Vocal Health and Pedagogy
Science, Assessment, and Treatment

Third Edition
# Contents

Foreword by Denyce Graves-Montgomery ix  
Preface xi  
Acknowledgments to the Third Edition xv  
About the Author xvii  
Contributors xxi  
Dedication xxvii

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The Singing Teacher in the Age of Voice Science</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Richard Miller</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Historical Overview of Voice Pedagogy</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Richard Miller</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Choral Pedagogy and Vocal Health</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Brenda J. Smith and Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Amateur and Professional Child Singers: Pedagogy and Related Issues</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Valerie L. Trollinger and Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Why Study Music?</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Christin Coffee Rondeau</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Medical Evaluation Prior to Voice Lessons: Another Controversy</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Aaron J. Jaworek and Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The Physics of Sound</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Music and the Brain</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Thomas Swirsky-Sacchetti, Robert Rider, Michael E. Keesler, and Steven Mandel</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Clinical Anatomy and Physiology of the Voice</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Robert Thayer Sataloff</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>An Overview of Laryngeal Function for Voice Production</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>R. J. Baken</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Laryngeal Function During Phonation</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>Ronald C. Scherer</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Vocal Tract Resonance</td>
<td>169</td>
</tr>
<tr>
<td></td>
<td>Johan Sundberg</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 14  Voice Care Professionals: A Guide to Voice Care Providers  
Robert Thayer Sataloff, Yolanda D. Heman-Ackah, and Mary J. Hawkshaw  
189

Chapter 15  Patient History  
Robert Thayer Sataloff  
195

Chapter 16  Special Considerations Relating to Members of the Acting Profession  
Bonnie N. Raphael  
219

Chapter 17  Physical Examination  
Robert Thayer Sataloff  
223

Chapter 18  The Clinical Voice Laboratory  
Jonathan J. Romak, Reinhardt J. Heuer, Mary J. Hawkshaw, and Robert Thayer Sataloff  
237

Chapter 19  Use of Instrumentation in the Singing Studio  
Robert Thayer Sataloff  
271

Chapter 20  High-Speed Digital Imaging  
Matthias Echternach  
275

Chapter 21  Evolution of Technology  
Jonathan J. Romak and Robert Thayer Sataloff  
289

Chapter 22  Common Medical Diagnoses and Treatments in Patients With Voice Disorders: An Introduction and Overview  
Robert Thayer Sataloff, Mary J. Hawkshaw, and Johnathan B. Sataloff  
295

Chapter 23  The Effects of Age on the Voice  
Robert Thayer Sataloff, Karen M. Kost, and Sue Ellen Linville  
319

Chapter 24  Pediatric Voice Disorders  
Alexander Manteghi, Amy Rutt, Robert Thayer Sataloff, and Caren J. Sokolow  
339

Chapter 25  Hearing Loss in Singers and Other Musicians  
Robert Thayer Sataloff, Brian McGovern, Joseph Sataloff, and Morgan A. Selleck  
355

Chapter 26  Eye Care and the Performing Arts  
Marcel J. Sislowitz  
373

Chapter 27  Endocrine Function  
Timothy D. Anderson, Dawn D. Anderson, and Robert Thayer Sataloff  
377

Chapter 28  The Vocal Effects of Thyroid Disorders and Their Treatment  
Julia A. Pfaff, Hilary Caruso-Sales, Aaron Jaworek, and Robert Thayer Sataloff  
393

Chapter 29  The Effects of Hormonal Contraception on the Voice  
Jennifer P. Rodney and Robert Thayer Sataloff  
405

Chapter 30  Breast Cancer in Professional Voice Users  
Dahlia M. Sataloff and Robert Thayer Sataloff  
411

Chapter 31  Autoimmune  
Robert Thayer Sataloff and Michael S. Benninger  
417

Chapter 32  Psychological Aspects of Voice Disorders  
Deborah Caputo Rosen, Reinhardt J. Heuer, David A. Sasso, and Robert Thayer Sataloff  
427
Chapter 33 Allergy
  John R. Cohn, Patricia A. Padams, Mary J. Hawkshaw, and Robert Thayer Sataloff
  459

Chapter 34 Respiratory Dysfunction
  Robert Thayer Sataloff, John R. Cohn, and Mary J. Hawkshaw
  465

Chapter 35 Pollution and Its Effects on the Voice
  Robert Thayer Sataloff
  479

Chapter 36 Pyrotechnics in the Entertainment Industry: An Overview
  Cynthia Del’Aria and David A. Opperman
  493

Chapter 37 Artificial Fogs and Smokes
  Monona Rossol
  505

Chapter 38 Infectious and Inflammatory Disorders of the Larynx
  Catherine F. Sinclair and Robert S. Lebovics
  513

Chapter 39 Pharyngitis
  Mona M. Abaza and Robert Thayer Sataloff
  531

Chapter 40 Sleep and the Vocal Performer
  Joanne E. Getsy, Robert Thayer Sataloff, and Julie A. Wang
  541

Chapter 41 Nutrition and the Professional Voice
  Jennifer A. Nasser and Nyree Dardarian
  555

Chapter 42 Reflux and Other Gastroenterologic Conditions That May Affect the Voice
  Robert Thayer Sataloff, Donald O. Castell, Philip O. Katz, Dahtlia M. Sataloff, and Mary J. Hawkshaw
  577

Chapter 43 Seating Problems and Vocalists
  Richard N. Norris
  669

Chapter 44 Bodily Injuries and Their Effects on the Voice
  Robert Thayer Sataloff
  673

Chapter 45 Performing Arts Medicine and the Professional Voice User: Risks of Nonvoice Performance
  William J. Dawson, Robert Thayer Sataloff, and Valerie L. Trollinger
  677

Chapter 46 Respiratory Behaviors and Vocal Tract Issues in Wind Instrumentalists
  Valerie L. Trollinger and Robert Thayer Sataloff
  687

Chapter 47 Neurologic Disorders Affecting the Voice in Performance
  Linda Dahl, Jessica W. Lim, Steven Mandel, Reena Gupta, and Robert Thayer Sataloff
  699

Chapter 48 Medications and the Voice
  Robert Thayer Sataloff, Mary J. Hawkshaw, Joseph Anticaglia, Michelle White, Kirsten Meenan, and Jonathan J. Romak
  727

Chapter 49 Psychiatric Manifestations of Medications Prescribed Commonly in Otolaryngology
  Steven H. Levy, Mona M. Abaza, Mary J. Hawkshaw, Robert Thayer Sataloff, and Reinhardt J. Heuer
  757

Chapter 50 Medications for Traveling Voice Performers
  Robert Thayer Sataloff and Mary J. Hawkshaw
  761
Foreword

I don’t know of anyone, in any profession, of any kind, who is as thoroughly and completely immersed and in love with the human voice as is Dr. Robert Sataloff. The name Dr. Sataloff is one that I have heard at every stage of my development as an artist. He is well known among singers and teachers as a specialist in caring for the professional voice, but it wasn’t until I had the great fortune of becoming a patient, that I was fully able to appreciate his unquestionable brilliance.

