THE QUEST FOR A UNIVERSAL THEORY OF LIFE
Searching for Life As We Don’t Know It

Integrating both scientific and philosophical perspectives, this book provides an informed analysis of the challenges of formulating a universal theory of life. Among the issues discussed are crucial differences between definitions and scientific theories and, in the context of examples from the history of science, how successful general theories develop. The central problem discussed is two-fold: First, our understanding of life is still tacitly wedded to an antiquated Aristotelian framework for biology; second, there are compelling reasons for considering that familiar Earth life, which descends from a last universal common ancestor, is unrepresentative. What is needed are examples of life as we don’t know it. Potential sources are evaluated, including artificial life, extraterrestrial life, and a shadow biosphere right here on Earth. A novel strategy for searching for unfamiliar life in the absence of a definition or general theory is developed. This book is a valuable resource for graduate students and researchers studying the nature, origins, and extent of life in the universe.

Carol E. Cleland is Professor of Philosophy at the University of Colorado, Boulder, USA, where she is also Director of the Center for the Study of Origins and a Co-Investigator at the Center for Astrobiology. She teaches advanced interdisciplinary courses in the philosophy of science, including graduate seminars on central issues in astrobiology. She publishes papers in major science and philosophy journals, and is co-editor of the anthology The Nature of Life (Cambridge University Press, 2010).
“An essential read for anyone interested in the nature of life and its origins. Cleland’s philosophical outlook means that she approaches the subject from a fresh perspective, framing important questions rarely discussed by scientists … and deliberating points in a provocative way that forces readers to examine some of their cherished beliefs that they thought were self-evident.”

Athel Cornish-Bowden,
French National Center for Scientific Research, Marseilles, France

“What is life? What universal principles apply to any biosphere? Our efforts to answer these deep questions are stymied because of our biased, Earth-bound perspective with only one kind of (known) life. In a book rich with original ideas and lucid insights, science philosopher Carol Cleland considers life from the perspective of what we don’t know – the limitations, hidden biases, sloppy definitions, and false assumptions that may lead us astray. From ‘shadow biospheres’ on Earth, to artificial life in the lab, to alien lifeforms in distant galaxies, Cleland expands our minds and leads us to rethink what we thought we knew.”

Robert Hazen,
Carnegie Institution for Science, Washington, USA

“Searching for life elsewhere in our solar system or beyond is at the forefront of science today due to recent discoveries about terrestrial life, planetary environments, and planets around other stars. We can’t extrapolate from our single example of life on Earth, which all share common biochemistry and are descended from a common ancestor, as to what the characteristics of life elsewhere in the universe might be. Given these uncertainties, how can we identify something as alive? What does it mean to be living? What is life? Carol Cleland takes a philosophy of science approach to what constitutes life, integrating it with biology in a planetary context. She has made a valuable contribution to our understanding of the nature of life and how to search for it, both on Earth and elsewhere.”

Bruce Jakosky,
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THE QUEST FOR A UNIVERSAL THEORY OF LIFE

Searching for Life As We Don’t Know It

CAROL E. CLELAND

University of Colorado, Boulder
For Leta and Elspeth
Contents

Acknowledgments xii
Introduction 1
1 The Enduring Legacy of Aristotle: The Battle over Life as Self-Organization or (Genetic-Based) Reproduction 8
  1.1 Overview 8
  1.2 Aristotle on the Nature of Life: Nutrition Versus Reproduction 10
  1.3 Classical Mechanism about Life: From Optimism to Quiet Desperation 15
  1.4 Darwin to the Rescue? 18
  1.5 Here We Go Again: Aristotelian Roots of Contemporary Accounts of the Nature and Origin(s) of Life 21
    1.5.1 Metabolism-Based Versus Evolution-Based Definitions of the Nature of Life 22
    1.5.2 Metabolism-First Versus Genes-First Theories of the Origin(s) of Life 25
  1.6 Concluding Thoughts 29
2 Why Life Cannot Be Defined 33
  2.1 Overview 33
  2.2 Popular Definitions of Life 36
    2.2.1 Thermodynamic Definitions 36
    2.2.2 Metabolic Definitions 37
    2.2.3 Evolutionary Definitions 40
    2.2.4 Defining Life as Self-Organized Complexity 43
  2.3 The Problem with Definitions 45
    2.3.1 Logical Character of Definition 45
    2.3.2 Limits of Definition 50
2.3.3 Diagnosing the Problem: A Defective Theory of Meaning and Reference 53
2.3.4 Why Natural Kinds Cannot Be “Defined” 55
2.3.5 Is life an Exception to the Rule? 59
2.4 Concluding Thoughts 61

