Comparative Hearing: Fish and Amphibians

Auditory Perception of Sound Sources

The first edition of this book has been recognized as the standard reference on biological effects of electric and magnetic fields from DC to microwaves. But much has changed in this science since the book's original publication in 1986. With contributions from eighteen leading researchers, this latest edition includes authoritative discussions of many new developments and will quickly become the new, must-have resource handbook. Dielectric properties of biological tissue are thoroughly examined, followed by chapters on physical mechanisms and biological effects of static and extremely low frequency magnetic fields. New chapters on topics that were treated very briefly in the first edition now receive extensive treatment. These topics include electric and magnetic fields for bone and soft tissue repair, electroporation, and epidemiology of ELF health effects. The chapter on computer methods for predicting field intensity has been substantially revised to describe new numerical techniques developed within the last few years and includes calculations of power absorbed in the human head from cellular telephones. The chapter discussing experimental results on RF interaction with living matter now contains information on effects of very high power, very short duration pulses. A new appendix on safety standards is based on the latest publications of governmental, as well as quasi-governmental organizations (such as the U.S. Council on Radiation Protection) in the United States, Europe, and Australia. With all its revisions, this updated version of the
**The Auditory Cortex**

Hearing and communication present a variety of challenges to the nervous system. To be heard and understood, a communication signal must be transformed from a time-varying acoustic waveform to a perceptual representation to an even more abstract representation that integrates memory stores with semantic/referential information. Finally, this complex, abstract representation must be interpreted to form categorical decisions that guide behavior. Did I hear the stimulus? From where and whom did it come? What does it tell me? How can I use this information to plan an action? All of these issues and questions underlie auditory cognition. Since the early 1990s, there has been a re-birth of studies that test the neural correlates of auditory cognition with a unique emphasis on the use of awake, behaving animals as model. Continuing today, how and where in the brain neural correlates of auditory cognition are formed is an intensive and active area of research. Importantly, our understanding of the role that the cortex plays in hearing has the potential to impact the next generation of cochlear- and brainstem-auditory implants and consequently help those with hearing impairments. Thus, it is timely to produce a volume that brings together this exciting literature on the neural correlates of auditory cognition. This volume compliments and extends many recent SHAR volumes such as Sound Source Localization (2005) Auditory Perception of Sound Sources (2007), and Human Auditory Cortex (2010). For example, in many of these volumes, similar issues are discussed such as auditory-object identification and perception with different emphases: in Auditory Perception of Sound Sources, authors discuss the underlying psychophysics/behavior, whereas in the Human Auditory Cortex, fMRI data are presented. The unique contribution of the proposed volume is that the authors will integrate both of these factors to highlight the neural correlates of cognition/behavior. Moreover, unlike other these other volumes, the neurophysiological data will emphasize the exquisite spatial and temporal resolution of single-neuron [as opposed to more coarse fMRI or MEG data] responses in order to reveal the elegant representations and computations used by the nervous system.

**Smell and Taste**

The Encyclopedia of the Neuroscience explores all areas of the discipline in its focused entries on a wide variety of topics in neurology, neurosurgery, psychiatry and other related areas of neuroscience. Each article is written by an expert in that specific domain and peer reviewed by the advisory board before acceptance into the encyclopedia. Each article contains a glossary, introduction, a reference section, and cross-references to other related encyclopedia articles. Written at a level suitable for university undergraduates, the breadth and depth of coverage will appeal beyond undergraduates to professionals and academics in related fields.

**Listening to Speech**

This book reviews the growing literature that is consistent with the hypothesis that hormones can regulate auditory physiology and perception across a broad range of animal taxa, including humans. Understanding how hormones modulate auditory function has far reaching implications for advancing our knowledge in the basic biomedical sciences and in understanding the evolution of acoustic communication systems. A fundamental goal of
neuroscience is to understand how hormones modulate neural circuits and behavior. For example, steroids such as estrogens and androgens are well-known regulators of vocal motor behaviors used during social acoustic communication. Recent studies have shown that these same hormones can also greatly influence the reception of social acoustic signals, leading to the more efficient exchange of acoustic information.

