

# 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

**Katharina Dittmar, David Liberles**



## **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

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

**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 mak traced back to the time of Darwin the appreciation ing 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 muta until the early years of last decade Since the 1970s tions 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 area of evolutionary genetics have made pioneer ef appears that the force of Darwinian positive selection has been detectably strong from the outset in avail forts to elaborate possibilities for major biological mechanisms for example gene duplication and exon able 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 catch significant attention among biologists generally analyses of genes with changed functions the early even recently One of the reasons was the lack of ex stages of such genes are usually associated with accel perimental or observational systems for investigating erated substitution rates Nonetheless a more general factual details of the birth process of new genes

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 Key Features Introduces the broad and interdisciplinary scope of endocrinology Provides clear chapter objectives and key concepts Includes summary and synthesis questions for each chapter that are suitable for exams and quizzes Includes a chapter devoted to endocrine disrupting chemicals Describes the roles played by the endocrine system in important health challenges related to appetite regulation obesity diabetes and other diseases stemming from mismatches to modernity Integrates evolutionary and comparative approaches to hormones and health

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

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**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.

*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 a multidisciplinary approach that will appeal to a wide circle of professionals in the fields of evolutionary biology, oncology, molecular biology and more.

**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 Enigmatic Realm of **Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Genome Evolution Gene And Genome Duplications And The Origin Of Novel Gene Functions** a literary masterpiece penned by a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those who partake in its reading experience.

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