Recoil Spectroscopy (Shull), Adsorption Dynamics (Granick), Scanning Angle Reflectometry (Gast), Monolayer Dynamics (Yu), Photophysics (Dean), and Self-Assembly (Rabolt). Other than Neutron Reflection and Infrared techniques, the most important relevant experimental methods for interface and surface analyses are missing, such as X-Ray Photoelectron Spectroscopy (XPS), Static and Dynamic Secondary Ion Mass Spectroscopy (SIMS), Scanning Force Microscopy (SFM), Scanning Tunnelling Microscopy (STM), Surfaces Forces Apparatus (SFA), Small Angle Neutron Scattering (SANS), and electron microscopy (TEM, SEM). This section would have benefited from a review article on experimental methods.

The strength of this book is that the reader will benefit from insights of several contributing authors who are giants in the field of surfaces and interfaces.

Richard P. Wool
Materials Science and Engineering
University of Illinois
Urbana, IL 61801

Receptors: Models for Binding, Trafficking and Signaling

By Douglas A. Lauffenburger and Jennifer J. Linderman, Oxford University Press, 1993, $70.00

Virtually every aspect of cell behavior is governed at some level by interactions of receptor molecules on the cell surface with ligands in the extracellular environment. The side-by-side coexistence of cells which exhibit markedly different responses to the same ligand soup underscores the sensitivity of control afforded both by the spectrum of receptors expressed by a particular cell and by the mechanisms each type of receptor employs to transmit signals once it binds a ligand. It also suggests a complexity not amenable to a purely phenomenological approach if cellular responses are to be understood at the level they can be manipulated. Molecular biology has brought tremendous analytical power to bear on characterization of cell surface receptors and their ligands. Likewise, it has provided the tools to study the dynamic behavior of these molecules within cells. Molecular biology alone, however, cannot be used to predict how the cellular environment should be manipulated to achieve a desired cell response, any more than spectroscopy alone can be used to predict the course of chemical reactions. In both cases, mechanistic models are needed to describe the complex interactions which occur. Such an approach is sorely needed in the receptor world, where control of cell behavior by application of growth factors, cytokines, and other ligands remains largely serendipitous. This lucid text provides a much-needed rational guide to quantitative mechanistic models of receptor-mediated cell behavior. It clearly demonstrates the power of the modeling approach in gaining insight into these confoundingly complex phenomena.

Receptors comprises six chapters which progress from the fundamentals of receptor-ligand binding kinetics to models of receptor-mediated phenomena in cell proliferation, adhesion, and motility. At each step, the authors illustrate the sensitivity of the qualitative aspects of model predictions to the quantitative values of the input parameters. It is a unique contribution to the field of receptor biology and cellular engineering because it is equally accessible—and useful—to the chemical engineer *and* the molecular or cell biologist. From the perspective of a chemical engineer, this book is a departure from many texts which provide a rigorous mathematical analysis of biological phenomena because it is richly informed by a comprehensive view of the underlying biology—it deals with *real* problems rather than tidy but arcane examples. The necessary descriptive information—classes of receptors, the cellular organelles involved in trafficking receptors and ligands, and the ways signals are transmitted—is presented in a clear, logical fashion which orients the novice to the vast literature in this field without watering it down. For the cell biologist, *Receptors* presents a thorough, yet comprehensible, introduction to the mathematical tools and physical basis needed for quantitative analysis of all the major classes of receptor-mediated phenomena. For each phenomenon, the authors describe the elementary models, summarize key results from mathematically more complex models, and provide extensive references and direction to carrying out more complex analysis and numerical calculations. At least one in-depth example is used for illustration, and references are made to numerous other systems amenable to similar analysis. Emphasis is also given to describing the strengths and weaknesses of various experimental techniques employed to obtain the necessary equilibrium and rate data. The reader is thus not overburdened with mathematics, yet can readily identify the benefits of a rigorous analysis and the means to accomplish it.

Receptors is an essential reference for engineers working in such diverse fields such as tissue engineering, drug design and delivery, and cell culture. And if the repeated "borrowing" of this reviewer's copy of the text by cell biologist colleagues is any indication, this book will have an impact far beyond the chemical engineering community—it may change the way receptor biologists view their work.

Linda G. Cima
Chemical Engineering Dept.
Massachusetts Institute of Technology
Cambridge, MA 02139