**Auditory Spectral Processing**

The symposium that has provided the basis for this book, "Plasticity of the Central Auditory System and Processing of Complex Acoustic Signals" was held in Prague on July 7-10, 2003. This is the fourth in a series of seminal meetings summarizing the state of development of auditory system neuroscience that has been organized in that great world city. Books that have resulted from these meetings represent important benchmarks for auditory neuroscience over the past 25 years. A 1980 meeting, "Neuronal Mechanisms of Hearing" hosted the most distinguished hearing researchers focusing on underlying brain processes from this era. It resulted in a highly influential and widely subscribed and cited proceedings co-edited by professor Lindsay Aitkin. The subject of the 1987 meeting was the "Auditory Pathway - Structure and Function". It again resulted in another important update of hearing science research in a widely referenced book - edited by the late Bruce Masterton. While the original plan was to hold a meeting summarizing the state of auditory system neuroscience every 7 years, historical events connected with the disintegration of the Soviet Empire and return of freedom to Czechoslovakia resulted in an unavoidable delay of what was planned to be a 1994 meeting. It wasn't until 1996 that we were able to meet for the third time in Prague, at that time to review "Acoustical Signal Processing in the Central Auditory System".

**Functional and Clinical Neuroanatomy**

This eBook comprises s series of original research and review articles dealing with the anatomical, genetic, and physiological organization of the auditory system from humans to monkeys and mice.

**Handbook of Biological Effects of Electromagnetic Fields, Third Edition - 2 Volume Set**

There has been substantial progress in understanding the contributions of the auditory forebrain to hearing, sound localization, communication, emotive behavior, and cognition. TheAuditory Cortex covers the latest knowledge about the auditory forebrain, including the auditory cortex as well as the medial geniculate body in the thalamus. This book will cover all important aspects of the auditory forebrain organization and function, integrating the auditory thalamus and cortex into a smooth, coherent whole. Volume One covers basic auditory neuroscience. It complements The Auditory Cortex, Volume 2: Integrative Neuroscience, which takes a more applied/clinical perspective.

**Human Auditory Development**

This volume will provide an important contemporary reference on hearing development and will lead to new ways of thinking about hearing in children and about remediation for children with hearing loss. Much of the material in this volume will document that a different model of hearing is needed to understand hearing during development. The book is expected to spur
Aging and Hearing

The contributors to this volume have provided a detailed and integrated introduction to the behavioural, anatomical, and physiological changes that occur in the auditory system of developing animals. Edwin W Rubel is Virginia Merrill Bloedel Professor of Hearing Sciences at the Virginia Merrill Bloedel Hearing Research Center at the University of Washington, Arthur N. Popper is Professor and Chair of the Department of Zoology at the University of Maryland, while Richard R. Fay is Associate Director of the Parmly Hearing Institute and Professor of Psychology at Loyola University of Chicago. Each volume in this series is independent and authoritative; taken as a set, the series will be the definitive resource in the field.

Plasticity of the Auditory System

As technology has made imaging of the brain noninvasive and inexpensive, nearly every psychologist in every subfield is using pictures of the brain to show biological connections to feelings and behavior. Handbook of Neuroscience for the Behavioral Sciences, Volume I provides psychologists and other behavioral scientists with a solid foundation in the increasingly critical field of neuroscience. Current and accessible, this volume provides the information they need to understand the new biological bases, research tools, and implications of brain and gene research as it relates to psychology.

The Auditory System at the Cocktail Party

This volume presents a set of essays that discuss the development and plasticity of the vertebrate auditory system. The topic is one that has been considered before in the Springer Handbook of Auditory Research (volume 9 in 1998, and volume 23 in 2004) but the field has grown substantially and it is appropriate to bring previous material up to date to reflect the wealth of new data and to raise some entirely new topics. At the same time, this volume is also unique in that it is the outgrowth of a symposium honoring two-time SHAR co-editor Professor Edwin W Rubel on his retirement. The focus of this volume, though, is an integrated set of papers that reflect the immense contributions that Dr. Rubel has made to the field over his career. Thus, the volume concurrently presents a topic that is timely for SHAR, but which also honors the pioneer in the field. Each chapter explores development with consideration of plasticity and how it becomes limited over time. The editors have selected authors with professional, and often personal, connections to Dr. Rubel, though all are, in their own rights, outstanding scholars and leaders in their fields. The specific audience will be graduate students, postdoctoral fellows, and established psychologists and neuroscientists who are interested in auditory function, development, and plasticity. This volume will also be of interest to hearing scientists and to the broad neuroscience community because many of the ideas and principles associate with the auditory system are applicable to most sensory systems. The volume is organized to appeal to psychophysicists, neurophysiologists, anatomists, and systems neuroscientists who attend meetings such as those held by the Association for Research in Otolaryngology, the Acoustical Society of America, and the Society for Neuroscience.