In his sophisticated latest project, Vocal Health and Pedagogy: Science, Assessment, and Treatment, Third Edition, Dr. Sataloff has poured years of intricate research, knowledge, and experience into his “must have” vocal Bible for clinicians, voice teachers, singers, and coaches alike. It answers every question you’ve ever had about the voice, from the physics of sounds, to vocal technique, to medications, to performance anxiety. Because Dr. Sataloff is himself a singer, composer, and conductor, he shares an affinity with his patients and with this material and is therefore aware of these many issues firsthand.

Vocal Health and Pedagogy leaves no stone unturned! And we are richer, healthier, and better prepared with less vocal worries and concerns for having this treasure trove of knowledge at our fingertips. This wealth of information will never exhaust, and we will refer to its pages for years to come. For anyone who loves the beauty of the human voice and the beauty of refined art, this work . . . itself a work of art, is for this generation and for generations to come. Molto Bravo Dr. Sataloff.

—Denyce Graves-Montgomery
Preface

The first and second editions of *Vocal Health and Pedagogy* were written as a companion book to *Professional Voice: The Science and Art of Clinical Care*. When I wrote the first edition of *Professional Voice: The Science and Art of Clinical Care*, which was published in 1991, I had hoped that it would be used not only as a medical text, but also for courses in vocal pedagogy and speech-language pathology. Although teachers in these fields found the book useful and helpful, only a few were comfortable using it in their courses because of the cost to their students. Now that the fourth edition of the book has expanded from 33 chapters in the first edition to 120 chapters in the fourth edition, the cost of the book has increased; and it has become virtually inaccessible to an important segment of the audience for whom it was written. Consequently, the third edition of *Vocal Health and Pedagogy* was written to make at least some of the information available to and affordable for students.

The first part of the book introduces basic concepts of voice science, assessment, and training. Chapter 1 provides perspective on modern voice medicine and a brief historical review of how knowledge about the larynx and voice has evolved over the centuries. Chapter 2 includes introductory information about the physics of sound. Chapter 2, *The Singing Teacher in the Age of Voice Science*, is a classic chapter by the late Richard Miller that was retained unchanged, as was his chapter (3) which provides an historical overview of voice pedagogy. Chapter 4 includes not only revisions of the previous chapter, but also new material on choral pedagogy for geriatric singers. Chapter 5, a new chapter on pedagogy for children that provides insights into training and approaches to teaching voice in primary and secondary schools. Chapter 6, a new chapter about the importance of studying music in general. Chapter 7 addresses the complex and controversial ethical issues faced by singing teachers with students or prospective students who refuse to undergo medical evaluation even when that is recommended by the teacher. Chapter 8 provides introductory information about the physics of sound. Chapter 9, an exceptionally interesting chapter on Music and the Brain, and it has been updated extensively. It reviews much of what is known currently about central development and processing of musical information; and this science should be extremely valuable in expanding the vision of voice teachers, researchers and clinicians. Chapter 10 on clinical anatomy and physiology of the voice has been rewritten and expanded. It contains a great deal of information about laryngeal anatomy, neuroanatomy, respiratory function and other topics that, to the best of my knowledge, have not been synthesized in similar detail in a single source elsewhere. Chapter 11, Baken’s overview of laryngeal function, has been updated with minor changes. Chapter 12 has been revised. In this chapter, Scherer expands on the information in Baken’s chapter and provides insights into many more complex aspects of laryngeal function. Sundberg has rewritten and updated Chapter 13 on vocal tract resonance. Chapter 14 on voice care professionals required just minor revisions.

Beginning the section on clinical assessment of voice disorders, Chapter 15 and 17 have been expanded to summarize information on numerous conditions not included in the last edition. Chapter 16 on special considerations for actors has only minor changes. Chapter 18 has been rewritten extensively. It includes not only basic concepts in laboratory evaluation, but also our most recent practices regarding instrumentation and test protocols. It also reviews techniques such as measurements of cepstral peak prominence, as well as updated references on validity and reliability of clinical voice measures. Chapter 19, (The Use of Instrumentation in the Singing Studio) needed only minor updates. Chapters 20 and 21 are new. In Chapter 20, Echternach expands extensively on the basic information about high-speed digital imaging. Chapter 21 provides an overview of the evolution of technology over more than a century, and its influence on the development of laryngology.

The second portion of the book contains additional information on the specific health and performance conditions that affect the voice and their assessment and treatment. Chapter 22, has been expanded to include new entities, and to provide more information on disorders that were covered as only separate chapters in previous editions. Chapter 23 also has been updated and expanded extensively. It contains
a discussion of a large number of studies on the aging voice that were not addressed in previous editions. 

Chapter 24 is new. While pediatric voice disorders are not discussed in detail in previous editions, this chapter adds not only differential diagnosis and treatment, but also suggestions on imaging of children, which can be challenging. Chapter 25 on hearing loss has been updated to include a review of the last literature. Chapter 26 on ophthalmologic care in performers required no changes. Chapter 27 on endocrine function has been rewritten and contains the latest information on topics covered in the previous edition, as well as topics that have not been addressed in prior voice literature. Chapter 28 is new. Thyroid surgery is extremely common and can have devastating consequences for voice professionals. This chapter reviews thyroid disorders and their many potential adverse effects. Chapter 29 also is new and provides the most current information on the vocal effects of birth control medications. Chapter 30 on breast cancer has been revised to include the latest information on surgical and adjunctive therapy and the implications of breast cancer treatment on singing performance. Chapter 31 is a new chapter on autoimmune disorders and their effects on the voice. Chapter 32 also has been rewritten extensively. In addition to covering various aspects of psychological assessment and treatment, it integrates information on the role of psychological professionals and others involved in management of voice patients. Chapter 33 (Allergy) and Chapter 34 (Respiratory Dysfunction) required only moderate revisions to bring them up to date.

