

## BOOKS

**Computer Aided Data Book of Vapor-Liquid Equilibria**, M. Hirata, S. Ohe, and K. Nagahama. Copublished by Kodansha Limited, Tokyo, and Elsevier Scientific Publishing Company, Amsterdam, Oxford, and New York, 1975, 933 pages + index, \$64.75

A most impressive and useful compilation of binary vapor-liquid equilibrium data! For each of 800 systems, one finds the following information: x-y-T-P data with cited reference, Antoine constants for each component, Wilson parameters with expected correlation errors, and an x-y plot of data and the curve predicted by Wilson's correlation. For each of another 133 binary systems, besides literature data, parameters are given for using a modified Redlich-Kwong equation of state to calculate vapor-liquid equilibria. For most of the latter systems, pressures exceed one atmosphere.

A well-written introduction to vapor-liquid equilibria is presented at the front of the book, and the vexing problem of obtaining optimum Wilson parameters is given especial consideration. The index has been carefully prepared and is easy to use.

My review copy was missing Table 3-1, but this is the only fault I can identify in what is otherwise a well-prepared and very useful book.

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**The Existential Pleasures of Engineering**, Samuel C. Florman, \$7.95, 160 pages, St. Martin's Press, New York.

In the face of countercultural and anti-technological critics of modern society like Charles Reich, Lewis Mumford, and Theodore Roszak, Samuel Florman has bridged C.P. Snow's two cultures, and provided an eminently readable and thought-provoking defense of engineers and the

beauties and triumphs of modern engineering.

Beginning with a chapter depicting "the Golden Age of engineering" (1850-1950), Florman paints a rosy picture of the enthusiasm, confidence, and pride engendered by progress. The engineering profession saw itself as an elite overcoming the barriers provided by nature to the full development of society. Whether bridge-building or rationalizing human labor through efficiency engineering, engineers were at the forefront of the struggle for a better world. Equations, laws, and correlations buttressed their advances; they believed wholeheartedly in the Seabees' credo: "Can do"—except, possibly, those involved in catalysis!

Florman discerns a distinct change in society's evaluation of engineering during the last quarter century. He aptly pinpoints the turnabout with the commencement of work on the first hydrogen bomb in 1950. Society came to understand that progress has a dialectical component. Every action produces an opposite reaction. Some began to ask whether man's taming of nature should be better described as man's tinkering with nature. And, as the current discussion of nuclear power illustrates, the consequences of the splitting of the atom remain a central focus of this controversy. Books like Rachel Carson's *Silent Spring*, Ralph Nader's *Unsafe at any Speed*, and Barry Commoner's *The Closing Circle* directed public attention to other crises fostered by technology. In the late sixties, America came to see technology in terms of the unconscionable napalming of Vietnamese peasants as well as the triumphal landing of men on the moon.

These developments suggest an investigation of engineering ethics. As Florman notes, engineers practice "the art or science of making practical applications of the knowledge of pure sciences." Serving as the link between

theoretical science and society, their work has a strong ethical component. Energy shortages, environmental desecration, and starvation present both political and engineering problems. Society increasingly finds itself asking when progress is defensible and how compromises involving the application of technology can be evaluated. Society's use of the accomplishments of science has become the critical issue. Florman's investigation undermines the ideals of the Golden Age engineers who felt that their work could transcend politics in the construction of a better world. Florman writes, "But long ago engineers discovered that fine sentiments. . . were ineffective in curbing excesses of technological development. Entrepreneurs were not easily dissuaded from seeking profit. . . ." And later, "The engineering profession is not on trial. It is our own democracy that is on trial." A profit-oriented capitalist society may encourage a political system which is inefficient in implementing recommendations made by engineers to curb possible technological abuses.

Having concluded that engineering should be absolved "for things done at the behest of society," Florman is ready to take on the countercultural critics. He employs Samuel Johnson's refutation of Berkeley as his emblem: Florman *accepts* contemporary man; he *accepts* the modern industrial culture built around consumer tastes for that second T.V. Society would not desire engineering's offerings if some facet of human nature were not gratified in the process.

On the other hand, countercultural critics generally consider man as he *could be*, not as he *now is*, arguing that man has potentials for development which are stifled in contemporary post-industrial society—in altering the external environment, man has warped his internal nature. Florman is cogent

and persuasive in his attack on their often puerile anti-technological bias. He rejects their portrait of man as empirically insupportable, though he argues that engineering has a positive role to play in the future development of society. The argument is based on contradictory views of human nature. The most extreme opponents of contemporary technology appear to imagine man without those natural attributes which lead engineers to delight in the products of technology, rather than examining ways of using these talents more constructively than they may have been in the past.