The Oxford Handbook of Auditory Science: The Auditory Brain
The cochlea does not just pick up sound; it also produces sounds of low intensity called Otoacoustic Emissions (OAEs). Sounds produced by healthy ears – either spontaneously or in response to stimuli - allow researchers and clinicians to study hearing and cochlear function noninvasively in both animals and humans. This book presents the first serious review of the biological basis of these otoacoustic emissions.

Mapping Human Visual and Auditory Cortex, Tracking Plasticity, and Linking FMRI to Perception

Auditory behavior, perception, and cognition are all shaped by information from other sensory systems. This volume examines this multi-sensory view of auditory function at levels of analysis ranging from the single neuron to neuroimaging in human clinical populations. Visual Influence on Auditory Perception Adrian K.C. Lee and Mark T. Wallace Cue Combination within a Bayesian Framework David Alais and David Burr Toward a Model of Auditory-Visual Speech Intelligibility Ken W. Grant and Joshua G. W. Bernstein An Object-based Interpretation of Audiovisual Processing Adrian K.C. Lee, Ross K. Maddox, and Jennifer K. Bizley Hearing in a “Moving” Visual World: Coordinate Transformations Along the Auditory Pathway Shawn M. Willett, Jennifer M. Groh, Ross K. Maddox Multisensory Processing in the Auditory Cortex Andrew J. King, Amy Hammond-Kenny, Fernando R. Nodal Audiovisual Integration in the Primate Prefrontal Cortex Bethany Plakke and Lizabeth M. Romanski Using Multisensory Integration to Understand Human Auditory Cortex Michael S. Beauchamp Combining Voice and Face Content in the Primate Temporal Lobe Catherine Perrotin and Christopher I. Petkov Neural Network Dynamics and Audiovisual Integration Julian Keil and Daniel Senkowski Cross-Modal Learning in the Auditory System Patrick Bruns and Brigitte Röder Multisensory Processing Differences in Individuals with Autism Spectrum Disorder Sarah H. Baum Miller, Mark T. Wallace Adrian K.C. Lee is Associate Professor in the Department of Speech & Hearing Sciences and the Institute for Learning and Brain Sciences at the University of Washington, Seattle Mark T. Wallace is the Louise B McGavock Endowed Chair and Professor in the Departments of Hearing and Speech Sciences, Psychiatry, Psychology and Director of the Vanderbilt Brain Institute at Vanderbilt University, Nashville Allison B. Coffin is Associate Professor in the Department of Integrative Physiology and Neuroscience at Washington State University, Vancouver, WA Arthur N. Popper is Professor Emeritus and research professor in the Department of Biology at the University of Maryland, College Park Richard R. Fay is Distinguished Research Professor of Psychology at Loyola University, Chicago

The Human Auditory System

This volume contains the papers presented at the 15th International Symposium on Hearing (ISH), which was held at the Hotel Regio, Santa Marta de Tormes, Salamanca, Spain, between 1st and 5th June 2009. Since its inception in 1969, this Symposium has been a forum of excellence for debating the neurophysiological basis of auditory perception, with computational models as tools to test and unify physiological and perceptual theories. Every paper in this symposium includes two of the following: auditory physiology, psychophysics or modeling. The topics range from cochlear physiology to auditory attention and learning. While the symposium is always hosted by European countries, participants come from all over the world and are among the leaders in their fields. The result is an outstanding symposium, which has been described by some as a “world summit of auditory research.” The current volume has a bottom-up structure from “simpler” physiological to more “complex” perceptual phenomena and follows the order of presentations at the meeting. Parts I to III are dedicated
Disorders of Peripheral and Central Auditory Processing

This volume brings together noted scientists who study presbycusis from the perspective of complementary disciplines, for a review of the current state of knowledge on the aging auditory system. Age-related hearing loss (ARHL) is one of the top three most common chronic health conditions affecting individuals aged 65 years and older. The high prevalence of age-related hearing loss compels audiologists, otolaryngologists, and auditory neuroscientists alike to understand the neural, genetic and molecular mechanisms underlying this disorder. A comprehensive understanding of these factors is needed so that effective prevention, intervention, and rehabilitative strategies can be developed to ameliorate the myriad of behavioral manifestations.