Chapter 35 contains substantial new information on topics such as World Trade Center Syndrome and laryngeal effects of asbestos exposure. Chapters 36 (Pyrotechnics in the Entertainment Industry), 37 (Artificial Fogs and Smokes), 38 (Infectious and Inflammatory Disorders of the Larynx), and 39 (Pharyngitis) all contain substantial new information and the most recent references. Chapter 39 (Pharyngitis) remains a separate chapter because of the importance of the complex issue of “sore throat” in professional voice users. It is included to review current practice and to serve as a reminder that pharyngitis still can be a serious, even life-threatening condition. Chapter 40 on sleep science and the importance of sleep in vocal performers has been rewritten almost completely by different authors and provides valuable insights unfamiliar to most otolaryngologists but extremely important to performers, especially those who travel extensively. Chapter 41 on nutrition has been largely rewritten and summarizes important recent changes in criteria and strategy, reflecting developments in nutritional science over the last decade. Chapter 42 includes extensive new information on laryngopharyngeal reflux, diagnosis, treatment, and research. It cites almost 600 references including literature written since publication of the last edition, as well as classic literature that was written previously. Chapter 43 (Seating Problems and Vocalists) has only minor changes. Chapter 44 on bodily injuries and their effects on the voice has been revised slightly, but Chapter 45 on performing arts-medicine has some particularly important additions. It includes a brief discussion on visual arts hazards (painting, sculpting, etc) and their implications for voice performance. Chapter 46 is a new discussion of respiratory behavior and vocal tract issues in wind instrumentalists. It addresses the facts behind the long-standing controversy about simultaneous study of voice and wind instruments. Chapter 47 on neurological disorders also has been revised extensively and contains the latest information about many conditions. Chapter 48 on medications and their effects on the voice has been updated and revised extensively. Chapter 49 offers a new and practical discussion of cough and the unified airway. Chapter 50 on medications for traveling performers has been revised to delete medications no longer are used frequently and add various medications and drug classes that were not included in previous editions.

The section on voice therapy and treatment begins with Chapter 51, Introduction to Treating Voice Abuse, and Chapter 52, Speech-Language Pathology and the Professional Voice User are unchanged. Chapter 53 on voice therapy has been rewritten extensively to include substantially more detail regarding specific therapeutic techniques that were not included in the previous editions, highlighting our current practices. Chapter 54 on voice rest has been revised to include additional information published on this controversial topic since the last edition. Only minor changes were necessary in Chapter 55, Increasing Vocal Effectiveness.

Chapter 56 on the singing voice specialist has been rewritten extensively to include the most current techniques for management of the singing voice, for using singing techniques to help nonsingers, and to reflect our latest beliefs and practices, as well as the most recent information from the evolving literature in this field. Chapter 57, The Role of the Acting-Voice Trainer on the Medical Care of Professional Voice Users needed only minor changes. Chapter 58 on exercise physiology has been rewritten completely by new authors and includes the most recent concepts and literature on this topic. Understanding exercise physiology is critical to understanding voice train-
ing and rehabilitation. **Chapter 59** reviews important information on postural analysis, a subject more familiar to other medical specialties (such as physiatry) than to otolaryngology and speech-language pathology, but one that is important to voice care and pedagogy.

In educational settings, it is the author’s hope that the third edition of *Vocal Health and Pedagogy*, will be used in conjunction with *Professional Voice: The Science and Art of Clinical Care, Fourth Edition*. Ideally, the longer book should be available as a library reference; and I believe that it would be valuable to anyone teaching courses in which the third edition of *Vocal Health and Pedagogy* is used as a student text.

The fourth edition of *Professional Voice: The Science and Art of Clinical Care* also should be useful as a reference for teachers or performers who develop voice problems and seek more extensive information.

Every effort has been made to maintain style and continuity of the book throughout. Although the interdisciplinary expertise of numerous authors has been invaluable in the preparation of this text, contributions have been edited carefully where necessary to maintain consistency of linguistic style and complexity; and I have written or co-authored 39 of the 59 chapters. All of us who have been involved with the preparation of this book hope that readers will find it not only informative but also enjoyable to read.

—Robert T. Sataloff, MD, DMA
Acknowledgments to the Third Edition

I remain indebted to the many friends and colleagues acknowledged in the first and second editions of this book. As always, special thoughts and thanks go to the late Wilbur James Gould whose vision and gentle leadership formed the foundation on which so many of us have continued to build, and to the late Hans von Leden.

I am especially indebted to the many distinguished colleagues who have contributed to this edition. Those who had contributed to previous editions worked diligently to revise and update their chapters. Those who had not contributed to previous editions have added insights and expertise that have made it possible to realize my vision of what I thought this book should be.

As always, I am indebted to the National Association of Teachers of Singing for permission to use material freely from my “Laryngoscope” articles which appear in the Journal of Singing (formerly the NATS Journal), and to Vendome for permission to republish articles and color pictures from my monthly “clinic” in Ear, Nose, and Throat Journal. I am also grateful to John Rubin and Gwen Korovin and to Plural Publishing for permission to republish a few chapters from our book (Rubin JR, Sataloff RT, Korovin G. Diagnosis and Treatment of Voice Disorders, 4th ed., Plural Publishing, Inc; San Diego, CA, 2015). In addition, I am indebted for permission to republish material from Choral Pedagogy, 3rd ed. (Smith B, Sataloff RT. Plural Publishing Inc, San Diego, CA; 2013), The Performer’s Voice (Benninger MS, Murry T, and Johns MM, Plural Publishing, Inc, San Diego, CA, 2016), Sataloff’s Comprehensive Textbook of Otolaryngology and Head and Neck Surgery (Jaypee, New Delhi, 2016), and Sataloff RT, Brandfonbrener A, Lederman R, Performing Arts Medicine, 3rd edition (Science and Medicine, Narberth, Pennsylvania, 2010).

