

33-1 Chordate Evolution

- First appeared 500 mya
- Most ancient were related to the echinoderms (starfish)
- Fossils present in Cambrian deposits of Burgess Shale
- Most ancient relative found so far is Pikaia, like a worm with a notochord, only found in Chordates column and pairs of muscles like invertebrates

Section 33 1 Chordate Evolution

Gerardo De Iuliis, Dino Pulerà



Section 33 1 Chordate Evolution:

Chordate Origins and Evolution Noriyuki Satoh, 2016-07-14 Chordate Origins and Evolution The Molecular Evolutionary Road to Vertebrates focuses on echinoderms starfish sea urchins and others hemichordates acorn worms etc cephalochordates lancelets urochordates or tunicates ascidians larvaceans and others and vertebrates In general evolution of these groups is discussed independently on a larger scale ambulacrarians echi hemi and chordates cephalo uro vert Until now discussion of these topics has been somewhat fragmented and this work provides a unified presentation of the essential information In the more than 150 years since Charles Darwin proposed the concept of the origin of species by means of natural selection which has profoundly affected all fields of biology and medicine the evolution of animals metazoans has been studied discussed and debated extensively Following many decades of classical comparative morphology and embryology the 1980s marked a turning point in studies of animal evolution when molecular biological approaches including molecular phylogeny MP molecular evolutionary developmental biology evo devo and comparative genomics CG began to be employed There are at least five key events in metazoan evolution which include the origins of 1 diploblastic animals such as cnidarians 2 triploblastic animals or bilaterians 3 protostomes and deuterostomes 4 chordates among deuterostomes and 5 vertebrates among chordates The last two have received special attention in relation to evolution of human beings During the past two decades great advances have been made in this field especially in regard to molecular and developmental mechanisms involved in the evolution of chordates For example the interpretation of phylogenetic relationships among deuterostomes has drastically changed In addition we have now obtained a large quantity of MP evo devo and CG information on the origin and evolution of chordates Covers the most significant advances in this field to give readers an understanding of the interesting biological issues involved Provides a unified presentation of essential information regarding each phylum and an integrative understanding of molecular mechanisms involved in the origin and evolution of chordates Discusses the evolutionary scenario of chordates based on two major characteristic features of animals namely modes of feeding energy sources and reproduction as the two main forces driving animal evolution and benefiting dialogue for future studies of animal evolution

A History of Bodies, Brains, and Minds Francisco Aboitiz, 2024-09-17 A panoramic view of the evolution of life on our planet from its origins to humanity's future In *A History of Bodies Brains and Minds* Francisco Aboitiz provides a brief history of life the brain and cognition from the earliest living beings to our own species The author proceeds from the basic premise that since evolution by natural selection is the process underlying the origin of life and its evolution on earth the brain and thus our minds must also be the result of biological evolution The aim of this book is to narrate how animal bodies came to be built with their nervous systems and how our species evolved with culture technology language and consciousness The book is organized in four parts each delving into a different aspect of evolutionary development Definitions lays the groundwork by discussing the principles of biological evolution and explores the definition and

mechanisms of life itself *Beginnings* describes the origins of life starting from the emergence of the first cells to the development of neurons as the building blocks for brain networks *The Rise of Bodies and Brains* examines the evolution of animals with bilateral symmetry the emergence of chordates and vertebrates and the expansion and diversification of the vertebrate brain *A Singular Ape* explores *Homo sapiens* and our species unique traits such as bipedality tool use culture language communication and consciousness Comprehensive and deeply insightful this book helps us understand our place in the natural world and the cosmos as well as what the future might hold for life on earth

Heart Development and Regeneration Nadia Rosenthal, Richard P. Harvey, 2010-05-28 The development of the cardiovascular system is a rapidly advancing area in biomedical research now coupled with the burgeoning field of cardiac regenerative medicine A lucid understanding of these fields is paramount to reducing human cardiovascular diseases of both fetal and adult origin Significant progress can now be made through a comprehensive investigation of embryonic development and its genetic control circuitry *Heart Development and Regeneration* written by experts in the field provides essential information on topics ranging from the evolution and lineage origins of the developing cardiovascular system to cardiac regenerative medicine A reference for clinicians medical researchers students and teachers this publication offers broad coverage of the most recent advances Volume One discusses heart evolution contributing cell lineages model systems cardiac growth morphology and asymmetry heart patterning epicardial vascular and lymphatic development and congenital heart diseases Volume Two includes chapters on transcription factors and transcriptional control circuits in cardiac development and disease epigenetic modifiers including microRNAs genome wide mutagenesis imaging and proteomics approaches and the theory and practice of stem cells and cardiac regeneration Authored by world experts in heart development and disease New research on epigenetic modifiers in cardiac development Comprehensive coverage of stem cells and prospects for cardiac regeneration Up to date research on transcriptional and proteomic circuits in cardiac disease Full color detailed illustrations

