

Table of Contents

Foreword.....	xv
Preface	xvii

Section I Initial States

Chapter I	
The Science of Social Emergence	1
<i>R. Keith Sawyer, Washington University in St. Louis, USA</i>	
Chapter II	
Agent Cognitive Capabilities and Orders of Social Emergence.....	17
<i>Christopher Goldspink, Incept Labs, Australia</i>	
<i>Robert Kay, Incept Labs, Australia & University of Technology, Sydney, Australia</i>	
Chapter III	
Agents and Social Interaction: Insights from Social Psychology.....	35
<i>Joseph C. Bullington, Georgia Southern University, USA</i>	
Chapter IV	
Predictive Models of Cultural Information Transmission	51
<i>M. Afzal Upal, Defence R&D, Canada</i>	
Chapter V	
Interaction of Agent in E-Business: A Look at Different Sources.....	60
<i>Jorge A. Romero, Towson University, USA</i>	

Section II Emergences

Chapter VI	
A Simulation of Temporally Variant Agent Interaction via Passive Inquiry	69
<i>Adam J. Conover, Towson University, USA</i>	

Chapter VII

Agent Feedback Messaging: A Messaging Infrastructure for Distributed Message Delivery	84
<i>Richard Schilling, Cognition Group, Inc., USA</i>	

Chapter VIII

Modeling Cognitive Agents for Social Systems and a Simulation in Urban Dynamics.....	104
<i>Yu Zhang, Trinity University, USA</i>	
<i>Mark Lewis, Trinity University, USA</i>	
<i>Christine Drennon, Trinity University, USA</i>	
<i>Michael Pellon, Trinity University, USA</i>	
<i>Phil Coleman, Trinity University, USA</i>	
<i>Jason Leezer, Trinity University, USA</i>	

Chapter IX

Developing Relationships Between Autonomous Agents: Promoting Pro-Social Behaviour Through Virtual Learning Environments Part I	125
<i>Scott Watson, University of Hertfordshire, UK</i>	
<i>Kerstin Dautenhahn, University of Hertfordshire, UK</i>	
<i>Wan Ching (Steve) Ho, University of Hertfordshire, UK</i>	
<i>Rafal Dawidowicz, University of Hertfordshire, UK</i>	

Chapter X

Construction of Meanings in Biological and Artificial Agents.....	139
<i>Martin Takáč, Comenius University in Bratislava, Slovakia</i>	

Chapter XI

Training Coordination Proxy Agents Using Reinforcement Learning	158
<i>Myriam Abramson, Naval Research Laboratory, USA</i>	

Chapter XII

The Generative Power of Signs: The Importance of the Autonomous Perception of Tags to the Strong Emergence of Institutions	173
<i>Deborah V. Duong, OSD/PAE Simulation Analysis Center, USA</i>	

Chapter XIII

Propositional Logic Syntax Acquisition Using Induction and Self-Organisation	185
<i>Josefina Sierra, Universidad Politécnica de Cataluña, Spain</i>	
<i>Josefina Santibáñez, Universidad de La Rioja, Spain</i>	

Chapter XIV

Hybrid Emotionally Aware Mediated Multiagency	199
<i>Giovanni Vincenti, Gruppo Vincenti, Italy</i>	
<i>James Braman, Towson University, USA</i>	

Chapter XV

Mapping Hybrid Agencies Through Multiagent Systems.....	215
<i>Samuel G. Collins, Towson University, USA</i>	
<i>Goran Trajkovski, Laureate Education Inc., USA</i>	

Section III Second Order Emergences

Chapter XVI

Developing Relationships Between Autonomous Agents: Promoting Pro-Social Behaviour Through Virtual Learning Environments, Part II	229
<i>Scott Watson, University of Hertfordshire, UK</i>	
<i>Kerstin Dautenhahn, University of Hertfordshire, UK</i>	
<i>Wan Ching (Steve) Ho, University of Hertfordshire, UK</i>	
<i>Rafal Dawidowicz, University of Hertfordshire, UK</i>	