Lastly, as always, I cannot express sufficient thanks to Mary J. Hawkshaw, RN, BSN, CORLN, for her tireless editorial assistance, proofreading, and scholarly contributions. I am also indebted to Christina Chenes for her painstaking preparation of the manuscript and for the many errors she found and corrected, and to my associates, Karen Lyons, MD, Amanda Hu, MD, Robert Wolfson, MD, and Frank Marlowe, MD, and to my laryngology fellows. Without their collaboration, excellent patient care, and tolerance of my many academic distractions and absences, writing would be much more difficult. I am also indebted to Ridley Chauvin for his excellent suggestions to improve the content and order of this book to make it more convenient for pedagogy classes. I remain forever grateful to my father and partner Joseph Sataloff, MD, D.Sc., who taught me to write and edit, and who encouraged me to write my first papers and book, and mentored me throughout our years of practice together, as well as to my other primary mentors in training, Drs. Walter Work, Charles Krause and Malcolm Graham. My greatest gratitude goes to my wife Dahlia M. Sataloff, MD, FACS, and sons Ben and John who patiently allow me to spend so many of my evenings, weekends, and vacations writing.
Robert Thayer Sataloff, MD, DMA, FACS, is Professor and Chairman, Department of Otolaryngology-Head and Neck Surgery and Senior Associate Dean for Clinical Academic Specialties, Drexel University College of Medicine. He is also Adjunct Professor in the departments of Otolaryngology-Head and Neck Surgery at Thomas Jefferson University and the University of Pennsylvania, as well as Adjunct Clinical Professor at Temple University and the Philadelphia College of Osteopathic Medicine; and he is on the faculty of the Academy of Vocal Arts. He served for nearly four decades as Conductor of the Thomas Jefferson University Choir. Dr. Sataloff is also a professional singer and singing teacher. He holds an undergraduate degree from Haverford College in Music Theory and Composition; graduated from Jefferson Medical College, Thomas Jefferson University; received a Doctor of Musical Arts in Voice Performance from Combs College of Music; and he completed Residency in Otolaryngology-Head and Neck Surgery and a Fellowship in Otology, Neurotology and Skull Base Surgery at the University of Michigan. Dr. Sataloff is Chairman of the Boards of Directors of the Voice Foundation and of the American Institute for Voice and Ear Research. In addition to directing all aspects of these two non-profit corporations, he has led other non-profit and for-profit enterprises. He has been Chairman and Chief Executive of a multi-physician medical practice for over 30 years; and he served as Vice President of Hearing Conservation Noise Control, Inc. from 1981 until the time of its sale in 2003. He has also served as Chairman of the Board of Governors of Graduate Hospital; President of the American Laryngological Association, the International Association of Phonosurgery, and the Pennsylvania Academy of Otolaryngology-Head and Neck Surgery; and in numerous other leadership positions. Dr. Sataloff is Editor-in-Chief of the Journal of Voice; Editor-in-Chief of Ear, Nose and Throat Journal; Associate Editor of the Journal of Singing and on the editorial boards of numerous otolaryngology journals. He has written approximately 1,000 publications, including 59 books, and has been awarded more than $5 million in research funding. His medical practice is limited to care of the professional voice and otology/neurotology/skull base surgery. Dr. Sataloff has developed numerous novel surgical procedures including total temporal bone resection for formerly untreatable skull base malignancy, laryngeal microflap and mini-microflap procedures, vocal fold lipoinjection, vocal fold lipoimplantation, and others. He has invented more than 100 laryngeal microsurgical instruments produced by Microfrance and Integra Medical, ossicular replacement prostheses.
produced by Grace Medical, and novel laryngeal prostheses with Boston Medical. Dr. Sataloff is recognized as one of the founders of the field of voice, having written the first modern comprehensive article on care of singers, and the first chapter and book on care of the professional voice, as well as having influenced the evolution of the field through his own efforts and through the Voice Foundation for nearly 4 decades. He has been involved extensively throughout his career in education, including development of new curricula for graduate education. Dr. Sataloff has been instrumental in training not only residents, but also fellows and visiting laryngologists from North America, South America, Europe, Asia and Australia. His fellows have established voice centers throughout the United States, in Turkey, Singapore, Brazil, and elsewhere. He also is active in training nurses, speech language pathologists, singing teachers, and others involved in collaborative arts medicine care, pedagogy and performance education. Dr. Sataloff has been recognized by Best Doctors in America (Woodward White Athens) every year since 1992, Philadelphia Magazine since 1997, and Castle Connolly's "America's Top Doctors" since 2002. Dr. Sataloff’s books include:

Contributors

Mona M. Abaza, MD, MS
Associate Professor
Department of Otolaryngology-Head and Neck Surgery
University of Colorado
Denver, Colorado
Chapters 39 and 49

Dawn D. Anderson, MD
MIT Medical Services
Cambridge, Massachusetts
Chapter 27

Timothy D. Anderson, MD
Director, Division of Voice and Swallowing
Department of Otolaryngology-Head and Neck Surgery
Lahey Clinic
Burlington, Massachusetts
Chapter 27

Joseph Anticaglia, MD
Ear, Nose, and Throat Associates of New York
Flushing, New York
Chapter 48

R. J. Baken, PhD
Professor Emeritus
Columbia University
New York, NY
Senior Lecturer
New York Medical College
Valhalla, NY
Chapter 11

Michael S. Benninger, MD
Chairman, Head and Neck Institute
Professor of Surgery
Lerner College of Medicine
The Cleveland Clinic
Cleveland, Ohio
Chapter 31

Ed Blake, MSc (Phty), MCST, SRP
Physiatrist
Specialist in Dance and Vocal Medicine

Physio-Ed Medical
London, England
Chapter 59

Donald O. Castell, MD
Professor of Medicine
Director of Esophageal Disorders Program
Department of Gastroenterology and Hepatology
Charleston, South Carolina
Chapter 42

Christin Coffee Rondeau, MM
Voice Teacher
Dayton, Ohio
Chapter 6

Susan E. Cline, MS, CCC-SLP
Clinical Voice Specialist
The Voice Care Center at Presbyterian Hospital
Charlotte, North Carolina
Chapters 54 and 56

John R. Cohn, MD, FCCP
Professor of Medicine and Pediatrics
Thomas Jefferson University
Philadelphia, Pennsylvania
Chapters 33 and 34

Linda Dahl, MD
Clinical Assistant Professor
Department of Otolaryngology-Head and Neck Surgery
New York Presbyterian Hospital/Weill Cornell Medical Center
Dahl Otolaryngology Center
New York, New York
Chapter 47

Nyree Dardarian, MS, RD, LDN, CSSD, FAND
Assistant Clinical Professor
Director, Center for Nutrition & Performance Coordinator, Individualized Supervised Practice Pathway
Drexel University
Philadelphia, Pennsylvania
Chapter 41
William J. Dawson, MD
Performing Artist in Residence
Duke University Hospital
Music Teaching Fellow
Duke Children’s Hospital
Durham, North Carolina
Chapter 45

Cynthia Del’Aria
Colorado Voice Clinic
Denver, Colorado
Chapter 36

Matthias Echternach, MD
Professor
Institute of Musicians Medicine
Freiburg University
Freiburg, Germany
Chapter 20

Sharon L. Freed, BA, MFA
Voice and Speech Consultant
Philadelphia, Pennsylvania
Chapter 57

Joanne E. Getsy, MD, FCCP, FAASM
Professor of Medicine
College of Medicine
Drexel University
Chief, Sleep Section
Program Director, Sleep Medicine Fellowship
Medical Director, Drexel Sleep Center
Medical Director, Hahnemann University Hospital Neurodiagnostics Sleep Disorders Center
Philadelphia, Pennsylvania
Chapter 57

