

1. Record Nr.	UNINA9910830299203321
Titolo	Conflicting models for the origin of life // edited by Stoyan K. Smoukov, Joseph Seckbach, Richard Gordon
Pubbl/distr/stampa	Hoboken, New Jersey ; ; Beverly, Massachusetts : , : John Wiley & Sons, Inc. : , : Scrivener Publishing LLC, , [2023] ©2023
ISBN	1-119-55556-6 1-119-55555-8
Descrizione fisica	1 online resource (504 pages)
Disciplina	050
Soggetti	Astronomy
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Foreword, "Are There Men on the Moon?" by Winston S. Churchill -- Preface -- Appendix to Preface by Richard Gordon and George Mikhailovsky -- Part I: Introduction to the Origin of Life Puzzle -- Chapter 1 Origin of Life: Conflicting Models for the Origin of Life -- 1.1 Introduction -- 1.2 Top-Down Approach-The Phylogenetic Tree of Life -- 1.3 Bottom-Up Approach-The Hypotheses -- 1.4 The Emergence of Chemolithoautotrophs and Photolithoautotrophs? -- 1.5 Viruses: The Fourth Domain of Life? -- 1.6 Where are We with the Origin of Life on Earth? -- References -- Chapter 2 Characterizing Life: Four Dimensions and their Relevance to Origin of Life Research -- 2.1 Introduction -- 2.2 The Debate About (Defining) Life -- 2.2.1 The Debate and the Meta-Debate -- 2.2.2 Defining Life is Only One Way to Address the Question "What is Life?" -- 2.3 Does Origin of Life Research Need a Characterization of Life? -- 2.4 Dimensions of Characterizing Life -- 2.4.1 Dimension 1: Dichotomy or Matter of Degree? -- 2.4.2 Dimension 2: Material or Functional? -- 2.4.3 Dimension 3: Individual or Collective? -- 2.4.4 Dimension 4: Minimal or Inclusive -- 2.4.5 Summary Discussion of the Dimensions -- 2.5 Conclusion -- Acknowledgments -- References -- Chapter 3 Emergence, Construction, or Unlikely? Navigating the Space of Questions Regarding