Chapter XVII

Reputation: Social Transmission for Partner Selection	243
<i>Mario Paolucci, Institute of Cognitive Science and Technology/CNR, Italy</i>	
<i>Rosaria Conte, Institute of Cognitive Science and Technology/CNR, Italy</i>	

Chapter XVIII

A Simulation of Temporally Variant Agent Interaction via Belief Promulgation.....	261
<i>Adam J. Conover, Towson University, USA</i>	

Chapter XIX

The Human Mirror Neuron System	275
<i>David B. Newlin, RTI International, USA</i>	

Chapter XX

Relationships Between the Processes of Emergence and Abstraction in Societies	288
<i>Eric Baumer, University of California, Irvine, USA</i>	
<i>Bill Tomlinson, University of California, Irvine, USA</i>	

Chapter XXI

Emergent Reasoning Structures in Law	305
<i>Vern R. Walker, Hofstra University, USA</i>	

Chapter XXII

Agents in Security: A Look at the Use of Agents in Host-Based Monitoring and Protection and Network Intrusion Detection	325
<i>Theodor Richardson, South University, USA</i>	

Chapter XXIII

Search as a Tool for Emergence	341
<i>Michael J. North, Argonne National Laboratory, USA & The University of Chicago, USA</i>	
<i>Thomas R. Howe, Argonne National Laboratory, USA & The University of Chicago, USA</i>	
<i>Nick Collier, Argonne National Laboratory, USA & PantaRei Corporation, USA</i>	
<i>Eric Tatara, Argonne National Laboratory, USA</i>	
<i>Jonathan Ozik, Argonne National Laboratory, USA & The University of Chicago, USA</i>	
<i>Charles Macal, Argonne National Laboratory, USA & The University of Chicago, USA</i>	
 Compilation of References	 364
About the Contributors	400
Index	408

Detailed Table of Contents

Foreword.....xv

Prefacexvii

Section I
Initial States

Chapter I
The Science of Social Emergence 1
R. Keith Sawyer, Washington University in St. Louis, USA

The chapter critically examines the sociology of emergence, developing an often-ignored, Durkheimian heritage into what amounts to a manifesto for a social science of emergence resting on a complex understanding of agents

Chapter II
Agent Cognitive Capabilities and Orders of Social Emergence..... 17
Christopher Goldspink, Incept Labs, Australia
Robert Kay, Incept Labs, Australia & University of Technology, Sydney, Australia

This chapter builds on Sawyer’s insights, interrogating the movement from agential properties to social emergence, and using an enactivist perspective to critique questions of structure and agency in sociology and to explore the challenge of modeling a social emergence that builds from cognitive to social levels.

Chapter III
Agents and Social Interaction: Insights from Social Psychology..... 35
Joseph C. Bullington, Georgia Southern University, USA

This chapter takes up the genealogical task from the perspective of social psychology and ethology, the other two disciplines MAS research has most often drawn from. In particular, asking how different agents (human and non-human) interact together and how insights from these studies can help researchers build more “life-like” agents to interact with us, including some of our more emergent properties (emotion, empathy and inference).

Chapter IV

Predictive Models of Cultural Information Transmission	51
<i>M. Afzal Upal, Defence R&D, Canada</i>	

This chapter takes the interdisciplinary legacies from the previous chapters into the area of simulations.

Chapter V

Interaction of Agent in E-Business: A Look at Different Sources	60
<i>Jorge A. Romero, Towson University, USA</i>	

This chapter takes aforementioned interdisciplinary legacies into e-business, respectively—and, in the process, bridges the theoretical and conceptual configurations of this section with the emergent organizations in the next.

Section II Emergences

Chapter VI

A Simulation of Temporally Variant Agent Interaction via Passive Inquiry	69
<i>Adam J. Conover, Towson University, USA</i>	

This chapter critiques the one-dimensional, temporal assumptions built into extant simulations (and, synecdochically, Conway’s “Game of Life”) and suggests the possibility of introducing heterogeneous temporalities into simulation design.