Reena Gupta, MD, FACS
Director, Division of Voice and Laryngology
Osborne Head and Neck Institute
Los Angeles, California
Chapter 47

Mary J. Hawkshaw, RN, BSN, CORLN
Research Professor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Philadelphia, Pennsylvania
Chapters 14, 18, 22, 33, 34, 42, 48, 49, and 50

Yolanda D. Heman-Ackah, MD
Medical Director
Philadelphia Voice Center
Clinical Professor

Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Adjunct Associate Professor
Department of Otolaryngology-Head and Neck Surgery
Thomas Jefferson University
Philadelphia, Pennsylvania
Chapter 14

Reinhardt J. Heuer, PhD
Professor Emeritus
Department of Communication Sciences and Disorders
Temple University
Adjunct Professor
Department of Otolaryngology-Head & Neck Surgery
Drexel University College of Medicine
Philadelphia, Pennsylvania
Chapters 18, 32, and 49

Michelle R. Horman, M.A., CCC-SLP
Instructor
Department of Otolaryngology-Head & Neck Surgery
Drexel University College of Medicine
Voice Pathologist
American Institute for Voice and Ear Research
Philadelphia, Pennsylvania
Chapter 53

Aaron J. Jaworek, MD
Clinical Instructor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Philadelphia, Pennsylvania
Specialty Physician Associates
Bethlehem, Pennsylvania
Chapters 7 and 28

Hala Kanona
Otolaryngology Registrar
Royal Ear Nose and Throat Hospital
London, England
Chapter 59

Philip O. Katz, MD
Clinical Professor
Department of Medicine
Jefferson Medical College
Chairman, Division of Gastroenterology and Nutrition
Albert Einstein Medical Center
Philadelphia, Pennsylvania
Chapter 42

Michael E. Keesler, JD, PhD
Post-Doctor Fellow
Clinical Neuropsychology
Diversified Psychological Resources, PC
Philadelphia, PA
Chapter 9

Karen M. Kost, MD, FRCSC
Professor
Department of Otolaryngology-Head and Neck Surgery
McGill University Health Center
Montreal, Canada
Chapter 23

Robert S. Lebovics, MD
Surgical Consultant
National Institutes of Health
Bethesda, Maryland
Chapter 38

Jessica W. Lim, M.D.
Assistant Professor, SUNY Downstate Health Sciences Center
Otolaryngology Program Site Director Lenox Hill Hospital
New York, New York
Chapter 47

Sue Ellen Linville, PhD
Professor
Department of Speech Pathology and Audiology
Marquette University
Milwaukee, Wisconsin
Chapter 23

Karen M. Lyons, MD
Clinical Associate Professor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Philadelphia, Pennsylvania
Chapters 54 and 56

Steven Mandel, MD
Clinical Professor of Neurology
Lenox Hill Hospital
Hofstra Northwell School of Medicine
Hempstead, New York
Chapters 9 and 47

Alexander Manteghi, DO
Pediatric Otolaryngology Fellow
University of California-San Diego
San Diego, California
Chapter 24

Leslie Mathieson, DipCST, FRCSLT
Visiting Lecturer in Voice Pathology
The University of Reading
Reading, United Kingdom
Chapter 59

Brian McGovern, Sc.D, FAA, CCC-A
Instructor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Philadelphia ENT Associates
Philadelphia, Pennsylvania
Chapter 25

Kirsten Meenan, BS
Drexel University College of Medicine
Philadelphia, Pennsylvania
Chapter 48

Richard Miller, DHL (deceased)
Professor of Singing
Director, Otto B. Schoepfle Vocal Arts Laboratory
Oberlin College, Conservatory of Music
Oberlin, Ohio
Chapters 2 and 3

Jennifer Nasser, PhD, RD
Associate Professor
Director
PhD Program in Nutrition Science
Department of Nutrition Science
Drexel University
Philadelphia, Pennsylvania
Chapter 41

Richard N. Norris, MD
Private Practice
Physical Medicine and Rehabilitation
Florence, Massachusetts
Chapter 43

Dave A. Opperman, MD
Otolaryngologist
Colorado Voice Clinic
Denver, Colorado
Chapter 36
Patricia A. Padams, RN, BSN, CEN
Nurse Manager and Clinical Research Coordinator
(In association with John R. Cohn, MD)
Thomas Jefferson University
Philadelphia, Pennsylvania
Chapter 33

Julia Pfaff, DO, MPH
Department of Otolaryngology-Head and Neck Surgery
Philadelphia College of Osteopathic Medicine
Philadelphia, PA
Chapter 28

Bonnie N. Raphael, PhD
Professor Emeritus
Professional Actor Training Program
Department of Dramatic Art
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina
Chapters 16, 55, and 57

Robert Rider, PhD
Diversified Psychological Resources, P.C.
Philadelphia, Pennsylvania
Chapter 9

Jennifer Rodney, MD
Resident Physician
Department of Otorhinolaryngology
University of Oklahoma Health Sciences Center
Oklahoma City, OK
Chapter 29

Jonathan J. Romak, MD
Instructor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Philadelphia, Pennsylvania
Chapters 18

Bridget Rose, MM, MS
Instructor
Department of Otolaryngology-Head and Neck Surgery
Drexel University College of Medicine
Senior Speech Language Pathologist
Philadelphia Ear, Nose, and Throat Associates
Philadelphia, Pennsylvania
Chapter 53

Deborah Caputo Rosen, RN, PhD
President
Caputo Rosen Consulting
Philadelphia, Pennsylvania
Chapter 32

Monona Rossol, MS, MFA
Industrial Hygienist
President: Arts, Crafts and Theater Safety, Inc
New York, New York
Chapter 37

Adam D. Rubin, MD
Adjunct Assistant Professor
Michigan State University School of Medicine
Department of Otolaryngology-Head and Neck Surgery
University of Michigan Medical Center
Director, Lakeshore Professional Voice Center
Lake Shore Ear, Nose and Throat Center
St. Clear Shores, Michigan
Chapters 65 and 75

John S. Rubin, MD, FRCS, FACS
Consultant ENT Surgeon
University College London
Hospitals NHS Trust
Lead Clinician
Voice Disorders Unit
Royal National Throat, Nose and Ear Hospital
Co-Lead
Voice and Swallowing Unit
National Hospital for Neurology and Neurosurgery
Honorary Visiting Professor
School of Health Sciences
City University London
Honorary Senior Lecturer
University College London
Chapters 54 and 56

Amy L. Rutt, D.O.
Assistant Professor
Department of Otorhinolaryngology-Head and Neck Surgery
Mayo Clinic Hospital
Jacksonville, Florida
Chapter 24

