

Chapter 30 Nonvertebrate Chordates Fishes Amphibians Answer

Authors Kenneth Miller and Joseph Levine continue to set the standard for clear, accessible writing and up-to-date content that engages student interest. Prentice Hall Biology utilizes a student-friendly approach that provides a powerful framework for connecting the key concepts a biology. Students explore concepts through engaging narrative, frequent use of analogies, familiar examples, and clear and instructional graphics. Whether using the text alone or in tandem with exceptional ancillaries and technology, teachers can meet the needs of every student at every learning level.

This book, published in two volumes, provides the most comprehensive review of lamprey biology since Hardisty and Potter's "The Biology of Lampreys" published more than 30 years ago. This second volume offers a synthesis of topics related to the lamprey gonad (e.g., lamprey sex ratios, sex determination and sex differentiation, sexual maturation, and sex steroids), the artificial propagation of lampreys, post-metamorphic feeding and the evolution of alternative feeding and migratory types, the history and status of sea lamprey control in the Laurentian Great Lakes and Lake Champlain, and an overview of contributions of lamprey developmental studies for understanding vertebrate evolution.

Vertebrate Endocrinology represents more than just a treatment of the endocrine system-it integrates hormones with other chemical bioregulatory agents not classically included with the endocrine system. It provides a complete overview of the endocrine system of vertebrates by first emphasizing the mammalian system as the basis of most terminology and understanding of endocrine mechanisms and then applies that to non-mammals. The serious reader will gain both an understanding of the intricate relationships among all of the body systems and their regulation by hormones and other bioregulators, but also a sense of their development through evolutionary time as well as the roles of hormones at different stages of an animal's life cycle. Includes new full color format includes over 450 full color, completely redrawn image Features a companion web site hosting all images from the book as PPT slides and .jpeg files Presents completely updated and revitalized content with new chapters, such as Endocrine Disrupters and Behavioral Endocrinology Offers new clinical correlation vignettes throughout

Owing its inspiration and title to *On the Origin of Species*, James W. Valentine's ambitious book synthesizes and applies the vast treasury of theory and research collected in the century and a half since Darwin's time. By investigating the origins of life's diversity, Valentine unlocks the mystery of the origin of phyla. One of the twentieth century's most distinguished paleobiologists, Valentine here integrates data from molecular genetics, evolutionary developmental biology, embryology, comparative morphology, and paleontology into an analysis of interest to scholars from any of these fields. He begins by examining the sorts of evidence that can be gleaned from fossils, molecules, and morphology, then reviews and compares the basic morphology and development of animal phyla, emphasizing the important design elements found in the bodyplans of both living and extinct phyla. Finally, Valentine undertakes the monumental task of developing models to explain the origin and early diversification of animal phyla, as well as their later evolutionary patterns. Truly a magnum opus, *On the Origin of Phyla* will take its place as one of the classic scientific texts of the twentieth century, affecting the work of paleontologists, morphologists, and developmental, molecular, and evolutionary biologists for decades to come. "A magisterial compendium . . . Valentine offers a judicious evaluation of an astonishing array of evidence."—Richard Fortey, *New Scientist* "Truly a magnum opus, *On the Origin of Phyla* has already taken its place as one of the classic scientific texts of the twentieth century, affecting the work of paleontologists, morphologists, and developmental, molecular, and evolutionary biologists for decades to

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come."—Ethology, Ecology & Evolution "Valentine is one of the Renaissance minds of our time. . . . Darwin wisely called his best-known work *On the Origin of the Species*; the origin of the phyla is an even stickier problem, and Valentine deserves credit for tackling it at such breadth . . . A magnificent book."—Stefan Bengtson, *Nature*

The Evolution of the Immune System: Conservation and Diversification is the first book of its kind that prompts a new perspective when describing and considering the evolution of the immune system. Its unique approach summarizes, updates, and provides new insights on the different immune receptors, soluble factors, and immune cell effectors. Helps the reader gain a modern idea of the evolution of the immune systems in pluricellular organisms Provides a complete overview of the most studied and hot topics in comparative and evolutionary immunology Reflects the organisation of the immune system (cell-based, humoral [innate], humoral [adaptive]) without introducing further and misleading levels of organization Brings concepts and ideas on the evolution of the immune system to a wide readership

