

# Contents

<b>1 Fins, Fossils and Fingers.</b> . . . . .	1
A Fish Approaching Land . . . . .	2
Tiktaalik . . . . .	3
References. . . . .	5
<b>2 The Hand, the Brain and Man's Travel in Time</b> . . . . .	7
The Origin of Man: A Prestigious Story. . . . .	9
Africa: Our Original Homeland . . . . .	10
Lucy . . . . .	11
Ardi: Our Earliest Ancestor . . . . .	13
<i>Homo habilis</i> : The 'Handy Man' . . . . .	15
<i>Homo erectus</i> : The Upright-Walking Man . . . . .	16
The Neanderthals . . . . .	18
The Hobbit from Flores: <i>Homo floresiensis</i> . . . . .	20
A Little Finger from an Unknown Prehistoric Relative . . . . .	21
How Did We Become Bipedals? . . . . .	22
The Savannah Hypothesis. . . . .	23
The Aquatic Ape Hypothesis . . . . .	24
Did Bipedalism Develop While We Were Still in the Trees? . . . . .	25
<i>Homo sapiens</i> : The Wise Man . . . . .	25
Out of Africa. . . . .	26
References. . . . .	27
<b>3 The Hand, the Brain and Tools</b> . . . . .	31
Homo Handmade . . . . .	34
References. . . . .	35
<b>4 How the Hand Generated Language.</b> . . . . .	37
References. . . . .	39

<b>5</b>	<b>Handprints from the Past.</b> . . . . .	41
	The Hand in the Cave . . . . .	42
	Hands and Rock Carvings . . . . .	44
	Stones with Hand Signs . . . . .	46
	References. . . . .	47
<b>6</b>	<b>The Intelligent Hand: An Extension of the Brain</b> . . . . .	49
	A Mirror of the Soul . . . . .	51
	The Hand and the Art of Medicine. . . . .	56
	The Intelligent Hand . . . . .	60
	The Written Word. . . . .	62
	The Symbolic Value of the Hand . . . . .	62
	Extending the Hand Through Technology . . . . .	64
	References. . . . .	65
<b>7</b>	<b>Touch</b> . . . . .	67
	The Seeing Hand. . . . .	71
	Sensory Feedback. . . . .	74
	Sensation and Balance . . . . .	76
	Sensation and Body Ownership . . . . .	77
	Protective Sensibility . . . . .	78
	Pain: The Gift Nobody Wants. . . . .	79
	Vittangi Disease: Congenital Insensitivity to Pain . . . . .	80
	References. . . . .	81
<b>8</b>	<b>The Sensational Brain.</b> . . . . .	83
	Somatosensory Cortex . . . . .	86
	The Cortical Hand Map . . . . .	88
	References. . . . .	90
<b>9</b>	<b>How the Hand Shapes the Brain</b> . . . . .	93
	Confusion in the Cortical Hand Representation. . . . .	95
	Interacting Hemispheres . . . . .	97
	How a Local Anaesthetic Cream, Applied to the Forearm, Can Improve Hand Sensibility . . . . .	97
	Nerve-Injured Hands. . . . .	98
	References. . . . .	100
<b>10</b>	<b>The Interaction of the Senses</b> . . . . .	103
	The Multisensory Brain . . . . .	105
	Sight and Sensation. . . . .	106
	Reading Hands . . . . .	107
	Listening Hands . . . . .	110
	The Sensor Glove . . . . .	111
	Synaesthesia . . . . .	111
	The Rubber Hand Phenomenon . . . . .	112

Helen Keller . . . . .	114
References. . . . .	115
<b>11 Mirrors in the Brain . . . . .</b>	<b>117</b>
Imitation and Learning . . . . .	118
Understanding the Intentions of Others . . . . .	119
Mirroring Touch . . . . .	120
Action Words . . . . .	121
Action Sounds. . . . .	122
Motor Imagery . . . . .	122
Hand and Mouth in Cooperation . . . . .	123
References. . . . .	124
<b>12 Creative Hands . . . . .</b>	<b>127</b>
The Hand, the Brain and the Creative Mind. . . . .	131
One Hand Missing . . . . .	134
Brain, Hand and Art . . . . .	136
Mouth and Hand . . . . .	136
A Difficult Task for the Brain. . . . .	136
Musicians' Brains. . . . .	137
Changes in the Cortical Hand Representation . . . . .	138
The Multisensory Brain . . . . .	139
The Extended Hand . . . . .	140
References. . . . .	142
<b>13 Right Hand or Left Hand? . . . . .</b>	<b>145</b>
Being Left-Handed . . . . .	146
Famous Lefties . . . . .	148
How Long Has Left-Handedness Existed?. . . . .	148
How Common Is It to Be Left-Handed?. . . . .	149
How Early in Life Does Left-Handedness Occur and What Is the Reason?. . . . .	149
Was Lucy Right- or Left-Handed? . . . . .	150
Theories About the Origin of Right-Handedness. . . . .	152
References. . . . .	152
<b>14 Losing a Hand . . . . .</b>	<b>155</b>
Phantom Sensation and Phantom Pain . . . . .	156
What Happens in the Brain After a Hand Amputation?. . . . .	156
Mirror Training: A Way to Treat Phantom Pain. . . . .	158
Hand Replantation . . . . .	159
The Salamander Hand. . . . .	161
References. . . . .	163
<b>15 Hand Transplantation . . . . .</b>	<b>165</b>
Hand Transplantation from an International Perspective . . . . .	167
A Controversial Procedure . . . . .	169

The Future. . . . .	170
References. . . . .	171
<b>16 The Mind-Controlled Robotic Hand. . . . .</b>	<b>173</b>
Controlling an Artificial Hand Through Direct Recordings from the Brain . . . . .	175
Controlling an Artificial Hand Using Electrodes Implanted in a Nerve . . . .	177
Intuitively Controlling an Artificial Hand Through EMG Signals: Myoelectric Prostheses . . . . .	178
How to Provide a Hand Prosthesis with Sensory Feedback? . . . . .	181
The Ideal Hand Prosthesis . . . . .	185
References. . . . .	185
<b>Index. . . . .</b>	<b>191</b>