Ballenger's Otorhinolaryngology

Chermak and Musiek's two-volume, award-winning handbooks are back in newly revised editions. Extensively revised and expanded, Volume I provides comprehensive coverage of the auditory neuroscience and clinical science needed to accurately diagnose the range of developmental and acquired central auditory processing disorders in children, adults, and older adults. Building on the excellence achieved with the best-selling 1st editions which earned the 2007 Speech, Language, and Hearing Book of the Year Award, the second editions include contributions from world-renowned authors detailing major advances in auditory neuroscience and cognitive science; diagnosis; best practice intervention strategies in clinical and school settings; as well as emerging and future directions in diagnosis and intervention. Exciting new chapters for Volume II include: Development of the Central Auditory Nervous System, by Jos J. EggermontCausation: Neuroanatomic Abnormalities, Neurological Disorders, and Neuromaturational Delays, by Gail D. Chermak and Frank E. MusiekCentral Auditory Processing As Seen From Dichotic Listening Studies, by Kenneth Hugdahl and Turid HellandAuditory Processing (Disorder): An Intersection of Cognitive, Sensory, and Reward Circuits, by Karen Banai and Nina KrausClinical and Research Issues in CAPD, by Jeffrey Weihing, Teri James Bellis, Gail D. Chermak, and Frank E. MusiekPrimer on Clinical Decision Analysis, by Jeffrey Weihing and Sam AtchersonCase Studies, by Annette E. Hurley

Modelled Response of the Electrically Stimulated Human Auditory Nerve Fibre

This comprehensive compendium of current knowledge in the fields of otology/neurotology, rhinology, facial plastic and reconstructive surgery, paediatric otorhinolaryngology, head and neck surgery and bronchoesophagology features sections on facial plastic, reconstructive surgery and paediatrics. The content reflects the central responsibility of the otorhinolaryngologist in treating patients with diseases affecting the senses of smell, taste and balance. Also encompassed in this section are treatments for disorders of human communication affecting hearing, voice, speech and language.
Tinnitus is a prevalent hearing disease, affecting 15% of the population, particularly hearing impaired, veterans and even young people who grow up with mp3 players and iPods. The mechanisms underlying tinnitus remain controversial. At present there is no cure for tinnitus, and treatment options are limited. Different from previous tinnitus books, including A. R. Moller's book [in press at Springer], which typically have a strong clinical flavor, the present volume focuses on neural mechanisms of tinnitus and its behavioral consequences. The proposed book starts with a general summary of the field and a short introduction on the selection and content of the remaining chapters. Chapter 2 overviews tinnitus prevalence and etiologies to set the tone for significance and complexity of this neurological disorder spectrum. Chapters 3-8 cover neuroscience of tinnitus in animal models from molecular mechanisms to cortical manifestation. Chapters 9-12 cover human brain responses to tinnitus and its clinical management.

The Mammalian Auditory Pathway: Neurophysiology

A comprehensive account of the neurobiological basis of language, arguing that species-specific brain differences may be at the root of the human capacity for language. Language makes us human. It is an intrinsic part of us, although we seldom think about it. Language is also an extremely complex entity with subcomponents responsible for its phonological, syntactic, and semantic aspects. In this landmark work, Angela Friederici offers a comprehensive account of these subcomponents and how they are integrated. Tracing the neurobiological basis of language across brain regions in humans and other primate species, she argues that species-specific brain differences may be at the root of the human capacity for language. Friederici shows which brain regions support the different language processes and, more important, how these brain regions are connected structurally and functionally to make language processes that take place in milliseconds possible. She finds that one particular brain structure (a white matter dorsal tract), connecting syntax-relevant brain regions, is present only in the mature human brain and only weakly present in other primate brains. Is this the "missing link" that explains humans’ capacity for language? Friederici describes the basic language functions and their brain basis; the language networks connecting different language-related brain regions; the brain basis of language acquisition during early childhood and when learning a second language, proposing a neurocognitive model of the ontogeny of language; and the evolution of language and underlying neural constraints. She finds that it is the information exchange between the relevant brain regions, supported by the white matter tract, that is the crucial factor in both language development and evolution.

The Functional Organization of the Auditory System

The Springer Handbook of Auditory Research presents a series of comprehensive and synthetic reviews of the fundamental topics in modern auditory research. It is aimed at all individuals with interests in hearing research including advanced graduate students, postdoctoral researchers, and clinical investigators. The volumes will introduce new investigators to important aspects of hearing science and will help established investigators to better understand the fundamental theories and data in fields of hearing that they may not normally follow closely. Each volume is intended to present a particular topic comprehensively, and each chapter will serve as a synthetic overview and guide to the
literature. As such, the chapters present neither exhaustive data reviews nor original research that has not yet appeared in peer-reviewed journals. The series focusses on topics that have developed a solid data and conceptual foundation rather than on those for which a literature is only beginning to develop. New research areas will be covered on a timely basis in the series as they begin to mature.