Epigenetic Mechanisms of the Cambrian Explosion provides readers with a basic biological knowledge and epigenetic explanation of the biological puzzle of the Cambrian explosion, the unprecedented rapid diversification of animals that began 542 million years ago. During an evolutionarily instant of ~10 million years, which represents only 0.3% of the time of existence of life on Earth, or less than 2% of the time of existence of metazoans, all of the 30 extant body plans, major animal groups (phyla) and several extinct groups appeared. The work helps address this phenomena and tries to answer remaining questions for evolutionary biology, epigenetics, and scientific researchers. The book recognizes and presents objective representations of alternative theories for epigenetic evolution in this period, with the author drawing on his epigenetic theory of evolution to explain the causal basis of the Cambrian explosion. Both empirical evidence and theoretical arguments are presented in support of this thought-provoking epigenetic theory. Explains the Cambrian explosion from an entirely epigenetic view Takes a causal rather than descriptive approach to the phenomenon Allows for a broad readership, including those with only a basic biological knowledge, while maintaining scientific rigor

This book provides a series of comprehensive views on various important aspects of vertebrate photoreceptors. The vertebrate retina is a tissue that provides unique experimental advantages to neuroscientists. Photoreceptor neurons are abundant in this tissue and they are readily identifiable and easily isolated. These features make them an outstanding model for studying neuronal mechanisms of signal transduction, adaptation, synaptic transmission, development, differentiation, diseases and regeneration. Thanks to recent advances in genetic analysis, it also is possible to link biochemical and physiological investigations to understand the molecular mechanisms of vertebrate photoreceptors within a functioning retina in a living animal. Photoreceptors are the most deeply studied sensory receptor cells, but readers will find that many important questions remain. We still do not know how photoreceptors, visual pigments and their signaling pathways evolved, how they were generated and how they are maintained. This book will make clear what is known and what is not known. The chapters are selected from fields of studies that have contributed to a broad understanding of the birth, development, structure, function and death of photoreceptor neurons. The underlying common word in all of the chapters that is used to describe these mechanisms is "molecule". Only with this word can we understand how these highly specific neurons function and survive. It is challenging for even the foremost researchers to cover all aspects of the subject.

Understanding photoreceptors from several different points of view that share a molecular perspective will provide readers with a useful interdisciplinary perspective.

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

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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 vertebrate head is the most complex part of the animal body and its diversity in nature reflects a variety of life styles, feeding modes, and ecological adaptations. This book will take you on a journey to discover the origin and diversification of the head, which evolved from a seemingly headless chordate ancestor. Despite their structural diversity, heads develop in a highly conserved fashion in embryos. Major sensory organs like the eyes, ears, nose, and brain develop in close association with surrounding tissues such as bones, cartilages, muscles, nerves, and blood vessels. Ultimately, this integrated unit of tissues gives rise to the complex functionality of the musculoskeletal system as a result of sensory and neural feedback, most notably in the use of the vertebrate jaws, a major vertebrate innovation only lacking in hagfishes and lampreys. The cranium subsequently further diversified during the major transition from fishes living in an aquatic environment to tetrapods living mostly on land. In this book, experts will join forces to integrate, for the first time, state-of-the-art knowledge on the anatomy, development, function, diversity, and evolution of the head and jaws and their muscles within all major groups of extant vertebrates. Considerations about and comparisons with fossil taxa, including emblematic groups such as the dinosaurs, are also provided in this landmark book, which will be a leading reference for many years to come.

One program that ensures success for all students

The first comprehensive book to cover all aspects of the last 25 years of PACAP (pituitary adenylate cyclase activating polypeptide) research, this book contains contributions from virtually all the leading researchers in the field, and addresses some of the following topics: evolutionary aspects of PACAP, distribution and occurrence of PACAP and its receptors, hormonal effects of PACAP, intracellular signaling, effects on cellular proliferation and differentiation, protective effects of PACAP, behavioral effects of PACAP, developmental aspects of PACAP, other physiological effects of PACAP (cardiovascular, thermoregulatory), human studies, drug design, metabolism and transport. This compendium can serve as an important reference for researchers and students in PACAP research and can also be a thorough introduction for those in related fields.

