## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>xvii</td>
</tr>
<tr>
<td>Preface</td>
<td>xix</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>xxiii</td>
</tr>
<tr>
<td>Contributors</td>
<td>xxv</td>
</tr>
<tr>
<td>Chapter 1: Let There Be Light</td>
<td>1</td>
</tr>
<tr>
<td>Jack Park</td>
<td></td>
</tr>
<tr>
<td>Opening Salvo</td>
<td>1</td>
</tr>
<tr>
<td>Resources</td>
<td>8</td>
</tr>
<tr>
<td>Topic Maps: General</td>
<td>8</td>
</tr>
<tr>
<td>Topic Map Software: Commercial</td>
<td>9</td>
</tr>
<tr>
<td>Topic Map Software: Open Source</td>
<td>9</td>
</tr>
<tr>
<td>What's in Here?</td>
<td>9</td>
</tr>
<tr>
<td>Historical and Background Chapters</td>
<td>10</td>
</tr>
<tr>
<td>Technical Chapters</td>
<td>11</td>
</tr>
<tr>
<td>Forward-Thinking Chapters</td>
<td>14</td>
</tr>
<tr>
<td>Chapter 2: Introduction to the Topic Maps Paradigm</td>
<td>17</td>
</tr>
<tr>
<td>Michel Biezunski</td>
<td></td>
</tr>
<tr>
<td>Managing Complex Knowledge Networks</td>
<td>17</td>
</tr>
<tr>
<td>Primary Constructs</td>
<td>18</td>
</tr>
<tr>
<td>Topics</td>
<td>18</td>
</tr>
<tr>
<td>Associations</td>
<td>19</td>
</tr>
<tr>
<td>Names</td>
<td>19</td>
</tr>
<tr>
<td>Scopes and Namespaces</td>
<td>20</td>
</tr>
<tr>
<td>Rules for Merging Topic Maps</td>
<td>21</td>
</tr>
</tbody>
</table>
## CONTENTS

The Big Picture: Merging Information and Knowledge .................. 22
A Step Toward Improved Interconnectivity ............................. 22
Design Principles for XTM ........................................ 23
  Simplicity .................................................. 23
  Neutrality ............................................... 25
From ISO/IEC 13250 to XTM ....................................... 25
Summary ....................................................... 30
Acknowledgments ................................................... 30

Chapter 3:  A Perspective on the Quest for Global Knowledge Interchange ........................................ 31

Steven R. Newcomb
Information Is Interesting Stuff ........................................ 32
Information and Structure Are Inseparable ......................... 34
Formal Languages Are Easier to Compute Than
  Natural Languages .......................................... 34
Generic Markup Makes Natural Languages More Formal ........ 35
A Brief History of the Topic Maps Paradigm ...................... 37
Data and Metadata: The Resource-Centric View .................. 40
  Metametadata, Metametametadata ............................... 42
Subjects and Data: The Subject-Centric View .................... 42
Understanding Sophisticated Markup Vocabularies ............... 45
The Topic Maps Attitude ........................................ 48
Summary ....................................................... 50

Chapter 4: The Rise and Rise of Topic Maps .......................... 51

Sam Hunting
Milestones in Standards and Specifications ....................... 53
  XTM 1.0 versus ISO 13250 .................................. 54
  OASIS ..................................................... 55
  Current ISO Activities ...................................... 55
Milestones in Software ............................................. 64
The Future of Topic Maps ........................................... 65
  The State of the Paradigm ................................ 65
  The Near Future ............................................ 66
**Chapter 5:** Topic Maps from Representation to Identity: Conversation, Names, and Published Subject Indicators .............................................................. 67

*Bernard Vatant*

What Is the Conversation About? ................................................................. 67
A Finger Pointing at a Planet ...................................................................... 69
So What about Published Subject Indicators? ........................................... 73
PSIs Are Binding Points for Subject Identity ............................................. 74
PSIs Have to Meet High Quality Requirements ......................................... 75
PSIs Are Good for Pragmatic Bottom-up Tasks ......................................... 75
PSIs Cannot Pretend to Universality nor Strong Symbolic Signification ...... 76
Back to the Conversation Subject ............................................................... 77
Addendum: A Note on the Figures ............................................................... 79

**Chapter 6:** How to Start Topic Mapping Right Away with the XTM Specification ................................................................. 81

*Sam Hunting*

XTM Topic Mapping ..................................................................................... 81
WhyTopicMaps? .......................................................................................... 82
Appetizer ...................................................................................................... 83
Introducing `<topic >`, `<baseName >`, `<scope >`, `<basenamestring >`, and `<occurrence >` ...................................................... 84
Introducing `<subjectIdentity >` ................................................................ 85
Introducing `<scope >` ................................................................................ 87
Main Course .................................................................................................. 88
Introducing `<association >`, `<member >`, and `<roleSpec >` ...................... 89
Introducing `<instanceof >` ...................................................................... 90
Dessert .......................................................................................................... 93
Brandy, Cigars ............................................................................................ 97
Introducing `<variant >`, `<variantName >`, and `<parameters >` ............... 97
Introducing `<resourceData >` .................................................................... 98
Paying the Bill and Putting on Your Coat .................................................. 98
Summary ...................................................................................................... 99
Acknowledgments ....................................................................................... 100
Resources .................................................................................................... 100
Chapter 7: Knowledge Representation, Ontological Engineering, and Topic Maps

