

WEEK 16 NUCLEIC ACID

- Nucleic acids are polymers that consist of nucleotide residues.
- Located in nuclei of cell.
- Hereditary determinants of living organisms.
- Elemental composition: carbon, hydrogen, oxygen, nitrogen and phosphorus.
- Friedrich Miescher isolated what he called 'nuclein' from the nuclei of pus cells.
- Nuclein was shown to have acidic properties, hence it was later called 'nucleic acid'.
- In 1889, Richard Altmann creates the term nucleic acid.
- In 1953, Watson and Crick presented the structure of DNA.

Nucleic Acid Structure

- Nucleic acids are polynucleotides.
- Their building blocks are nucleotides.
- Energy rich compounds that drive metabolic process in cells.
- Serve as chemical signals, key links in cellular systems that respond to hormones and other extracellular stimuli.
- Structural component of a number of enzyme cofactor and metabolic intermediates.
- Each nucleotide is formed by 3 units: phosphate, sugar, and a nitrogenous base.

Nucleotide

- Besides being the basic unit of genetic material for all living things, a nucleotide can have other functions as well.
- A nucleotide can be a base in another molecule, such as adenosine triphosphate (ATP), which is the main energy molecule of the cell. They are also found in coenzymes like NAD and NADP, which come from ADP; these molecules are used in many chemical reactions that play roles in metabolism.
- Another molecule that contains a nucleotide is cyclic AMP (cAMP), a messenger molecule that is important in

many processes including the regulation of metabolism and transporting chemical signals to cells.

- Nucleotides not only make up the building blocks of life, but also form many different molecules that function to make life possible.

Nucleotide Structure

- Nucleotide structure is simple, but the structure they can form together is complex.

- This molecule consists of two strands which wrap around each other, forming hydrogen bonds in the middle of the structure for support.



- Each nucleotide within has a specific structure which enables this formation.

1. Phosphate Group

- The phosphate group, is probably familiar from another important molecule ATP.
- Adenosine triphosphate, or ATP, is the energy molecule that most life on Earth relies upon to store and transfer energy between reactions.
- ATP contains three phosphate groups, which can store a lot of energy in their bonds.
- Unlike ATP, the bonds formed within a nucleotide are known as phosphodiester bonds, because they happen between the phosphate group and the sugar molecule.
- During DNA replication, an enzyme known as DNA polymerase assembles the correct nucleotide bases, and begins organizing them against the chain it is reading.
- Another protein, DNA ligase, finished the job by creating the phosphodiester bond between the sugar molecule of one base and the phosphate group of the next.
- This creates the backbone of a new genetic molecule, able to be passed to the next generation. DNA and RNA contain all the genetic information necessary for cells to function.

Nucleic Acid And Molecular Biology Vol 8

M. Luckner, L. Nover, H. Böhm



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DNA Repair Francesca Storici, 2011-09-09 DNA repair is fundamental to all cell types to maintain genomic stability A collection of cutting edge reviews DNA Repair On the pathways to fixing DNA damage and errors covers major aspects of the DNA repair processes in a large variety of organisms emphasizing foremost developments questions to be solved and new directions in this rapidly evolving area of modern biology Written by researchers at the vanguard of the DNA repair field the chapters highlight the importance of the DNA repair mechanisms and their linkage to DNA replication cell cycle progression and DNA recombination Major topics include base excision repair nucleotide excision repair mismatch repair double strand break repair with focus on specific inhibitors and key players of DNA repair such as nucleases ubiquitin proteasome enzymes poly ADP ribose polymerase and factors relevant for DNA repair in mitochondria and embryonic stem cells This book is a journey into the cosmos of DNA repair and its frontiers

The biochemistry of the Nucleic Acids J.N. Davidson, 2012-12-02 The Biochemistry of the Nucleic Acids provides an elementary outline of the main biochemical features of nucleic acids and nucleoproteins The book describes the occurrence and biological functions of nucleic acids their chemical constituents and catabolism This text is organized into 14 chapters and begins with a historical overview from the discovery of the nucleic acids to their isolation and characterization The discussion then shifts to bacterial transforming factors and transduction phenomena along with the genetic function and metabolic stability of DNA the chemical composition of the cell nucleus and the Feulgen nuclear reaction The reader is methodically introduced to the structure and biosynthesis of RNA and DNA nucleic acids found in viruses and biosynthesis of mononucleotides An account of nucleases and related enzymes is also given A chapter on the precise mechanism by which nucleic acids are broken down in the cell concludes the book This book is intended for students of biochemistry chemists and biologists

