Auditory Electrophysiology: A Student Handbook

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PREFACE

- In the field of modern neuroscience and audiology, understanding the intricacies of auditory electrophysiology is essential. The auditory system is a marvel of biological engineering, enabling us to perceive and interpret the symphony of sounds that surround us every day. Auditory electrophysiology, a subfield within the broader discipline of electrophysiology, offers a unique window into the inner workings of this complex system.
- This comprehensive handbook serves as your indispensable companion on a journey into the fascinating world of auditory electrophysiology. Whether you are a student embarking on your academic career, a researcher diving deeper into auditory science, or a clinician seeking to expand your diagnostic and treatment capabilities, this handbook is designed to be your reliable guide.
- Our aim is to equip you with the knowledge and tools necessary to explore the mysteries of hearing and to apply this understanding to improve the lives of those affected by auditory disorders. Whether your interests lie in basic science, clinical practice, or technological innovation, this handbook will provide you with a solid foundation upon which to build your expertise.

METHODS

Literature Review
A comprehensive review of seminal and contemporary literature pertaining to auditory electrophysiology was conducted to inform the content of the textbook. Key concepts and findings from research articles, textbooks, and scholarly journals were synthesized to ensure the accuracy and relevance of the material presented.

Content Organization
The student handbook is organized into 11 chapters, covering topics which range from the neural basis of hearing to advanced techniques in automation of auditory brainstem responses. Each chapter is structured to facilitate progressive learning and to provide clear explanations using visualizations, and practical case studies.

Writing Process
The writing process involved collaboration amongst members of the Auditory Electrophysiology Research Laboratory at Ohio University. Such members consisted of Dr. Fuh-Cherng Jeng MD, PhD, who is an expert in neural and auditory processing of speech and non-speech stimuli, and Sydney Bauer, a dual PhD/AuD graduate student.
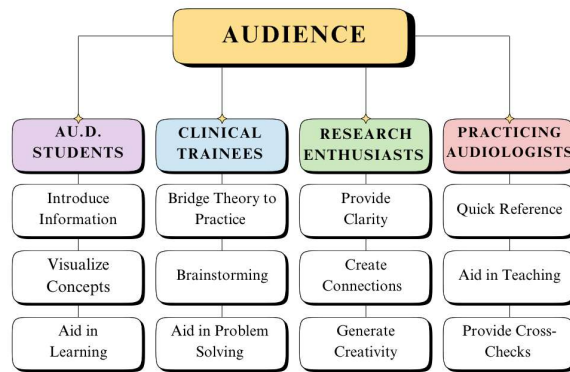
Visual Design
Visual elements such as figures, diagrams, and tables were designed to enhance understanding and retention of complex concepts. Attention was paid to the clarity of visual representations, ensuring accessibility for readers with varying levels of expertise in auditory electrophysiology.
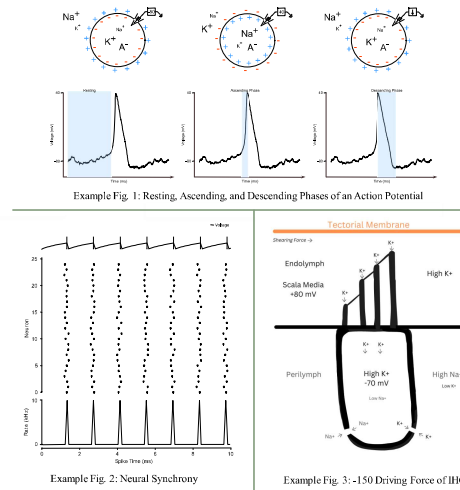
Review Process
Prior to publication, the handbook manuscript will undergo rigorous review by experts in the field of auditory electrophysiology. Feedback from reviewers will be carefully considered and incorporated into subsequent revisions to enhance the quality and comprehensiveness of the final product.

PURPOSE

AUDIENCE			
AU.D. STUDENTS	CLINICAL TRAINEES	RESEARCH ENTHUSIASTS	PRACTICING AUDIOLOGISTS
Introduce Information	Bridge Theory to Practice	Provide Clarity	Quick Reference
Visualize Concepts	Brainstorming	Create Connections	Aid in Teaching
Aid in Learning	Aid in Problem Solving	Generate Creativity	Provide Cross-Checks

EXAMPLE FIGURES

Example Fig. 1: Resting, Ascending, and Descending Phases of an Action Potential

Example Fig. 2: Neural Synchrony

Example Fig. 3: -150 Driving Force of IHC

AN INSIDE LOOK

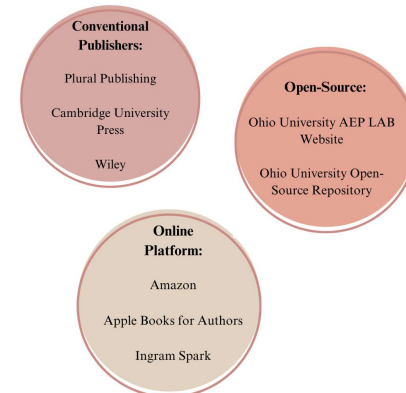| TOPIC SYNOPSIS:	CHAPTER 1	CHAPTER 2	CHAPTER 3	CHAPTER 4	CHAPTER 5
	o Anatomy of the Auditory System	o Stimulating Systems	Stimulus Factors Affecting the ABR:	o Transducer Effects on Frequency Spectrum	o Biological Calibration
	o Mechanics of Auditory Transduction	o Recording Systems	o Stimulus Type	o Bone Conduction ABRs	o Electroacoustic Calibration
	o Recording Auditory Evoked Potentials	o ABR Recording Set-Up	o Stimulus Intensity	o Air-Bone Gap in ABRs	o Relationships of dB nHL and dB ppeSPL
	o Adult vs. Neonatal ABRs	o Differential Amplification	o Stimulus Polarity	o Contralateral Masking of ABRs	o Correction Factors
	o Latency-Intensity Function	o Acoustic Filtering	o Stimulus Rate	o Non-Pathologic Subject Variables	o ABR Growth Function
	o Envelope of the Traveling Wave	o Sampling Rate	o Stimulus Duration		o Threshold Estimation
		o Averaging			
		o Artifact Rejection			

*ABR = Auditory Brainstem Response

VISUAL DESIGN PLATFORMS

Data analysis and visualization were performed using Python programming language. Illustrations within each chapter were created using open-sourced software such as Canva, Python, GIMP, and Veusz. These tools aided in facilitating the exploration and interpretation of electrophysiological data presented in the handbook.

POTENTIAL PUBLISHERS

Conventional Publishers:
Plural Publishing
Cambridge University Press
Wiley

Open-Source:
Ohio University AEP LAB Website
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