Leo Obrst and Howard Liu

Knowledge as Interpretation

Data, Knowledge, and Information

Knowledge Issues: Acquisition, Representation, and Manipulation

The Roots of Ontological Engineering: Knowledge Technologies

Root: Knowledge Representation

Root: Knowledge Engineering

Slightly Shriveled Root: Expert Systems (and Their Deficiencies)

New Knowledge Technology Branches: Toward Ontological Engineering

Branch: The Formalization of Semantic Networks and the Rise of Description Logics

Branch: Constraint and Logic Programming

Ontological Engineering

Ontologies and Topic Maps

Ontologies

How Ontologies Relate to Topic Maps

How to Build an Ontology

Ontology-Driven Topic Maps

The Advantages of the Ontology-Driven Topic Maps Approach

The Future of the Ontology-Driven Topic Maps Approach

Summary

Acknowledgments

References

Selected Information and Research Sites

Chapter 8: Topic Maps in the Life Sciences

John Park and Nefer Park

A Literature Review

The Need for Classification

The Five Kingdoms

Kingdom Animalia
Creating Topic Maps for a Web Site ................................................................. 155
A First View ........................................................................................................ 155
Developing the XTM Document ...................................................................... 155
Where Are We Now? ......................................................................................... 163
Summary ............................................................................................................ 165
Resources for More Information on the Life Sciences .................................. 166

Chapter 9: Creating and Maintaining Enterprise Web Sites with Topic Maps and XSLT ................................................................. 167
Nikita Ogievetsky
The XTM Framework for the Web ..................................................................... 168
XTM as Source Code for Web Sites ................................................................. 171
HTML Visualization of Topic Map Constructs .............................................. 173
Topics .................................................................................................................. 174
  Special <topic> Elements: Root ...................................................................... 174
  The Special Topic Map Website Ontology Layer ........................................... 176
XSLT Layers ....................................................................................................... 182
The XSLT Layout Layer ..................................................................................... 183
The XSLT Back-End and Presentation Layers ................................................ 188
  Querying Topic Types .................................................................................... 188
  Querying and Displaying Topic Names ......................................................... 190
  Querying and Displaying Topic Occurrences ............................................... 192
  Querying and Displaying Topic Associations .............................................. 195
Summary ............................................................................................................ 197
Acknowledgments ............................................................................................. 197
References ......................................................................................................... 198

Chapter 10: Open Source Topic Map Software ............................................... 199
About Open Source Software .......................................................................... 199
Four Projects ..................................................................................................... 200

SemanText ......................................................................................................... 204
Eric Freese
  Browsing Topic Maps ..................................................................................... 204
  Creating and Modifying Topic Maps ............................................................. 204
  Developing Inference Rules .......................................................................... 208
  Future Plans .................................................................................................. 209
  Summary .................................................................................................... 210
XTM Programming with TM4J
Kal Ahmed
The TM4J Core API .................................................. 211
File Organization and Packaging .................................... 211
Package Dependencies .................................................. 213
Getting Started .......................................................... 213
Using the Basic API Features ........................................ 213
Loading a Topic Map .................................................... 218
Creating Implicit Topics ............................................... 220
Saving a Topic Map ...................................................... 221
Using the Advanced API Features .................................... 223
Property Change Listeners .............................................. 225
TM3—A Sample Topic Map Processing Application ............. 228
Defining the Topic Map Ontology .................................... 228
Designing the Application .............................................. 229
Implementing the Application ......................................... 230
Extending the Application .............................................. 243
TM4J Future Directions ................................................ 244
Summary ................................................................. 244

Nexist Topic Map Testbed
Jack Park
The Development of Nexist ......................................... 244
The Past ................................................................. 245
The Present ............................................................. 245
Use Cases ............................................................... 245
Design Requirements .................................................. 249
The Persistent XTM Engine ............................................ 249
The Persistent Store .................................................... 249
The XTM Engine ........................................................ 251
The User Interface ...................................................... 254
The Server User Interface ............................................. 254
The Client User Interface ............................................. 254
Summary ................................................................. 260
References ............................................................... 260
GooseWorks Toolkit .......................................................... 260

5am Hunting
  Program Design ...................................................... 261
  GwTk’s Omnivorous Nature ........................................... 262
  ISO Compliance ..................................................... 263
  Use Cases ............................................................ 263
  Query Language ..................................................... 264
  Current Tools ....................................................... 265
  Summary ............................................................. 265