However, this is not the central point in understanding contemporary society's evaluation of the engineering profession. Florman comments on the large body of literature antagonistic to the products of technology:

Poems and stories that are hostile to the machine are either antiquated or foolish, or else express a message that the engineer has already heard a thousand times.

The hostile authors who wrote them are the forerunners of contemporary countercultural writers. Florman deals sharply with this earlier tradition, but underplays a new component in the recent critics' popularity. Both approaches find favor with a relatively small group of intellectuals (or their close relatives, the anti-intellectuals), but it is presumably the mass following of contemporary critics that has raised Florman's ire. The counterculturalists champion nature, which suddenly appears to be taking its revenge on the engineering profession's earlier bravado. Much earlier anti-technology literature is devoted to the defense of nature, helpless in the face of human inventiveness (and destructiveness). The reversal of this situation has been coupled with a "revolution in rising expectations" in society's appraisal of engineering, a phenomenon inherent in Florman's definition of contemporary man as "not content because he *wants* more than he can ever have." Society has come to expect solutions from engineering. When a "Can't do" flag shows, bitterness results. Engineers should be aware that the public expects them to find an *easy* solution to the energy crisis and will be sorely disillusioned if this does not occur—and soon. Obviously, society has developed the false idea that engineers are automatic problem solvers, and has lost sight of the creative, and therefore unpredictable, nature of technological progress.

The final section of the book relates to its title. Florman wishes to refute the counterculturalists' charge that the engineer and his works are dull and

uncreative. Defining existentialism as involving a "rejection of dogma" and a "reliance on the passions, impulses, urges, and intuitions" (though we wonder why, in his admittedly selective definition, Florman avoided a discussion of "responsibility," which Sartre made an integral part of his understanding of existentialism, and which is central to Florman's view of the position of engineers in society), Florman presents an excess of carefully collected literary fragments as proof of the existence of existentialism in engineering.

Perhaps these quotes obscure the engineer's best answer to the counterculturalists, embodied in Jerome Weisner's comment, "Technical and scientific work is usually fun." Could this idea be carried further—isn't engineering a development of forms of "play" inherent in children's games? Described in these terms, engineering and its products may appear more acceptable even to radical counterculturalists.

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**Applied Optimal Control**, Revised Printing, Arthur E. Bryson, Jr. and Yu-Chi Ho, Halsted Press, Division of John Wiley & Sons, Inc., New York (1975), 481 pages.

This classic book on optimization, estimation, and control is essentially the same as the original version published by Ginn and Company in 1969. Most of the rather large number of typographical errors and misprints present in the original printing have been corrected in this revised printing. Except for these changes, the text appears to be identical to the original.

The book is concerned with the analysis and design of dynamic systems. It presents the applied mathematics needed by engineers who are attempting to apply optimal control to the solution of engineering control problems. The first three chapters cover optimization of dynamic systems. The next five chapters deal with optimal feedback control, including linear systems with quadratic criteria, numerical solutions of optimal programming and control problems, and singular solutions of optimization and control problems. One chapter is devoted to differential games. The final five chapters are concerned with the effect of uncertainty and include the concepts of probability and random processes, optimal filtering, prediction, and smoothing, and optimal feedback control in the presence of uncertainty.

Most of the examples are drawn from the aerospace field, but should be understandable to chemical engineers. The book is designed for self-study. Students of control will welcome the reprinting of this book. It was an excellent text in 1969 and is still an important work in the field.

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**Design and Control of Chemical Process Systems**, J. R. Borer, McGraw-Hill Book Co. (U.K.) Limited, 153 pages, \$12.50.

This book is a brief sketch of the tools of process control system design, written by an experienced process control engineer. The selection of topics and the emphasis provide a rare opportunity for gaining an "insider's" view of the problems of controller design. As such, the book will be of particular interest to teachers of the subject, and they should examine it with care. Some of the examples are instructive, and the overall point of view provides some of the practitioner's input which our control courses and research badly need.

The topics include an elementary discussion of process dynamics, conventional single loop design procedures, and topics in multivariable control including multivariable compensation, system identification, and computer control. A satisfactory treatment of each of these topics within 153 pages is, of course, an impossible task, and the result is a book that can be read and appreciated only by someone who is already familiar with the important concepts. The level of mathematics required of the reader is surprisingly uneven; page 34 contains a detailed exposition of the solution of the equation  $dy/dt + ky = 0$ , for example, while the author freely uses properties of matrix differential equations and matrix decomposition in the later chapters.

Readers should be warned that this is a difficult book to get through, but not because of the technical level of the material. The writing style is often awkward, the intermingling of equations and text is confusing, and the book contains errors in grammar and punctuation; portions of the text appear to me to be transcriptions of dictation. I would not have thought it possible to produce so poorly edited a manuscript, and I feel that the publisher has done the author and his readers a great disservice by failing to provide the expected editorial services.

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