Hilary M. Caruso Sales, D.O.
Department of Otolaryngology-Head and Neck Surgery
Philadelphia College of Osteopathic Medicine
Medical University of South Carolina
Philadelphia, Pennsylvania
Chapter 28

Mary J. Sandage, PhD, CCC-SLP
Assistant Professor
Department of Communication Disorders  
Auburn University  
Auburn, Alabama  
Chapter 58

David A. Sasso, MD, MPH  
Assistant Clinical Professor  
Child Study Center  
Yale School of Medicine  
New Haven, Connecticut  
Chapter 32

Dahlia M. Sataloff, MD  
Chairman, Department of Surgery  
Pennsylvania Hospital  
Clinical Professor  
Department of Surgery  
University of Pennsylvania  
Perelman School of Medicine  
Philadelphia, PA  
Chapters 30 and 42

Johnathan B. Sataloff, BS, BA  
Harvard Medical School  
Harvard University  
Boston, MA  
Chapters 22 and 25

Robert Thayer Sataloff, MD, DMA  
Professor and Chairman  
Department of Otolaryngology-Head and Neck Surgery  
Senior Associate Dean for Clinical Academic Specialties  
Drexel University College of Medicine  
Chairman, The Voice Foundation  
Chairman, American Institute for Voice and Ear Research  
Faculty, Academy of Vocal Arts  
Philadelphia, Pennsylvania  
Chapters 1, 4, 5, 7, 8, 10, 14, 15, 17, 18, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 38, 39, 40, 42, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, and 57

Ronald C. Scherer, PhD  
Distinguished Research Professor  
Department of Communication Disorders  
Bowling Green State University  
Bowling Green, Ohio  
Chapter 12

Morgan A. Selleck, MD  
Resident  
Department of Otolaryngology-Head and Neck Surgery

Chapel Hill School of Medicine  
University of North Carolina  
Chapel Hill, North Carolina  
Chapter 25

Catherine F. Sinclair, MD  
Director  
Division of Head and Neck Surgery  
St. Luke’s and Roosevelt Hospital Centers New York  
Assistant Clinical Professor  
Albert Einstein School of Medicine  
New York, New York  
Chapter 38

Marcel J. Sislowitz, MD, FCAS  
Assistant Clinical Professor  
Mt. Sinai Medical School  
New York, New York  
Chapter 26

Brenda J. Smith, MDA  
Assistant Professor of Music (Voice)  
School of Music  
University of Florida  
Gainesville, Florida  
Chapter 4

Jean Skeffington, MA, CCC-SLP  
Voice Pathologist/Singing Voice Specialist  
Lakeshore Ear, Nose, and Throat Center  
St. Clair Shores, Michigan  
Chapter 54

Caren J. Sokolow, MA, CCC-A  
Clinical Audiologist  
American Institute for Voice and Ear Research  
Philadelphia, Pennsylvania  
Chapter 24

Johan Sundberg, PhD  
Professor, Department of Speech Communication and Music Acoustics  
Royal Institute of Technology  
Stockholm, Sweden  
Chapter 13

Thomas Swirsky-Sacchetti, PhD  
Clinical Associate Professor Neurology and Psychiatry  
Jefferson Medical College  
Thomas Jefferson University  
Philadelphia, Pennsylvania  
Chapter 9
Julie A. Wang, MD
Assistant Professor
Division of Internal Medicine
Drexel University College of Medicine
Philadelphia, PA
Chapter 40

Michelle White, BA
Department of Otolaryngology-Head and Neck Surgery

Carol N. Wilder, PhD (deceased)
Professor of Speech Science
Teachers College
Columbia University
New York, New York
Chapter 52
To Dahlia, Ben and John Sataloff, my patient and long suffering family who allow me the time to write and to Mary J. Hawkshaw, my dear friend and invaluable collaborator and to my fellows who have given me so much inspiration and pride.
Introduction

Robert Thayer Sataloff

The human voice is extraordinary. It is capable of conveying not only complex thought, but also subtle emotion. In an instant, it can communicate the terror of a scream or the beauty of a song. As appreciated as the uniqueness and power of the human voice have been for centuries, only in the last few decades have we begun to understand how the voice works and how to care for it. The importance of the human voice in modern society cannot be overstated. It is the primary instrument through which most of us project our personalities and influence our compatriots. Professional voice users constitute an ever-increasing segment of our population, and their need for expert care has inspired new interest in understanding the function and dysfunction of the human voice. Professional voice users provide exciting challenges and special responsibilities for physicians and other health care professionals. Professional voice users include not only singers and actors, but also attorneys, politicians, clergy, educators (including some physicians), telephone receptionists, and others. Although they span a broad range of vocal sophistication and voice needs, they share a dependence on vocal endurance and quality for their livelihoods. However, the vocal needs of performing artists are especially great. In this book, we emphasize the problems of professional actors and especially singers, because they are the Olympic athletes of the voice world. Their extreme anatomic, physiologic, and therapeutic demands tax our clinical and research skills; but what we learn from them is applicable to the care of all voice patients. In most cases, mastery of the science and art of caring for professional singers provides the physician with sufficient expertise to treat other professional voice users as well, so long as the physician takes the trouble to really understand the special needs and problems associated with various voice-dependent professions.

Voice problems may arise from laryngeal or systemic disease, trauma, or improper treatment. The consequences of voice dysfunction may be devastating; if permanent (or even temporary) vocal problems result from suboptimal medical care, they may result in substantial claims for damages. Possibly spurred by the striking increase in litigation, but largely to provide good medical care for its own sake, a great many physicians have recently turned their attention to professional voice care. Interdisciplinary research has resulted in new understanding and technology that have improved the standard of practice of laryngologists, speech-language pathologists, singing teachers, and acting-voice trainers. It is no longer sufficient for a physician to glance at a singer’s vocal folds with a laryngeal mirror and continuous light and declare, “Your cords are fine. It must be the way you sing.” Similarly, it is no longer sufficient to say, “The voice sounds bad” or “The voice sounds better,” anymore than we would tolerate such vagueness in describing hearing.

Although physicians frequently are called on to care for singers and other voice professionals, most doctors still have little or no training in sophisticated analysis and treatment of subtle problems of the voice. Voice disorders are complex. Initially, voice complaints may seem vague and subjective, especially to health care professionals unfamiliar with the jargon of singers and actors. However, accurate diagnosis and rational treatment may be achieved through systematic inquiry based on understanding of the anatomy, physiology, psychology, and psychoacoustics of voice production. More thorough understanding of voice is valuable not only in caring
for voice problems themselves, but also in providing good medical care by recognizing systemic diseases that present with laryngeal manifestations. Just as otologists routinely diagnose diabetes and hypothyroidism that cause dizziness or fluctuating hearing loss, laryngologists should be alert to xerophonia as a sign of diabetes, muffling of the voice from hypothyroidism, fatigue from myasthenia gravis, and many other similar problems. Hypochondriasis is rare among serious singers and most other voice professionals. In general, failure to establish a diagnosis in a professional vocalist with a voice complaint is due to lack of expertise on the part of the physician rather than an imaginary complaint on the part of the singer or actor.