**Encyclopedia of Neuroscience, Volume 1**

All natural auditory signals, including human speech and animal communication signals, are spectrally and temporally complex, that is, they contain multiple frequencies and their frequency composition, or spectrum, varies over time. The ability of hearers to identify and localize these signals depends on analysis of their spectral composition. For the overwhelming majority of human listeners spoken language is the major means of social communication, and this communication therefore depends on spectral analysis. Spectral analysis begins in the cochlea, but is then elaborated at various stages along the auditory pathways in the brain that lead from the cochlea to the cerebral cortex. The broad purpose of Auditory Spectral Processing is to provide a comprehensive account of the way in which spectral information is processed in the brain and the way in which this information is used by listeners to identify and localize sounds. Examines spectral processing mechanisms at different levels along the auditory neuraxis, from the cochlear nucleus to the cortex Reviews in detail psychophysical and neurophysiological evidence on the way in which spectral information is processed within and across frequency channels Presents information on the nature of the spectral information required for speech and music perception Examines a series of issues that relate to the role of spectral analysis in higher order/cognitive aspects of hearing and in clinical and applied contexts

**Development of the Auditory System**

Functional and Clinical Neuroanatomy: A Guide for Health Care Professionals is a comprehensive, yet easy-to-read, introduction to neuroanatomy that covers the structures and functions of the central, peripheral and autonomic nervous systems. The book also focuses on the clinical presentation of disease processes involving specific structures. It is the first review of clinical neuroanatomy that is written specifically for nurses, physician assistants, nurse practitioners, medical students and medical assistants who work in the field of neurology. It will also be an invaluable resource for graduate and postgraduate students in neuroscience. With 22 chapters, including two that provide complete neurological examinations and diagnostic evaluations, this book is an ideal resource for health care professionals across a wide variety of disciplines. Written specifically for "mid-level" providers in the field of neurology Provides an up-to-date review of clinical neuroanatomy based on the latest guidelines Provides a logical, step-by-step introduction to neuroanatomy Offers hundreds of full-color figures to illustrate important concepts Highlights key subjects in "Focus On" boxes Includes Section Reviews at critical points in the text of each chapter

**The Human Auditory Cortex**

Auditory Perception of Sound Sources covers higher-level auditory processes that are perceptual processes. The chapters describe how humans and other animals perceive the sounds that they receive from the many sound sources existing in the world. This book will provide an overview of areas of current research involved with understanding how sound-source determination processes operate. This book will focus on psychophysics and
perspective as well as being relevant to basic auditory research. Contents: Perceiving Sound Sources: An Overview William A. Yost Human Sound Source Identification Robert A. Lutfi Size Information in the Production and Perception of Communication Sounds Roy D. Patterson, David R. R. Smith, Ralph van Dinther, and Tom Walters The role of memory in auditory perception Laurent Demany, and Catherine Semal Auditory Attention and Filters Ervin R. Hafter, Anastasios Sarampalis, and Psyche Loui Informational masking Gerald Kidd Jr., Christine R. Mason, Virginia M. Richards, Frederick J. Gallun, and Nathaniel I. Durlach Effects of harmonicity and regularity on the perception of sound sources Robert P. Carlyon, and Hedwig E. Gockel Spatial Hearing and Perceiving Sources Christopher J. Darwin Envelope Processing and Sound-Source Perception Stanley Sheft Speech as a Sound Source Andrew J. Lotto, and Sarah C. Sullivan Sound Source Perception and Stream Segregation in Non-human Vertebrate Animals Richard R. Fay About the editors: William A. Yost, Ph.D., is Professor of Psychology, Adjunct Professor of Hearing Sciences of the Parmly Hearing Institute, and Adjunct Professor of Otolaryngology at Loyola University of Chicago. Arthur N. Popper is Professor in the Department of Biology and Co-Director of the Center for Comparative and Evolutionary Biology of Hearing at the University of Maryland, College Park. Richard R. Fay is Director of the Parmly Hearing Institute and Professor of Psychology at Loyola University of Chicago. About the series: The Springer Handbook of Auditory Research presents a series of synthetic reviews of fundamental topics dealing with auditory systems. Each volume is independent and authoritative; taken as a set, this series is the definitive resource in the field.