A 1999 edition of a highly successful book describing comprehensive research in

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the study of the neural crest.

The Vertebrata is one of the most speciose groups of animals, comprising more than 58,000 living species. This book provides a detailed account on the comparative anatomy, development, homologies and evolution of the head, neck, pectoral and forelimb muscles of vertebrates. It includes hundreds of illustrations, as well as numerous tables showing the homologies between the muscles of all the major extant vertebrate taxa, including lampreys, elasmobranchs, hagfish, coelacanth, dipnoans, actinistians, teleosts, halecomorphs, ginglymodians, chondrosteans, caecilians, anurans, urodeles, turtles, lepidosaurs, crocodylians, birds, and mammals such as monotremes, rodents, tree-shrews, flying lemurs and primates, including modern humans. It also provides a list of more than a thousand synonyms that have been used by other authors to designate these muscles in the literature. Importantly, it also reviews data obtained in the fields of evolutionary developmental biology, molecular biology and embryology, and explains how this data helps to understand the evolution and homologies of vertebrate muscles. The book will be useful to students, teachers, and researchers working in fields such as functional morphology, ecomorphology, evolutionary developmental biology, zoology, molecular biology, evolution, and phylogeny. As the book includes crucial information about the anatomy, development, homologies, evolution and muscular abnormalities of our own species, *Homo sapiens*, it will also be helpful to physicians and medical students.

The book provides the most comprehensive review of lamprey biology since Hardisty and Potter's five-volume "The Biology of Lampreys" published more than 30 years ago. Published in two volumes, it includes contributions from international lamprey experts, reviewing and providing new insights into the evolution, general biology, and management of lampreys worldwide. This first volume offers up-to-date chapters on the systematics, general biology, conservation status, and conservation needs of lampreys. It will serve as an important reference for researchers working on any aspect of lamprey biology and fishery managers whose mandate is to control or conserve lamprey populations.

Chordates comprise lampreys, hagfishes, jawed fishes, and tetrapods, plus a variety of more unfamiliar and crucially important non-vertebrate animal lineages, such as lancelets and sea squirts. This will be the first book to synthesize, summarize, and provide high-quality illustrations to show what is known of the configuration, development, homology, and evolution of the muscles of all major extant chordate groups. Muscles as different as those used to open the siphons of sea squirts and for human facial communication will be compared, and their evolutionary links will be explained. Another unique feature of the book is that it covers, illustrates, and provides detailed evolutionary tables for each and every muscle of the head, neck and of all paired and median appendages of extant vertebrates.

In 1687 in Connecticut, Kit Tyler, feeling out of place in the Puritan household of

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her aunt, befriends an old woman considered a witch by the community and suddenly finds herself standing trial for witchcraft.

This book addresses a growing need to decipher the biological processes associated with fish reproduction, in view of the growth of aquaculture and the dwindling natural stocks of commercially important fish. It presents a comprehensive overview on egg production in fish, from the standpoint of the oocyte. Special emphasis is placed on using state-of-the-art tools including electron microscopy for discerning the ultra-structure of the follicle and genomic/proteomic tools to fully understand biological basis of fish reproduction.

Long-Range Control of Gene Expression covers the current progress in understanding the mechanisms for genomic control of gene expression, which has grown considerably in the last few years as insight into genome organization and chromatin regulation has advanced. Discusses the evolution of cis-regulatory sequences in drosophila Includes information on genomic imprinting and imprinting defects in humans Includes a chapter on epigenetic gene regulation in cancer

