

# Contents

List of Boxes, Color Plates, Figures, and Tables	<i>xiii</i>
SUMMARY	1
Advancing Neuroscience in the Decade of the Brain, 2	
Examples of the Value of Integrating Knowledge to Solve Problems, 4	
The Growth of Neuroscience, 7	
Computer and Information Technology in Biomedical and Neuroscience Research, 8	
Building Consensus, Identifying Needs, 10	
The Brain Mapping Initiative: Committee Recommendations, 13	
Conclusion, 19	
<b>1 INTRODUCTION</b>	<b>21</b>
<b>2 ADVANCING NEUROSCIENCE IN THE DECADE OF THE BRAIN</b>	<b>25</b>
Complexity and the Need for Information Management, 26	
Examples of the Value of Integrating Knowledge to Solve Problems, 31	
The Growth of Neuroscience, 41	
References, 46	

<b>3</b>	<b>OVERVIEW OF NEUROSCIENCE RESEARCH: A CLOSER LOOK AT THE NEURAL HIERARCHY</b>	<b>48</b>
	References and Bibliography, 65	
<b>4</b>	<b>COMPUTER AND INFORMATION TECHNOLOGY IN BIOMEDICAL AND NEUROSCIENCE RESEARCH</b>	<b>66</b>
	Critical Breakthroughs, Important Opportunities, 69	
	Conclusion, 88	
	References, 89	
<b>5</b>	<b>BUILDING CONSENSUS, IDENTIFYING NEEDS</b>	<b>91</b>
	Building a Useful Resource Complex, 93	
	The Challenges Ahead, 99	
	Strategies for Building a Base of Experience, 107	
	References, 111	
<b>6</b>	<b>THE BRAIN MAPPING INITIATIVE: COMMITTEE CONCLUSIONS AND RECOMMENDATIONS</b>	<b>113</b>
	The Long-Range Goal, 113	
	Phase 1: Implementation, 116	
	Phase 2: Long-Term Integration and Its Potential Benefits, 125	
	Summary of Recommendations, 127	
	References, 129	
	<b>APPENDIXES</b>	
	<b>A Task Force Topics and Rosters</b>	<b>133</b>
	<b>B Samples of Requests for Opinions</b>	<b>136</b>
	<b>C Lists of Speakers and Demonstrators in Symposia and Open Hearings</b>	<b>139</b>
	<b>INDEX</b>	<b>143</b>

## List of Boxes, Color Plates, Figures, and Tables

### BOXES

- 2-1 The Gene for Neurofibromatosis 1, 30
- 2-2 Sometimes the Brain Learns to Ignore Visual Input, 32
- 3-1 Not All Neuroscience Research Is Concerned with Neurons, 56
- 3-2 The Genetics of Color Vision, 64
- 4-1 Relational Databases Versus Object-Oriented Databases, 77

### COLOR PLATES

- 2-1 The visual processing region of the monkey cerebral cortex
- 2-2 Autoradiogram of opiate receptors in the spinal cord
- 2-3 Infrared thermograph of chronic pain patient
- 3-1 Computerized PET images
- 3-2 Loss of dopaminergic neurons in Parkinson's disease
- 3-3 Voltage and ion sensitive dyes: microfluorometric image
- 3-4 Computer-enhanced image illustrating in situ hybridization
- 3-5 Aging and loss of dendritic spines
- 4-1 The HIV-1 protease
- 4-2 Computer-assisted reconstruction of EEG activity
- 4-3 Three-dimensional reconstruction of a monkey brain

### FIGURES

- 2-1 Magnetic resonance images of identical twins, one with schizophrenia and the other without, 39
- 3-1 The neural hierarchy, 49
- 3-2 An action potential tracing, 59
- 3-3 The synthesis of cyclic adenosine monophosphate, 61
- 3-4 The acetylcholine receptor, 63
- 4-1 The decreasing cost of computer memory, 71
- 4-2 Computer-assisted neuronal reconstruction, 75
- 4-3 Growth of on-line searches of word-oriented databases, 78
- 4-4 *Brain Browser*, 83

### TABLES

- 2-1 Prevalence of Selected Neurological Disorders, Mental Illnesses, and Alcohol and Drug Abuse, 42
- 2-2a Investment in Neuroscience Research by the National Institutes of Health, 45
- 2-2b Investment in Neuroscience Research by the Alcohol, Drug Abuse, and Mental Health Administration, 45
- 2-3 U.S. Investment in Neuroscience and Mental Health Research: Sponsoring Agencies and Foundations, 46
- 4-1 Text Versus Image Data: Byte Requirements, 72
- 4-2 Selected Genome and Scientific Databases, 80