CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

CULTURAL-HISTORICAL PERSPECTIVES ON COLLECTIVE INTELLIGENCE

In the era of digital communication, collective problem solving is increasingly important. Large groups can now resolve issues together in completely different ways, which has transformed the arts, sciences, business, education, technology, and medicine. Collective intelligence is something we share with animals and is different from machine learning and artificial intelligence. To design and utilize human collective intelligence, we must understand how its problem-solving mechanisms work. From democracy in ancient Athens, through the invention of the printing press, to COVID-19, this book analyzes how humans developed the ability to find solutions together. This wide-ranging, thought-provoking book is a game-changer for those working strategically with collective problem solving within organizations and using a variety of innovative methods. It sheds light on how humans work effectively alongside machines to confront the most urgent challenges ever faced by humanity. This title is also available as Open Access on Cambridge Core.

ROLF K. BALTZERSEN is Professor in the Faculty of Education at Østfold University College, Norway. His research interests include collective intelligence, communication, metacognition, educational technology, and teaching.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

CURRENT PERSPECTIVES IN SOCIAL AND BEHAVIORAL SCIENCES

Current Perspectives in Social and Behavioral Sciences provides thought-provoking introductions to key topics, invaluable to both the student and scholar. Edited by world leading academics, each volume contains specially-commissioned essays by international contributors, which present cutting-edge research on the subject and suggest new paths of inquiry for the reader. This series is designed not only to offer a comprehensive overview of the chosen topics, but to display and provoke lively and controversial debate.

Published titles:

Culture, Mind, and Brain: Emerging Concepts, Models, and Applications
edited by LAURENCE J. KIRMAYER, SHINOBU KITAYAMA, CAROL M. WORTHMAN, and CONSTANCE A. CUMMINGS

Genetics, Ethics and Education
edited by SUSAN BOUREGY, ELENA L. GRIGORENKO, STEPHEN R. LATHAM and MEI TAN

Global Perspectives on Teacher Motivation
edited by HELEN WATT, PAUL RICHARDSON, and KARI SMITH

Nurturing Creativity in the Classroom,
2nd edition edited by RONALD A. BEGHETTO and JAMES C. KAUFMAN

Research and Theory on Workplace Aggression
edited by NATHAN A. BOWLING and M. SANDY HERSHCOVIS

Mindfulness and Performance
edited by AMY L. BALTZELL

Creativity and Reason in Cognitive Development,
2nd edition edited by JAMES KAUFMAN and JOHN BAER

Reflections on the Learning Sciences
edited by MICHAEL A. EVANS, MARTIN J. PACKER and R. KEITH SAWYER

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

CULTURAL-HISTORICAL PERSPECTIVES ON COLLECTIVE INTELLIGENCE

Patterns in Problem Solving and Innovation

ROLF K. BALTZERSEN

Østfold University College

CAMBRIDGE UNIVERSITY PRESS

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781108833745
DOI: 10.1017/9781108981361

© Rolf K. Baltzersen

This work is in copyright. It is subject to statutory exceptions and to the provisions of relevant licensing agreements; with the exception of the Creative Commons version the link for which is provided below, no reproduction of any part of this work may take place without the written permission of Cambridge University Press.
An online version of this work is published at doi.org/10.1017/9781108981361 under a Creative Commons Open Access license CC-BY-NC-ND 4.0 which permits re-use, distribution and reproduction in any medium for non-commercial purposes providing appropriate credit to the original work is given. You may not distribute derivative works without permission. To view a copy of this license, visit https://creativecommons.org/licenses/by-nc-nd/4.0
All versions of this work may contain content reproduced under license from third parties.
Permission to reproduce this third-party content must be obtained from these third-parties directly.
When citing this work, please include a reference to the DOI 10.1017/9781108981361