The Evo-Devo Origin of the Nose, Anterior Skull Base and Midface Roger Jankowski, 2013-03-19 The phylontogenic theory proposes an original understanding of nose sinus and midface formation and development by looking back in evolution for the first traces of the olfactory organ and then tracing its successive phyletic transformations to become part of the respiratory apparatus and finally the central point of human facial anatomy Von Baer s Darwin s Haeckel s Garstang s Gould s and Buss explorations of parallels between phylogeny and ontogeny help to trace the nose and midface story The paradigm of existing parallels between ontogeny and phylogeny proves useful both in seeking to understand the holoprosencephalic spectrum of facial malformations which represent radically different pathways of facial development after the life s tape has been started to run again and in formulating hypotheses on chordate to vertebrate evolution The phylontogenic theory leads to new medical hypotheses on nose and sinus diseases and opens the field of evolution and development based medicine

Evolving Neural Crest Cells Brian Frank Eames, Daniel Meulemans Medeiros, Igor Adameyko, 2020-07-28 Vertebrates

possess lineage specific characteristics These include paired anterior sense organs and a robust modular head skeleton built of cellular cartilage and bone All of these structures are derived at least partly from an embryonic tissue unique vertebrates the neural crest The evolutionary history of the neural crest and neural crest cells has been difficult to reconstruct This volume will use a comparative approach to survey the development of the neural crest in vertebrates and neural crest like cells across the metazoa This information will be used to reveal neural crest evolution and identify the genomic genetic and gene regulatory changes that drove them Key selling features Summarizes the data regarding neural crest cells and neural crest derivatives Uses a broad based comparative approach Suggests hypothesis that the origin of neural crest cells involved the novel co activation of ancient metazoan gene programs in neural border cells Illustrates how the emergences of neural crest made possible the diversification of vertebrate heads

Chordate Zoology P.S.Verma,2010-12 FOR B Sc B Sc Hons

CLASSES OF ALL INDIAN UNIVERSITIES AND ALSO AS PER UGC MODEL CURRICULUM Contents CONTENTS

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Index Medicus, 2004 Vols for 1963 include as pt 2 of the Jan issue Medical subject headings Ebook:

Biology BROOKER,2014-09-16 Ebook Biology

Evolutionary Developmental Biology of Invertebrates 6 Andreas

Wanninger,2015-08-11 This multi author six volume work summarizes our current knowledge on the developmental biology of all major invertebrate animal phyla The main aspects of cleavage embryogenesis organogenesis and gene expression are discussed in an evolutionary framework Each chapter presents an in depth yet concise overview of both classical and recent literature supplemented by numerous color illustrations and micrographs of a given animal group The largely taxon based chapters are supplemented by essays on topical aspects relevant to modern day EvoDevo research such as regeneration embryos in the fossil record homology in the age of genomics and the role of EvoDevo in the context of reconstructing evolutionary and phylogenetic scenarios A list of open questions at the end of each chapter may serve as a source of inspiration for the next generation of EvoDevo scientists Evolutionary Developmental Biology of Invertebrates is a must have for any scientist teacher or student interested in developmental and evolutionary biology as well as in general invertebrate zoology This chapter is dedicated to the Deuterostomia comprising the Echinodermata and Hemichordata usually grouped together as the Ambulacraria as well as the Cephalochordata and the Tunicata *The Orexin System. Basic Science and Role in Sleep Pathology* M.A. Steiner,M. Yanagisawa,M. Clozel,Julien Bogousslavsky,2021-05-28 The orexin system discovered in 1998 has emerged as a crucial player in regulating the sleep and wake balance inside our brain This discovery has sparked a burst of novel and dynamic research on the physiology and pathology of sleep The Orexin System Basic

