a well-delineated, thoughtful, and complete review of all aspects of neuroscience, with specific focus on underlying neuronal structure and its relation to function and behavior. It is notable that the text reviews in-depth scientific literature, research evidence, and is most geared towards individuals who have both research and clinical backgrounds. Conversely, clinicians with limited neuroscience background may find it difficult to interpret some of the cited studies and information. The focus on innovative findings within a well-organized structure provides fundamental knowledge for researchers and medical (especially mental-health) professionals. The thorough discussion of related psychiatric conditions and relevant behavioral neuroscience literature will especially benefit clinicians who are hoping to understand the underlying neurobiological basis for emotional and behavioral issues that warrant clinical attention. In closing, the text is an excellent, well-organized, detailed yet concise, pertinent review of relevant behavioral neuroscience and is highly recommended for clinician-scientists well versed in the neurosciences.

Elizabeth Leung, DO
General Psychiatry Resident, PGY-3
New York Medical College
Westchester Medical Center
Valhalla, NY

Aaron J. Roberto, MD
Child and Adolescent Psychiatry Fellow (2nd year)
Harvard Medical School
Boston Children's Hospital
Boston, MA

A Short History of Medicine. *By Erwin H. Ackerknecht. Baltimore, Maryland: John Hopkins University Press; 2016. US $29.95 (Paperback). 272 p. ISBN: 978-1421419541*

With the continued rise of drug development, medical advances, and translational research, it is humbling to revisit mankind's fortuitous beginnings into this field. *A Short History of Medicine* extraordinarily captures this rich history and is a valuable book for any scholar within the field of biomedical research. The author grasps the reader's attention from the beginning with a discussion on paleomedicine and notable ancient civilizations. Many advances during this time were purely founded on a supernatural ideology. Trephination had become common practice for the release of "spirits" mostly caused by cranial pressure due to head injuries. It wasn't until the onset of ancient India, China, and Greece that physicians became more empirical in their approach to medicine. The separation of physicians from the hierarchy of priests had a profound impact on their practice. As mentioned in the book, during the time of Hippocrates,unstable job security and lower social status of practicing physicians prompted their disposition of avoiding the "incurable." Interestingly, the Hippocratic Oath defines the role of physicians as caregivers that diagnose and prevent harm to their patients, however during that time it was deemed ethical to avoid the "impossible" prognosis.

The author provides a brilliant concise history on drug development. This initially was founded on the ability of the physician to utilize the local pharmacopeia through the use of plants and diet. Specialization was rampant from the success of physicians and their progression to treat only patients with similar diagnoses. As noted in the chapter on basic sciences, Francois Magendie is described as one of the fathers of modern pharmacology. This began from the ability to isolate pure compounds from raw drugs. His pioneering work included introducing drugs from the alkaloid family and his continued study of morphine. From this research, opium, nicotine, and many other narcotics were further characterized. Synthetic drugs were also introduced by pharmacologic industry, including sulfonal. These advances coincide with the work of Paul Ehrlich in chemotherapy. His motivation to discover vital stains or dyes for hematology, led to his side chain theory: that there was a chemical affinity of certain drugs to certain cells. His work laid the foundation for explaining the host's immune response to infection.

The newly revised expanded edition contains a few added figures, notably in the Greek medicine chapters. However, not much has changed from the previous edition and would not recommend obtaining a second new version, unless for the sole purpose of having a well-printed text. The previous 1982 edition typesetting is a word/letter jumble in comparison. Undoubtedly, written originally in 1955, this book contains unapologetic personal opinions. However, the author provides a clear and concise narrative that educates and informs the enthusiast or avid student.

Eric M. Johnson Chavarria
Molecular Biophysics and Biochemistry
Yale School of Medicine

Applying Pharmacogenomics in Therapeutics. *Edited by Xiaodong Feng and Hong-Guang Xie. Boca Raton, Florida: CRC Press (Taylor & Francis Group); 2016. US $129.95 (Hardcover). 294 p. ISBN: 978-1466582675*

Applying Pharmacogenomics in Therapeutics introduces the principles of pharmacogenomics and personalized medicine in our new century of omics biotechnolo-

gy. This book covers the fundaments, clinical practices, and applications of precise drug therapy. In their preface, Xiaodong and Hong-Guang state that the birth of pharmacogenomics promotes the development of precision medicine, "the major purpose of which is to improve health and treat diseases." They use many examples of clinical applications of pharmacogenomics in drug therapy of cancer, cardiovascular and pulmonary diseases, and neurologic and psychiatric disorders.