Chapter VII

Agent Feedback Messaging: A Messaging Infrastructure for Distributed Message Delivery	84
<i>Richard Schilling, Cognition Group, Inc., USA</i>	

This chapter exploits some of the diverse temporalities from the previous chapter, in order to build scalable models of agent communications based in part on biofeedback.

Chapter VIII

Modeling Cognitive Agents for Social Systems and a Simulation in Urban Dynamics	104
<i>Yu Zhang, Trinity University, USA</i>	
<i>Mark Lewis, Trinity University, USA</i>	
<i>Christine Drennon, Trinity University, USA</i>	
<i>Michael Pellon, Trinity University, USA</i>	
<i>Phil Coleman, Trinity University, USA</i>	
<i>Jason Leezer, Trinity University, USA</i>	

Zhang et al. look to interactionist models of social cognition in order to build MAS where decision-making emerges from the interactions between agents rather than through the more autonomous models of decision making in classic rational choice theory.

Chapter IX

Developing Relationships Between Autonomous Agents: Promoting Pro-Social Behaviour

Through Virtual Learning Environments Part I	125
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Scott Watson, University of Hertfordshire, UK

Kerstin Dautenhahn, University of Hertfordshire, UK

Wan Ching (Steve) Ho, University of Hertfordshire, UK

Rafal Dawidowicz, University of Hertfordshire, UK

This chapter looks to social interactionism, networking, and community in order to build “socially interactive virtual agents” for the creation of virtual learning environments.

Chapter X

Construction of Meanings in Biological and Artificial Agents	139
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Martin Takáč, Comenius University in Bratislava, Slovakia

This chapter underscores the problem and promise of communicative models in MAS. Tacking back and between ethological examples and AI simulation, Takáč proposes interactionist communications premised on models of evolutionary adaptation.

Chapter XI

Training Coordination Proxy Agents Using Reinforcement Learning	158
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Myriam Abramson, Naval Research Laboratory, USA

This chapter examines the ways agents might build on models of teamwork in order to coordinate with other agents to fulfill the needs of human agents.

Chapter XII

The Generative Power of Signs: The Importance of the Autonomous Perception of Tags to

the Strong Emergence of Institutions	173
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Deborah V. Duong, OSD/PAE Simulation Analysis Center, USA

This chapter looks to one of the relatively undeveloped directions in agent perception in order to build new models for the emergent of MAS socialities.

Chapter XIII

Propositional Logic Syntax Acquisition Using Induction and Self-Organisation	185
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Josefina Sierra, Universidad Politécnica de Cataluña, Spain

Josefina Santibáñez, Universidad de La Rioja, Spain

This chapter explores the possibility for emergent socialities between diverse agents based on almost sui generis communicative models where syntactical structures emerge in the space of agent interaction.

Chapter XIV

Hybrid Emotionally Aware Mediated Multiagency	199
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Giovanni Vincenti, Gruppo Vincenti, Italy

James Braman, Towson University, USA

This chapter on the other hand explores the possibilities latent in more affective communications: What advantages might an “emotion-based agent” have over other kinds of social agents? Could emotion-based agents couple more effectively with human agents?

Chapter XV

Mapping Hybrid Agencies Through Multiagent Systems.....	215
<i>Samuel G. Collins, Towson University, USA</i>	
<i>Goran Trajkovski, Laureate Education Inc., USA</i>	

This chapter inverts the usual assumptions implicit in MAS by suggesting that it is the human agents who may be emulating non-human agents, and that the task for the researcher is as much to develop different human behaviors as it is as different models for non-human agents. In the process, the authors draw a much richer (and more ambiguous) picture of agent communication (including the possibilities in miscommunication). Fittingly, the application of some of these ideas leads us to questions of second-order emergence.

