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Nota di contenuto	Contents; Preface; 1 Introduction; 1.1 What is Linearity?; 1.2 Why Uncertainty?; 1.3 How Does Nonlinearity Change Our View?; 1.4 Complex Networks; 1.5 Summary and a Look Forward; 2 Physiology in Fractal Dimensions; 2.1 Complexity and the Lung; 2.2 The Principle of Similitude; 2.2.1 Fractals, Self-similarity and Renormalization; 2.2.2 Fractal Lungs; 2.2.3 Why fractal transport?; 2.3 Allometry Relations; 2.3.1 Empirical Allometry; 2.3.2 WBE model; 2.3.3 WW model; 2.4 Fractal Signals; 2.4.1 Spectral decomposition; 2.5 Summary; 3 Dynamics in Fractal Dimensions; 3.1 Nonlinear Bio-oscillators 3.1.1 Super Central Pattern Generator (SCPG) model of gait3.1.2 The cardiac oscillator; 3.1.3 Strange attractors (deterministic randomness); 3.2 Nonlinear Bio-mapping; 3.2.1 One-dimensional maps; 3.2.2 Two-dimensional maps; 3.2.3 The Lyapunov exponent; 3.3 Measures of Strange Attractors; 3.3.1 Correlational dimension; 3.3.2 Attractor reconstruction from data; 3.3.3 Chaotic attractors and false alarms; 3.4 Summary and perspective; 4 Statistics in Fractal Dimensions; 4.1 Complexity and Unpredictability; 4.1.1 Scaling Measures; 4.2 Fractal

Stochastic Dynamics; 4.2.1 Simple Random Walks
4.2.2 Fractional random walks and scaling 4.2.3 Physical/physiological models; 4.3 Physiologic Time Series; 4.3.1 Heart Rate Variability (HRV); 4.3.2 Breath rate variability (BRV); 4.3.3 Stride rate variability (SRV); 4.4 Summary and Viewpoint; 5 Applications of Chaotic Attractors; 5.1 The Dynamics of Epidemics; 5.2 Chaotic Neurons; 5.3 Chemical Chaos; 5.4 Cardiac Chaos; 5.5 EEG Data and Brain Dynamics; 5.5.1 Normal activity; 5.5.2 Epilepsy: reducing the dimension; 5.5.3 Task-related scaling; 5.6 Retrospective; 6 Physiological Networks: The Final Chapter?; 6.1 Introduction to Complex Networks
6.1.1 A little history 6.1.2 Inverse power laws; 6.2 The Decision Making Model (DMM); 6.2.1 Topological Complexity; 6.2.2 Temporal Complexity; 6.3 Criticality; 6.3.1 Neuronal Avalanches; 6.3.2 Multiple Organ Dysfunction Syndrome (MODS); 6.4 Finale; References; Index

Sommario/riassunto

This exceptional book is concerned with the application of fractals and chaos, as well as other concepts from nonlinear dynamics to biomedical phenomena. Herein we seek to communicate the excitement being experienced by scientists upon making application of these concepts within the life sciences. Mathematical concepts are introduced using biomedical data sets and the phenomena being explained take precedence over the mathematics. In this new edition what has withstood the test of time has been updated and modernized; speculations that were not borne out have been expunged and the breakthroughs
