As described in its preface, the first edition of The Kidney: Physiology and Pathophysiology, published in 1985, focused on renal physiology, "conceived broadly as the study of those processes by which the kidney maintains the volume and composition of the body in the face of physiologic demands and pathologic disturbances." Since the publication of the first edition, science has become more reductionist, an evolution that has been reflected in the content of subsequent editions. Dissection of physiologic phenomena at the level of organs and cells was replaced by descriptions of the roles of individual molecules. As this trend in science has continued, so has the present edition continued to evolve in this direction. A complete understanding of physiologic processes must include knowledge of individual molecules—it should also include an integration of how these molecules work together to effect cellular and organ function that ultimately allow the system to address the requisite physiological demands.

The main focus of the Fourth Edition is to describe the present state of knowledge from molecules to systems that contribute to normal physiologic function of the kidney and the homeostatic mechanisms subserved by the kidney. The present edition will also concentrate on how these mechanisms malfunction resulting in the diseased state. Again we will address the pathophysiology of disease states from the molecular to the system level. One of the delightful features of nephrology is the ability to understand disease pathophysiology and to appreciate principles of clinical medicine. Thus, the clinician addressing a patient with a fluid and electrolyte disorder need not memorize a list of possible causes, but can deduce them through a thorough understanding of kidney function. As science continues to evolve, our understanding of the pathophysiologic basis of disease can now be applied to a much broader set of ailments. We, therefore, continue to broaden the scope of this book—to place greater emphasis on the mechanisms of disease.

Section One begins with general principles of epithelial and nonepithelial transport and regulation. This extensive section of the book continues a tradition established in the first edition, but builds on it to include a more extensive discussion of transport regulation. Section Two describes the organization of the kidney with an emphasis on renal development. Section Three follows, describing the mechanisms of fluid and electrolyte regulation and dysregulation. In no other book can one find this subject addressed with the depth and thoroughness found in this textbook. The Fourth Edition includes the most in-depth discussion of recently described families of transporters, integrating this information to describe their role in physiologic and pathophysiologic processes.

Section Four, the pathophysiology of renal disease, has been expanded as our knowledge of these processes and their contribution to renal ailments has grown. Of note is a new series of chapters focused on the mechanisms of renal progression. Progression of renal disease is a major area in which nephrologists can intervene to ensure that patients with asymptomatic increases in serum creatinine do not continue to lose kidney function, resulting in end stage renal disease. A thorough understanding of the roles of glomerular pressure, proteinuria, inflammation, lipids, and oxidants will allow researchers and clinicians to prevent renal failure, decreasing the need for dialysis and transplant.

The evolution of our understanding of kidney function and dysfunction derives from a series of discoveries made by a myriad of investigators, each benefiting from and building upon the accomplishments of their predecessors. The same can be said for textbooks. This textbook was originally conceived by the vision of two of the greatest renal physiologists of the twentieth century, Donald Seldin and Gerhard Giebisch. Their commitment to science and education created the vision for this book. It is our intent to continue their tradition and to honor them for all that they have contributed to this book, to nephrology, to epithelial physiology, and to science in general.

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