**Perspectives on Auditory Research**

The Auditory System at the Cocktail Party is a rather whimsical title that points to the very serious challenge faced by listeners in most everyday environments: how to hear out sounds of interest amid a cacophony of competing sounds. The volume presents the mechanisms for bottom-up object formation and top-down object selection that the auditory system employs to meet that challenge. Ear and Brain Mechanisms for Parsing the Auditory Scene by John C. Middlebrooks and Jonathan Z. Simon Auditory Object Formation and Selection by Barbara Shinn-Cunningham, Virginia Best, and Adrian K. C. Lee Energetic Masking and Masking Release by John F. Culling and Michael A. Stone Informational Masking in Speech Recognition by Gerald Kidd, Jr. and H. Steven Colburn Modeling the Cocktail Party Problem by Mounya Elhilali Spatial Stream Segregation by John C. Middlebrooks Human Auditory Neuroscience and the Cocktail Party Problem by Jonathan Z. Simon Infants and Children at the Cocktail Party by Lynne Werner Older Adults at the Cocktail Party by M. Kathleen Pichora-Fuller, Claude Alain, and Bruce A. Schneider Hearing with Cochlear Implants and Hearing Aids in Complex Auditory Scenes by Ruth Y. Litovsky, Matthew J. Goupell, Sara M. Misurelli, and Alan Kan About the Editors: John C. Middlebrooks is a Professor in the Department of Otolaryngology at the University of California, Irvine, with affiliate appointments in the Department of Neurobiology and Behavior, the Department of Cognitive Sciences, and the Department of Biomedical Engineering. Jonathan Z. Simon is a Professor at the University of Maryland, College Park, with joint appointments in the Department of Electrical and Computer Engineering, the Department of Biology, and the Institute for Systems Research. Arthur N. Popper is Professor Emeritus and Research Professor in the Department of Biology at the University of Maryland, College Park. Richard R. Fay is Distinguished Research Professor of Psychology at Loyola University, Chicago. About the Series: The Springer Handbook of Auditory Research presents a series of synthetic reviews of fundamental topics dealing with auditory systems. Each volume is independent and authoritative; taken as a set, this series is the definitive resource in the field.
The Neurophysiological Bases of Auditory Perception

The Human Auditory System: Fundamental Organization and Clinical Disorders provides a comprehensive and focused reference on the neuroscience of hearing and the associated neurological diagnosis and treatment of auditory disorders. This reference looks at this dynamic area of basic research, a multidisciplinary endeavor with contributions from neuroscience, clinical neurology, cognitive neuroscience, cognitive science communications disorders, and psychology, and its dramatic clinical application. A focused reference on the neuroscience of hearing and clinical disorders Covers both basic brain science, key methodologies and clinical diagnosis and treatment of audiology disorders Coverage of audiology across the lifespan from birth to elderly topics

Active Processes and Otoacoustic Emissions in Hearing

Smell and Taste, Volume 164 focuses on recent clinical research regarding two of our primary chemical senses, smell and taste. This volume is the most comprehensive neurology book on disorders of smell and taste function. Its major sections include epidemiology, anatomy and physiology, and clinical assessment, including neuroimaging, clinical conditions affecting smell and taste function (e.g., autoimmune disorders, head trauma, diseases of the nose and mouth, etc.). The widespread use of olfactory testing in clinical trials searching for biomarkers of neurodegenerative diseases is reviewed, along with evidence that smell dysfunction can be an early marker in neurodegenerative diseases and autoimmune disorders. Covers all aspects of disorders of taste and smell for beginning students of various disciplines (neurology, psychiatry, neuropsychology, otolaryngology) Teaches that smell and taste testing can be useful in differential diagnosis and can assess brain regions not normally assessed by traditional neurological or neuropsychological tests Addresses, in detail, recent evidence that smell loss is a better predictor of future mortality than dementia and even heart disease

