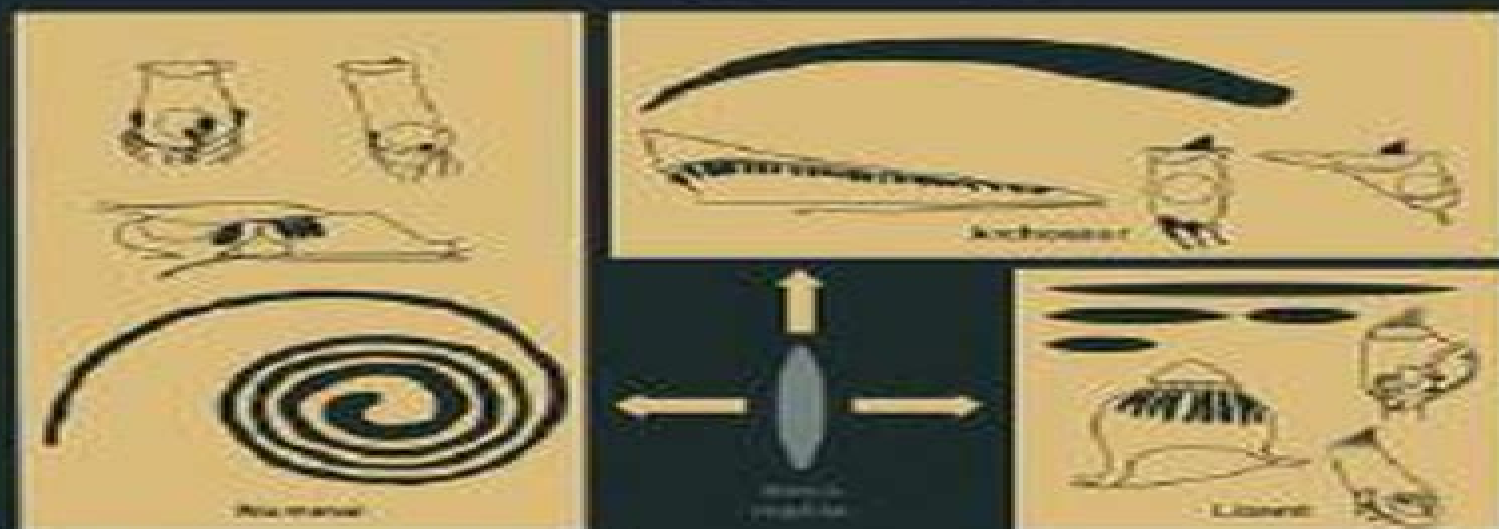


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# Evolution of the Vertebrate Auditory System



Springer

# Evolution Of The Vertebrate Auditory System

**Sunil Puria, Richard R. Fay, Arthur N.  
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## **Evolution Of The Vertebrate Auditory System:**

*Evolution of the Vertebrate Auditory System* Geoffrey A. Manley, Richard R. Fay, 2004-09-02 The function of vertebrate hearing is served by a surprising variety of sensory structures in the different groups of fish amphibians reptiles birds and mammals This book discusses the origin specialization and functional properties of sensory hair cells beginning with environmental constraints on acoustic systems and addressing in detail the evolutionary history behind modern structure and function in the vertebrate ear Taking a comparative approach chapters are devoted to each of the vertebrate groups outlining the transition to land existence and the further parallel and independent adaptations of amniotic groups living in air The volume explores in depth the specific properties of hair cells that allowed them to become sensitive to sound and capable of analyzing sounds into their respective frequency components *Evolution of the Vertebrate Auditory System* is directed to a broad audience of biologists and clinicians from the level of advanced undergraduate students to professionals interested in learning more about the evolution structure and function of the ear

*Evolution of the Vertebrate Auditory System* Geoffrey A. Manley, Richard R. Fay, 2014-09-01