Progress in Biophysics and Molecular Biology J. A. V. Butler, D. Noble, 2014-05-18 Progress in Biophysics and Molecular Biology Volume 32 summarizes the significant progress that has been made in the fields of biophysics and molecular biology Topics range from metabolic regulation and transfer RNA to cellular metabolism and prokaryotic and eukaryotic ribosomes This volume consists of five chapters and begins with a discussion of mathematical models used in the study of metabolic regulation with emphasis on the energy metabolism of eukaryotes The next chapter examines the possible functions of transfer RNA minor components paying particular attention to the principle of location function relationships The reader is also introduced to spatial functional correlations in cellular metabolism and highlights the role of organized multienzyme systems along with the fundamentals of ribosome structure and function in prokaryotes and eukaryotes A chapter that analyzes the structures and functions of transfer RNA concludes the book This book will be of interest to scientists students and researchers working in the fields of biophysics and molecular biology

[Electrochemistry of Nucleic Acids and Proteins](#) E. Palecek, F. Scheller, J. Wang, 2005 Covers highly sophisticated methods of electrochemical analysis of nucleic acids and proteins Summarises the present state of electrochemical analysis

of nucleic acids and proteins Includes future trends in the electrochemical analysis in genomics and proteomics INDICE 1 Polarography of DNA Retrospective 2 Electrochemical properties of nucleic acid components 3 Electrochemistry of nucleic acids 4 Electroch Etc **The Role of Phages in Early Molecular Genetics** Luigi Marongiu, 2025-12-02 In the shadow of global conflicts from World War II through the tensions of the Cold War an extraordinary scientific revolution was quietly unfolding A brilliant collective of geneticists and microbiologists known as the Phage Group harnessed the power of bacterial viruses to unlock the very structure of genes giving birth to Molecular Biology as we know it today As antimicrobial resistance threatens global health phages have reemerged as critical subjects of scientific inquiry yet their pivotal role in the genetic discoveries of the 1940s 1960s remains largely overlooked until now The Role of Phages in Early Molecular Genetics History of an Emerging Discipline bridges history physics and virology offering both scientists and general readers a compelling narrative of how these microscopic entities revolutionized our understanding of life itself Key Features Explains how bacterial viruses became the unexpected heroes in humanity's quest to understand the genetic code Discusses the forgotten historical and social forces Lysenkoism Spencerism and McCarthyism that shaped scientific progress yet vanished from our collective memory Provides a fascinating parallel between the emergence of phage biology and quantum physics two revolutionary fields developing in tandem By illuminating the shared patterns of scientific discovery across disciplines The Role of Phages in Early Molecular Genetics History of an Emerging Discipline provides a timely reminder of how breakthrough knowledge emerges and why the Phage Group's legacy deserves its rightful place in scientific history

Proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability Jerzy Neyman, 1961

Cancer Chemotherapy Reports, 1974 *Life's Greatest Secret* Matthew Cobb, 2015-07-07 Everyone has heard of the story of DNA as the story of Watson and Crick and Rosalind Franklin but knowing the structure of DNA was only a part of a greater struggle to understand life's secrets Life's Greatest Secret is the story of the discovery and cracking of the genetic code the thing that ultimately enables a spiraling molecule to give rise to the life that exists all around us This great scientific breakthrough has had farreaching consequences for how we understand ourselves and our place in the natural world and for how we might take control of our and life's future Life's Greatest Secret mixes remarkable insights theoretical dead ends and ingenious experiments with the swift pace of a thriller From New York to Paris Cambridge Massachusetts to Cambridge England and London to Moscow the greatest discovery of twentieth century biology was truly a global feat Biologist and historian of science Matthew Cobb gives the full and rich account of the cooperation and competition between the eccentric characters mathematicians physicists information theorists and biologists who contributed to this revolutionary new science And while every new discovery was a leap forward for science Cobb shows how every new answer inevitably led to new questions that were at least as difficult to answer just ask anyone who had hoped that the successful completion of the Human Genome Project was going to truly yield the book of life or that a better understanding of epigenetics or junk DNA

was going to be the final piece of the puzzle But the setbacks and unexpected discoveries are what make the science exciting and it is Matthew Cobb s telling that makes them worth reading This is a riveting story of humans exploring what it is that makes us human and how the world works and it is essential reading for anyone who d like to explore those questions for themselves