The Human Auditory System

This study determined whether the Hodgkin-Huxley model for unmyelinated nerve fibres could be more comprehensively modified to predict excitation behaviour at Ranvier nodes of a human sensory nerve fibre, as specifically applied to the prediction of temporal characteristics of the human auditory system. The model was developed in three phases. Firstly, the Hodgkin-Huxley model was modified to describe action potential dynamics at Ranvier nodes using recorded ionic membrane current data from single human myelinated peripheral nerve fibres. A nerve fibre cable model, based on a combination of two existing models, was subsequently developed using human sensory nerve fibre morphometric data. Lastly the morphological parameters of the nerve fibre model were changed to resemble a Type I peripheral auditory nerve fibre and coupled to a volume-conduction model of the cochlea. This study is the first to show that the Hodgkin-Huxley model equations can be modified successfully to predict excitation behaviour of a generalised human peripheral sensory nerve fibre without using the Goldman-Hodgkin-Katz equations. The model includes a more comprehensive establishment of temperature dependence of the physiological and electrical parameters compared to existing models. Two versions of the human Type I auditory nerve fibre model were developed, one simulating an undamaged (non-degenerate) fibre and another a damaged (degenerate) fibre. Comparison between predicted and measured results indicated similar transient and persistent sodium, as well as slow potassium ionic membrane currents to those found in generalised sensory nerve fibres. Results confirm that chronaxie, rheobase current, mean latency, threshold and relative refractive periods depend on the amount of degeneracy
of fibres. The model could account for threshold differences observed between different asymmetric waveforms. The combination of persistent sodium and slow potassium ionic membrane currents could in part predict non-monotonic excitation behaviour observed experimentally. A simplified method was developed to calculate electrically evoked compound action potential responses following neural excitation. It provided a computationally effective way to obtain an estimate of profile widths from the output of models that calculate neural excitation profiles, and an indirect way to estimate stimulus attenuation by calculating the value of the parameter that produces the best fit to experimental data. Results also confirmed that electrode arrays located closer to the modiolus produce more focussed neural excitation spread than more laterally located arrays.

Hearing and Hormones

This volume will cover a variety of topics, including child language development; hearing loss; listening in noise; statistical learning; poverty; auditory processing disorder; cochlear neuropathy; attention; and aging. It will appeal broadly to auditory scientists—and in fact, any scientist interested in the biology of human communication and learning. The range of the book highlights the interdisciplinary series of questions that are pursued using the auditory frequency-following response and will accordingly attract a wide and diverse readership, while remaining a lasting resource for the field.

Aging and Hearing

Since the first edition of the Aging Auditory System volume (in 2009), there has been a tremendous amount of research in basic, translational, and clinical sciences related to age-related changes in auditory system structure and function. The new research has been driven by technical and conceptual advances in auditory neuroscience at multiple levels ranging from cells to cognition. The chapters in Aging and Hearing: Causes and Consequences span a broad range of topics and appeal to a relatively wide audience. Our goal in this volume is to put together state-of-the-art discussions about new developments in aging research that will appeal to a broad audience, serving as an important update on the current state of research on the aging auditory system. This update includes not only the recent research, but also consideration of how human and animal studies or translational and basic research are working in tandem to advance the field. This new edition is a natural complement to the previous SHAR volume on the aging auditory system edited by Gordon-Salant, Frisina, Popper, and Fay. The target audience for this volume will be graduate students, researchers, and academic faculty from a range of disciplines (psychology, hearing science/audiology, physiology, neuroscience, engineering). It also will appeal to clinical audiologists as well as to researchers working in the hearing device industry. Individuals who attend conferences sponsored by the Association for Research in Otolaryngology, Acoustical Society of America, Auditory Cognitive Neuroscience Society, American Auditory Society, Society for Neuroscience, American Speech, Language and Hearing Association, and the American Academy of Audiology (among others) are likely to find value in the volume.

Multisensory Processes

We live in a complex and dynamically changing acoustic environment. To this end, the auditory cortex of humans has developed the ability to process a remarkable amount of diverse acoustic information with apparent ease. In fact, a phylogenetic comparison of auditory systems reveals that human auditory association cortex in particular has undergone
extensive changes relative to that of other species, although our knowledge of this remains incomplete. In contrast to other senses, human auditory cortex receives input that is highly pre-processed in a number of sub-cortical structures; this suggests that even primary auditory cortex already performs quite complex analyses. At the same time, much of the functional role of the various sub-areas in human auditory cortex is still relatively unknown, and a more sophisticated understanding is only now emerging through the use of contemporary electrophysiological and neuroimaging techniques. The integration of results across the various techniques signify a new era in our knowledge of how human auditory cortex forms basis for auditory experience. This volume on human auditory cortex will have two major parts. In Part A, the principal methodologies currently used to investigate human auditory cortex will be discussed. Each chapter will first outline how the methodology is used in auditory neuroscience, highlighting the challenges of obtaining data from human auditory cortex; second, each methods chapter will provide two or (at most) three brief examples of how it has been used to generate a major result about auditory processing. In Part B, the central questions for auditory processing in human auditory cortex are covered. Each chapter can draw on all the methods introduced in Part A but will focus on a major computational challenge the system has to solve. This volume will constitute an important contemporary reference work on human auditory cortex. Arguably, this will be the first and most focused book on this critical neurological structure. The combination of different methodological and experimental approaches as well as a diverse range of aspects of human auditory perception ensures that this volume will inspire novel insights and spurn future research.

