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 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.