First published 2022

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data
NAMES: Baltzersen, Rolf K., 1974- author.
TITLE: Cultural-historical perspectives on collective intelligence : patterns in problem solving and innovation / Rolf K. Baltzersen, Østfold University College.
DESCRIPTION: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2022. | SERIES: Current perspectives in social and behavioral sciences | Includes bibliographical references and index.
IDENTIFIERS: LCCN 2021017609 (print) | LCCN 2021017610 (ebook) | ISBN 9781108833745 (hardback) | ISBN 9781108986755 (hardback) | ISBN 9781108981361 (epub)
SUBJECTS: LCSH: Swarm intelligence. | Technological innovations–Social aspects. | Human-computer interaction.
CLASSIFICATION: LCC Q337.3 .B35 2022 (print) | LCC Q337.3 (ebook) | DDC 006.3/824–dc23
LC record available at https://lccn.loc.gov/2021017609
LC ebook record available at https://lccn.loc.gov/2021017610

ISBN 978-1-108-83374-5 Hardback
ISBN 978-1-108-98675-5 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

For my children, Silvia and Johannes.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

Contents

List of Figures *page* xiii
List of Tables xviii

1 What Is Collective Intelligence? 1
1.1 The Need for New Types of Collective Problem Solving 1
1.2 Theoretical Perspectives on CI 6
1.2.1 A General Group Intelligence Factor 7
1.2.2 Self-Organization 9
1.2.3 The Role of Diversity 10
1.3 Top Solvers in Online Innovation Teams 15
1.4 A Cultural-Historical Perspective on CI 16
1.5 The Methodological Steps 18
1.5.1 Step 1: Review Current CI Practices 18
1.5.2 Step 2: Identifying CI as Three Types of Collective Problem Solving 20
1.5.3 Step 3: A Historical Analysis of the Problem-Solving Types 22
1.5.4 Step 4: Design of CI 23

2 Crowdsourcing 27
2.1 What Is Crowdsourcing? 27
2.2 Online Innovation Contests 28
2.2.1 Background 28
2.2.2 The IdeaRally: Rapid Problem Solving in Large Groups 32
2.2.3 The Climate CoLab: Transparent Innovation Contests 36
2.3 Online Citizen Science 38
2.3.1 Zooniverse: Online Citizen Science Platforms 38
2.3.2 FoldIt: Citizen Science Games 42
2.4 Summary 46
2.4.1 Crowdsourcing Skills 47
2.4.2 Design of Crowdsourcing 48

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

3 Open Online Knowledge Sharing 50
3.1 Background 50
3.2 Open Sharing of Scientific Knowledge 51
3.2.1 Open Access Publishing 51
3.2.2 Open Database Projects 52
3.2.3 Open Textbooks 54
3.2.4 Wikipedia 56
3.2.5 The Polymath Project 58
3.2.6 Galaxy Zoo Quench 61
3.3 Open Sharing of Practical Knowledge 62
3.3.1 Open Sharing of Videos 62
3.3.2 Open Sharing of Geographical Resources 66
3.3.3 Open Sharing of Corporate Knowledge 67
3.3.4 Open Sharing of Political Arguments 68
3.4 Summary 72

4 Human Swarm Problem Solving 75
4.1 Background 75
4.2 Decision Threshold Methods 77
4.2.1 Quorum Decisions as Swarm Problem Solving among Animals 77
4.2.2 Human Quorum Response as Swarm Problem Solving 82
4.2.3 Majority Decisions 85
4.3 Averaging 88
4.3.1 Averaging as Swarm Problem Solving in Animals 88
4.3.2 Human Averaging as Swarm Problem Solving 90
4.4 Large Gatherings 93
4.4.1 Large Gatherings as Swarm Problem Solving among Animals 93
4.4.2 Large Gatherings as Human Swarm Problem Solving 96
4.5 Heterogeneous Social Interaction 104
4.5.1 Heterogeneous Social Interaction in Animal Swarm Problem Solving 104
4.5.2 Human Heterogeneous Social Interaction as Human Swarm Problem Solving 108
4.6 Environmental Sensing 114
4.6.1 Environmental Sensing in Animal Swarm Problem Solving 114
4.6.2 Human Environmental Sensing 118
4.7 What Is Human Swarm Problem Solving? 124
4.7.1 Predefined Problems 125
4.7.2 Prespecified Problem-Solving Procedures 126
4.7.3 Rapid Time-Limited Problem Solving 129
4.7.4 Individual Learning 131
4.7.5 Summary of the Basic Characteristics in Human Swarm Problem Solving 133

