Modern Control Engineering, Maxwell Noton, Pergamon Press, New York (1972). 277 pages. $17.50.

A professor teaching a graduate level control theory course has a very difficult task in selecting a textbook, since auxiliary courses, the background and orientation of the students, and the particular discipline (chemical, electrical, etc.) influence the decision. *Modern Control Engineering* somehow obtains a least-squares satisfaction of all of these criteria.

Noton's textbook is designed as a detailed introduction to control theory for the first-year graduate student in any discipline. Although chemical process systems have their idiosyncrasies—"a system is a system is a system"—and in this light the material in this book is quite applicable to chemical process problems. In fact, Noton's clarity throughout makes the book quite suitable for the engineer who does not specialize in process control. However, elementary knowledge of classical control theory and the rudiments of optimization theory is desirable and would increase the student's appreciation for the material presented.

Noton first introduces the student to dynamic systems (state representation, eigenvalues, etc.) and then reviews the principles of finite-dimensional, or static, optimization. A very comprehensive and up-to-date survey of optimization techniques follows. Having laid this groundwork, he then proceeds to present the theory and practice of infinite-dimensional, or dynamic, optimization. This is the largest of six chapters in the book and rightfully so. Noton consistently uses the minimum principle, which circumvents possible confusion over minimum versus maximum principle. Special emphasis is placed on handling nonlinear systems and state and control constraints; however, Noton does not discuss the treatment of large-scale systems, a research area of great activity and of special relevance to chemical engineers.

The author then moves to the subject of dynamic programming, with an emphasis on computation, for which he provides rather complete coverage. The next chapter is "Introductory Stochastic Estimation and Control"—a very readable discussion of observer and filtering theory, both of which are topics of current interest in chemical engineering. His example of driving in a "foggy car rally" clearly illustrates optimal decision-making under uncertainty.

Noton closes with a chapter documenting actual applications of dynamic optimization; in an earlier chapter he indicates that steady state optimization has more potential ($) than dynamic optimization. The brevity of this final chapter probably reinforces the idea that further basic research in process control should not be funded.

In summary, the book appears to be well-suited for use in an introductory graduate chemical engineering course; homework problems, some requiring computer solutions, are presented after each chapter. In its scope, the book is comparable to McCausland's *Introduction to Optimal Control,* but it is not as detailed as the control theory books of Sage, Bryson and Ho, Lapidus and Luus, Koppel, and Denn. I am planning to adopt the book as the principal text for a graduate course in optimal control (spring, 1973).

T. F. Edgar
Department of Chemical Engineering
University of Texas
Austin, Texas

Kinetics of Electrode Processes, Tibor Erdey-Gruz, transl. by L. Simandi; transl. revised by D. A. Durham, Wiley, New York (1972). 482 pages. $27.50.

The author describes the kinetics of electrode processes in both aqueous solutions and molten salts. The book is organized such that the first three chapters treat the general principles of electrode processes, including detailed discussions of the kinetics of electron exchange and the rate-determining effects of diffusion and prior chemical reactions. In Chapter 4 the kinetics of specific electrodes are described: H_2 electrode, O_2 electrode, Cl_2 electrode, redox electrodes, and the kinetics of metal dissolution and deposition. Some 20 pages are devoted to an all too brief review of anodic and cathodic processes in molten salts. Chapters on semiconductor electrode processes and anodic film formation kinetics complete the book, except for an appendix. A 46-page appendix defines and discusses a number of fundamental electrochemical concepts, including absolute reaction rate theory and a few pages on experimental procedures.

The book is very readable and contains few typographical errors. It is highly theoretical in its viewpoint and rather complete in its derivations and literature references (covering the period up to the middle of 1970).

This book, with its wealth of information, should be of value to anyone engaged in the theoretical or practical aspects of electrochemistry.

Raymond D. Gillen
Leeds and Northrup Company
North Wales, Pennsylvania

Fluid Mechanics, Theodore Allen, Jr. and Richard L. Ditsworth, McGraw Hill Book Company, New York (1972). 415 pages, $15.50.

As stated by the authors, this book "is intended as a text for a first course in fluid mechanics offered to engineering students" who have had courses in vectorial mechanics and thermodynamics. It is subdivided into nine chapters (382 pages) with six appendices (26 pages). Chapter 1 contains basic definitions regarding a flowing continuum as well as some concepts and theorems (without proof) of field theory. The reader is led to the derivation of the Navier-Stokes equations (Chapter 4) through a statement of the mass conservation law (Chapter 2) and an introduction into the nature of forces and associated stresses in fluids (Chapter 3). Chapters 5 and 6 are devoted to integral forms of the momentum equation and energy laws, respectively. The remaining three chapters deal with irrotational flow, dimensional analysis, and an introduction to turbulence and boundary layer flows. The book has been written in simple language and contains numerous examples used effectively to apply and expand the theory. One feature which teachers may find attractive is the large number of problems and self-study questions accompanying each chapter.

In the reviewer's opinion a textbook for an introductory fluid mechanics course should be rather comprehensive while retaining a fairly high degree of thoroughness. Of these two characteristics, comprehensiveness appears to be highly desirable because, in the words of Professor G. K. Batchelor, "students are apt to derive their ideas of the content of a subject from the topics treated in the textbooks they can lay hands on." Therefore, despite the fact that it is practically impossible to present a thorough account of the science of fluid mechanics in a single book of