The book introduces up-to-date principles and concepts of pharmacology, genomics, and the combination in pharmacogenomics as an excellent reference book. It covers the basic methods of biotechnology and biomarkers of genetic and genomic testing in a precise and simple manner to understand the concepts of pharmacogenomics in clinical practice. The authors enumerate relevant clinical applications and recent therapeutic interventions of how to improve in diagnosis and drug targeting by understanding the sequence of the DNA of patients. Therefore, the knowledge and interpretation of tests in pharmacogenomics are critical for drug safety and efficacy as well as future advancement in health care. The book exemplifies clinical cases of genetic variants in several diseases, defining genetic determinants for drug response and thoroughly describes the applications and therapy in clinical practice. Finally, the authors connect pharmacogenomics with the generation of cost-effectiveness treatments.

Applying Pharmacogenomics in Therapeutics is intended for graduate, medical school courses. or healthcare professionals with a deep focus on genomics, pharmacy, pharmacology, and clinical care practice. Healthcare providers and research scientists would benefit from this text as a reference tool of the recent advances in this field. This text is well written and provides useful examples, tables and clinical cases to better understand and practice the concepts being described. Each chapter begins with a short list of key concepts, an introduction to the topic of the chapter, and concludes with a summary and study questions to practice. The book facilitates an extensive number of references per chapter to educate in depth and to provide tools to increase research and knowledge to the readers. Overall, this text is a comprehensive presentation of the recent approaches in personalized therapy based on genome sequencing and pharmacology combination.

Judit Jimenez-Sainz
Department of Therapeutic Radiology
Yale School of Medicine

Biotechnology Operations: Principles and Practices, Second Edition. *By John M. Centanni and Michael J. Roy. Boca Raton, Florida: CRC Press (Taylor & Francis Group); 2017. $129.95 (Hardcover). 496 p. ISBN: 978-1498758796*

Biotechnology Operations: Principles and Practices, now in its second edition, is a textbook dedicated to the technical details of the business of biotechnology and bringing products to market by navigating many regulatory hurdles along the way. As readers quickly discover, having a plan is key to a successful biotech venture and the authors spare no details in laying out the organization tools required to move a product forward. Although the book is self-described as following along with seven major areas of biotechnology operations, the book is perhaps more appropriately split into two halves – the business and the science aspects of biotechnology.

The first chapters of the book cover the organizational facets of biotech startups by describing typical management structure, regulatory hurdles, and quality assurance practices that are common in the business. Although the subject matter tends to be rather dry, the authors strike a much-appreciated balance between keeping the text adequately detailed and easy to understand. Fine details are often presented in table format throughout the book in order to improve readability and make for an easy reference should the reader choose to return to these sections at a later date. The latest edition of the book touts an increased number of figures for better understanding of key points, though there are often long stretches throughout the book with no visual aids. This is particularly felt in the chapters on regulatory affairs and regulatory compliance as the text in these chapters is necessarily dense. Continued improvement in both the quantity and quality of figures would be an excellent addition to what is already a great reference.

The second half of the book is largely dedicated to specific techniques employed in biomanufacturing, quality control, clinical and nonclinical research, with updated sections for the emerging fields of tissue engineering and others. These chapters provide an excellent overview of the commonly used methods for the production of things like biologics, devices, and the quality assurance measures expected by regulatory agencies for each of these classes of product and more. It is quite clear that the authors have a tremendous breadth of knowledge in the field as they cover numerous aspects of manufacturing in each of these fields, at times in great detail.

Overall, this book is an excellent choice for graduate-level scientists, researchers, and entrepreneurs in biotechnology who are hoping to gain the technical knowledge necessary for bringing a product all the way from conception through production and eventually to market.

Gregory A. Breuer
Department of Pathology
Yale University