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

5 The Origins of Human Swarm Problem Solving 135
5.1 Background 135
5.2 The Emergence of Group Hunting 136
5.3 The Emergence of Premodern Trade 139
5.4 Human Swarm Problem Solving in Ancient Athens 143
5.4.1 Maximizing Information about the Athenian Territory 143
5.4.2 Heterogeneous Social Interaction through Rotation and Randomization 147
5.4.3 Decision Threshold Methods in the Assembly and the People's Court 153
5.4.4 Large Gatherings in Athens 159
5.5 A Summary of Human Swarm Evolution 163
5.5.1 The Evolution of Synchronized Swarm Problem Solving 165
5.5.2 The Evolution of Pinpointed Swarm Problem Solving 167

6 Human Stigmergic Problem Solving 171
6.1 What Is Stigmergic Problem Solving? 171
6.1.1 Background 171
6.1.2 Quantitative Stigmergy 173
6.1.3 Qualitative Stigmergy 175
6.1.4 Sematectonic Stigmergy 177
6.1.5 Marker-Based Stigmergy 178
6.1.6 Human Stigmergic Problem Solving Is Solution-Centered 178
6.2 Rating Complete Solutions 180
6.2.1 Search Engines and Collaborative Filtering 180
6.2.2 Different Rating Methods 184
6.3 Reestimating Solutions 186
6.4 Completing Solutions 192
6.5 Adapting Complete Solutions 195
6.5.1 Background 195
6.5.2 Open Textbooks 195
6.5.3 Internet Memes 197
6.6 What Is Human Stigmergic Problem Solving? 200
6.6.1 Solution-Centered Collective Problem Solving 200
6.6.2 "Rating Complete Solutions" as Marker-Based, Quantitative Stigmergy 203
6.6.3 "Reestimating Solutions" as Quantitative, Sematectonic Stigmergy 204
6.6.4 "Completing Solutions" as Qualitative, Sematectonic Stigmergy 204
6.6.5 "Adapting Complete Solutions" as Sematectonic, Qualitative Stigmergy 206
6.6.6 Improvement of Solutions as the Basis for Human Stigmergic Problem Solving 207

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

7 The Origins of Human Stigmergic Problem Solving 208
7.1 Background 208
7.2 The Invention of Writing 209
7.3 The Invention of the Printing Press 214
7.3.1 Mass Copying of Printed Information 215
7.3.2 Flexible Modification of Printed Information 225
7.4 A Summary of Human Stigmergic Evolution 232
7.4.1 The Invention of Writing 232
7.4.2 The Invention of the Printing Press 234
7.4.3 The Invention of the Internet 235

8 Collaborative Problem Solving 238
8.1 Background 238
8.2 Working Well with Others 239
8.2.1 Being in a Symmetrical Group Relationship 240
8.2.2 Interest in Meeting People Who Are Different 241
8.3 Cognitive Diversity 242
8.4 Equal Participation 247
8.5 Joint Coordination 250
8.5.1 Establishing a Shared Understanding of the Problem 251
8.5.2 Planning the Process 251
8.5.3 Staying Focused on Shared Goals 251
8.5.4 Ensuring the Conversational Flow 252

9 The Origins of Collaborative Problem Solving 254
9.1 Background 254
9.2 Antecedents to Mutual Collaboration 254
9.2.1 Mutual Collaboration Originates from Gestural Communication 255
9.2.2 Three Communicative Motives 258
9.2.3 The Joy of Collaboration 260
9.3 Antecedents to Collaborative Culture 262
9.3.1 The Emergence of a Community of Learners 262
9.3.2 Equal Participation 266
9.4 A Summary of the Evolution of Collaborative Problem Solving 271