**Neural Correlates of Auditory Cognition**

**Tinnitus**

Volume 1: The Ear (edited by Paul Fuchs) Volume 2: The Auditory Brain (edited by Alan Palmer and Adrian Rees) Volume 3: Hearing (edited by Chris Plack) Auditory science is one of the fastest growing areas of biomedical research. There are now around 10,000 researchers in auditory science, and ten times that number working in allied professions. This growth is attributable to several major developments: Research on the inner ear has shown that elaborate systems of mechanical, transduction and neural processes serve to improve sensitivity, sharpen frequency tuning, and modulate response of the ear to sound. Most recently, the molecular machinery underlying these phenomena has been explored and described in detail. The development, maintenance, and repair of the ear are also subjects of contemporary interest at the molecular level, as is the genetics of hearing disorders due to cochlear malfunctions.

**Plasticity and Signal Representation in the Auditory System**

Volume 1: The current understanding of the organization of the human visual system is discussed, with emphasis on the travelling wave and population receptive field (pRF) modeling methods of measuring visual field maps (VFMs) in humans. Functional magnetic resonance imaging (fMRI) measurement of pRFs of neurons in the visual cortices of humans revealed VFMs organized into roughly circular 'clover leaf' clusters. These VFMs were compared between normal, aging, and diseased brains to understand how the brain changes over time and help develop tools to differentiate normal aging and dementia. Finally, visual working memory, the ability to hold things in mind for brief periods of time, and its likely relationship to VFMs is discussed, with implications for future research. Volume 2: Plasticity,
Auditory Development and Plasticity

The human species is largely defined by its use of spoken language, so integral is speech communication to behavior and social interaction. Despite its importance in everyday life, comparatively little is known about the auditory mechanisms that underlie the ability to understand language. The current volume examines the perception and processing of speech from the perspective of the hearing system. The chapters in this book describe a comprehensive set of approaches to the scientific study of speech and hearing, ranging from anatomy and physiology, to psychophysics and perception, and computational modeling. The auditory basis of speech is examined within a biological and an evolutionary context, and its relevance to applied domains such as communication disorders and speech technology discussed in detail. This volume will be of interest to scientists, engineers, and clinicians whose professional work pertains to any aspect of spoken language or hearing science.

Handbook of Neuroscience for the Behavioral Sciences

This book considers deafness as a medical condition, exploring the neuronal consequences on the peripheral and the central nervous system as well as on cognition and learning, viewed from the standpoint of genetics, neuroanatomy and neurophysiology, molecular biology, systems neuroscience, and cognitive neuroscience.

Deafness

This book presents the latest findings in clinical audiology with a strong emphasis on new emerging technologies that facilitate and optimize a better assessment of the patient. The book has been edited with a strong educational perspective (all chapters include an introduction to their corresponding topic and a glossary of terms). The book contains material suitable for graduate students in audiology, ENT, hearing science and neuroscience.

Language in Our Brain
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.

**The Aging Auditory System**

The auditory system has a remarkable ability to adjust to an ever-changing environment. The six review chapters that comprise Plasticity of the Auditory System cover a spectrum of issues concerning this ability to adapt, defined by the widely applicable term “plasticity”. With a selection of chapters that is wide in scope, this volume represents much of the most current research in this field. The volume stands alone, but is closely related a previous SHAR volume, Development of the Auditory System (Volume 9) by Rubel, Popper, and Fay. Intended for upper-level undergraduates, graduate students, and researchers of auditory development, the book fully addresses the difficulties, challenges, and complexities of this topic as it applies to the auditory development of a wide variety of species.

**The Frequency-Following Response**

Experimental approaches to auditory research make use of validated animal models to determine what can be generalized from one species to another. This volume brings together our current understanding of the auditory systems of fish and amphibians. To address broader comparative issues, this book treats both fish and amphibians together, to overcome the differing theoretical and experimental paradigms that underlie most work on these groups.

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