Chapter 11: Topic Map Visualization .................................. 267
Bénédicte Le Grand
  Requirements for Topic Map Visualization ....................... 267
    Different Uses for Topic Maps ................................. 268
    Representation Requirements .................................. 268
    Navigation Requirements ...................................... 269
  Visualization Techniques ........................................ 270
    Current Topic Map Visualizations ............................. 270
    General Visualization Techniques ............................ 270
  Summary ............................................................. 281
  References .......................................................... 281

Chapter 12: Topic Maps and RDF ..................................... 283
Eric Freese
  A Sample Application: The Family Tree ........................ 283
  RDF and Topic Maps ................................................ 284
    An Introduction to RDF ........................................ 284
    The RDF DataModel ............................................. 285
    RDFXML Syntax ................................................ 288
    RDF Schema .................................................... 291
    The Similarities ............................................... 292
    The Differences ................................................ 294
  Combining Topic Maps and RDF .................................. 295
    Modeling RDF Using Topic Map Syntax ......................... 296
    Example 1: Markup Schemes .................................... 299
    Example 2: Topic Reification .................................. 300
    Example 3: Associations ....................................... 301
Example 4: Bag Data Structure .................................................. 303
Example 5: Another Association ............................................... 305
Example 6: Multiple Occurrences .............................................. 307
Example 7: Another Bag Data Structure ................................. 309
Example 8: RDF ................................................................. 311
Example 9: Sorted Data Structures ......................................... 315
Example 10: Aggregation ......................................................... 316
Example 11: Relational Data Structures ................................. 320
Example 12: Dublin Core Metadata ......................................... 321
Summary ............................................................................. 325
References .......................................................................... 325

Chapter 13: Topic Maps and Semantic Networks .................. 327

Eric Freese
Semantic Networks: The Basics ............................................. 328
Comparing Topic Maps, RDF, and Semantic Networks ........... 330
Building Semantic Networks from Topic Maps ..................... 330
Published Subject Indicators ................................................. 331
Association Properties ......................................................... 332
Type Hierarchies ................................................................. 334
Topic Map Schemas ............................................................. 339
Harvesting the Knowledge Identified in Markup .................... 353
Identifying and Interpreting the Knowledge Found within Documents .................................................. 353
Summary ............................................................................. 354
References .......................................................................... 355

Chapter 14: Topic Map Fundamentals for Knowledge Representation .................................................. 357

H. Holger Rath
A Simple KR Example ............................................................ 357
Topic Map Templates ............................................................. 360
Class Hierarchies .................................................................. 362
Superclass-Subclass Relationship as Association .................. 363
Class-Instance Relationship as Association ......................... 364
Association Properties .......................................................... 365
### Chapter 15: Topic Maps in Knowledge Organization

Alexander Sigel

Suggestions for Reading This Chapter ........................................... 383
KO, Knowledge Structures, and TMs ........................................... 385
KOxTM: Impact Directions and Open Questions .......................... 386
What Is KO? ........................................................................... 391
KO as a Use Case for TMs ......................................................... 424
KO: A Primary Use Case for TMs ................................................. 425
Knowledge Networks in KM: ATypical KOxTM Use Case .............. 425
KO on Topic Map Core Concepts (the "T-A-O" and "I-F-S" of Topic Maps) .................................................. 426
The Potential Value of TMs for KO ............................................. 427
Temporary Impediments to TM Adoption: KO Prejudices ............. 428
KO Challenges That Recur with TMs .......................................... 430
Examples of KO Issues That Recur with TMs ............................. 431
Illustrative Examples ............................................................... 438
Shorter Examples of Fruitful KO with TMs ................................. 439
Toward a TM on KO Resources: First Experiences ...................... 447
A Look into the Future: Toward Innovative TM-Based Information Services .................................................. 449
Chapter 16: Prediction: A Profound Paradigm Shift
Kathleen M. Fisher

Language
Transmitting the Word
Lightness of Being
A Brief History of Knowledge Representation and Education
The Ephemeral Nature of Many New Ideas
What the Research Suggests about Knowledge Representation and Learning
Students Learn from Semantic Networks
Students’ Models Become Increasingly Similar to Instructors’ Models
Constructing Semantic Networks Alters the Ways We Think and Learn
Semantic Network-Based Courses Teach, Not Just Tell
Understanding Relations Is Understanding
A Paradigm Shift: Patterning Speech to Patterning Thought

Chapter 17: Topic Maps, the Semantic Web, and Education
Jack Park

What Is the Semantic Web?
How Can Topic Maps Play an Important Role in the Semantic Web?
What’s Next?
Education on the Web
Constructivist Learning Theory
Principles of Constructivist Learning
Toward Constructivist Learning Environments
IBIS
Topic Maps
Toward an Implementation ........................................ 521
An Application ...................................................... 526
Closing Salvo ......................................................... 526
References ............................................................ 527

Glossary ............................................................... 531

Appendix A: Tomatoes Topic Map ............................... 543
Appendix B: Topic Map for Chapter 9 ......................... 547
Appendix C: XSLT Style Sheet for Chapter 9 ............... 563
Appendix D: Genealogical Topic Map ......................... 569

Index ................................................................. 585