## **Contents**

Preface xi Acknowledgments xv

## 1 Introduction 1

2 A Parallel Distributed Processing Model of Language: Phonologic, Semantic, and Semantic-Phonologic (Lexical) Processing 5

Concept Representations 7

The Acoustic-Articulatory Motor Pattern Associator Network 10

Lexicons 14

The Representation of Knowledge in Auto-Associator and Pattern Associator Networks:

Attractor Basins, Attractor Trenches, and Quasi-Regular Domains 16

Semantic-Phonologic (Lexical) and Phonologic Impairment in Aphasias 21

Phonologic Paraphasic Errors 22

Factors Influencing Phonologic and Lexical Errors in Internally Generated Aphasic Language 23

## 3 Grammar: The Model 27

Semantic Contributions to Syntax 31

Adjectives 31

Verbs 32

Semantic Instantiation of Verbs 34

Verb Thematic, Implementational, and Flavor Representations 3

Frontal 36

Postcentral: Verb Flavor 4

Relations between Nouns and Verbs 45

Abstract Nouns and Verbs 48

Lexical Instantiation of Verbs: The Relationship between Modified Concept

Representations and Morphologic and Phonologic Sequence Representations 4

Prepositions 54

Locative 54

Obligatory 55

Personal Pronouns 56

viii Contents

4

Sequence: The Basis of Syntax 57 Phrase Structure Rules, Grammatic Morphology, and the Competition Model Phrase Structure Rules 57 Grammatic Morphology The Competition Model Syntax: Sequence at the Sentence Level Recursion 75 Grammar: A Synthesis 80 Disorders of Grammar in Aphasia 83 Grammaticality Judgment and the Issue of Loss of Knowledge versus Loss of Access to Knowledge Syntax Deficits in Verb Production in Broca's Aphasia—Potential Mechanisms 92 Semantic-Conceptual Lexical 94 Grammatic 96 Distributed Representations of Verb Semantics Thematic and Flavor (Manner-Path) Representations of Verbs 98 Concreteness Effects 101 "Heavy" versus "Light" Verbs 102 Unaccusative and Unergative Verbs 103 Psychological Verbs 105 Verb Naming Errors as a Reflection of the Nature of Neural Networks Supporting Verb Meaning Verb Representations: A Summary Syntax: Phrase Structure Rules Grammatic Morphology—Cross-Linguistic Aphasia Studies 111 Support for the Competition Model 121 Sparing of Grammatic Morphology in Production of Richly Inflected Languages: Implications for Neuroanatomy of Grammar 123 Support for the Competition Model from Studies of Language Comprehension 126 Hierarchy of Morphologic Sequence Knowledge 130 Grammatic Morphology—Special Cases Personal Pronouns 131 Auxiliary Verbs 134 **Locative Prepositions Obligatory Prepositions** Verb Past Tense Formation 137 Single-Route Connectionist Model 142 Hybrid Associative Symbolic Model 145 Performance by Normal Subjects 147 Discrepant Results 148 Other Forms 149 Tense versus Agreement 150 Present Tense versus Past Tense 152 The Competition Model and a Return to Syntax 152 Disorders of Comprehension 156

Contents ix

## 5 Conclusion 161

Future Research Directions 168

Glossary 175 Notes 177 References 181 Index 199