**Evolutionary Neuroscience** Jon H Kaas, 2009-07-28 Evolutionary Neuroscience is a collection of articles in brain evolution selected from the recent comprehensive reference *Evolution of Nervous Systems* Elsevier Academic Press 2007 The selected chapters cover a broad range of topics from historical theory to the most recent deductions from comparative studies of brains The articles are organized in sections focused on theories and brain scaling the evolution of brains from early vertebrates to present day fishes amphibians reptiles and birds the evolution of mammalian brains and the evolution of primate brains including human brains Each chapter is written by a leader or leaders in the field and has been reviewed by other experts Specific topics include brain character reconstruction principles of brain scaling basic features of vertebrate brains the evolution of the major sensory systems and other parts of brains what we can learn from fossils the origin of neocortex and the evolution of specializations of human brains The collection of articles will be interesting to anyone who is curious about how brains evolved from the simpler nervous systems of the first vertebrates into the many different complex forms now found in present day vertebrates This book would be of use to students at the graduate or undergraduate levels as well as professional neuroscientists cognitive scientists and psychologists Together the chapters provide a comprehensive list of further reading and references for those who want to inquire further The most comprehensive authoritative and up to date single volume collection on brain evolution Full color throughout with many illustrations Written by leading scholars and experts

**Perspectives on Auditory Research** Arthur N. Popper, Richard R. Fay, 2014-03-22 *Perspectives on Auditory Research* celebrates the last two decades of the Springer Handbook in Auditory Research Contributions from the leading experts in the field examine the progress made in auditory research over the past twenty years as well as the major questions for the future

**Brains Through Time** Georg F. Striedter, R. Glenn Northcutt, 2020 This book encourages readers to view similarities and differences in various species as fundamental to a

comprehensive understanding of nervous systems      *Encyclopedia of Perception* E. Bruce Goldstein, 2010 Because of the ease with which we perceive many people see perception as something that just happens However even seemingly simple perceptual experiences involve complex underlying mechanisms which are often hidden from our conscious experience These mechanisms are being investigated by researchers and theorists in fields such as psychology cognitive science neuroscience computer science and philosophy A few examples of the questions posed by these investigations are What do infants perceive How does perception develop What do perceptual disorders reveal about normal functioning How can information from one sense such as hearing be affected by information from another sense such as vision How is the information from all of our senses combined to result in our perception of a coherent environment What are some practical outcomes of basic research in perception These are just a few of the questions this encyclopedia will consider as it presents a comprehensive overview of the field of perception for students researchers and professionals in psychology the cognitive sciences neuroscience and related medical disciplines such as neurology and ophthalmology      **The Senses: A Comprehensive Reference**

, 2020-09-30 The Senses A Comprehensive Reference Second Edition Seven Volume Set is a comprehensive reference work covering the range of topics that constitute current knowledge of the neural mechanisms underlying the different senses This important work provides the most up to date cutting edge comprehensive reference combining volumes on all major sensory modalities in one set Offering 264 chapters from a distinguished team of international experts The Senses lays out current knowledge on the anatomy physiology and molecular biology of sensory organs in a collection of comprehensive chapters spanning 4 volumes Topics covered include the perception psychophysics and higher order processing of sensory information as well as disorders and new diagnostic and treatment methods Written for a wide audience this reference work provides students scholars medical doctors as well as anyone interested in neuroscience a comprehensive overview of the knowledge accumulated on the function of sense organs sensory systems and how the brain processes sensory input As with the first edition contributions from leading scholars from around the world will ensure The Senses offers a truly international portrait of sensory physiology The set is the definitive reference on sensory neuroscience and provides the ultimate entry point into the review and original literature in Sensory Neuroscience enabling students and scientists to delve into the subject and deepen their knowledge All inclusive coverage of topics updated edition offers readers the only current reference available covering neurobiology physiology anatomy and molecular biology of sense organs and the processing of sensory information in the brain Authoritative content world leading contributors provide readers with a reputable dynamic and authoritative account of the topics under discussion Comprehensive style content in depth complex coverage of topics offers students at upper undergraduate level and above full insight into topics under discussion      **Auditory and Vestibular Efferents** David K. Ryugo, Richard R. Fay, Arthur N. Popper, 2010-11-22 Efferent sensory systems have emerged as major components of processing by the central nervous system Whereas the afferent sensory systems bring environmental information into the

brain efferent systems function to monitor sharpen and attend selectively to certain stimuli while ignoring others This ability of the brain to implement these functions enables the organism to make fine discriminations and to respond appropriately to environmental conditions so that survival is enhanced Our focus will be on auditory and vestibular efferents topics linked together by the inner ear connection The biological utility of the efferent system is striking How it functions is less well understood and with each new discovery more questions arise The book that is proposed here reflects our vision to share what is known on the topic by authors who actually have made the observations

