Chemistry of Catalytic Processes, by Bruce C. Gates, James R. Katzer, and G. C. A. Schuit. McGraw-Hill, 1979, 464 pp. $28.50.

This book treats the subject of catalysis from the viewpoint of both chemical engineers and chemists. The authors consider a number of industrially important catalytic processes from the standpoint of the basic chemistry involved as well as the engineering features which are important in commercial practice. The processes discussed include catalytic cracking, catalytic reforming, and hydrodesulfurization of petroleum fractions. Also included are partial oxidation processes and a variety of processes employing transition metal complexes as catalysts. The treatment includes discussions of reaction mechanisms, kinetics, and reactor design. Material is presented which will be of interest to workers whose activities range from process development to exploratory or basic research in catalysis. The book is written at a level which is well within the grasp of advanced undergraduates or beginning graduate students in chemical engineering or chemistry. It should be of interest primarily as a reference book rather than as a basic textbook, although it could be used effectively in a specialized course such as the short course which has frequently been conducted by the authors. For this latter purpose the authors have included a number of useful problems at the ends of the various chapters.

It is difficult to treat the subject of catalysis in a single volume, with a good balance between overall perspective and an adequate amount of detail. The authors have succeeded in balancing their treatment in the individual chapters, each of which is concerned with a particular process or class of processes. However, it would have been helpful if the authors had included an introductory chapter considering catalytic processes in a general way, i.e., considering features common to all catalytic reactions and processes. Whle such an introductory chapter would have unified the presentation, its omission does not detract seriously from the book. Overall, the book is a useful addition to the literature of catalysis.

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LETTERS TO THE EDITOR

To the Editor:

Grevillot and Tondeur are to be congratulated on their very readable article 'Equilibrium Staged Parametric Pumping' [*AIChE J.*, 22, 1055 (1976)]. It is important that new or novel separation techniques reach as wide an audience as possible. One method of accomplishing this is to show simplified analogies with classical unit-operations such as these authors have done with a McCabe-Thiele representation of batch parametric pumping.

By using a stage-concept to represent a packed column configuration, the authors uncover some interesting results relating to the *limit regime* (ultimate steady state). The authors suggest the limiting separation depends for example, on the shape of the non-linear isotherms, on the spacing between them (temperature difference) and most especially on the number of stages assumed to represent the bed. At first glance, it may appear that prediction of limiting separation is at odds with the theory of ultimate separation we published at an earlier date (Foo and Rice, 1975; Rice, 1976), with subsequent modifications (Foo and Rice, 1977). However, it is well known (see for example Gupta and Sweed, 1973) that the number of effective stages needed to represent a packed bed configuration depends on the magnitude and type of dispersive forces acting. Thus if axial mixing is violent or mass transfer coefficient is small, only a few stages might represent a finite, but long packed bed. In our work (which, we are sad to report, was not mentioned by Grevillot and Tondeur), the dissipation effects arising from intraparticle diffusion (the strongest effect), film resistance and axial mixing are combined in a unified theory to predict ultimate steady-state (or limiting regime). In most cases, an asymptotic form of the general theory (Rice, 1976) can be used for design purposes when proper account is taken of the initial charge composition (i.e. the constant mass condition, Foo and Rice, [*AIChE J.*, 23, 120 (1977)]. The continuum theory (as opposed to a stage-concept) includes the proper length and time scales needed for design purposes.

While a stage theory is appealing for its simplicity, it cannot be used for a priori predictions or design of packed parapumps until there is uncovered a fundamental relationship to compute HETS in such periodic adsorptive-desorptive systems.

To illustrate the approximate equivalence of the two results it is easy to show that the McCabe-Thiele Representation for N stages under conditions of linear equilibria is (c.f. Grevillot and Tondeur, Eq. (11)):

$$x_1 = (\alpha/\alpha')^N x_{N+1} \qquad (1)$$

or defining the ultimate separation factor as

$$\alpha_\infty = x_1/x_{N+1} \qquad (2)$$

there results

$$\ln(\alpha_\infty) = N(\ln \alpha/\alpha') \qquad (3)$$

We may estimate a value of N corresponding to a packed bed with axial dispersion (after Klinkenberg and Sjenitzer (1956), which was originally suggested by Kramers and Alberda (1953) for simple tube flow) to give:

$$N \simeq Lv/2D_T \qquad (4)$$