Invertebrate Embryology and Reproduction deals with the practical and theoretical objectives of the descriptive embryology of invertebrates, along with discussions on reproduction in these groups of animals. It explains several morphological and anatomical expressions in the field and covers the embryology of invertebrate animals, starting from the Protozoa, to the Echinodermata, the Protochordate and Tunicates. These groups include economically important aquatic invertebrates, such as crustaceans, as well as medically important invertebrates and economic arthropods. Each chapter is preceded by the taxonomy of the discussed phylum and/or the species to enable the reader to locate the systematic position. Covers phylum definition, general characteristics, classification, reproduction, agametic reproduction, gametic reproduction, spawning, fertilization, development and embryogenesis Includes recent findings in the area, along with detailed figures and photos that illustrate important concepts Brings together difficult-to-obtain research data from the field, not only in Egyptian libraries, but globally, and previously only found through specialized references not widely available Clarifies descriptions with striking photos and electron microscopical studies of different species

World-class palaeontologists and biologists summarise the state-of-the-art on fish evolution and development.

The goldfish, *Carassius auratus*, a member of the Carp family, Cyprinidae, has been domesticated for many hundreds of years, as a food fish, a laboratory animal and now most important commercially, for ornamental and aesthetic purposes. There are now many scores of recognised varieties, which have been produced over time by selection processes and other methods described in detail in this stimulating book. Goldfish Varieties and Genetics covers all major aspects relating to goldfish breeding and genetics in a readable and user-friendly style. An account is presented of the domestication and evolution of the goldfish, including comprehensive details of the relevant genetic and biological principles involved in the development strategies and production of new varieties. The book also covers the subject of goldfish appreciation and the international significance of goldfish shows and show standards. The book concludes with an exciting forward look at the potential evolutionary future for the goldfish. This important and timely book brings together, for the first time, a wealth of

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scientific information, presented in a clear and understandable manner by Dr Joseph Smartt, who has many years' experience working in fish genetics and breeding. The book is a must-have purchase for all serious goldfish breeders, hobbyists and dealers, fish biologists and geneticists, aquarium keepers and aquaculture personnel. The author, Joseph Smartt is a Senior Visiting Research Fellow at the Department of Biological Sciences, University of Southampton, UK.

Widely praised for its comprehensive coverage and exceptionally clear writing style, this text explores how the anatomy, physiology, ecology, and behaviour of animals interact to produce organisms that function effectively in their environments and how lineages of organisms change through evolutionary time.

Polyploidy – whole-genome duplication (WGD) – is a fundamental driver of biodiversity with significant consequences for genome structure, organization, and evolution. Once considered a speciation process common only in plants, polyploidy is now recognized to have played a major role in the structure, gene content, and evolution of most eukaryotic genomes. In fact, the diversity of eukaryotes seems closely tied to multiple WGDs. Polyploidy generates new genomic interactions – initially resulting in “genomic and transcriptomic shock” – that must be resolved in a new polyploid lineage. This process essentially acts as a “reset” button, resulting in genomic changes that may ultimately promote adaptive speciation. This book brings together for the first time the conceptual and theoretical underpinnings of polyploid genome evolution with syntheses of the patterns and processes of genome evolution in diverse polyploid groups.

Because polyploidy is most common and best studied in plants, the book emphasizes plant models, but recent studies of vertebrates and fungi are providing fresh perspectives on factors that allow polyploid speciation and shape polyploid genomes. The emerging paradigm is that polyploidy – through alterations in genome structure and gene regulation – generates genetic and phenotypic novelty that manifests itself at the chromosomal, physiological, and organismal levels, with long-term ecological and evolutionary consequences.

A complete guide to endonuclease-based genomic engineering, from basic science to application in disease biology and clinical treatment.

Synthesizing coverage of sensation and reward into a comprehensive systems overview, *Neurobiology of Sensation and Reward* presents a cutting-edge and multidisciplinary approach to the interplay of sensory and reward processing in the brain. While over the past 70 years these areas have drifted apart, this book makes a case for reuniting sensation and reward by highlighting the important links and interface between the two. Emphasizing the role of reward in reinforcing behaviors, the book begins with an exploration of the history, ecology, and evolution of sensation and reward. Progressing through the five senses, contributors explore how the brain extracts information from sensory cues. The chapter authors examine how different animal species predict rewards, thereby integrating sensation and reward in learning, focusing on effects in anatomy, physiology, and behavior. Drawing on empirical research, contributors build on the themes of the book to present insights into the human sensory rewards of perfume, art, and music, setting the scene for further cross-disciplinary collaborations that bridge the neurobiological interface between sensation and

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reward.

