

# Genome Evolution

Gene and Genome Duplications and the  
Origin of Novel Gene Functions

Axel Meyer and Yves Van de Peer (eds.)



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# Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions

**David Baud**



## **Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions:**

**Genome Evolution** Axel Meyer, Yves van de Peer, 2003-04-30 Table of contents *Genome Evolution* Axel Meyer, Yves van de Peer, 2011-06-28 In the years since the publication of Susumu Ohno's 1970 landmark book *Evolution by gene duplication* tremendous advances have been made in molecular biology and especially in genomics. Studies of genome structure and function prerequisite to testing hypotheses of genome evolution were all but impossible until recent methodological advances. This book evaluates newly generated empirical evidence as it pertains to theories of genomic evolutionary patterns and processes. Tests of hypotheses using analyses of complete genomes interpreted in a phylogenetic context provide evidence regarding the relative importance of gene duplication. The alternative explanation is that the evolution of regulatory elements that control the expression of and interactions among genes has been a more important force in shaping evolutionary innovation. This collection of papers will be of interest to all academic and industry researchers working in the fields of molecular biology, biotechnology, genomics, and genome centers.

*The Evolution of the Genome* T. Ryan Gregory, 2011-05-04 *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, 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.

*Evolution after Gene Duplication* Katharina Dittmar, David Liberles, 2011-06-09 Gene duplication has long been believed to have played a major role in the rise of biological novelty through evolution of new function and gene expression patterns. The first book to examine gene duplication across all levels of biological organization, *Evolution after Gene Duplication* presents a comprehensive picture of the mechanistic process by which gene duplication may have played a role in generating biodiversity. Key Features: Explores comparative genomics, genome evolution studies, and analysis of multi gene families such as Hox, globins, olfactory receptors, and MHC immune system. A complete post genome treatment of the topic originally covered by Ohno's 1970 classic, this volume extends coverage to include the fate of

associated regulatory pathways Taps the significant increase in multi gene family data that has resulted from comparative genomics Comprehensive coverage that includes opposing theoretical viewpoints comparative genomics data theoretical and empirical evidence and the role of bioinformatics in the study of gene duplication This up to date overview of theory and mathematical models along with practical examples is suitable for scientists across various levels of biology as well as instructors and graduate students

**Gene Sharing and Evolution** Joram PIATIGORSKY, Joram Piatigorsky, 2009-06-30 In Gene Sharing and Evolution Piatigorsky explores the generality and implications of gene sharing throughout evolution and argues that most if not all proteins perform a variety of functions in the same and in different species and that this is a fundamental necessity for evolution

**Plant Genome Diversity Volume 2** Johann Greilhuber, Jaroslav Dolezel, Jonathan Wendel, 2012-11-13 This second of two volumes on Plant Genome Diversity provides in 20 chapters insights into the structural evolution of plant genomes with all its variations Starting with an outline of plant phylogeny and its reconstruction the second part of the volume describes the architecture and dynamics of the plant cell nucleus the third examines the evolution and diversity of the karyotype in various lineages including angiosperms gymnosperms and monilophytes The fourth part presents the mechanisms of polyploidization and its biological consequences and significance for land plant evolution The fifth part deals with genome size evolution and its biological significance Together with Volume I this comprehensive book on the plant genome is intended for students and professionals in all fields of plant science offering as it does a convenient entry into a burgeoning literature in a fast moving field

[The Siberian Sturgeon \(Acipenser baerii, Brandt, 1869\) Volume 1 - Biology](#) Patrick Williot, Guy Nonnotte, Denise Vizziano-Cantonnet, Mikhail Chebanov, 2018-04-06 The biology of the Siberian sturgeon *Acipenser baerii* Brandt 1869 has become a very attractive subject of investigation for biologists since the 1980s This volume 1 is part of a two volume set devoted to the species the second of which focuses on farming The present volume is divided into three parts Biology and ecology Biology and physiology of reproduction and Ecophysiology i e adaptation to the environment The first part addresses a broad range of topics such as the ecology including a new approach to species specificity a new insight on the mineralization of vertebral elements two approaches to sex determination transposable elements in the gonads early ontogeny olfaction and gustation nutrition and swimming The second part includes neurochemical and anatomical descriptions of the central nervous system and an updated version of the oogenesis the characteristics of both sperm and spermatozoa and a synthesis on gonadal steroids synthesis plasmatic levels and biological activities In turn the third part reveals how the physiology of the species changes depending on environmental factors such as oxygen ammonia and nitrite Some fundamental consequences of ammonia are developed sublethal and lethal levels effects on gill epithelium and haematology acid base balance on AA and adenyl nucleotides levels in plasma brain and muscle tissue In addition the book includes two methodological chapters dealing with fish dorsal aortic cannulation and respiration physiology