3 What Is a Scientific Theory?
3.1 Overview 63
3.2 The Syntactic Conception of Scientific Theories 65
3.3 The Semantic Conception of Scientific Theories 68
3.4 Scientific Theories and Definitions 73
    3.4.1 Scientific Theories Do Not “Define” Natural Kinds 74
    3.4.2 Nonstandard Definitions Do Not “Define” Scientific Theories 76
3.5 Concluding Thoughts 79

4 How Scientific Theories Develop
4.1 Overview 82
4.2 How Scientifically Fruitful Ontologies Develop: Content Matters 84
4.3 The Goldilocks Level of Abstraction 88
4.4 The Threat Posed by Premature Commitment to Ontologies 93
4.5 The Monist (Versus Pluralist) Stance 98
4.6 Concluding Thoughts 102

5 Challenges for a Universal Theory of Life
5.1 Overview 105
5.2 The Magnitude of the $N = 1$ Problem of Biology 107
5.3 Microbes: The Most Representative and Least Well Understood Form of Earth Life
    5.3.1 Planet of the Microbes 115
    5.3.2 A Brief History of Misunderstandings and Surprises 118
5.4 The Problem of Contingencies and the Origin(s) of Life 120
    5.4.1 A Plague of Contingencies (on Both the SM World and the RNA World) 123
    5.4.2 The Origin Versus Nature Problem 127
5.5 Concluding Thoughts 130

6 Rethinking the Traditional Paradigm for Life: Lessons from the World of Microbes 132
6.1 Overview 132
6.2 Evolution Viewed Through the Lens of the Microbial World 133
    6.2.1 The Concept of a Biological Species and the Tree of Life 134
## Contents

6.2.2 Is Lamarck Hiding in the Shadows? 138

6.3 The Living Individual Viewed Through the Lens of the Microbial World 143

6.3.1 Is the Host–Microbiome Complex (Holobiont) a Living Thing? 146

6.3.2 Biofilms: Aggregates of Cells or Living Individuals? 149

6.3.3 Could Rock-Powered Ecosystems Be Living Things? 155

6.4 Concluding Thoughts 159

7 Artificial Life: Could ALife Solve the $N = 1$ Problem? 161

7.1 Overview 161

7.2 Soft ALife: Digital Organisms? 161

7.3 Hard ALife: Living Robots? 164

7.4 Synthetic Biology: Creating Novel Life in the Laboratory? 167

7.5 Concluding Thoughts 170

8 Searching for Extraterrestrial Life Without a Definition or Universal Theory of Life 172

8.1 Overview 172

8.2 A Case Study: The Viking Missions to Mars 172

8.3 The Role of Anomalies in Scientific Discovery 176

8.4 Searching for Anomalies Using Tentative (Versus Defining) Criteria 184

8.5 Concluding Thoughts 193

9 A Shadow Biosphere: Alien Microbes on Earth? 195

9.1 Overview 195

9.2 How Scientifically Plausible Is a Shadow Biosphere? 196

9.2.1 Did Life Originate Only Once on Earth? 197

9.2.2 Could the Present-Day Earth Be Host to a Shadow Biosphere? 201

9.3 If They Exist, Why Have We Not Found Them? 206

9.3.1 Limitations to Microscopy 206

9.3.2 Limitations to Cultivation 207

9.3.3 Limitations to Metagenomic Methods 208

9.4 Potentially Biological Anomalies: Have We Already Encountered Them? 211

9.5 Concluding Thoughts 215

Conclusion 217

References 220

Index 243
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