Vertebrate palaeontology is a lively field, with new discoveries reported every week... and not only dinosaurs! This new edition reflects the international scope of vertebrate palaeontology, with a special focus on exciting new finds from China. A key aim is to explain the science. Gone are the days of guesswork. Young researchers use impressive new numerical and imaging methods to explore the tree of life, macroevolution, global change, and functional morphology. The fourth edition is completely revised. The cladistic framework is strengthened, and new functional and developmental spreads are added. Study aids include: key questions, research to be done, and recommendations of further reading and web sites. The book is designed for palaeontology courses in biology and geology departments. It is also aimed at enthusiasts who want to experience the flavour of how the research is done. The book is strongly phylogenetic, and this makes it a source of current data on vertebrate evolution.

Scientific Frontiers in Developmental Toxicology and Risk Assessment reviews advances made during the last 10-15 years in fields such as developmental biology, molecular biology, and genetics. It describes a novel approach for how these advances might be used in combination with existing methodologies to further the understanding of mechanisms of developmental toxicity, to improve the assessment of chemicals for their ability to cause developmental toxicity, and to improve risk assessment for developmental defects. For example, based on the recent advances, even the smallest, simplest laboratory animals such as the fruit fly, roundworm, and zebrafish might be able to serve as developmental toxicological models for human biological systems. Use of such organisms might allow for rapid and inexpensive testing of large numbers of chemicals for their potential to cause developmental toxicity; presently, there are little or no developmental toxicity data available for the majority of natural and manufactured chemicals in use. This new approach to developmental toxicology and risk assessment will require simultaneous research on several fronts by experts from multiple scientific disciplines, including developmental toxicologists, developmental biologists, geneticists, epidemiologists, and biostatisticians.

More than three hundred million years ago—a relatively recent date in the two billion years since life first appeared—vertebrate animals first ventured onto land. This usefully illustrated book describes how some finned vertebrates acquired limbs, giving rise to more than 25,000 extant tetrapod species. Michel Laurin uses paleontological, geological, physiological, and comparative anatomical data to describe this monumental event. He summarizes key concepts of modern paleontological research, including biological nomenclature, paleontological and molecular dating, and the methods used to infer phylogeny and character evolution. Along with a discussion of the evolutionary pressures that may have led vertebrates onto dry land, the book also shows how extant vertebrates yield clues about the conquest of land and how scientists uncover evolutionary history. Fish form an extremely diverse group of vertebrates. At a conservative estimate

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at least 40% of the world's vertebrates are fish. On the one hand they are united by their adaptations to an aquatic environment and on the other they show a variety of adaptations to differing environmental conditions - often to extremes of temperature, salinity, oxygen level and water chemistry. They exhibit an array of behavioural and reproductive systems. Interesting in their own right, this suite of adaptive physiologies provides many model systems for both comparative vertebrate and human physiologists. This four volume encyclopedia covers the diversity of fish physiology in over 300 articles and provides entry level information for students and summary overviews for researchers alike. Broadly organised into four themes, articles cover Functional, Thematic, and Phylogenetic Physiology, and Fish Genomics Functional articles address the traditional aspects of fish physiology that are common to all areas of vertebrate physiology including: Reproduction, Respiration, Neural (Sensory, Central, Effector), Endocrinology, Renal, Cardiovascular, Acid-base Balance, Osmoregulation, Ionoregulation, Digestion, Metabolism, Locomotion, and so on. Thematic Physiology articles are carefully selected and fewer in number. They provide a level of integration that goes beyond the coverage in the Functional Physiology topics and include discussions of Toxicology, Air-breathing, Migrations, Temperature, Endothermy, etc. Phylogenetic Physiology articles bring together information that bridges the physiology of certain groupings of fishes where the knowledge base has a sufficient depth and breadth and include articles on Ancient Fishes, Tunas, Sharks, etc. Genomics articles describe the underlying genetic component of fish physiology and high light their suitability and use as model organisms for the study of disease, stress and physiological adaptations and reactions to external conditions. Winner of a 2011 PROSE Award Honorable Mention for Multivolume Science Reference from the Association of American Publishers The definitive encyclopedia for the field of fish physiology Three volumes which comprehensively cover the entire field in over 300 entries written by experts Detailed coverage of basic functional physiology of fishes, physiological themes in fish biology and comparative physiology amongst taxonomic Groups Describes the genomic bases of fish physiology and biology and the use of fish as model organisms in human physiological research Includes a glossary of terms Biology and Physiology of Freshwater Neotropical Fish is the all-inclusive guide to fish species prevalent in the neotropical realm. It provides the most updated systematics, classification, anatomical, behavioral, genetic, and functioning systems information on freshwater neotropical fish species. This book begins by analyzing the differences in phylogeny, anatomy, and behaviour of neotropical fish. Systems such as cardiovascular, respiratory, renal, digestive, reproductive, muscular, and endocrine are described in detail. This book also looks at the effects of stress on fish immune systems, and how color and pigmentation play into physiology and species differentiation. Biology and Physiology of Freshwater Neotropical Fish is a must-have for fish biologists and zoologists. Students in