**Origin and Evolution of New Gene Functions** Manyuan Long, 2012-12-06 Although interest in

evolutionary novelties can be that these different mechanisms cooperate in the way traced back to the time of Darwin the appreciation of new genes. In the second phase of new gene evolution conventional models of new gene evolution and systematical experimental pursuit of the origin and evolution of new gene functions did not appear for example by gene duplication held that the mutation until the early years of last decade. Since the 1970s functions fixed in the early stages of the new genes are Susumu Ohno, Walter Gilbert and others from the assumed to be neutral or nearly neutral. However, it is an area of evolutionary genetics that has made pioneer efforts appears that the force of Darwinian positive selection has been detectably strong from the outset in available forms to elaborate possibilities for major biological mechanisms for example gene duplication and exon shuffling. Population genetic studies of young genes created through the process of exon recombination. This may shuffling by which new gene functions could arise. However, the problem of new gene evolution did not account for a common phenomenon in phylogenetic trees. Significant attention among biologists generally analyses of genes with changed functions the early even recently. One of the reasons was the lack of experimental systems for investigating evolved substitution rates. Nonetheless, a more general factual details of the birth process of new genes.

**Polyploidy and Genome Evolution** Pamela S. Soltis, Douglas E. Soltis, 2012-10-03  
 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.

Evolution Through Genetic Exchange Michael L. Arnold, 2006-07-27 This is the first book to focus on the rapidly expanding field of reticulate non tree-like or network evolution. Written by a top researcher in the field, this book includes a wealth of examples from viral, prokaryotic and eukaryotic clades.

*Evolutionary Biology: Genome Evolution, Speciation, Coevolution and Origin of Life* Pierre Pontarotti, 2014-07-25 This book includes the most essential contributions presented at the 17th Evolutionary Biology Meeting in Marseille which took place in September 2013. It consists of 18 chapters organized according to the following

categories Molecular and Genome Evolution Phylogeography of Speciation and Coevolution Exobiology and Origin of Life The aims of the annual meetings in Marseille which bring together leading evolutionary biologists and other scientists using evolutionary biology concepts e g for medical research are to promote the exchange of ideas and to encourage interdisciplinary collaborations Offering an overview of the latest findings in the field of evolutionary biology this book represents an invaluable source of information for scientists teachers and advanced students

**General and Comparative Endocrinology** A.M. Schreiber, 2023-11-24 General and Comparative Endocrinology An Integrative Approach takes a holistic approach to endocrinology introducing students to the diverse facets of this interdisciplinary science ranging from the medical to comparative domains while also exploring evolutionary environmental and conservation specializations within the field The textbook is founded on the principle that students interested in the health sciences will benefit from understanding how proficiency in endocrine function among a diversity of organisms contributes to advances in modern medicine Likewise students intrigued by comparative physiology will benefit from the wealth of knowledge derived from medical clinical endocrinology the historical bedrock of the field This textbook represents the modern field of endocrinology in its totality by addressing topics and recent advances not currently discussed in other introductory endocrinology textbooks

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 Integrates evolutionary and comparative approaches to hormones and health

**Evolution by Tumor Neofunctionalization** Andrei P. Kozlov, 2014-02-15 Evolution by Tumor Neofunctionalization explores the possibility of the positive role of tumors in evolution of multicellular organisms This unique perspective goes beyond recent publications on how evolution may influence tumors to consider the possible role of tumors in evolution Widespread in nature tumors represent a much broader category than malignant tumors only The majority of tumors in humans and other animals may never undergo malignant transformation Tumors may differentiate with the loss of malignancy and malignant tumors may spontaneously regress Cellular oncogenes and tumor suppressor genes play roles in normal development Many features of tumors could be used in evolution and there are examples of tumors that have played a role in evolution This book will stimulate thinking on this topic by specialists in the fields of evolutionary biology oncology molecular biology molecular evolution embryology evo devo tumor immunology pathology and clinical oncology Covers the role that tumors might play in evolution Provides multidisciplinary approach that will appeal to a wide circle of professionals in the fields of evolutionary biology oncology molecular biology and more

**Handbook of Comparative Genomics** Cecilia Saccone, Graziano Pesole, 2005-03-11 This comprehensive reference covers the comparative methodology involved in studying molecular evolution Providing a practical introduction to the role of

bioinformatics in comparative genomics this publication further discusses the basic technology used in genome sequencing projects and provides an overview of genome storage databases currently in use This timely and cutting edge text also Reviews the basic principles of genomics and gene expression analysis Discusses analytic methods in proteomics and transcriptomics Includes a comprehensive list of Web resource Issues in Genomics and Non-Human Genetic Research: 2011 Edition ,2012-01-09 Issues in Genomics and Non Human Genetic Research 2011 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Genomics and Non Human Genetic Research The editors have built Issues in Genomics and Non Human Genetic Research 2011 Edition on the vast information databases of ScholarlyNews You can expect the information about Genomics and Non Human Genetic Research in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Genomics and Non Human Genetic Research 2011 Edition has been produced by the world's leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at <http://www.ScholarlyEditions.com>