History

Fascination with the human voice has prompted study for centuries, as reviewed in Dr. Hans von Leden’s classic chapter, “A Cultural History of the Larynx and Voice,” in this book. A brief overview helps put the evolution of voice medicine, and modern developments in voice care, into perspective. In Corpus Hippocraticum, Hippocrates in the fifth century BC provided some of the earliest medical speculation on the workings of the voice, recognizing the importance of the lungs, trachea, lips, and tongue in phonation. Aristotle expanded knowledge on the scientific workings of the voice and commented on the close relationship between the voice and the soul, recognizing its importance in emotional expression. Claudius Galen, who practiced from AD 131 to 201, is hailed as the founder of laryngology and voice science. He wrote an essay on the human voice (among his over 300 books) that is frequently referenced but has, unfortunately, been lost. He recognized the workings of the voice, described the larynx, recognized the importance of the brain in controlling phonation, and, for the first time, distinguished between speech and voice. Galen’s work went virtually unchallenged for more than 15 centuries, and some of it is still regarded as correct.

Major advancement did not come until the Renaissance and the writings of Leonardo da Vinci, particularly Quaderni D’Anatomia in 1500. Additional important Renaissance writers who advanced knowledge of the voice included Andreas Vesalius, Bartolomeus Eustachius, and Fabricius ab Aquapendente. Fabricius wrote three books on the larynx, including De Larvge Vocis Instrumenta. Similar important advances occurred in the east, particularly in the ninth century when Rhazes the Experi-enced, in Baghdad, described disorders of the voice and hoarseness and recommended respiratory and voice training. There are also excellent descriptions of voice production and disorders in the Quanun, written by Avicenna the Persian. The Quanun was a standard medical textbook for more than 500 years. Major additional advances occurred in the 18th century through the efforts of Giovanni Morgagni, who first related dysphonia to abnormalities in the larynx. Also in the 18th century, Antoine Ferrein described physiological experiments on animal and human cadaver larynges and coined the term vocal cords, comparing the vocal folds to the strings of an instrument. Albrecht von Haller described the anatomy of vocal resonance. Later, Johannes Müller in Germany described the mechanisms of vocal fold vibration. In the 19th century, Hermann von Helmholtz essentially started the experimental science of acoustics with experiments that are still considered valid. All of the scientists mentioned above laid the foundation for the close liaison that has existed between physicians and singers.

However, the clear and widely recognized beginning of arts-medicine in the voice world dates from the time of Manuel García, who was born in 1805. García was a world-famous opera singer while in his teens. Although he was the son of an acclaimed singer and director, his probably faulty technique and extensive operative singing impaired his voice sufficiently to cause him to retire while still in his 20s. Thereafter, he became a thoughtful, effective, and famous teacher and was made Professor of Singing at the Conservatoire de Paris at the age of 30. In 1854, García bought a dental mirror and invented the technique of indirect laryngoscopy using the sun as his light source. The laryngeal mirror is still the basic tool for visualizing vocal folds and is used daily by otolaryngologists. García observed larynges closely with his new tool and presented his findings before the Royal Society of Medicine in 1855. He was considered the greatest singing teacher of his age; on his 100th birthday in 1905, he was honored by physicians, music teachers, and scientists from all over the world.1 Voice medicine continued to develop slowly throughout the first seven decades of the 20th century.

The development of modern voice medicine and surgery may be traced to Hirano’s description of the anatomy of the vibratory margin of the vocal fold in 1975, first published in English in 1977.2 Hirano’s observations led to our understanding of the layered structure of the vocal fold and to the realization that we need also to conceptualize vocal fold pathology and vocal fold surgery in layers. This paradigm evolved simultaneously with additional scientific
discoveries and voice laboratory instrumentation that permitted more accurate assessment of voice function and treatment outcome.

In the past four decades, increasing interest and new technology have generated unprecedented activity within a number of disciplines. Since 1972, laryngologists, voice scientists, physicists, computer scientists, speech-language pathologists, singing teachers, acting teachers, voice coaches, singers, actors, and other professionals have met at the Voice Foundation’s week-long annual Symposium on Care of the Professional Voice, started by Dr. Wilbur James Gould. At this unique meeting, formerly held at the Juilliard School of Music and now located in Philadelphia, experts have gathered to report their research and share their ideas. The resultant interdisciplinary understanding and cooperation have produced great advances and hold even greater promise for future understanding. These activities have rendered care of the professional voice the most advanced discipline within the new specialty of arts medicine. They have also inspired numerous successful interdisciplinary publications, including the Journal of Voice. This important journal abandons traditional specialty boundaries and brings together in one peer-reviewed journal, with international distribution, articles of high quality on all subjects relating to the voice.

In many ways, the status of voice care is still analogous to that of otology 40 years ago. Until recently, voice evaluation was reminiscent of ear examinations with a head mirror instead of a microscope or whispered voice tests instead of audiograms. In many places, it still is. Fortunately, expert research has led to greater understanding of the voice and development of instrumentation for sophisticated assessment and quantitative analysis to facilitate clinical management and research. Although efforts have focused largely on professional singers and actors, the knowledge they have accrued has advanced our understanding of voice in general and modified substantially the state of the art in clinical care of all persons with voice disorders. Still, the field is new. The first extensive article in the English literature intended to teach clinicians how to approach professional singers was not published until 1986, and the first major American general textbook of otolaryngology containing a chapter on care of the professional voice was not published until 1986. The first modern comprehensive textbook in English on medical care of the professional voice was not published until 1991 (the first edition of this text). However, it should be remembered that, although these contributions in English helped signal the arrival and acceptance of voice as a subspecialty, there were noteworthy predecessors who discussed voice; some even touched on the type of professional voice user.