Section III Second Order Emergences

Chapter XVI

Developing Relationships Between Autonomous Agents: Promoting Pro-Social Behaviour Through Virtual Learning Environments, Part II	229
<i>Scott Watson, University of Hertfordshire, UK</i>	
<i>Kerstin Dautenhahn, University of Hertfordshire, UK</i>	
<i>Wan Ching (Steve) Ho, University of Hertfordshire, UK</i>	
<i>Rafal Dawidowicz, University of Hertfordshire, UK</i>	

This chapter takes the social theories elaborated in Part I in the designs of Virtual Learning Environments designed to reduce the incidence (as well as mitigate the effects) of school bullying. In these hybrid agent interactions, “believability” is an emergent category—non-human agents can be “too believable” (and hence unbelievable), as are ideas about empathy and engagement.

Chapter XVII

Reputation: Social Transmission for Partner Selection	243
<i>Mario Paolucci, Institute of Cognitive Science and Technology/CNR, Italy</i>	
<i>Rosaria Conte, Institute of Cognitive Science and Technology/CNR, Italy</i>	

This chapter looks at reputation as the “meta-belief” enabling other beliefs and, in the process, generates other, emergent socialities: cooperation, altruism, and other reciprocal behaviors.

Chapter XVIII

A Simulation of Temporally Variant Agent Interaction via Belief Promulgation.....	261
<i>Adam J. Conover, Towson University, USA</i>	

In this chapter, the forms emerging from temporal variance in a MAS are exploited by agents who attempt to influence each other’s beliefs, in the process stretching Conway’s cellular automata to new (and emergent) applications in both simulations and future, hybrid MAS.

Chapter XIX

The Human Mirror Neuron System	275
<i>David B. Newlin, RTI International, USA</i>	

This chapter applies MAS to neurophysiology, and in the process introduces a tantalizing example of second-order emergence in the self-reflexive monitoring of oneself facilitated by the imitative impulse structured into our frontal-parietal mirror neuron system.

Chapter XX
Relationships Between the Processes of Emergence and Abstraction in Societies 288
 Eric Baumer, University of California, Irvine, USA
 Bill Tomlinson, University of California, Irvine, USA

This chapter also incorporates emergent cognition into its models; in this case what the authors terms an “abstraction-emergence loop” that captures the way agents generalize on their experience and thereby influence the behavior of subsequent local behaviors.

Chapter XXI
Emergent Reasoning Structures in Law 305
 Vern R. Walker, Hofstra University, USA

In this chapter’s applications of a “Default-Logic” framework result in MAS capable of both rendering legal decisions as well as deliberating on the structure of legal reasoning itself, in the process implicating both human- and non-human agents in the future of the legal process itself.

Chapter XXII
Agents in Security: A Look at the Use of Agents in Host-Based Monitoring and Protection
and Network Intrusion Detection 325
 Theodor Richardson, South University, USA

This chapter develops a model network intrusion where “malicious” and “normal” traffic are (secondarily) emergent concepts arising from an emergent MAS consensus.

Chapter XXIII
Search as a Tool for Emergence..... 341
 Michael J. North, Argonne National Laboratory, USA & The University of Chicago, USA
 Thomas R. Howe, Argonne National Laboratory, USA & The University of Chicago, USA
 Nick Collier, Argonne National Laboratory, USA & PantaRei Corporation, USA
 Eric Tatara, Argonne National Laboratory, USA
 Jonathan Ozik, Argonne National Laboratory, USA & The University of Chicago, USA
 Charles Macal, Argonne National Laboratory, USA & The University of Chicago, USA

This chapter details search tools for emergent agents. As new properties emerge in MAS, the relationship of the observer changes—that is, new kinds of properties are sought after and search engines represent the boundary between one kind of emergence (emergent properties of agents) and another emergence (new foci emerges from the consciousness of emergent properties).

Compilation of References 364
About the Contributors 400
Index..... 408