Comparative Studies of Hearing in Vertebrates A. N. Popper, R. R. Fay, 2012-12-06 The past two decades have seen an extraordinary growth of interest in the auditory mechanisms of a wide range of vertebrates and invertebrates Investigations have ranged from auditory mechanisms in relatively simple animals where just a few cells are employed for detection of sound to the highly complex detection and processing systems of man and the other mammals Of particular significance to us has been the growing interest in general principles of vertebrate auditory system organization as opposed to a specific and limited concern for the mammalian or even human systems Some of the interest in nonmammalian systems has risen from the desire to find simpler experimental models for both the essential components e.g. the hair cell receptor and the more complex functions e.g. frequency analysis of all vertebrate auditory systems Interest has also risen from questions about the evolution of hearing and the covariation or lack of it in structure and function in a wide variety of biological solutions to the problems of acoustic mechanoreception Of course the desire to find simpler experimental models and the need to answer questions about the evolution of hearing are not unrelated In fact detailed analyses of a variety of systems have led several times to the realization that some of the simple systems are more complex than initially thought

Sturkie's Avian Physiology Colin G. Scanes, Sami Dridi, 2021-11-06 Sturkie's Avian Physiology Seventh Edition is the classic comprehensive single volume on the physiology of domestic as well as wild birds This latest edition is thoroughly revised and updated and features several new chapters with entirely new content on such topics as vision sensory taste pain reception evolution and domestication Chapters throughout have been greatly expanded due to the many recent advances in the field This book is written by international experts in different aspects of avian physiology For easy reading and searches this book is structured under a series of themes beginning with genomic studies sensory biology and nervous systems and major organs The chapters then move on to investigate metabolism endocrine physiology reproduction and finally cross cutting themes such as stress and rhythms New chapters on feathers and skin are featured as well Sturkie's Avian Physiology Seventh Edition is an important resource for ornithologists poultry scientists and other researchers in avian studies It is also useful for students in avian or poultry physiology as well as avian veterinarians Stands out as the only single volume devoted to bird physiology Features updates revisions or additions to each chapter Written and edited by international leaders in avian studies

*Biology of Perceptual Systems* Edward Carterette, 2012-12-02 Handbook of Perception Volume III Biology of Perceptual Systems reviews the literature on the

biological aspects of human perception with emphasis on perceptual systems and elements of sensory physiology This volume is organized into 19 chapters and begins with a discussion of energy transduction detection and discrimination along with the properties of neurons alone and as conjoined in nets The focus then shifts to psychogenesis the relatively new field of ethology and the natural diversity and evolutionary divergence of sensory systems The chapters that follow examine the genetics of behavior the facts and theories about the way in which animals and men construct patterned stimulation of receptors into significant objects and the structure and function of sensory systems on which vertebrates depend for their construction of the varieties of experience The book methodically introduces the reader to chemoreception tasting and smelling cutaneous mechanoreception of position velocity transients active texture perception mechanisms of spatial orientation and of motion in space thermoreception vision and audition In almost every case the underlying physiological mechanisms are related to the psychophysical or perceptual observations This book is a valuable resource for psychologists biologists and natural scientists as well as for those who are interested in the biology of human perception

Evolution of the Vertebrate Ear Jennifer A. Clack, Richard R. Fay, Arthur N. Popper, 2016-12-21 The evolution of vertebrate hearing is of considerable interest in the hearing community However there has never been a volume that has focused on the paleontological evidence for the evolution of hearing and the ear especially from the perspective of some of the leading paleontologists and evolutionary biologists in the world Thus this volume is totally unique and takes a perspective that has never been taken before It brings to the fore some of the most recent discoveries among fossil taxa which have demonstrated the sort of detailed information that can be derived from the fossil record illuminating the evolutionary pathways this sensory system has taken and the diversity it had achieved

