The study of the temporal bone represents one of the most formidable challenges in clinical anatomy secondary to the small size of its component structures and the difficulties entailed in gaining adequate exposure while minimizing the destructive process of anatomical dissection. In this atlas we employ the use of CT and MR microscopy scanners, commonly used in research laboratories to image small animals such as mice or rats, to study the temporal bones harvested from human cadavers. Although these imaging techniques currently cannot compete with high power light microscopy (let alone even higher power microscopic tools) and can only achieve resolutions of 20–80 μm, they allow us to obtain an isotropic volumetric acquisition that can be reconstructed in any plane of section with no additional tissue destruction. The volumetric nature of the acquisitions also allows the reconstruction of 3D images that are ideal for demonstrating the complex anatomical relationships of the middle and inner ear. These relationships are often most effectively portrayed in temporal bone anatomy publications by the use of medical art work. In the anatomy section of this book (Chap. 2), we have attempted to replace the standard medical illustrations of the middle and inner ear with 3D reconstructions generated from imaging microscopy data. We believe that the use of 3D image postprocessing, another advantage of volumetric acquisitions, facilitates understanding of the unique anatomical relationships of the miniscule structures that compose the temporal bone. Several temporal bone labs have done similar work with digitization of microtomed histological sections, but these techniques are limited by microtome artifacts and the complexities of digitizing histological sections.

The microimaging techniques we have employed produce images that are similar in appearance to those acquired in clinical medicine using state-of-the-art multidetector computed tomography and high field magnetic resonance imaging. In the Multiplanar Atlas section of this book (Chap. 3) we have endeavored to carefully compare images of preserved cadaver temporal bone specimens acquired with CT microscopy at 20 μm and 9.4 T MR microscopy at 78 μm with those acquired with clinical imaging equipment used in our everyday radiology practice. Additionally, image review using multiplanar reconstructions and maximum intensity projections are useful in demonstrating complex anatomical relationships of the middle and inner ear to better effect. In the Advanced Imaging Applications section of this book (Chap. 4) we have focused on the utility of these postprocessing techniques. We have also provided a Temporal Bone Anatomy Tool on CD that will permit the user to scroll through the CT and MR microscopy datasets in three orthogonal planes on a desktop personal computer. Chapter 5 contains a brief introduction on how to use the Anatomy Tool.
It is our hope that applying these microscopic imaging techniques to the study of the temporal bone will assist us in achieving greater degrees of diagnostic accuracy using our current clinical imaging tools. In addition, we believe that familiarity with the imaging appearance of the temporal bone at this level of anatomical detail will provide the clinical imager with the incentive to push for greater degrees of resolution from our current and future clinical imaging equipment. Ultimately, improved image resolution and more accurate image interpretation will lead to better care of our patients.

Rochester, Minnesota, USA

John I. Lane, MD
Robert J. Witte, MD
Temporal Bone
An Imaging Atlas
Lane, J.I.; Witte, R.J.
ISBN: 978-3-642-02209-8