10 Intelligent Engagement 276
10.1 Background 276
10.2 Mass Deliberation 278
10.2.1 Citizens' Council in Ostbelgien 279
10.2.2 Better Reykjavík 282
10.3 Mass Voting 285
10.4 Transparent Collective Work 290
10.4.1 Crowd Peer Review 292
10.4.2 The Icelandic Experiment 295
10.4.3 Crowdsourcing Bills of Law 296

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

10.5 Social Media Activism 298
10.6 Dysfunctional Engagement 303
10.7 Summary 309

11 Intelligent Contributions 313
11.1 Background 313
11.2 Many Different Perspectives on the Same Work 314
11.3 The Golden Middle Way Is the Best Solution 317
11.3.1 Meeting at the Quantitative Middle Point 318
11.3.2 Finding a Balanced Representation of All Sides 319
11.3.3 Identifying Commonalities 320
11.4 Searching for the Unexpected Solution 325
11.5 Modularizing the Tasks 329
11.5.1 A Modularization Strategy 329
11.5.2 Modularization in Strongly Interconnected Content Structures 332
11.5.3 Modularization in Loosely Connected Content Structures 333
11.6 Summary 335

12 Intelligent Evaluations 340
12.1 Background 340
12.2 The Reputation Society 341
12.2.1 The Emergence of the Reputation Society 341
12.2.2 Online Reputations Moving into New Domains 344
12.2.3 Reputation Score Systems in Social Media 346
12.3 Evaluating the Collective Work 349
12.3.1 Shared Coordination 349
12.3.2 The Need for Coordinators 353
12.4 Institutionalizing Critical Discourse 355
12.4.1 The Nomothetai 355
12.4.2 The Citizen's Assembly in Ireland 356
12.4.3 Knowledge Commons 361
12.5 Summary 363

13 COVID-19 as a Wicked Problem 366
13.1 Background 366
13.2 The Test and Trace Strategy 368
13.3 Effective Communication about the Pandemic 370
13.4 Rule Compliance 373
13.5 COVID-19 in a CI Perspective 375
13.5.1 Transparent Information 376
13.5.2 Citizen Responsibility 377
13.5.3 Collective Learning 378

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

14 Motivation to Contribute 381
14.1 Background 381
14.2 Being Immersed 382
14.2.1 Being Immersed in Simple Tasks 382
14.2.2 Being Immersed in Complex Tasks 383
14.3 Being Recognized 384
14.4 Being Part of a Community 386
14.5 Learning as Motivation 389
14.5.1 Individual Learning as Motivation 389
14.5.2 Collective Learning as Motivation 390
14.5.3 Transformative Learning as Motivation 391
14.6 Economic Motivation 392
14.7 Making Societal Contributions 393
14.8 Summary 396

15 The Intelligent Society 399
15.1 Background 399
15.2 Instrumentarian Intelligence 401
15.3 Civic Intelligence 408

References 419
Index 442

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

Figures

4.1 Two worker ants of the species *Temnothorax albipennis* performing a tandem run, image courtesy of Thomas O'Shea-Wheller, 2016 *page* 80
4.2 Meerkat (*suricata suricatta*) digging in the Kalahari Desert, photo © Tim Jackson/Getty Images 81
4.3 People raise their hands to vote during the annual Landsgemeinde meeting at a square in the town of Appenzell, April 29, 2012. Appenzell is one of Switzerland's two remaining Landsgemeinden, a 700-year tradition of an open-air assembly in which citizens can take key political decisions directly by raising their hands, photo Christian Hartmann/Reuters/NTB © 84
4.4 Olive Baboons crossing Uaso Nyiro River in Kenya, photo Don Farrall/Getty Images © 89
4.5 The honeybee waggle dance. The direction the bee moves informs others about where the site is. The duration of each dance informs about the distance to the site, photo Paul Starosta/Getty Images © 95
4.6 Hackathon in Berkeley, California in 2018. Students work at Cal Hacks 5.0, the largest collegiate hackathon, in Berkeley, CA, November 3, 2018, photo Max Whittaker/The New York Times/NTB 100
4.7 Cow moose defends her newly born calf from the Grant Creek wolf pack while surrounded in a tundra pond in Denali National Park, Alaska, photo Patrick J. Endres/Getty Images © 105
4.8 African Elephant herd walking on marshy area of Amboseli National park, Kenya. The oldest female is the leader of the herd, photo Manoj Shah/Getty Images © 106

