

1. Record Nr.	UNISA996466752403316
Titolo	Undecidability, uncomputability, and unpredictability / / Anthony Aguirre, Zeeya Merali, David Sloan, editors
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-70354-1
Descrizione fisica	1 online resource (181 pages)
Collana	Frontiers Collection
Disciplina	511.3
Soggetti	Decidability (Mathematical logic) Completeness theorem Incompleteness theorems
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Contents -- 1 Introduction -- Reference -- 2 Undecidability and Unpredictability: Not Limitations, but Triumphs of Science -- 2.1 The Pessimistic View -- 2.2 On Axiomatic Theories and Structural Differentiation -- 2.3 The Physical World: Every Thing Must Go -- 2.4 Ontic Structural Realism -- 2.5 Quantum-Optimistic Conclusions -- References -- 3 Indeterminism and Undecidability -- 3.1 Introduction: Godel and Bell -- 3.2 Randomness and Its Unprovability -- 3.3 Rethinking Bell's Theorem -- 3.4 Are Deterministic Hidden Variable Theories Deterministic? -- 3.5 Conclusion and Discussion -- References -- 4 Unpredictability and Randomness -- 4.1 Introduction -- 4.2 CA a Closer Look -- 4.3 Conditional Branching -- 4.3.1 Conditional Branching Candidates -- 4.4 Measuring Randomness -- 4.4.1 Random Oracle -- 4.4.2 BCA -- 4.4.3 Distinguishing Chances -- 4.5 Speculations -- References -- 5 Indeterminism, Causality and Information: Has Physics Ever Been Deterministic? -- 5.1 When Did Physics Become Unpredictable? -- 5.2 The "Orthodox Interpretation" of Classical Physics -- 5.3 An Alternative, Indeterministic Interpretation of Classical Physics -- 5.3.1 Determinism at Odds with Information Principles -- 5.3.2 "Finite Information Quantities" (FIQs) -- 5.3.3 The Classical "Measurement Problem" -- 5.4 (In)determinism and Causality -- 5.5 Concluding Remarks -- References -- 6

Undecidability, Fractal Geometry and the Unity of Physics -- 6.1 The Disunity of 20th Century Physics -- 6.2 Chaos and the Undecidable Geometry of Fractal Attractors -- 6.3 Towards a Unification of 21st Century Physics -- 6.3.1 Chaos Theory and Relativity Theory -- 6.3.2 Chaos Theory and Quantum Theory -- 6.3.3 Quantum Theory and General Relativity Theory -- 6.4 Discussion -- References -- 7 A Godelian Hunch from Quantum Theory -- 7.1 Introduction. 7.2 A Godelian Hunch from Quantum Contextuality -- 7.2.1 Counterfactual Undecidability -- 7.2.2 Topological Undecidability -- 7.3 A Godelian Hunch from the Measurement Problem -- 7.3.1 Wigner's Friend, Universality, Meta-Contextuality and Measurement -- 7.3.2 "Wigner's Friendifications" -- 7.3.3 The Heirs of Copenhagen -- 7.4 Conclusion: Is Physics Paradoxical? -- 7.5 Epilogue: A Godelian Hunch from Time -- References -- 8 Epistemic Horizons: This Sentence Is $\frac{1}{\sqrt{2}}(|\text{true}\rangle + |\text{false}\rangle)$ -- 8.1 Introduction: Interpretation Versus Reconstruction -- 8.2 Horizons of Our Understanding -- 8.2.1 Superposition -- 8.2.2 Entanglement -- 8.3 Does This Ring a Bell? -- 8.4 Epistemic Horizons: Incomplete Quantum Mechanics? -- 8.5 Hardy's Paradox -- 8.6 The Frauchiger-Renner Argument -- 8.7 Conclusion -- References -- 9 Why Is the Universe Comprehensible? -- 9.1 Introduction -- 9.2 Comprehensibility -- 9.3 The Price of Comprehensibility -- 9.4 Limitations -- References -- 10 Noisy Deductive Reasoning: How Humans Construct Math, and How Math Constructs Universes -- 10.1 Introduction -- 10.2 Formal Systems -- 10.3 A Stochastic Mathematical Reasoner -- 10.4 Connections to Actual Mathematical Practice -- 10.4.1 Generating New Research Questions -- 10.4.2 Bayesian Models of Heuristics of Human Mathematicians- General Considerations -- 10.4.3 A Bayesian Justification of Abduction in Mathematical Reasoning -- 10.4.4 A Bayesian Formulation of the Value of Multiple Proof Paths in Mathematical Reasoning -- 10.5 Measures over Multiverses -- 10.6 Future Research Directions -- 10.7 Conclusion -- References -- 11 Computational Complexity as Anthropic Principle: A Fable -- 11.1 Laplace Builds a Demon -- 11.2 The Science that Destroys Demons -- References -- Appendix List of Winners -- First Prizes -- Second Prize -- Third Prizes -- Fourth Prizes. Prize for an Interesting Literary Discourse -- Prize for a Creative Approach to the Problem.
