engineering, and often the terminology used is difficult for physicians to comprehend. On the other hand, the physiologic response to these devices is somewhat different from the descriptions found in ordinary textbooks of physiology, and it is difficult, particularly for nonmedical personnel, to understand the specifications required of their devices. It is therefore quite important to have a textbook that can easily be understood by both medical and engineering personnel.

Engineering in the Heart and Blood Vessels is such a book. The authors, representing both the field of engineering (Myers) and that of surgery (Parsonnet), show their particular experience with and knowledge of cardiac pacemakers. Their account of these devices, which includes description, physiologic explanations, history, requirements, and surgical problems, is clear, understandable, and sufficient. The wordage given to implantable materials, artificial hearts, and artificial vessels is not sufficient, however. Granted, it is a difficult task to cover all of the problems extensively, but for the reader interested in the latter subjects the book may be somewhat disappointing. It succeeds in giving an overall review of the field, however, and is a good starting point for the novice. For engineers and physicians interested particularly in cardiac pacemakers and in electrical stimulation of the body, this is a most valuable text and reference book. It would be useful as a textbook for biomedical engineering and medical school students.

YUKIHIKO NOSE
Artificial Organs Research Laboratory, Cleveland Clinic Foundation, Cleveland, Ohio

Metabolism of Hormones

Androgens and Anabolic Agents. Chemistry and Pharmacology. JULIUS A. VIDA. Academic Press, New York, 1969. xii + 332 pp., illus. $16.50.

The androgens provide an attractive opportunity for studying the relationship of chemical structure to biological activity. The separation of the anabolic (nitrogen-retaining) from the androgenic activity would prove very useful.

The first comprehensive study of correlation of chemical structure with androgenic-anabolic activity was made by the utilization of the renotrophic effect of the androgens in the mouse. A simple correlation between tissue weight and chemical structure was found. The saturation of the α,β-unsaturated 3-keto group resulted in primarily a decrease in androgen activity without a comparable decrease in the renotrophic activity. The most effective compound was androstane-3α, 17β-diol. On the other hand, oxidation of the 17β-hydroxyl group produced a greater reduction in renotrophic than in androgenic activity. These studies were extended to the skeletal muscles of the guinea pig. The temporal and other head and neck muscles gave a relative response practically identical to that of the mouse kidney. Furthermore, androstan-17β-ol,3-one was more potent than testosterone on the seminal vesicles and prostates, and still more potent on the muscles.

The presentation of a practical assay and the observation that the removal of the 19-methyl group resulted in a compound, nortestosterone, which had much more relative activity on the levator ani muscle than on the prostate prompted many of the pharmaceutical companies to prepare large numbers of compounds. Use of the levator ani as representative of the anabolic action has been questioned by many investigators, but the assay of a large number of steroids has nevertheless made it possible to attempt comparisons of biological activity with chemical structure. The author evaluates and compares the several suggested theories and systematically examines the effect of various changes in the molecule on the relative response of the two types of target tissues. The major portion (203 pp.) of the monograph consists of a tabulation of the activities of 650 compounds. The biological properties and metabolism of the androgens are summarized in the first chapter to provide background information for the purpose of the monograph—correlation of chemical structure with the relative response of the levator ani and the ventral prostate (and seminal vesicle) of the rat.

The suggested theories are based on the assumption that the steroids must fit a specific tissue receptor. Each of the theories is supported by some of the biological data, but in every instance several unexplainable facts persist. This is not too surprising. Many factors have to be taken into consideration in the response of any organ to the injection of specific substances. One that has been almost completely ignored is the solubility of the substances in tissue fluid. Unfortunately, the parenteral studies were done by the subcutaneous injection of oily solutions, and the amount of material actually absorbed from the injection site is unknown. The route of administration is another important factor. A good example is 17-methylandrostan-17β-ol, which when administered via a subcutaneously implanted pellet is practically inactive in the mouse because of the inability of the tissue fluids to dissolve the steroid from the pellet, but which when given orally proves to have renotrophic activity comparable to that of methyltestosterone and a much lower androgenic activity. Another important consideration is the chemical nature of the hormone at the site of action. Not only are these hormones metabolized to a variety of compounds but the qualitative and quantitative changes vary among tissues and also among species of animals. The author provides a brief discussion of these factors.

The monograph is a valuable reference source in that it brings together and evaluates all the material in this particular assay. The 85 pages of text are written concisely and clearly. The book does not provide any further enlightenment, however, regarding the relationship of chemical structure to androgenic or anabolic activity. The question still remains: can the anabolic activity of the androgens be separated from the androgenic activity, or is it part of the sex-linked response, as some investigators have claimed, and therefore inseparable from the effect on the accessory sex organs? The differential response of several tissues with alterations in chemical structure, however, provides the possibility of the synthesis (or even the natural occurrence) of a steroid with primarily anabolic activity.

CHARLES D. KOCHAKIAN
Medical Center, University of Alabama in Birmingham

Wall-less Cells

The Mycoplasmatales and the L-Phase of Bacteria. LEONARD HAYFLICK, Ed. Appleton-Century-Crofts, New York, 1969. xxii + 738 pp., illus. $30.

That organisms which lack cell walls are under intensive study is evident from the table of contents and the size of this book. The editor has drawn together 26 chapters by 35 contributors, mostly from the Second International