- Expanded coverage on blindsight and synesthesia

### Chapter 3 – Perception

- New information on the effects of brain damage on face and object recognition
- Expanded coverage on face processing, including prosopagnosia (face blindness) and pareidolia

### Chapter 4 – Visual Imagery and Spatial Cognition

- Expanded coverage on the difference between object and spatial imagery, including aphantasia

### Chapter 5 – Attention

### Chapter 6 – Short- versus Long-Term Memories

- New section on the relation between working memory and attention, including a retro-cue paradigm

### Chapter 7 – Long-Term Memory for Meaning and Knowledge

- Expanded coverage of neural mechanism of repetition priming

### Chapter 8 – Long-Term Memory for Events

- New information on individual differences in long-term event memories and brain processes associated with forgetting
- Expanded coverage of false memories and eyewitness testimony

### Chapter 9 – Cognitive Development and Language Acquisition

- Expanded discussion of categorical perception of speech sounds, the role of gestures in language use, early development of speech perception and gesture usage, and critical periods for language acquisition

### Chapter 10 – Language Development and Reading

- Expanded coverage of generative grammar, bilingualism, different types of writing systems, and the use of inference in comprehension and recall of text
- New sections on the dual-route theory of word recognition and the moving window technique of McConkie and Rayner for the study of reading

### Chapter 11 – Higher Conceptual Processes

- Expanded coverage of apophenia (patternicity) and intelligence

### Chapter 12 – Consciousness

- Expanded discussion on mind wandering and mindfulness meditation

### Chapter 13 – Life Span Development, Normal Aging, and Pathology

- Expanded discussion of neurological theories of aging

### Chapter 14 – Emotion and Cognition

- Expanded discussion on cognitive bias, including negativity bias
- New sections on alexithymia and autism

### Chapter 15 – Current and Future Applications of Cognitive Science

- New information on the application of cognitive science to learning and educational practice
- Completely revised and updated sections on artificial intelligence, human-technology interactions, and robotics

### Appendix

- Full-color figures of the surface (left side), vertical midline section, and horizontal midline section of the brain with labels for structures mentioned in the text

## Acknowledgments

The authors are deeply indebted to the BVT Publishing staff for its continued help, advice, and support. We would especially like to thank Janai Escobedo, Suzanne Schmidt, Teresa Daly, and Regina Roths for their expert assistance and kind patience at every stage of our textbook's production.