

Contents

About the author	ix
Preface to the third edition	xi
1 Introducing cognitive neuroscience	1
Cognitive neuroscience in historical perspective	2
Does cognitive psychology need the brain?	9
Does neuroscience need cognitive psychology?	11
2 Introducing the brain	15
Structure and function of the neuron	15
The gross organization of the brain	20
The cerebral cortex	24
The subcortex	26
The midbrain and hindbrain	28
3 The electrophysiological brain	31
In search of neural representations: single-cell recordings	33
Electroencephalography and event-related potentials	36
Mental chronometry in electrophysiology and cognitive psychology	41
Magnetoencephalography	47
4 The imaged brain	49
Structural imaging	50
Functional imaging	52
From image to cognitive theory: experimental design	57
Analyzing data from functional imaging	66
Interpreting data from functional imaging	70
Why do functional imaging data sometimes disagree with lesion data?	72
Brain-reading: is “Big Brother” round the corner?	74

5	The lesioned brain	81
	Dissociations and associations	84
	Single-case studies	86
	Group studies and lesion-deficit analysis	90
	Animal models in neuropsychology	94
	Transcranial magnetic stimulation (TMS)	95
	Transcranial direct current stimulation (tDCS)	103
6	The seeing brain	107
	From eye to brain	108
	Cortical blindness and “blindsight”	114
	Functional specialization of the visual cortex beyond V1	115
	Recognizing objects	120
	Recognizing faces	126
	Vision imagined	132
7	The attending brain	135
	Spatial and non-spatial attentional process	136
	The role of the parietal lobes in attention	140
	Theories of attention	148
	Neglect as a disorder of spatial attention and awareness	157
8	The acting brain	165
	A basic cognitive framework for movement and action	166
	The role of the frontal lobes in movement and action	167
	Planning actions: the SAS model	173
	Ownership and awareness of actions	175
	Action comprehension and imitation	177
	Acting on objects	180
	Preparation and execution of actions	188
9	The remembering brain	195
	Short-term and working memory	196
	Different types of long-term memory	203
	Amnesia	204
	Functions of the hippocampus and medial temporal lobes in memory	210
	Theories of remembering, knowing, and forgetting	218
	The role of the prefrontal cortex in long-term memory	223
10	The hearing brain	231
	The nature of sound	233
	From ear to brain	234
	Basic processing of auditory information	237
	Music perception	243

Voice perception	249	
Speech perception	250	
11 The speaking brain		259
Spoken word recognition	261	
Semantic memory and the meaning of words	266	
Understanding and producing sentences	278	
Retrieving and producing spoken words	284	
12 The literate brain		293
Visual word recognition	296	
Reading aloud: routes from spelling to sound	303	
Spelling and writing	310	
Does spelling use the same mechanisms as reading?	315	
13 The numerate brain		319
Universal numeracy?	320	
The meaning of numbers	322	
Models of number processing	334	
14 The executive brain		345
Anatomical and functional divisions of the prefrontal cortex	347	
Executive functions in practice	350	
The organization of executive functions	356	
The role of the anterior cingulate in executive functions	369	
15 The social and emotional brain		373
Theories of emotion	374	
Neural substrates of emotion processing	382	
Reading faces	392	
Reading minds	396	
16 The developing brain		407
Structural development of the brain	410	
Functional development of the brain: sensitive periods and innate knowledge?	413	
Behavioral genetics	419	
Beyond nature versus nurture: gene–environment interplay	423	
References		431
Author Index		511
Subject Index		521