**Primate Hearing and Communication** Rolf M. Quam, Marissa A. Ramsier, Richard R. Fay, Arthur N. Popper, 2017-09-04 Presents a comprehensive review of nonhuman primate audition and vocal communication These are obviously intimately related topics but are often addressed separately The hearing abilities of primates have been tested experimentally in a large number of species across the primate order and these studies have revealed both consistent patterns as well as interesting variation within and between taxonomic groups Recent studies have shed light on how variation in anatomical structures along the auditory pathway relates to variation in auditory sensitivity At the same time ongoing studies of vocal communication in wild primate populations continue to reveal new insights into the social and environmental contexts of many primate calls and the range of known primate vocalizations has increased dramatically with the development of more sophisticated and accessible auditory equipment and software that enables the recording and analysis of higher fidelity and broader band recordings including documenting very high frequency i e ultrasound vocalizations Historically the relative importance of primate calls has been evaluated qualitatively by the perception of the researcher but new methods and approaches now enable a greater appreciation for how signals are used and perceived by the primates in question The integration of anatomical and behavioral data on acoustic communication and

the environmental correlates thereof has significant potential for reconstructing behavior in the fossil record This confluence of factors and accumulating evidence for the sophistication and complexity in both the signal and its interpretation indicate that a book synthesizing this information across primates is warranted and represents an important contribution to the literature

**Sing Like Fish** Amorina Kingdon, 2024-06-04 A captivating exploration of how underwater animals tap into sound to survive and a clarion call for humans to address the ways we invade these critical soundscapes from an award winning science writer Sing Like Fish is that rare book that makes you see the world differently Mark Kurlansky New York Times bestselling author of Salt and Cod LONGLISTED FOR THE ANDREW CARNEGIE MEDAL FOR EXCELLENCE IN NONFICTION For centuries humans ignored sound in the silent world of the ocean assuming that what we couldn't perceive didn't exist But we couldn't have been more wrong Marine scientists now have the technology to record and study the complex interplay of the myriad sounds in the sea Finally we can trace how sounds travel with the currents bounce from the seafloor and surface bend with the temperature and even saltness how sounds help marine life survive and how human noise can transform entire marine ecosystems In Sing Like Fish award winning science journalist Amorina Kingdon synthesizes historical discoveries with the latest scientific research in a clear and compelling portrait of this sonic undersea world From plainfin midshipman fish whose swim bladder drumming is loud enough to keep houseboat dwellers awake to the syntax of whalesong from the deafening crackle of snapping shrimp to the seismic resonance of underwater earthquakes and volcanoes sound plays a vital role in feeding mating parenting navigating and warning even in animals that we never suspected of acoustic ability Meanwhile we jump in our motorboats and cruise ships oblivious to the impact below us Our lifestyle is fueled by oil in growling tankers and furnished by goods that travel in massive container ships Our seas echo with human made sound but we are just learning of the repercussions of anthropogenic noise on the marine world's delicate acoustic ecosystems masking mating calls chasing animals from their food and even wounding creatures from plankton to lobsters With intimate and artful prose Sing Like Fish tells a uniquely complete story of ocean animals submerged sounds envisions a quieter future and offers a profound new understanding of the world below the surface

[Evolutionary Biomechanics of Sound Production and Reception](#) Carl Soulsbury, Fernando Montealegre-Z, Damian Octavio Elias, 2022-01-20 [Encyclopedia of Animal Behavior](#), 2009-04-01 The Encyclopedia of Animal Behavior Three Volume Set has engaged with great success the efforts of many of the best behavioral biologists of the 21st century Section editors drawn from the most accomplished behavioral scientists of their generation have enrolled an international cast of highly respected thinkers and writers all of whom have taken great care and joy in illuminating every imaginable corner of animal behavior This comprehensive work covers not only the usual topics such as communication learning sexual selection navigation and the history of the field but also emerging topics in cognition animal welfare conservation and applications of animal behavior The large section on animal cognition brings together many of the world's experts on the subject to provide a comprehensive overview of this