Life's Origins -- 3.1 How Can We Approach the Origins Quest(ion)? -- 3.2 Avian Circularities -- 3.3 Assuming That... -- 3.4 Unlikely -- 3.5 Construction -- 3.6 Emergence -- References -- Part II: Chemistry Approaches -- Chapter 4 The Origin of Metabolism and GADV Hypothesis on the Origin of Life -- 4.1 Introduction -- 4.2 [GADV]-Amino Acids and Protein 0th-Order Structure -- 4.3 Exploration of the Initial Metabolism: The Origin of Metabolism. 4.3.1 From What Kind of Enzymatic Reactions Did the Metabolic System Originate? -- 4.3.2 What Kind of Organic Compounds Accumulated on the Primitive Earth -- 4.3.3 What Organic Compounds were Required for the First Life to Emerge? -- 4.4 From Reactions Using What Kind of Organic Compounds Did the Metabolism Originate? -- 4.4.1 Catalytic Reactions with What Kind of Organic Compounds Were Incorporated Into the Initial Metabolism? -- 4.4.2 Search for Metabolic Reactions Incorporated Into the Initial Metabolism -- 4.4.3 Syntheses of [GADV]-Amino Acids Leading to Produce [GADV]-Proteins/Peptides Were One of the Most Important Matters for the First Life -- 4.4.4 Nucleotide Synthetic Pathways were Integrated at the Second Phase in the Initial Metabolism -- 4.5 Discussion -- 4.5.1 Protein 0th-Order Structure Was the Key for Solving the Origin of Metabolism -- 4.5.2 Validity of GPG-Three Compounds Hypothesis on the Origin of Metabolism -- 4.5.3 Establishment of the Metabolic System and the Emergence of Life -- 4.5.4 The Emergence of Life Viewed from the Origin of Metabolism -- Acknowledgments -- References -- Chapter 5 Chemical Automata at the Origins of Life -- 5.1 Introduction -- 5.2 Theoretical Models -- 5.2.1 The Chemoton Model -- 5.2.2 Autopoiesis -- 5.2.3 Biotic Abstract Dual Automata -- 5.2.4 Automata and Diffusion-Controlled Reactions -- 5.2.5 Quasi-Species and Hypercycle -- 5.2.6 Computer Modeling -- 5.2.7 Two-Dimensional Automata -- 5.3 Experimental Approach -- 5.3.1 The Ingredients for Life -- 5.3.2 Capabilities Required for the Chemical Automata -- 5.3.2.1 Autonomy -- 5.3.2.2 Self-Ordering and Self-Organization -- 5.3.2.3 About Discriminating Aggregation -- 5.3.2.4 Autocatalysis and Competition -- 5.4 Conclusion -- References -- Chapter 6 A Universal Chemical Constructor to Explore the Nature and Origin of Life -- 6.1 Introduction. 6.2 Digitization of Chemistry -- 6.3 Environmental Programming, Recursive Cycles, and Protocells -- 6.4 Measuring Complexity and Chemical Selection Engines -- 6.5 Constructing a Chemical Selection Engine -- Acknowledgements -- References -- Chapter 7 How to Make a Transmembrane Domain at the Origin of Life: A Possible Origin of Proteins -- 7.1 Introduction -- 7.2 The Initial "Core" Amino Acids -- 7.3 The Thickness of Membranes of the First Vesicles -- 7.4 Carbon-Carbon Distances Perpendicular to a Membrane -- 7.5 The Thickness of Modern Membranes -- 7.6 A Prebiotic Model for the Coordinated Growth of Membrane Thickness and Transmembrane Peptides -- 7.7 A Model for the Coordinated Growth of Membrane Thickness and Transmembrane Peptides -- 7.8 RNA World with the Protein World -- 7.9 Conclusion -- Acknowledgements -- References -- Part III: Physics Approaches -- Chapter 8 Patterns that Persist: Heritable Information in Stochastic Dynamics -- 8.1 Introduction -- 8.2 Markov Processes -- 8.2.1 Simple Examples of Markov Processes -- 8.2.2 Stochastic Dynamics -- 8.2.3 Master Equation -- 8.2.4 Dynamic Persistence -- 8.2.5 Coarse Graining -- 8.2.6 Entropy Production -- 8.3 Results -- 8.3.1 The Persistence Filter -- 8.4 Mechanisms of Persistence -- 8.5 Effects of Size N and Disequilibrium -- 8.6 Probability of Persistence -- 8.6.1 Continuity Constraint -- 8.6.2 Locality Constraint -- 8.6.3 New Strategies for Persistence -- 8.7 Measuring Persistence in Practice

-- 8.7.1 Computable Information Density (CID) -- 8.7.2 Quantifying Persistence in Dynamic Assemblies of Colloidal Rollers -- 8.8 Conclusions -- 8.9 Methods -- 8.9.1 Coarse-Graining -- 8.10 Monte Carlo Optimization -- 8.11 Experiments on Ferromagnetic Rollers -- 8.12 A Persistence in Equilibrium Systems -- Acknowledgements -- References.