Science and Role in Sleep Pathology honors this research and the authors share their ideas and perspectives on the novel developments within the field The book examines the intricate role of the orexin system in regulating sleep and wake and its interaction with other wake regulating systems The orexin system is dissected at the cellular and molecular level to explore the diversity of the orexin producing neurons their projections and their signaling pathways Additionally the book discusses the diseases which are associated with a dysfunctional orexin system such as narcolepsy insomnia substance abuse and Alzheimer s disease and explores the new potential therapeutic applications derived from the burst of research around this fascinating system This publication is essential reading for neurobiologists neurologists psychopharmacologists sleep researchers and other researchers and clinical scientists interested in sleep sleep research insomnia and medicine in general

Life (Loose Leaf) David E. Sadava,H. Craig Heller,Gordon H. Orians,William K. Purves,David M. Hillis,2006-11-15 CO PUBLISHED BY SINAUER ASSOCIATES INC AND W H FREEMAN AND COMPANY LIFE HAS EVOLVED from its original publication to this dramatically revitalized Eighth Edition LIFE has always shown students how biology works offering an engaging and coherent presentation of the fundamentals of biology by describing the landmark experiments that revealed them This edition builds on those strengths and introduces several innovations As with previous editions the Eighth Edition will also be available in three paperback volumes Volume I The Cell and Heredity Chapters 1 20 Volume II Evolution Diversity and Ecology Chapters 1 21 33 52 57 Volume III Plants and Animals Chapters 1 34 51 *Cumulated Index Medicus* ,1996 *Evolutionary Developmental Biology* ,2021-02-16 Evolutionary Developmental Biology Volume 141 focuses on recent research in evolutionary developmental biology the science studying how changes in development cause the variations that natural selection operate on Several new hypotheses and models are presented in this volume and these concern how homology may be properly delineated how neural crest and placode cells emerged and how they formed the skull and jaw and how plasticity and developmental symbiosis enable normal development to be regulated by environmental factors New models for homology New hypotheses for the generation of chordates New models for the roles of plasticity and symbionts in normal development *Life, Vol. II: Evolution, Diversity and Ecology* David E. Sadava,2008 Co published by Sinauer Associates Inc and W H Freeman and Company Visit the Life Eighth Edition preview site LIFE HAS EVOLVED from its original publication to this dramatically revitalized Eighth Edition LIFE has always shown students how biology works offering an engaging and coherent presentation of the fundamentals of biology by describing the landmark experiments that revealed them This edition builds on those strengths and introduces several innovations As with previous editions the Eighth Edition will also be available in three paperback volumes Volume I The Cell and Heredity Chapters 1 20 Volume II Evolution Diversity and Ecology Chapters 1 21 33 52 57 Volume III Plants and Animals Chapters 1 34 51 **Introduction to Paleobiology and the Fossil Record** Michael J. Benton,David A. T. Harper,2013-04-25 This book presents a comprehensive overview of the science of the history of life Paleobiologists bring many analytical tools to bear in interpreting the fossil

record and the book introduces the latest techniques from multivariate investigations of biogeography and biostratigraphy to engineering analysis of dinosaur skulls and from homeobox genes to cladistics All the well known fossil groups are included including microfossils and invertebrates but an important feature is the thorough coverage of plants vertebrates and trace fossils together with discussion of the origins of both life and the metazoans All key related subjects are introduced such as systematics ecology evolution and development stratigraphy and their roles in understanding where life came from and how it evolved and diversified Unique features of the book are the numerous case studies from current research that lead students to the primary literature analytical and mathematical explanations and tools together with associated problem sets and practical schedules for instructors and students any serious student of geology who does not pick this book off the shelf will be putting themselves at a huge disadvantage The material may be complex but the text is extremely accessible and well organized and the book ought to be essential reading for palaeontologists at undergraduate postgraduate and more advanced levels both in Britain as well as in North America Falcon Lang H Proc Geol Assoc 2010 this is an excellent introduction to palaeontology in general It is well structured accessibly written and pleasantly informative I would recommend this as a standard reference text to all my students without hesitation David Norman Geol Mag 2010 Companion website This book includes a companion website at www.blackwellpublishing.com/paleobiology The website includes An ongoing database of additional Practical s prepared by the authors Figures from the text for downloading Useful links for each chapter Updates from the authors

