

1. Record Nr.	UNINA9910438041603321
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Titolo	Infobiotics : Information in Biotic Systems // by Vincenzo Manca
Pubbl/distr/stampa	Berlin, Heidelberg : , : Springer Berlin Heidelberg : , : Imprint : Springer, , 2013
ISBN	9783642362231 3642362230
Edizione	[1st ed. 2013.]
Descrizione fisica	1 online resource (xviii, 384 pages) : illustrations (some color)
Collana	Emergence, Complexity and Computation, , 2194-7295 ; ; 3
Disciplina	570.151
Soggetti	Computational intelligence Artificial intelligence Biomathematics Bioinformatics Computational Intelligence Artificial Intelligence Mathematical and Computational Biology Computational and Systems Biology
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"ISSN: 2194-7287."
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Title; Preface; Acknowledgements; Contents; Acronyms; Part I Topics in Discrete Biomathematics; Discrete Information and Life; Symbols and Molecules; Molecules and Protocells; Sequences and Polymers; LUCA and the Sequence Paradox; Multisets and Membranes; Chemistry Multisets; Liposome Membranes; Populations and Hypermultisets; Trees and Hierarchies; Graphs and Interactions; Graphs of Molecule Structures; Graphs of Reactions; Neuron Graph; Strings and Genomes; Biological Monomers and Polymers; DNA Strings and DNA Helix; DNA Notation and Double String Operations; DNA Helix; DNA Pool Operations Writing and Reading DNAPlasמיד Cloning Algorithm; DNA Computing; Adleman's Experiment; PCR and XPCR Protocols; XPCR; DNA Extraction by XPCR; DNA Recombination by XPCR; L-Systems and Morphogenesis; String Models and Theories; Membrane Computing; Informational Analysis of Genomes; Algorithms and Biorhythms; Metabolic Grammars;

Lotka-Volterra Dynamics; The Brusselator (Belousov-Zhabotinsky Reaction); Time Series and Inverse Dynamics; Metabolic Approximation; Goniometricus: A Metabolic Grammar of Sine and Cosine; Generalization of the Goniometricus Model
 Stoichiometric Expansion and Stepwise Regression Log-Gain Principle; The Stepwise Regression LGSS; Problems Related to the Regression with LGSS; Models of Mitosis; Reactivity and Inertia; Metabolic Patterns; Metabolic Oscillators; Anabolism and Catabolism; The Ubiquity of Metabolism; Metabolic Computing; Revisiting MP Grammars; Life Strategies; The Enzymatic Paradox; Genes and Proteins; Bio-inspired Algorithms; Replication and Autopoiesis; Main Informational Steps from LUCA to OVUM; Life Analysis and Synthesis; Life Evolution; Time's Arrow and Complexity; Life and Computation
 Part II Discrete Mathematical Backgrounds Numbers and Measures; Sets and Functions; Relations and Operations; Functions and Variables; Numbers and Digits; Natural Numbers; Sums and Positional Representations; Integer Numbers; Rational and Real Numbers: Approximation and Infinite; Incommensurability, Divisibility, and Distinguishability; Complex Numbers and Real Vectors; Euler's Identity; Polar Representation of Complex Numbers; Some of Euler's Jewels; Induction and Recurrence; Fibonacci Sequence; Arithmetic and Logic; A Glimpse of the History of Formal Logic; Series and Growths
 Arithmetical Progressions Figurate Numbers; Geometrical Progressions; Logistic Maps; Natural Exponential Growth; Asymptotic Orders and Infinitesimals; Scales of Time, Space, and Matter; Discrete Dynamical Systems; Languages and Grammars; Strings and Languages; Grammars and Chomsky Hierarchy; Regular Expressions and Finite Automata; Patterns and Rules; Turing Machine; Decidability and Undecidability; Register Machines; Information, Codes, and Entropy; Shannon's Entropy; Optimal Codes and Compression; Typicality and Transmission; Combinations and Chances; Factorials and Binomial Coefficients
 Permutations and Arrangements

Sommario/riassunto

The book presents topics in discrete biomathematics. Mathematics has been widely used in modeling biological phenomena. However, the molecular and discrete nature of basic life processes suggests that their logic follow principles that are intrinsically based on discrete and informational mechanisms. The ultimate reason of polymers, as key element of life, is directly based on the computational power of strings, and the intrinsic necessity of metabolism is related to the mathematical notion of multiset. The switch of the two roots of bioinformatics suggests a change of perspective. In bioinformatics, the biologists ask computer scientists to assist them in processing biological data. Conversely, in infobiotics mathematicians and computer scientists investigate principles and theories yielding new interpretation keys of biological phenomena. Life is too important to be investigated by biologists alone, and though computers are essential to process data from biological laboratories, many fundamental questions about life can be appropriately answered by a perspicacious intervention of mathematicians, computer scientists, and physicists, who will complement the work of chemists, biochemists, biologists, and medical investigators. The volume is organized in seven chapters. The first part is devoted to research topics (Discrete information and life, Strings and genomes, Algorithms and Biorhythms, Life Strategies), the second one to mathematical backgrounds (Numbers and Measures, Languages and Grammars, Combinations and Chances).