Intelligent Communication, Control and Devices Rajesh Singh,Sushabhan Choudhury,Anita Gehlot,2018-04-10 The book focuses on the integration of intelligent communication systems control systems and devices related to all aspects of engineering and sciences It contains high quality research papers presented at the 2nd international conference ICICCD 2017 organized by the Department of Electronics Instrumentation and Control Engineering of University of Petroleum and Energy Studies Dehradun on 15 and 16 April 2017 The volume broadly covers recent advances of intelligent communication intelligent control and intelligent devices The work presented in this book is original research work findings and practical development experiences of researchers academicians scientists and industrial practitioners

DNA Replication Herve Seligmann,2011-08-01 The study of DNA advanced human knowledge in a way comparable to the major theories in physics surpassed only by discoveries such as fire or the number zero However it also created conceptual shortcuts beliefs and misunderstandings that obscure the natural phenomena hindering its better understanding The deep conviction that no human knowledge is perfect but only perfectible should function as a fair safeguard against scientific dogmatism and enable open discussion With this aim this book will offer to its readers 30 chapters on current trends in the field of DNA replication As several contributions in this book show the study of DNA will continue for a while to be a leading front of scientific activities

Nanocarriers for Nucleic Acids and Proteins Luis H. Reyes,Juan C. Cruz,Yashwant V. Pathak,2025-08-11 At the frontier of modern medicine lies a revolution in drug delivery systems that operates at the scale of billionths of a meter Nanocarriers for Nucleic Acids and Proteins presents a comprehensive exploration of these groundbreaking technologies that are reshaping therapeutic approaches across medical science From fundamental concepts to cutting edge applications this comprehensive volume brings together world class researchers to provide an in depth examination of Design principles and characteristics of various nanocarrier systems Advanced delivery mechanisms for nucleic acids and proteins Breakthrough applications in gene therapy and cancer immunotherapy Critical aspects of translating laboratory success to clinical implementation Featuring detailed coverage of lipid based polymer based inorganic and bio inspired nanocarriers this essential resource bridges the gap between theoretical understanding and practical application Whether you are developing new therapeutic approaches optimizing delivery systems or exploring the frontiers of nanomedicine this comprehensive guide provides the insights and frameworks needed to advance your work

Publications, Reports, and Papers for 1968 from Oak Ridge National Laboratory F. M. O'Hara,Ann S. Klein,1969

Proceedings Of The 6th Asia-pacific Bioinformatics Conference Alvis Brazma,Satoru Miyano,Tatsuya Akutsu,2007-12-21 High throughput sequencing and functional genomics technologies have given us the human genome

sequence as well as those of other experimentally medically and agriculturally important species thus enabling large scale genotyping and gene expression profiling of human populations Databases containing large numbers of sequences polymorphisms structures metabolic pathways and gene expression profiles of normal and diseased tissues are rapidly being generated for human and model organisms Bioinformatics is therefore gaining importance in the annotation of genomic sequences the understanding of the interplay among and between genes and proteins the analysis of the genetic variability of species the identification of pharmacological targets and the inference of evolutionary origins mechanisms and relationships This proceedings volume contains an up to date exchange of knowledge ideas and solutions to conceptual and practical issues of bioinformatics by researchers professionals and industry practitioners at the 6th Asia Pacific Bioinformatics Conference held in Kyoto Japan in January 2008 a

Subject Guide to Books in Print, 1996 **RNA Processing** Paula Grabowski, 2011-08-29 RNA functions broadly as informational molecule genome enzyme and machinery for RNA processing While these functions reflect ancient activities they also remain vital components of contemporary biochemical pathways In eukaryotic cells RNA processing impacts the biogenesis of RNA molecules of essentially every shape and function The collection of articles in this volume describes the current state of understanding of the broad array of RNA processing events in animal and plant cells key unanswered questions and cutting edge approaches available to address these questions Some questions discussed in this volume include how viruses subvert the RNA processing machinery of the host cell how the coordination of co transcriptional RNA processing is regulated at the level of chromatin the status of RNA processing in plant organelles and how micro RNA machinery is biosynthesized and regulated

