six metal atoms having catalytic properties distinct from those of metal crystallites found on amorphous solids, as discussed by Dalla Betta and Boudart. The role of hydrocarbon bridging compounds in facilitating the transport of hydrogen atoms from metal crystallites where they are formed to surfaces of zeolite supports is an important problem in bifunctional catalysis considered in the paper by Neikam and Vannice.

In a fraction of the papers, the emphasis is on new chemistry rather than catalytic function. New elements of hydrocarbon chemistry are described in the papers by Parravano (redistribution of carbon between cyclic paraffins) and Bhasin (intramolecular hydrogen transfer in olefins). Whan and Kemball and Hughes et al., respectively, have considered the little investigated topics of olefin disproportionation and molecular redistribution of paraffins and alkylbenzene.

Most of the papers we have cited concern catalysts and reactions bearing some relation to industrial processing, and there are many other good papers relating to ammonia synthesis, catalytic reforming, Ziegler-Natta polymerization, Phillips polymerization, and other processes. The great accomplishments in catalysis have been the process developments, and the *Proceedings* reaffirm the cliché that understanding follows the application in catalysis. The expected continuation of this pattern suggests future research emphasis on processes coming into prominence, and the present papers foretell the concern for reduction of nitrogen oxides, total combustion of hydrocarbons, and processing of fossil fuels to remove sulfur, nitrogen, and metals.

As chemical engineers, we are encouraged by the contributions of our colleagues to the *Proceedings* and to catalysis. We look ahead to increasing integration of chemistry into chemical engineering teaching and research and to more process synthesis which incorporates both design of reactors and plants and design of reactions at the molecular level.

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Computer Programs for Chemical Engineering, 7 Volumes, Aztec Publishing Company, P.O. Box, 5574, Austin, Texas.

These volumes were originally prepared by the CACHE Committee (Computer Aids for Chemical Engineering in Education) for use in chemical engineering education. They represent a tremendous collective effort by the editors and the contributors to put before chemical engineering educators tested programs that can serve in almost any type of course.

The specific volumes and their editors are

Volume	Editor	No. of pages	No. of computer programs	Cost
Stoichimetry	E. J. Henley	241	13	$11.95
Kinetics	M. Reilly	388	24	$13.95
Control	A. Westerberg	240	11	$11.95
Transport	R. Gordon	418	21	$13.95
Thermodynamics	R. Jelinek	350	15	$13.95
Design	R. Jelinek	400	11	$13.95
Stagewise Computations	J. Christensen	369	17	$13.95

Each of the volumes contains a number of problems that have been used by the respective contributors in their courses together with listings of the computer programs used to solve the problems. Most of the computer programs are fairly short so that they can be punched into cards without any difficulty. Problem statements and explanations range from two to twenty pages. Almost all the computer programs have ample documentation so that they can be used by the instructor and/or student without difficulty. A number of the programs not only have input and Fortran listings but also provide sample outputs so that the user can easily understand the results. Some of the problems include a brief statement of the pedagogical impact of the program including past usage, the concepts illustrated, and the objectives of the problem.

These volumes should prove extremely useful to anyone engaged in chemical engineering education. In addition, there are a surprising number of codes that could prove useful in industrial practice in the absence of suitable in-house computer library codes because, in addition to the codes in the design volume, there are many codes in the other volumes that can be helpful in process design.

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Computation for Process Engineers, G. L. Wells and P. M. Robson, Halsted Press, 192 pages. $12.75.

Computer systems are gaining widespread usage in the chemical process industries. But books describing their applications are slow to appear. Most books do not venture past the basic numerical methods and Fortran because interactions among input-output programs, data structures, and subprograms are difficult to describe in simple terms that do not over-emphasize computing in relation to process engineering.

Computation for Process Engineers is one of the first books to dwell in this virgin territory. Its intent is to discuss the computational aspects of the problems presented in *Process Engineering with Economic Objective* by G. L. Wells.

The book's audience is difficult to define. It is either (1) the chemical engineering student and process engineer with limited background in Fortran programming, or (2) the process engineer with experience in the use and design of computing systems.

Computation for Process Engineers is a collection of chapters that review various aspects of computation. As an introductory text for students and process engineers, the coverage is often spotty and incomplete; many details are glossed over and computer jargon is commonplace. Experienced persons, on the other hand, would likely find the computation strategies too elementary and tersely presented. Most strategies are reviewed very briefly with references to the literature.

The book, in my opinion, might appeal to chemcial engineers who have limited knowledge of Fortran and seek exposure to the role of computing systems in process engineering. It would serve well as the basis for a two-day introductory course.

Chapter 1 defines computer terms: software, hardware, flow-charting, languages, and man-machine communication. But the definitions presume prior knowledge of the terms. I question whether this chapter might not best be omitted; excellent texts are available.

The categorization of unit computations in Chapter 2 is useful. The important point is that three kinds of programs are used to model process units: programs for material balances, material and energy balances and costing (short rating), and detailed design computations (full rating).

Chapter 3 reviews numerical and optimization methods. Methods for root-