Gene Regulatory Networks, 2020-05-22 Gene Regulatory Networks Volume 139 in the Current Topics in Developmental Biology series highlights new advances in the field with this new volume presenting interesting chapters written by an international board of authors Topics in this release include Mouse hindbrain GRN Xenopus endoderm GRN organogenesis Vertebrate limb GRN The notochord gene regulatory network in chordate evolution conservation and divergence from Ciona to vertebrates Ciona early embryo GRNs Boolean logic models Modeling GRN response to morphogen gradient GRN architecture Theory of GRN evolution Evolution of fly segmentation GRNs GRN evolution in echinoderms Evolution of network specificity and more Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Current Topics in Developmental Biology series Includes the latest information on gene regulatory networks

Principles of Developmental Genetics Sally A. Moody, 2007-07-19 Unlike anything currently available in the market Dr Sally A Moody and a team of world renowned experts provide a groundbreaking view of developmental genetics that will influence scientific approaches in embryology comparative biology as well as the newly emerging fields of stem cell biology and regenerative medicine Principles of Developmental Genetics highlights the intersection of developmental biology with new revolutionary genomic technologies and details how these advances have accelerated our understanding of the molecular genetic processes that regulates development This definitive resource provides researchers with the opportunity to gain important insights into the clinical applicability of emerging new

technologies and animal model data This book is a must have for all researchers in genetics developmental biology regenerative medicine and stem cell biology Includes new research not previously published in any other book on the molecular genetic processes that regulates development Chapters present a broad understanding on the application of animal model systems allowing researchers to better treat clinical disorders and comprehend human development Relates the application of new technologies to the manipulation of stem cells causes of human birth defects and several human disease conditions Each chapter includes a bulleted summary highlighting clinical aspects of animal models The Neural Crest and Neural Crest Cells in Vertebrate Development and Evolution Brian K. Hall, 2008-12-28 A presentation of all aspects of neural crest cell origins embryological and evolutionary development and evolution neural crest cell behavior migration and anomalies neurocristopathies and birth defects that arise from defective neural crest development The treatment of development will include discussions of cellular molecular and genetic aspects of the differentiation and morphogenesis of neural crest cells and structures derived from neural crest cells The origins of the neural crest in embryology will be discussed using the recent information on the molecular basis of the specification of the neural crest Also presented are the advances in our understanding of the evolution of jaws from studies on lampreys and of the neural crest from studies on ascidians and amphioxus **The Dissection of Vertebrates** Gerardo De Iuliis, Dino Pulerà, 2019-07-24 Detailed and concise dissection directions updated valuable information and extraordinary illustrations make The Dissection of Vertebrates 3rd Edition the new ideal manual for students in comparative vertebrate anatomy as well as a superb reference for vertebrate and functional morphology vertebrate paleontology and advanced level vertebrate courses such as in mammalogy ornithology ichthyology and herpetology This newly revised edition of the most comprehensive manual available continues to offer today's more visually oriented student with a manual combining pedagogically effective text with high quality accurate and attractive visual references This new edition features updated and expanded phylogenetic coverage revisions to the illustrations and text of the lamprey shark perch mudpuppy frog cat pigeon and reptile skull chapters and new sections on amphioxus or lancelet Branchiostoma Cephalochordata a sea squirt Ciona Urochordata shark musculature a gravid shark shark embryo cat musculature and the sheep heart Using the same systematic approach within a systemic framework as the first two editions The Dissection of Vertebrates 3rd Edition covers several animals commonly used in providing an anatomical transition sequence Nine animals are covered amphioxus sea squirt lamprey shark perch mudpuppy frog cat and pigeon plus five reptile skulls two mammal skulls and the sheep heart Winner of a 2020 Textbook Excellence Award College Texty from the Textbook and Academic Authors Association Seven detailed vertebrate dissections providing a systemic approach Includes carefully developed directions for dissection Original high quality award winning illustrations Clear and sharp photographs Expanded and updated features on phylogenetic coverage New sections on amphioxus Cephalochordata sea squirt Urochordata shark musculature gravid shark shark embryo cat musculature sheep heart Major Events in Early

Vertebrate Evolution Per Erik Ahlberg, 2001-02-15 A multi author volume Major Events in Early Vertebrate Evolution examines the origin and early evolution of the backboned animals vertebrates the group which comprises all fishes amphibians reptiles birds and mammals including ourselves This volume draws together evidence from fossils genes and developmental biology the study of how embryo

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