Secondary Metabolism and Cell Differentiation M. Luckner, L. Nover, H. Böhm, 2013-06-29 1 Secondary Metabolism and Differentiation In addition to the primary metabolic reactions which are similar in all living beings formation and breakdown of nucleic acids and proteins as well as of their precursors of most carbohydrates of some carboxylic acids etc a vast number of metabolic pathways lead to the formation of compounds peculiar to a few species or even to a single chemical race only These reactions in accord with CZAPEK 1921 and PAECH 1950 are summed up under the term secondary metabolism and their products are called secondary metabolites The wide variety of secondary products formed in nature includes such well known groups as alkaloids antibiotics cardiac glycosides tannins saponins volatile oils and others A considerable number of them are of economic importance in therapeutics or technology Although secondary products are produced by micro organisms higher plants and animals cf LUCKNER 1972 most of the substances are found in the plant kingdom The lack of mechanisms for true excretion in higher plants may result in this unequal distribution the waste products of metabolism in plants instead being accumulated in the vacuoles the cell walls or in special excretory cells or spaces of the organism metabolic excretion cf FREY WYSSLING 1935 1970 MOTHES 1966a b 1972 LUCKNER et al 1976 Many secondary substances have however a direct biologic function They can be regulatory effectors e g

Medical Books and Serials in Print, 1984 *Handbook of Soil Sciences (Two*

Volume Set) Pan Ming Huang, Yuncong Li, Malcolm E. Sumner, 2018-10-03 An evolving living organic inorganic covering soil is in dynamic equilibrium with the atmosphere above the biosphere within and the geology below It acts as an anchor for roots a purveyor of water and nutrients a residence for a vast community of microorganisms and animals a sanitizer of the environment and a source of raw materials for co

Genetic Diversity in Microorganisms Mahmut Caliskan, 2012-02-24 Genetic Diversity in Microorganisms presents chapters revealing the magnitude of genetic diversity of microorganisms living in different environmental conditions The complexity and diversity of microbial populations is by far the highest among all living organisms The diversity of microbial communities and their ecologic roles are being explored in soil water on plants and in animals and in extreme environments such as the arctic deep sea vents or high saline lakes The increasing availability of PCR based molecular markers allows the detailed analyses and evaluation of genetic diversity in microorganisms The purpose of the book is to provide a glimpse into the dynamic process of genetic diversity of microorganisms by presenting the thoughts of scientists who are engaged in the generation of new ideas and techniques employed for the assessment of genetic diversity often from very different perspectives The book should prove useful to students researchers and experts in the area of microbial phylogeny genetic diversity and molecular biology

The Genesis Quest Michael Marshall, 2020-08-20 A fascinating and challenging story New York Review of Books This is an incredibly absorbing and insightful book about the most important scientific question of our age Mark Miodownik author of *Stuff Matters* The story of the quest to understand life's genesis is a universal one in which everyone can find pleasure and fascination By asking how life came to be we are implicitly asking why we are here whether life exists on other planets and what it means to be alive This book is the story of a group of fragile flawed humans who chose to wrestle with these questions By exploring the origin of life we can catch a glimpse of the infinite How did life begin Why are we here These are some of the most profound questions we can ask For almost a century a small band of eccentric scientists has struggled to answer these questions and explain one of the greatest mysteries of all how and why life began on Earth There are many different proposals and each idea has attracted passionate believers who promote it with an almost religious fervour as well as detractors who reject it with equal passion But the quest to unravel life's genesis is not just a story of big ideas It is also a compelling human story rich in personalities conflicts and surprising twists and turns Along the way the journey takes in some of the greatest discoveries in modern biology from evolution and cells to DNA and life's family tree It is also a search whose end may finally be in sight In *The Genesis Quest* Michael Marshall shows how the quest to understand life's beginning is also a journey to discover the true nature of life and by extension our place in the universe

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