rapidly developing area Chapters relating to animal welfare give a full view of behavioral interactions of humans with companion animals farm animals and animals in the wild The key role of animal behavior in conservation biology receives broad attention including chapters on topics such as the effects of noise pollution captive breeding and how the behavioral effects of parasites interacts with conservation issues Animal behavior in environmental biology is highlighted in chapters on the effects of endocrine disruptors on behavior and a large number of chapters on key species such as wolves chimpanzees hyenas and sharks Clear accessible writing complements a wealth of information for undergraduate college students about the essential concepts of animal behavior and the application of those concepts across the field In depth coverage of concepts methods and exemplar organisms serves the needs of graduate students and professionals in the field From the use of behavior in assessing the welfare of pigs to the social behavior of insects from animal empathy to bat brains this authoritative reference with its in depth introductory articles rich array of illustrations interactive cross referenced links and numerous suggested readings can guide the student or the professional to an expanded appreciation of the far flung world of animal behavior An invaluable tool for teaching and a source of enrichment and detail for any topic covered in an animal behavior course the Encyclopedia of Animal Behavior is the definitive reference work in its field and will be for years to come Comprehensive work which covers the usual topics along with emerging areas of animal behavior This encyclopedia contains clear accessible writing and is well illustrated including an online video complimenting a wealth of information As an online reference this work will be subject to period updating This ensures that the work always remains current Contains in depth introductions to the material that make each well illustrated section come alive with the best the new content the discipline has to offer Glossary includes a compendium of behavioral terms that form a succinct mosaic of virtually every concept and phenomenon related to animal behavior Section editors drawn from around the world represent the best and the brightest among today s behavioral biologists and have recruited a broad range of internationally recognized experts Editors in Chief are experienced scientists and writers who between them have authored or edited eight books and teach courses in animal behavior at their respective universities

**Sensing Sound** Bernd Fritzsche, 2023-12-01 Hearing is a prerequisite for the evolution of language and thus the development of human societies It is the only major sense whose evolution can be traced back to vertebrates starting with sarcopterygians The book explores the evolution of auditory development that has remained largely unexplored in contemporary theories of neurosensory brain evolution including the telencephalon It describes how sensory epithelia from the basilar papilla evolved in the ear and connected dedicated cochlear neurons to neuronal centers in the brain and deals with how sound is converted through sound modulations into reliably decoded messages The loss of hearing with age is expected to reach 2.6 billion people by 2050 As such the book explains and reviews hearing loss at the molecular level to the behavioral level and provides suggestions to manage the loss

**The Middle Ear** Sunil Puria, Richard R. Fay, Arthur N. Popper, 2013-03-19 The middle ear plays a vital role in the sense and sensitivity of hearing Of the various



characteristics that distinguish mammals from other vertebrates several pertain specifically to the middle ear system such as the presence of three middle ear bones and the four layer composite structure of the tympanic membrane The Middle Ear attempts to elucidate the role this system plays in sound transmission as viewed from both scientific and clinical perspectives

Encyclopedia of Fish Physiology ,2011-06-01 Fish form an extremely diverse group of vertebrates At a conservative estimate 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 The Evolutionary Biology of Hearing Douglas B. Webster, Richard R. Fay, 2012-12-06 To develop a science of hearing that is intellectu The five day conference was held at the Mote ally satisfying we must first integrate the diverse Marine Laboratory in Sarasota Florida May extensive body of comparative research into an 24 1990 The invited participants came from the evolutionary context The need for this integra fields of comparative anatomy physiology biophys tion and a conceptual framework in which it could ics animal behavior psychophysics evolutionary be structured were demonstrated in landmark biology ontogeny and paleontology Before the

papers by van Bergeijk in 1967 and Wever in 1974 conference preliminary manuscripts of the invited However not since 1965 when the American papers were distributed to all participants This facilitated even encouraged discussions through Society of Zoologists sponsored an evolutionary conference entitled The Vertebrate Ear has there out the conference which could be called among other things lively The preview of papers along been a group effort to assemble and organize our current knowledge on the evolutionary as with the free exchange of information and opinion opposed to comparative biology of hearing also helped improve the quality and consistency of In the quarter century since that conference the final manuscripts included in this volume there have been major changes in evolutionary In addition to the invited papers several studies concepts e g punctuated equilibrium in sys were presented as posters during evening sessions

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