APHERESIS IS A WELL-ESTABLISHED specialty discipline, with its most complete and coherent expression found in the broader area of transfusion medicine. National societies, such as the American Society for Apheresis (ASFA) and similar organizations in Europe, Japan, South America, and elsewhere hold regular meetings for individuals interested in apheresis. International societies, such as the World Apheresis Association, also meet regularly. Apheresis has been the subject of countless presentations and publications; indeed, several biomedical journals are devoted primarily to this field. Before publication of the first edition of this book, however, there had not been a reference text on apheresis.

The editors believe this volume will continue to fill that need. Like its predecessors, the third edition provides a comprehensive account of the scientific, technical, and practical aspects of most of the uses thus far found for apheresis instruments. The list of chapter authors is again eclectic and, like the list of editors, contains several new names. It includes engineers and inventors who have developed apheresis instruments, physicians with expertise in the science of apheresis and the treatment of diseases for which apheresis products or procedures are important therapeutically, nurses and technologists who work with apheresis instruments on a daily basis and understand how to care for donors and patients during procedures, and individuals with expertise in regulatory and managerial issues pertaining to apheresis. The book is intended for health-care professionals working in any branch of apheresis donation or therapy; it should be useful for individuals at all levels in the transfusion medicine and blood banking communities, as well as for physicians and other medical professionals who care for patients needing apheresis products or procedures.

The third edition retains the format of 32 chapters grouped into six sections. Section I is introductory. The first two chapters are historical and cover apheresis instruments and applications, respectively. The senior authors of these chapters were all active participants in the early era of apheresis and played important roles in the definition and growth of the specialty. Chapter 1 is virtually unchanged from the first edition, while Chapter 2 is a new chapter covering the history of both donor and patient apheresis from the standpoint of Dr. Edwin Taft, the archivist of ASFA. The remaining two chapters in this section cover fundamental current knowledge that is relevant to most of the succeeding chapters. Chapter 3 presents physiologic concepts pertinent to apheresis, including adverse reactions, particularly those related to hypovolemia and ionized hypocalcemia. Chapter 4, which describes the state of the art in apheresis instrumentation, contains descriptions of new instruments intended for multiple component donations and a new device for photopheresis.

Component donation is covered in Section II. This is the purpose for which apheresis
instruments were originally intended, and the one that still accounts for the majority of apheresis procedures performed in the United States and elsewhere. Chapter 5 describes the assessment and care of apheresis donors. The next six chapters are devoted to various aspects of transfusable components obtained by apheresis, including production, storage, leukocyte content, bacterial contamination, matching, and clinical use.

Section III covers direct therapeutic applications of apheresis—the modern incarnations of the medieval practice of “bloodletting” to remove evil humors. It provides the reader with scientific background and practical recommendations on therapeutic apheresis and the diseases treated with it. Chapter 12 presents an overview of the approach to patients requiring apheresis therapy. Therapeutic removal of platelets and leukocytes is covered in Chapter 13, while in Chapter 14 the reader will find mathematical and metabolic principles of blood component exchanges and plasma replacement solutions. Chapters 15 through 17 focus on the role of therapeutic plasma exchange in specific disorders, grouped by organ system. Chapter 18 is a new chapter, devoted to therapeutic apheresis in the context of organ transplantation. The section concludes with chapters on the exchange, removal, and transfusion of red cells by apheresis; the selective extraction of specific plasma components for therapeutic purposes; and the application of therapeutic apheresis to pediatric patients. Each chapter has been fully updated with the results of relevant clinical studies published since the second edition was released. We are particularly pleased that we have been able to provide the latest ASFA indication category assignments as they appear in the special issue of the Journal of Clinical Apheresis published in 2010.

Section IV, which is devoted to stem cell transplantation, has been considerably expanded in this edition. All the chapter authors are new, and the scope of most of the chapters has been broadened. The opening chapter discusses clinical stem cell transplantation from its beginning to the current state of the art, including the prevalent use of hematopoietic progenitor cells collected with apheresis instruments. The next chapter focuses mobilization and collection of progenitor cells. It covers new and experimental mobilizing agents, including their mechanisms of action, instruments and methods for collection, and developing regulations applicable to these activities. The following chapter combines material previously covered in two separate chapters into a single, integrated discussion of stem cell processing, from receipt in the laboratory through issue for transplantation. The final chapter in this section is devoted to the new field of regenerative medicine, which is a topic that should be of interest to many readers of this work because of its many areas of overlap with apheresis and blood stem cell processing.

Section V explores the use of mononuclear cells collected by apheresis, including T lymphocytes and dendritic cells, to modulate immunity, particularly in patients with malignant or infectious diseases. Treatment strategies range from straightforward transfer of unmodified cells to elaborate protocols that include ex vivo activation, immunization, or gene insertion, sometimes coupled with expansion in culture before infusion. The chapter on photopheresis includes the latest guidelines for clinical use of this presumably immunomodulatory technique. The last chapter in this section covers gene transfer, which, in addition to its potential immunomodulatory effects, can correct some inherited deficiency disorders.

Section VI deals with regulatory and quality management aspects of apheresis. We asked authors who have experience in management of regulatory affairs and quality assurance programs to discuss these areas as they relate to the operation of an apheresis unit. One chapter describes regulatory agencies that oversee apheresis and summarizes their most pertinent documents and requirements. Another presents quality management concepts and their application to apheresis facilities and equipment. The concluding chapter is devoted to quality management of the personnel who work in apheresis facilities. All these chapters have been updated with the latest concepts and regulatory requirements.
In editing chapters we have not tried to eliminate all instances of duplication of content. We expect that most readers will consult individual chapters as needs arise rather than moving steadily from cover to cover. We have therefore preferred that each chapter contain enough information to stand alone and have purposely retained some repetition of fundamental concepts for that purpose.

As editors, we could not close without acknowledging the invaluable assistance we received in the course of bringing this new edition to completion. We cannot possibly name all the persons who deserve our gratitude, but the list would include all the chapter authors and the highly professional editorial staff at AABB Press.

Astute readers may note that several important uses of apheresis instruments have been omitted, either because they do not ordinarily occur in the transfusion medicine arena or because they have been well-covered in other texts. These uses include red cell washing and deglycerolization and intraoperative blood recovery. We again chose not to describe several excellent apheresis instruments that are not available in the United States. With these exceptions, however, we strove for the most comprehensive possible coverage. We expect that anyone with a specific question about any area of apheresis will be able to find the answer with this book, either in the references cited or, in most cases, in the text itself.

Bruce C. McLeod, MD
Zbigniew (Ziggy) M. Szczepiorkowski, MD, PhD
Robert Weinstein, MD
Jeffrey L. Winters, MD

Editors