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zoology, ichthyology, and fish farming will also find this book useful for its coverage of some of the world's rarest and least-known fish species. Features chapters written by top neotropical fish researchers and specialists Discusses environmental effects on neotropical fishes, including climate change and pollution Details the phylogenetic occurrence of electroreceptors and electric organs in fish

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Ordinarily, textbooks are developed by first writing chapters, then making decisions about art and images, and finally, once the book is complete, assembling a test bank and ancillary media. This process dramatically limits the integration across resources, and reduces art, media, and assessments to ancillary material, rather than essential resources for student learning. *Biology: How Life Works* is the first project to develop three pillars—the text, the visual program, and the assessment—at the same time. All three pillars were developed in parallel to make sure that each idea is addressed in the most appropriate medium, and to ensure authentic integration. These three pillars are all tied to the same set of core concepts, share a common language, and use the same visual palette. In this way, the text, visual program, and assessments are integral parts of student learning, rather than just accessories to the text

Looks at amphibians from around the world, including the fire-bellied toad, giant salamander, and poison dart frog.

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, *Concepts of Biology* is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of *Concepts of Biology* is that instructors can customize the book, adapting it to the approach that works best in their classroom. *Concepts of Biology* also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

The *Evolution of the Genome* provides a much needed overview of genomic study through clear, detailed, expert-authored discussions of the key areas in genome biology. This includes the evolution of genome size, genomic parasites,

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gene and ancient genome duplications, polypoidy, comparative genomics, and the implications of these genome-level phenomena for evolutionary theory. In addition to reviewing the current state of knowledge of these fields in an accessible way, the various chapters also provide historical and conceptual background information, highlight the ways in which the critical questions are actually being studied, indicate some important areas for future research, and build bridges across traditional professional and taxonomic boundaries. The Evolution of the Genome will serve as a critical resource for graduate students, postdoctoral fellows, and established scientists alike who are interested in the issue of genome evolution in the broadest sense. Provides detailed, clearly written chapters authored by leading researchers in their respective fields Presents a much-needed overview of the historical and theoretical context of the various areas of genomic study Creates important links between topics in order to promote integration across subdisciplines, including descriptions of how each subject is actually studied Provides information specifically designed to be accessible to established researchers, postdoctoral fellows, and graduate students alike

Hagfishes and lampreys, both examples of jawless fishes, are elongated, eel-like animals lacking paired fins, and are the only living representatives of ancient creatures that gave rise to current species of fish and, eventually, humans. This volume provides an overview of the current status of knowledge on a variety of topics related to jawless fishes, including their taxonomy, zoogeography, phylogeny, molecular biology, evolution, life history, role in the ecosystem, and fisheries and management of hagfishes and lampreys worldwide. This is the first book dealing exclusively with the various aspects of jawless fish species throughout the world. It brings together a number of papers providing new data on jawless fishes, and offers readers a range of useful information within a single reference, reflecting the growing appreciation for hagfishes and lampreys worldwide.

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