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Nota di contenuto	BIONANOTECHNOLOGY; CONTENTS; PREFACE; 1 The Quest for Nanotechnology; Biotechnology and the Two-Week Revolution; From Biotechnology to Bionanotechnology; What is Bionanotechnology?; 2 Bionanomachines in Action; The Unfamiliar World of Bionanomachines; Gravity and inertia are negligible at the nanoscale; Nanomachines show atomic granularity; Thermal motion is a significant force at the nanoscale; Bionanomachines require a water environment; Modern Biomaterials; Most natural bionanomachines are composed of protein; Nucleic acids carry information; Lipids are used for infrastructure Polysaccharides are used in specialized structural rolesThe Legacy of Evolution; Evolution has placed significant limitations on the properties of natural biomolecules; Guided Tour of Natural Bionanomachinery; 3 Biomolecular Design and Biotechnology; Recombinant DNA Technology; DNA may be engineered with commercially available enzymes; Site-directed mutagenesis makes specific changes in the genome; Fusion proteins combine two functions; Monoclonal Antibodies; Biomolecular

Structure Determination; X-ray crystallography provides atomic structures
NMR spectroscopy may be used to derive atomic structuresElectron microscopy reveals molecular morphology; Atomic force microscopy probes the surface of biomolecules; Molecular Modeling; Bionanomachines are visualized with computer graphics; Computer modeling is used to predict biomolecular structure and function; The protein folding problem; Docking simulations predict the modes of biomolecular interaction; New functionalities are developed with computer-assisted molecular design; 4 Structural Principles of Bionanotechnology; Natural Bionanomachinery is Designed for a Specific Environment
A Hierarchical Strategy Allows Construction of NanomachinesThe Raw Materials: Biomolecular Structure and Stability; Molecules are composed of atoms linked by covalent bonds; Dispersion and repulsion forces act at close range; Hydrogen bonds provide stability and specificity; Electrostatic interactions are formed between charged atoms; The hydrophobic effect stabilizes biomolecules in water; Protein Folding; Not all protein sequences adopt stable structures; Globular proteins have a hierarchical structure; Stable globular structure requires a combination of design strategies
Chaperones provide the optimal environment for foldingRigidity can make proteins more stable at high temperatures; Many proteins make use of disorder; Self-Assembly; Symmetry allows self-assembly of stable complexes with defined size; Quasisymmetry is used to build assemblies too large for perfect symmetry; Crowded conditions promote self-assembly; Self-Organization; Lipids self-organize into bilayers; Lipid bilayers are fluid; Proteins may be designed to self-organize with lipid bilayers; Molecular Recognition; Crane principles for molecular recognition
Atomicity limits the tolerance of combining sites

Sommario/riassunto

Discussions of the basic structural, nanotechnology, and system engineering principles, as well as an introductory overview of essential concepts and methods in biotechnology, will be included.?? Text is presented side-by-side with extensive use of high-quality illustrations prepared using cutting edge computer graphics techniques.?? Includes numerous examples, such applications in genetic engineering.?? Represents the only available introduction and overview of this interdisciplinary field, merging the physical and biological sciences.?? Concludes with the authors' expert assessment of the fu