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The Spinal Reflex -- 4 Excitation Models -- 4.1 Introduction -- 4.2 Linear Strength-Duration Model -- 4.3 Electrical Cable Representations -- 4.4 Myelinated Nerve Model -- 4.5 Response to Monophasic Stimulation -- 4.6 Response to Biphasic and Repetitive Stimuli -- 4.7 Parameter Variation Effects -- 5 Electrical Properties of the Heart -- 5.1 Cardiovascular System: General Anatomical and Functional Aspects --5.2 Origin and Spread of Excitation -- 5.3 Elementary Processes of Excitation and Contraction -- 5.4 Stimulation, Propagation, and Refractoriness -- 5.5 Regular and Ectopic Pacemakers -- 5.6 Effects of Autonomic Nerves and of Changes in Electrolyte Composition -- 5.7 Electrocardiogram -- 5.8 Abnormalities in Cardiac Rhythm as Reflected in the ECG -- 5.9 Mechanism of Flutter and Fibrillation -- 5.10 Vulnerable Period: Threshold for Fibrillation -- 5.11 Electrical Defibrillation -- 6 Cardiac Sensitivity to Electrical Stimulation -- 6.1 Introduction -- 6.2 Threshold Sensitivity with Respect to Cardiac Cycle -- 6.3 Strength-Duration Relations for Unidirectional Currents -- 6.4 Biphasic and Sinusoidal Stimulation -- 6.5 Duration Sensitivity for Oscillatory Stimuli -- 6.6 Energy Criteria and Impulse Currents -- 6.7 Body-Size Scaling -- 6.8 Statistical Distribution of Thresholds -- 6.9 Combined AC and DC Stimuli -- 6.10 Electrodes and Current Density -- 7 Sensory Responses to Electrical Stimulation -- 7.1 Introduction --7.2 Mechanisms of Electrical Transduction -- 7.3 Perception of Transient Monophasic Currents -- 7.4 Suprathreshold Responses --7.5 Stimulus Waveform Factors -- 7.6 Electrodes and Current Density -- 7.7 Body Location Sensitivity -- 7.8 Skin Temperature -- 7.9 Tactile Masking -- 7.10 Individual Differences in Electrical Sensitivity -- 7.11 Startle Reactions -- 7.12 Electrical Stimulation of Domestic Animals --7.13 Visual and Auditory Effects -- 8 Skeletal Muscle Response to Electrical Stimulation -- 8.1 Introduction -- 8.2 Neuromuscular Structure and Function -- 8.3 Fundamental Principles of Skeletal Muscle Electrical Stimulation -- 8.4 Functional Neuromuscular Stimulation Systems -- 8.5 Skeletal Muscle Stimulation in Electrical Accidents -- 8.6 Analysis of the Let-Go Phenomenon -- 8.7 Effects of Electrical Stimulation on Respiration -- 9 Stimulation via Electric and Magnetic Fields -- 9.1 Introduction -- 9.2 Electric Field Induction Principles -- 9.3 Direct Perception of ELF Electric Fields -- 9.4 Human Reactions to AC Electric Field-Induced Shock -- 9.5 Time-Varying Magnetic Field Induction -- 9.6 Principles of Excitation by Time-Varying Magnetic Fields -- 9.7 Experimental Investigations of Magnetic Excitation: Large Area Exposure -- 9.8 Visual and Auditory Reactions to Electromagnetic Exposure -- 9.9 Local Magnetic Stimulation -- 9.10 Scales of Reaction: Power Frequency -- 9.11 Magnetic Forces on Moving Charges -- 10 High-Voltage and High-Current Injuries -- 10.1 Introduction -- 10.2 Modes of Injury -- 10.3 Impedance Considerations and Current Distribution in the Body -- 10.4 Thermal Trauma -- 10.5 Nonthermal Trauma -- 10.6 Lightning Injuries -- 10.7 Clinical Observations -- 10.8 Clinical Treatment -- 11 Standards and Rationale -- 11.1 Introduction -- 11.2 Electromagnetic Field Exposure Standards -- 11.3 Pulsed Electromagnetic Fields -- 11.4 Consideration of Spark Discharges in EMF Standards -- 11.5 Absorbed Energy and Thermal Considerations in EMF Standards -- 11.6 Consideration of EMF Interaction Mechanisms in Standards Setting -- 11.7 ELF Magnetic Field Standards Derived from Established Mechanisms -- 11.8 Standards in Consumer Products and Installations -- References. Electric currents and electromagnetic fields have been applied to biological systems, particularly humans, with both therapeutic and

pathological results. Applied Bioelectricity discusses biological responses to electric currents and electromagnetic fields, including

Sommario/riassunto

medical applications and shock hazards. The book covers fundamental physical and engineering principles of responses to short-term electrical exposure and emphasizes human reactions, although animal responses to electricity are considered as well. The treatment covers reactions from the just-detectable to the clearly detrimental. An important new chapter discusses standards for human exposure to electromagnetic fields and electric current and demonstrates how these standards have been developed based on the principles treated in earlier chapters. J. Patrick Reilly is a member of the principal staff of the Johns Hopkins University Applied Physics Laboratory and is President of Metatec Associates.