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

4.9 Starlings move as one giant organism to synchronize their defence against predators, Kent, United Kingdom, photo Sandra Standbridge/Getty Images © 115
4.10 Bronze whaler shark swimming through a giant ball of sardines, waiting to feed on them. Off the East coast of South Africa, photo wildestanimal/Getty Images © 117
5.1 *The Venus of Willendorf.* This is an 11-centimetre Venus figurine estimated to have been made around 25,000 years ago. It was found in Austria and is carved from a limestone that is not local to the area, photo Dorling Kindersley/Getty Images © 141
5.2 The kleroterion, the Greek lottery machine. These machines were primarily used to select jurors in Athens. Each court had machines placed in front of the entrance. The model of this kleroterion has 11 columns and was probably not used in the courts, but in the Council. There were 12 tribes in the third century BC and the kleroterion could then be used to select committee members representing all tribes except the one holding the presidency, photo Gianni Dagli Orti/REX/Shutterstock editorial/NTB © 150
5.3 The Chigi vase from seventh century BC showing hoplites going to battle, photo Francesco Bino, image courtesy of The National Etruscan Museum © 155
5.4 Ostraka, shards of pottery used as a voting ballot. The name of Themistocles, son of Neocles, are written on the shards of pottery. He was banned from Athens through ostracism in 470 BC, Agora Museum, Athens, Greece, photo Akg-images/NTB © 156
5.5 The Pnyx hill in Athens where the Assembly had its meetings, photo Miguel Sotomayor/Getty Images © 160
6.1 Leafcutter ants following the same trail when carrying leaves back to the nest, photo Ricardo Riechelmann/EyeEm/Getty Images © 174
6.2 Cathedral termite mounds near Adelaide River, Northern Territory, Australia. The termite mound structures are approximately 100 years old and can stand up to seven meters in height. The mounds are made with a combination of soil, mud, chewed wood, and saliva. The life of the termite is a constant race against rain because a heavy downpour can ruin part of the mounds. Therefore, the termites will always be

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

rebuilding their mounds, photo Yvonne van der Horst/Getty Images © 174
6.3 Potter wasp building mud nest, São Paulo, Brazil, photo Kassá/Getty Images © 176
6.4 Two hornets building a nest together by making hexagonal cells, Mana, HI, United States, photo Craig Damlo/Getty images © 177
6.5 Cheetahs scent marking their territory together, Masai Mara in Kenya, photo Mike Powles/Getty images © 179
7.1 Inscribed clay tablet from third millennium BC. Proto-Cuneiform clay tablet with seal impressions: administrative account of barley distribution with cylinder seal impression of a male figure, hunting dogs, and boars ca. 3100–2900 BC. Sumerian, Mesopotamia, probably from Uruk (modern Warka), photo Raymond and Beverly Sackler Gift, 1988/The Metropolitan Museum of Art 210
7.2 Egyptian scribes managing granaries when reaping the corn. The scribes record quantities of harvest wheat, probably for tax purposes. Tomb of Menna. Detail from the frescoes in the vestibule, XVIII dynasty of Amenhotep III in Luxor. Original ca. 1400–1352 BC, photo Z. Radovan/Bible Land Pictures/AKG/NTB 213
7.3 *The Printer's Workshop*, 1568. One of 133 woodcut book illustrations, showing the interior of a printing press. In the foreground, two men working at the press, the right man applying ink onto the letterpress matrix, the left man taking off a freshly printed sheet. In the background, two men seated in front of type drawers, holding a composition stick. In the foreground, two piles of printed and blank sheets of paper. Credit: From Panoplia by Hartmann Schopper. (Frankfurt-am-Main, 1568), Photo © The Trustees of the British Museum 216
7.4 Martin Luther's translation of the New Testament, 1524. Luther's first translation of the New Testament arrived in September 1522. This 1524 edition was printed by Melchior Lotter in Wittenberg, Germany. Its most stunning distinction is the 44 woodcuts made by Georg Lemberger in what is known as Fürstenkolorit. In this type of illumination, the woodcuts are colored and heightened with gold, suggesting this Bible was created for an aristocrat.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