The importance of interdisciplinary voice care to the evolution of modern voice care cannot be overemphasized. Although there were a few scattered collaborations in the 19th and 20th centuries, the first formal, academically based interdisciplinary voice clinic in the United States was established by Drs. Hans von Leden and Paul Moore at Northwestern University Medical School in 1954. These pioneers, a laryngologist and a speech pathologist, established a clinic in which they saw patients simultaneously, sharing insights and optimizing patient care. They continued this approach separately after von Leden moved to Los Angeles and Moore moved to the University of Florida in Gainesville, although it was not always possible for them to practice as closely with interdisciplinary colleagues “under one roof.” This concept was expanded in Philadelphia in 1981 when the author (RTS) hired a singing teacher and a speech-language pathologist as full-time employees of his medical practice. His expanded interdisciplinary voice team now includes three singing teachers, three speech-language pathologists, a psychologist, a voice scientist, an acting-voice trainer, and two otolaryngologic nurse-clinicians. It also includes the very close collaboration of arts-medicine colleagues located nearby, including a pulmonologist, psychiatrist, neurologist, gastroenterologist, endocrinologist, ophthalmologist, and others. He anticipates further expansion of this interdisciplinary approach, because it has proven so valuable in advancing patient care and stimulating creative research.

In the past several years, many new centers and academic training programs have acquired voice laboratories and begun practicing and teaching modern, advanced voice care, but more time will be required before state-of-the-art care is available in most geographical areas.

At present, new understanding of special aspects of the history and physical examination of professional voice users has been supplemented by technological advances through voice analysis, which are readily available to interested clinicians. Flexible fiberoptic laryngoscopy has been indispensable. The development and refinement of laryngeal stroboscopy are singularly important advancements. Strobvideolaryngoscopic evaluation of vocal fold behavior in slow motion allows diagnoses that are simply missed without it. High-speed video and videokymography are promising new techniques that may improve our ability to assess the mucosal wave. Spectrography, electrolaryngography, electromyography, airflow analysis, and other techniques have also...
enhanced our ability to analyze and treat voice disorders reliably.

When physicians encounter a patient with a voice problem, they approach the problem using a combination of art (style, empathy, intuition) and science (objective analysis based on facts). Both components are important, and no physician, speech-language pathologist, singing teacher, or acting voice teacher can be considered excellent if she or he abandons the art of practice in favor of dispassionate scientific analysis alone. However, care is at least as bad when we are forced to depend on intuition almost exclusively, because of insufficient knowledge. This is popularly called “winging it,” and it is a fair description of most voice care prior to the last two decades. Fortunately, science has provided us with an understanding that the voice consists of at least three principal components (power source, oscillator, resonator), that each component is designed to control specific aspects of voice production, and that there are ways to identify and quantify the performance of each component. This information provides voice care professionals with a framework and language with which we can think about voice problems. This has permitted us to add not only scientific fact, but also scientific thought to voice care.

The knowledge acquired through medical and basic science research has advanced not only clinical care but also the teaching of voice. Modern singing, acting, and speech teachers have acquired new scientific understanding of the voice and use their new knowledge to augment and refine their traditional approaches to voice training. This should lead to consistently healthier and more efficient voice training. There are many other fascinating potential implications as well. For example, to sing correctly is essentially an athletic endeavor. In this century, most athletic records have been broken. Often this has been the result of technological advancements, such as computer analysis of a runner’s form using high-speed photography or stroboscopy. Through these and other methods, the marathon, pole vault, high jump, and swimming records of 50 years ago are barely qualifying marks for today’s high school students. Similar principles have just begun to be applied to the proper training of the voice. It is tempting to speculate about the results. Perhaps, as in other athletic pursuits, we shall find that the healthy limits of human vocal potential are far greater than we think.

Major advances in physician education have had substantial impact on patient care nationally and internationally. Development and voluntary standardization of content of laryngeal fellowships have been particularly important. Fellowships are producing well-trained laryngologists who understand not only voice, but also other aspects of the field, and they are entering academic medicine in the United States and elsewhere so that they can pass on state-of-the-art knowledge to the next generation of otolaryngologists. Substantial strides also have been made in public awareness, particularly through international celebrations of World Voice Day, and summarized by Sataloff. Laryngologists also are learning how to build a professional voice practice so that voice professionals can have access to centers of excellence in voice care.

**Discretion**

The excitement and glamour associated with caring for a famous performer naturally tempt the physician to talk about his or her distinguished patient. However, this tendency must be tempered. It is not always in a singer’s or actor’s best professional interest to have it known that he or she has consulted a laryngologist, particularly for treatment of a significant vocal problem. Famous singers and actors are ethically and legally entitled to the same confidentiality we assure for our other patients.

**Notation**

In speech-language pathology, voice science, and academic music, sounds are designated using the International Phonetic Alphabet (IPA) (Appendix I). This is standard notation and will be used throughout this book. Readers should familiarize themselves with IPA notation and use it, because its meaning is well defined and widely understood.

**Conclusion**

For centuries, most physicians functioned in relative isolation, having only limited daily interaction and intellectual discourse with colleagues outside of medicine. During the last 4 decades, that model has changed. Laryngologists not only collaborate with voice scientists, speech-language pathologists, singing and acting teachers, physicists, chaoticians, molecular geneticists, computer scientists, neurologists, pulmonologists, pathologists, endocrinologists, pharmacologists, psychiatrists, and other professionals, but we also have incorporated information,
thought processes, and problem-solving strategies from these various disciplines into our clinical thinking, research, and educational programs. This fundamental change has broadened our vision and provided us with new intellectual tools that we use daily and that underlie dramatic improvements in knowledge and patient care. In laryngology fellowships and a growing number of residencies, programs are evolving to provide our trainees with not only new information but also with the ability to think more broadly and collaboratively, not just within the new, expanded paradigms, but even further “outside the box.”

Great progress has been made toward understanding the function, dysfunction, and treatment of the human voice. Because so many of the advances have involved collaboration among physicians, voice scientists, speech-language pathologists, singing and acting teachers, singers, and actors, they have been applied practically much more quickly than usual. The dramatic progress that has occurred in the last 4 decades has resulted in great diagnostic and therapeutic benefits for all patients with voice complaints and in the emergence of a new medical specialty in voice. Scientific advances and collaboration have given us not merely new tools, but rather a whole new approach to the voice. No longer must we depend on intuition and mysticism in the medical office or voice studio. We now have the knowledge and vocabulary necessary for accurate analysis of voice problems and systematic, logical solutions. Thus, we finally have enough information to include effectively in our voice armamentarium the most important missing component—rational thought. It has raised the standard of voice care and training forever.

We have much reason to be proud of the recent advances in the state of the art in laryngology, although it is somewhat disappointing to note the paucity of good, prospective, controlled studies in laryngology that might confirm or refute our growing body of belief which still is grounded largely in papers that do not meet the highest standards of evidence-based research. We know vastly more than we did 40 years ago about diagnosis, nonsurgical and surgical treatment, quantification of voice function, outcomes assessment, important unanswered questions, and how to go about answering those questions. Our future promises continued advances in all of those areas and more.

References