

TABLE OF CONTENTS

List of Contributors	ix
INTRODUCTION	
1. Current Work and Open Problems: A Road-Map for Research into the Emergence of Communication and Language <i>Chrystopher L. Nehaniv, Caroline Lyon, and Angelo Cangelosi</i>	1
PART I EMPIRICAL INVESTIGATIONS ON HUMAN LANGUAGE	
2. Evolving Meaning: The Roles of Kin Selection, Allomothering and Paternal Care in Language Evolution <i>W. Tecumseh Fitch</i>	29
3. ‘Needs only’ Analysis in Linguistic Ontogeny and Phylogeny <i>Alison Wray</i>	53
4. Clues from Information Theory Indicating a Phased Emergence of Grammar <i>Caroline Lyon, Chrystopher L. Nehaniv, and Bob Dickerson</i>	71
5. Emergence of a Communication System: International Sign <i>Rachel Rosenstock</i>	87
6. Distributed Language: Biomechanics, Functions, and the Origins of Talk <i>Stephen J. Cowley</i>	105
PART II SYNTHESIS OF COMMUNICATION AND LANGUAGE IN ARTIFICIAL SYSTEMS	
7. The Recruitment Theory of Language Origins <i>Luc Steels</i>	129
8. <i>In silico</i> Evolutionary Developmental Neurobiology and the Origin of Natural Language <i>Eörs Szathmáry, Zoltán Szatmáry, Péter Ittész, Gergő Orbán, István Zachár, Ferenc Huszár, Anna Fedor, Máté Varga, Szabolcs Számadó</i>	151
9. Communication in Natural and Artificial Organisms: Experiments in Evolutionary Robotics <i>Davide Marocco and Stefano Nolfi</i>	189

vi Table of Contents

10. From Vocal Replication to Shared Combinatorial Speech Codes: A Small Step for Evolution, A Big Step for Language <i>Pierre-Yves Oudeyer</i>	207
11. Learning and Transition of Symbols: Towards a Dynamical Model of a Symbolic Individual <i>Takashi Hashimoto and Akira Masumi</i>	223
12. Language Change among ‘Memoryless Learners’ Simulated in Language Dynamics Equations <i>Makoto Nakamura, Takashi Hashimoto, and Satoshi Tojo</i>	237
13. The Evolution of Meaning-Space Structure through Iterated Learning <i>Simon Kirby</i>	253
14. The Emergence of Language: How to Simulate It <i>Domenico Parisi and Marco Mirolli</i>	269
15. Lexical Acquisition with and without Metacommunication <i>Jonathan Ginzburg and Zoran Macura</i>	287
16. Agent Based Modelling of Communication Costs: Why Information Can Be Free <i>Ivana Čače and Joanna J. Bryson</i>	305
17. Language Change and the Inference of Meaning <i>Andrew D. M. Smith</i>	323
18. Language, Perceptual Categories and their Interaction: Insights from Computational Modelling <i>Tony Belpaeme and Joris Bleys</i>	339
PART III INSIGHTS FROM ANIMAL COMMUNICATION	
19. Emergence of Linguistic Communication: Studies on Grey Parrots <i>Irene M. Pepperberg</i>	355
20. A Possible Role for Selective Masking in the Evolution of Complex, Learned Communication Systems <i>Graham R. S. Ritchie and Simon Kirby</i>	387

21. The Natural History of Human Language: Bridging the Gaps without Magic <i>Bjorn Merker and Kazuo Okanoya</i>	403
22. Neural Substrates for String-Context Mutual Segmentation: A Path to Human Language <i>Kazuo Okanoya and Bjorn Merker</i>	421
Index	435