Luther downplayed the importance of priests, arguing that the divine text was straightforward enough for everyone to read and understand, Image Courtesy Museum of the Bible Collection. All rights reserved. © Museum of the Bible, 2021 220
7.5 Book frontispiece from 1679. Portrait of Jean-Baptiste Tavernier (1605–1689). Tavernier was a seventeenth-century French gem merchant and traveler. In 1675, he published Les Six Voyages de Jean-Baptiste Tavernier from his six voyages to Persia and India between the years 1630 and 1668. Credit: State Library Victoria, Australia 222
7.6 Printed illustrations in John Gerard's *Herbal History of Plants* from 1633. This is the most famous English herbal, first published in 1597. Credit: Gerard, J., Davyes, R., Johnson, T., Priest, R., Dodoens, R. & Katherine Golden Bitting *Collection on Gastronomy* (1633). *The herball: or, Generall historie of plantes*. London, Printed by Adam Islip, Joice Norton and Richard Whitakers. Retrieved from the Library of Congress, Washington, DC, United States. www.loc.gov/item/44028884/ 226
7.7 *Theatre of the World, 1570.* Theatrum Orbis Terrarum (Theatre of the World), is considered to be the first true modern atlas, written by Abraham Ortelius and originally printed on May 20, 1570, in Antwerp, World Map. Credit: Ortelius, A., Diesth, A. C. & Llwyd, H. (1570) Theatrvm Orbis Terrarvm. Antverpiae: Apud Aegid. Coppenium Diesth. [Map] Retrieved from the Library of Congress, Washington, DC, United States, www.loc.gov/item/98687183/ 227
7.8 An overview of human stigmergic evolution through three different phases, author: own work 233
9.1 Smiling baby girl pointing at a unicorn figure, photo Westend61/Getty Images © 258
9.2 Regular flint handaxe from Boxgrove, West Sussex, England. From the Acheulian period. The typical tool is a general-purpose handaxe. Credit: © The Trustees of the British Museum 263
14.1 A juror identity card or pinakia identifying citizen by names. Clay fragment with Greek inscription, fourth century BC. The identity cards list the name of the juror, his father, and that of his area (demos). When selecting jurors by lot, these plates or "identity tokens" were inserted into the kleroterion,

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

the randomization machine. This fragment is located in the museum of the Ancient Agora, Athens. Photo John Hios/Akg-images/NTB 394

15.1 Printer's workshop in Antwerp, sixteenth century. Fourth plate from a print series entitled Nova Reperta (New Inventions of Modern Times) consisting of a title page and 19 plates, engraved by Jan Collaert I (ca. 1530–1581), after Jan van der Straet, called Stradanus, and published by Philips Galle around 1600. Illustration of men working at the book mill in Antwerp, Belgium. In the background, a man prepares paper for printing in the press depicted on the right. In a screw press such as that shown, each sheet had to be laid on the type, moved into the press, and pressure applied using the screw. In the center of the foreground, a young boy lays out the newly printed paper for proofreading. On the left, workers set type to be printed. Credit Harris Brisbane Dick Fund, 1934. The Metropolitan Museum of Art, CC0 1.0 Universal Public Domain Dedication 409

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-83374-5 — Cultural-Historical Perspectives on Collective Intelligence
Rolf K. Baltzersen
Frontmatter
More Information

Tables

6.1 A comparison between the election results in the swing states in the US 2020 presidential election and the results from a prediction market *page* 187
6.2 An overview of the four different types of stigmergic problem solving 202
9.1 A comparison of elaborative collaborative problem solving and rule-governed collaborative problem solving 274
14.1 An overview of different motivational factors relevant to CI 397
15.1 A comparison of civic intelligence and instrumentarian intelligence. Two competing models for an intelligent society 412

© in this web service Cambridge University Press www.cambridge.org