Chapter 9 When We Were Triangles: Shape in the Origin of Life via Abiotic, Shaped Droplets to Living, Polygonal Archaea During the Abiocene -- 9.1 Introduction -- 9.1.1 What Correlates with Archaea Shape? Nothing! -- 9.1.2 Archaea's Place in the Tree of Life -- 9.1.3 The Discovery and Exploration of Shaped Droplets -- 9.1.4 Shaped Droplets as Protocells -- 9.1.5 Comparison of Shaped Droplets with Archaea -- 9.1.6 The S-Layer -- 9.1.7 The S-Layer as a Two-Dimensional Liquid with Fault Lines -- 9.1.8 The Analogy of the S-Layer to Bubble Rafts -- 9.1.9 Energy Minimization Model for the S-Layer in Polygonal Archaea -- 9.2 Discussion -- 9.3 Conclusion -- Acknowledgements -- References -- Chapter 10 Challenges and Perspectives of Robot Inventors that Autonomously Design, Build, and Test Physical Robots -- 10.1 Introduction -- 10.2 Physical Evolutionary-Developmental Robotics -- 10.2.1 Robotic Invention -- 10.2.2 Physical Morphology Adaptation -- 10.3 Falling Paper Design Experiments -- 10.3.1 Design-Behavior Mapping -- 10.3.2 More Variations of Paper Falling Patterns -- 10.3.3 Characterizing Falling Paper Behaviors -- 10.4 Evolutionary Dynamics of Collective Bernoulli Balloons -- 10.5 Discussions and Conclusions -- Acknowledgments -- References -- Part IV: The Approach of Creating Life -- Chapter 11 Synthetic Cells: A Route Toward Assembling Life -- 11.1 Compartmentalization: Putting Life in a Box -- 11.2 The Making of Cell-Sized Giant Liposomes -- 11.3 Coacervate-Based Synthetic Cells -- 11.4 Adaptivity and Functionality in Synthetic Cells -- 11.5 Synthetic Cell Information Processing and Communication -- 11.6 Intracellular Information Processing: Making Decisions with All the Noise -- 11.7 Extracellular Communication: the Art of Talking and Selective Listening -- 11.8 Conclusions -- Acknowledgments -- References.

Chapter 12 Origin of Life from a Maker's Perspective-Focus on Protocellular Compartments in Bottom-Up Synthetic Biology -- 12.1 Introduction -- 12.2 Unifying the Plausible Protocells in Line with the Crowded Cell -- 12.3 Self-Sustained Cycles of Growth and Division -- 12.4 Transport and Energy Generation at the Interface -- 12.4.1 Energy and Complexity -- 12.4.2 Energy Compartmentation -- 12.5 Synergistic Effects Towards the Origin of Life -- References -- Part V: When and Where Did Life Start? -- Chapter 13 A Nuclear Geyser Origin of Life: Life Assembly Plant - Three-Step Model for the Emergence of the First Life on Earth and Cell Dynamics for the Coevolution of Life's Functions -- 13.1 Introduction -- 13.2 Natural Nuclear Reactor -- 13.2.1 Principle of a Natural Nuclear Reactor -- 13.2.2 Natural Nuclear Reactor in Gabon -- 13.2.3 Radiation Chemistry to Produce Organics -- 13.2.4 Hadean Natural Nuclear Reactor -- 13.3 Nuclear Geyser Model as a Birthplace of Life on the Hadean Earth -- 13.4 Nine Requirements for the Birthplace of Life -- 13.5 Three-Step Model for the Emergence of the First Life on Hadean Earth -- 13.5.1 The Emergence of the First Proto-Life -- 13.5.1.1 Domain I: Inorganics -- 13.5.1.2 Domain II: From Inorganic to Organic -- 13.5.1.3 Domain III: Production of More Advanced BBL -- 13.5.1.4 Domain IV: Passage Connecting Geyser Main Room with the Surface and Fountain Flow -- 13.5.1.5 Domain V: Production of BBL in an Oxidizing Wet-Dry Surface Environment -- 13.5.1.6 Domain VI: Birthplace of the First Proto-Life -- 13.5.1.7 Utilization of Metallic Proteins -- 13.5.2 The Emergence of the Second

Proto-Life -- 13.5.2.1 Drastic Environmental Change from Step 1 to  
Step 2 -- 13.5.2.2 Biological Response from Step 1 to Step 2 -- 13.5.3  
The Emergence of the Third Proto-Life, Prokaryote.  
13.5.3.1 Drastic Environmental Changes from Step 2 to Step 3.

---