

C O N T E N T S

LIST OF ILLUSTRATIONS	<i>vii</i>
ACKNOWLEDGMENTS	<i>ix</i>

Introduction	<i>3</i>
--------------	----------

PART 1 Against Localization

Introduction: Localization versus Holism	<i>12</i>
Paul Broca: The Case of Tan and Motor Memory	<i>16</i>
Wernicke and Lichtheim: Specific Memory Centers and Fixed Images	<i>21</i>
Giraudeau: A Case of Word Deafness	<i>25</i>
Dejerine: The Man Who Could Not Read What He Had Written	<i>30</i>
The Forgotten Details—Music, Multidigit Numbers, and Color Vision	<i>47</i>
Contemporary Misreadings of Dejerine: Geschwind and the Disconnection Syndrome	<i>54</i>
Dejerine and Bernstein: Movement and Memory	<i>57</i>
Against Localization I: Shattering the Foundation	<i>63</i>
Against Localization II: Hughlings-Jackson and Cursing	<i>66</i>
Against Localization III: Freud—The Fragmentary Memory	<i>72</i>
A Literary Interlude: Marcel Proust and Lost Time	<i>81</i>
Localization of Function Today: The Brain as a Collec- tion of Functionally Specialized Units	<i>84</i>
Context and Meaning: A. A. Low and A. R. Luria	<i>85</i>
Three Routes in Reading: John C. Marshall and Freda Newcombe	<i>89</i>
Context and Categorization: Elizabeth Warrington	<i>93</i>
	<i>v</i>

PART 2 Language as Gesture and the Recognition of Speech

The Perception of Speech	102
Categorization, Not Localization	110

PART 3 Machine Recognition

David Marr: Beyond Artificial Intelligence	116
The Goals of the Visual System	119
The Computing Brain and Modularity	122
Symbols in the Brain: The Primal Sketch	128
The 2½-D Sketch	136
The 3-D Model	138
Naming the Object	142
Another Machine—PDP: Hidden Memories	145

PART 4 Neural Darwinism: A New Approach to Memory and Perception

Clinical Studies	160
The Sense of Time	160
Penfield's Memory "Flashbacks" and Emotions	163
The Biological View	167
Darwin	167
The Immune System	168
The Brain	170
CAMs: Context and History in Embryology	172
Edelman's Theory of Neuronal Group Selection	177
Brain Maps	179
"Darwin II": A New Approach to Machine Simulations of Recognition	185
Epilogue and Conclusion	192

APPENDIXES	197
------------	-----

NOTES	213
-------	-----

INDEX	221
-------	-----

LIST OF ILLUSTRATIONS

Figure 1.1	Lichtheim's schema of the speech apparatus and reading and writing centers.	23
Figure 1.2	Examples of Oscar's handwriting before and after his attack of verbal blindness.	38
Figure 1.3	Dejerine's schematic rendition of the brain lesions responsible for Oscar's verbal blindness.	45
Figure 1.4	Charcot's apparatus for creating motor images of words and letters in patients with verbal blindness.	57
Figure 1.5	The Marshall-Newcombe schema for reading aloud.	91
Figure 2.1	Kratzenstein's acoustic resonators, 1779.	98
Figure 2.2	Von Kempelen's speaking machine, 1791.	99
Figure 2.3	The pattern playback.	104
Figure 2.4	The dichotic listening experiment.	105
Figure 2.5	The effect of silence on the perception of a stop consonant.	107
Figure 2.6	Spectrogram of the words <i>gray ship</i> .	108
Figure 2.7	Diagram of the overlapping phonetic segments for the word <i>bag</i> .	109
Figure 3.1	The principal axis of symmetry in two views of a water bucket.	118
Figure 3.2	Random-dot stereograms.	125
Figure 3.3	The derivation of the primal sketch.	130

List of Illustrations

Figure 3.4	A cubist image of Charlie Chaplin.	134
Figure 3.5	Ullman's rotating cylinders.	137
Figure 3.6	The axes of symmetry in a human figure.	140
Figure 3.7	A PDP network.	146
Figure 3.8	The McClelland and Rumelhart system for reading pronounceable non-words and ambiguous letters in words.	150
Figure 3.9	An example of an ambiguous letter.	152
Figure 3.10	Different muscular movements used to draw a figure.	153
Figure 4.1	Darwin II: A new approach to machine recognition.	186
Figure B.1	Areas of the brain stimulated in Penfield's Case 3.	202
Figure B.2	Areas of the brain stimulated in Penfield's Case 22.	204
Figure B.3	Areas of the brain stimulated in Penfield's Case 36.	207
Figure C.1	Darwin II: An experiment in associative recall.	211