**The Biology of Sole** José A. Munoz-Cueto, Evaristo Mañanós-Sánchez, F. Javier Sánchez-Vázquez, 2019-05-13 This book reviews up to date knowledge on the biology of sole *Solea senegalensis* and *S. solea* These flatfish species are increasingly important in Europe both from the ecological and production point of view This book is divided into two sections A general fisheries aquaculture and engineering overviews B physiological developmental rhythmic welfare and genetic aspects which will be of immense interest for the aquaculture industry Experts from both academia and research institutes provide their expertise on sole biology

**Gene Duplication** Felix Friedberg, 2011-10-21 The book Gene Duplication consists of 21 chapters divided in 3 parts General Aspects A Look at Some Gene Families and Examining Bundles of Genes The importance of the study of Gene Duplication stems from the realization that the dynamic process of duplication is the sine qua non underlying the evolution of all living matter Genes may be altered before or after the duplication process thereby undergoing neofunctionalization thus creating in time new organisms which populate the Earth The Genome of an Organism Masroor Elahi Babar, Muhammad Ashraf, 2025-05-06 This book very carefully explains the fundamental processes of evolutionary genetics such as mutation natural selection genetic drift and speciation It discusses the role of these concepts in evolution and what the consequences are of their overacting and depressive behavior It gives an up to date overview of the studies on Evolutionary Genetics and the fundamentals of the relationships between genetics and evolution irrespective of the environment organisms inhabit Further discussion can be found on the structure of genetics theories of Darwin and Mendel evolutionary mechanisms and genetics and species formation gene flow phenotypic evolution behavioral genetics genetics and developmental evolution genetic manipulation and control of convergent evolution theory of adaptation

in animals and transmission of adaptive changes to the next generation possible variations in natural populations and their causes and finally the origin of new genes and their impacts on evolutionary process and phenotypic expressions     The Zebrafish in Biomedical Research Samuel Cartner, Judith S. Eisen, Susan F. Farmer, Karen J. Guillemin, Michael L. Kent, George E. Sanders, 2019-11-22 The Zebrafish in Biomedical Research Biology Husbandry Diseases and Research Applications is a comprehensive work that fulfills a critical need for a thorough compilation of information on this species The text provides significant updates for working vivarium professionals maintaining zebrafish colonies veterinarians responsible for their care and well being zoologists and ethologists studying the species and investigators using the species to gain critical insights into human physiology and disease As the zebrafish has become an important model organism for the study of vertebrate development and disease organ function behavior toxicology cancer and drug discovery this book presents an important resource for future research Presents a complete view of the zebrafish covering their biology husbandry diseases and research applications Includes the work of world renowned authors Provides the first authoritative and comprehensive treatment of zebrafish in biomedical research as part of the ACLAM series

The Top Books of the Year Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions The year 2023 has witnessed a remarkable surge in literary brilliance, with numerous compelling novels captivating the hearts of readers worldwide. Lets delve into the realm of top-selling books, exploring the engaging narratives that have captivated audiences this year. The Must-Read : Colleen Hoover's "It Ends with Us" This touching tale of love, loss, and resilience has captivated readers with its raw and emotional exploration of domestic abuse. Hoover skillfully weaves a story of hope and healing, reminding us that even in the darkest of times, the human spirit can triumph. Uncover the Best : Taylor Jenkins Reids "The Seven Husbands of Evelyn Hugo" This captivating historical fiction novel unravels the life of Evelyn Hugo, a Hollywood icon who defies expectations and societal norms to pursue her dreams. Reids captivating storytelling and compelling characters transport readers to a bygone era, immersing them in a world of glamour, ambition, and self-discovery. Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions : Delia Owens "Where the Crawdads Sing" This captivating coming-of-age story follows Kya Clark, a young woman who grows up alone in the marshes of North Carolina. Owens spins a tale of resilience, survival, and the transformative power of nature, entrancing readers with its evocative prose and mesmerizing setting. These top-selling novels represent just a fraction of the literary treasures that have emerged in 2023. Whether you seek tales of romance, adventure, or personal growth, the world of literature offers an abundance of engaging stories waiting to be discovered. The novel begins with Richard Papen, a bright but troubled young man, arriving at Hampden College. Richard is immediately drawn to the group of students who call themselves the Classics Club. The club is led by Henry Winter, a brilliant and charismatic young man. Henry is obsessed with Greek mythology and philosophy, and he quickly draws Richard into his world. The other members of the Classics Club are equally as fascinating. Bunny Corcoran is a wealthy and spoiled young man who is always looking for a good time. Charles Tavis is a quiet and reserved young man who is deeply in love with Henry. Camilla Macaulay is a beautiful and intelligent young woman who is drawn to the power and danger of the Classics Club. The students are all deeply in love with Morrow, and they are willing to do anything to please him. Morrow is a complex and mysterious figure, and he seems to be manipulating the students for his own purposes. As the students become more involved with Morrow, they begin to commit increasingly dangerous acts. The Secret History is a exceptional and thrilling novel that will keep you guessing until the very end. The novel is a warning tale about the dangers of obsession and the power of evil.

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