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Nota di contenuto	Intro -- Preface to the Fourth Edition -- Preface to the Third Edition -- Preface to the Second Edition -- Preface to the First Edition -- Contents -- 1 Introduction -- 1.1 What is Bioinformatics? -- 1.2 What Can Bioinformatics Do? -- 1.3 An Ontology of Bioinformatics -- 1.4 The Organization of This Book -- References -- Part I Overview -- 2 Genotype, Phenotype, and Environment -- References -- 3 Regulation and Control -- 3.1 The Concept of Machine -- 3.2 Regulation -- 3.3 Cybernetics -- 3.4 Adaptation -- 3.5 The Integrating Rôle of Directive Correlation -- 3.6 Timescales of Adaptation -- 3.7 The Architecture of Functional Systems -- 3.8 Autonomy and Heterarchical Architecture -- 3.9 Biological Information Processing -- References -- 4 Evolution -- 4.1 Phylogeny and Evolution -- 4.1.1 Group and Kin Selection -- 4.1.2 Models of Evolution -- 4.2 Evolutionary Systems -- 4.3 Evolutionary Computing -- 4.4 Concluding Remarks on Evolution -- References -- 5 Origins of Life and Earth Prehistory -- References -- Part II Information -- 6 The Nature of Information -- 6.1 Structure and Quantity -- 6.1.1 The Generation of Information -- 6.1.2 Conditional and Unconditional Information -- 6.1.3 Experiments and Observations -- 6.2 Constraint -- 6.2.1 The Value of Information -- 6.2.2 The Quality of Information -- 6.3 Accuracy, Meaning, and Effect -- 6.3.1 Accuracy -- 6.3.2 Meaning -- 6.3.3 Effect -- 6.3.4 Significs -- 6.4 Further Remarks on Information Generation and Reception -- 6.5 Summary -- References -- 7 The Transmission of Information -- 7.1 The Capacity of a Channel -- 7.2 Coding -- 7.3 Decoding -- 7.4 Compression -- 7.4.1 Use of

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 Chapter15TheMoleculesofLife -- 15.1
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 Thenextstageofcomplexityistoconsidermolecules(Table15.2)
 andmacromolecules(Table15.3).Thisisstillhighlyreductionist,however,
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 h.Wordsare,however,groupedintosentences,which,inturn,
 arearrangedintoparagraphs.Thecellisanalogouslyhighlystructured-
 moleculesaregroupedintosupramolecularcomplexes,which,inturn,
 areassembledintoorganelles.Thisstructure,

some of which is visible in the optical microscope,
 but which mostly needs the higher resolution. -- 15.1
 Molecules and Supramolecular Structure -- Element -- 500 -- Notypes
 -- Element -- 1600 -- H -- Element -- 15.2 Water -- 10 nm --
 Density -- 15.3 DNA -- The O-H infrared spectrum
 (of HOD in liquid D₂O).
 Bonded and nonbonded interactions are in equilibrium: --
 at room temperature or about 2.4 kJ/mol -- Fig. 15.2 Polymerized DNA.
 The so-called -- Fig. 15.2 Polymerized DNA. The so-called --
 end is at the lower right (after Agnoli, 1967 --
 reproduced with permission of the Accademia dei Lincei) -- to -- Fig. 15.2
 Polymerized DNA. The so-called -- Fig. 15.3 The hydrogen-
 bonding patterns of complementary bases (thymine [T], adenine [A], gua-
 nine [G], cytosine [C], moving around clockwise from the upper left)
 (after Agnoli, 1967 --
 reproduced with permission of the Accademia dei Lincei). In RNA, uracil (U)
 replaces thymine (i.e., the methyl group on the base is replaced by hydrogen)
 and the ribose has a hydroxyl group. The lower pair is denoted by CpG (Sect.
 14.8.4) -- Fig. 15.3 The hydrogen-
 bonding patterns of complementary bases (thymine [T], adenine [A], gua-
 nine [G], cytosine [C], moving around clockwise from the upper left)
 (after Agnoli, 1967 --
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 replaces thymine (i.e., the methyl group on the base is replaced by hydrogen)
 and the ribose has a hydroxyl group. The lower pair is denoted by CpG (Sect.
 14.8.4) -- A sex expected from their aromatic structure,
 the bases are planar. Figure 15.4 shows the formation of the double helix.
 The genes of most organisms are formed by such a double helix.
 The melting of the H-bonds as the temperature is raised is highly cooperative
 (due to the repulsive electrostatic force between the charged phosphate group
 s). On average, the separation into single stranded DNA occurs at about 80 --
 Fig. 15.3 The hydrogen-bonding patterns of complementary bases (thymine
 [T], adenine [A], gua-nine [G], cytosine [C],
 moving around clockwise from the upper left) (after Agnoli, 1967 --
 reproduced with permission of the Accademia dei Lincei). In RNA, uracil (U)
 replaces thymine (i.e., the methyl group on the base is replaced by hydrogen)
 and the ribose has a hydroxyl group. The lower pair is denoted by CpG (Sect.
 14.8.4) -- Table 15.5 summarizes some signi-
 cant discoveries relating to DNA. -- Discovery event -- Example:
 UCSC Genome Browser -- Crick -- Discovery event.
 A tetranucleotide structure elucidated -- 1944 -- Principal worker(s) --
 Discovery event -- where -- (15.4) -- is Boltzmann's constant, and --
 . -- 15.4 RNA -- 15.4 RNA --
 The concept can be illustrated by focusing on loop closure,
 considered to be the most important folding event.
 The potential energy is the enthalpy (i.e., the number -- RNA has
 various functions: as a messenger (mRNA),
 acting as an intermediary in protein synthesis -- as an enzyme (ribozymes)
 -- as part (about 60% by weight, the rest being protein) of the ribosome (rRNA)
 --
 as the carrier for transferring amino acids to the growing polypeptide chain syn-
 thesized at the ribosome (tRNA) --
 and as a modulator of DNA and mRNA interactions - small interfering RNA
 (siRNA -- see Sect. 14.8.4). -- 15.4 RNA -- Fig. 15.5 A piece of RNA
 (from the Q -- Fig. 15.5 A piece of RNA (from the Q -- 15.5 Proteins --
 Globular proteins -- Fig. 15.5 A piece of RNA (from the Q --
 which may be very large, such that they form gels by entanglement.
 The polypeptide backbone is extensively decorated with relatively short polys

ac-charides. Typically they act as lubricants and engulfers (example: mucin) -- -- . -- . -- which may be very large, such that they form gels by entanglement. The polypeptide backbone is extensively decorated with relatively short polysaccharides. Typically they act as lubricants and engulfers (example: mucin) -- -- . -- which are also globular, but permanently embedded (transversally) in a lipid bilayer membrane. They mainly function as channels, energy and signal transducers, and motors (examples: ATPase, bacteriorhodopsin, and porin). -- which may be very large, such that they form gels by entanglement. The polypeptide backbone is extensively decorated with relatively short polysaccharides. Typically they act as lubricants and engulfers (example: mucin) -- -- . -- 4.4 -- . -- . -- denotes a benzene ring. Square brackets denote a ring structure -- . -- Fig. 15.6 Hydrogen-bonding capabilities of the peptide backbone and the polar residues (after Baker and Hubbard). Residues not shown are incapable of hydrogen bond formation. Fig. 15.6 Hydrogen-bonding capabilities of the peptide backbone and the polar residues (after Baker and Hubbard). Residues not shown are incapable of hydrogen bond formation.
