- Hydrodynamics of a recirculating fluidized bed
- UF_6 formation from the surface reactions of uranium and fluorine
- Auxiliary power recovery from coal gasification processes

The projects at Oak Ridge are oriented toward laboratory-type research and development work, complementing the industrial nature of the problems at the Albany Station.

PROGRAM DESCRIPTION

EACH TERM, A SELECT number of graduate students (presently the enrollment is limited to 24) are admitted to the School. Since the program is highly demanding, self-motivation, industriousness, and other such qualities are also sought in addition to exceptional academic achievements. The requirements for the Master of Science in Chemical Engineering Practice (Course X-A) are the same as those for the Master of Science in Chemical Engineering, except that 24 units of Practice School experience is accepted in lieu of the Master's thesis.

Bachelor of Science graduates of the department ordinarily meet the requirements of the program in two terms. Beginning in September following their graduation, students spend the semester at the Practice School; half at Albany, New York, and the other half at Oak Ridge, Tennessee. Then they return to the Institute to complete the program during the Spring term. A similar program also begins in February and extends to the end of May.

For the students who have graduated in chemical engineering from other schools, the usual program of study involves one or two terms at the Institute followed by the field station work in the Practice School. Students with chemistry majors usually require an additional term at the Institute.

Although there are no specific course requirements for the Practice School program (beyond the usual S.M. degree course requirements) the courses listed in Table 1 have been found to be particularly beneficial according to the students who participated in the program. □

TABLE I

Suggested Prerequisite Courses.

FALL	SPRING
ChE Thermodynamics	Same
Advanced Heat Transfer	Heat and Mass Transfer
Industrial Chemistry	Same
Catalysis and Catalytic Processes	Chemical Reaction Engineering
Analytical Treatment of ChE Processes	Advanced Calculus for Engineers
Structure and Properties of Polymers	Physical Chemistry of Polymers

REFERENCES

1. King, C. J., and A. S. West, "The Expanding Domain of Chemical Engineering," *Chem. Eng. Progr.*, *72*, 35 (1976).
2. Lewis, W. K., "Practice Training in Universities," *Chem. Eng. News*, *29*, 1397 (1951).
3. Walker, W. H., "The School of Chemical Engineering Practice. A Year's Experience," *Ind. Eng. Chem.*, *9*, 1087 (1917).
4. Walker, W. H., "A Master's Course in Chemical Engineering," *Ind. Eng. Chem.*, *8*, 746 (1916).

ChE book reviews

APPLIED CHEMICAL PROCESS DESIGN

By Frank Aerstin and Gary Street
Plenum Press, 1978, 294 pages.
Reviewed by Frank J. Lockhart
University of Southern California, L.A.

This is not a textbook. Developments, discussions and derivations have been eliminated, leaving a concise presentation of methods and correlations useful in process design, pilot plants or production. Some of the methods are theoretical, some are not; but they all are empirical in that they can be used satisfactorily in the real world.

Explanations are scarce, which means the user needs prior education in the basics of topics such as fluid flow, heat transfer, and distillation. A critical user will check the validity of various dimensional equations which probably have not been seen before. For example, page 16 has a dimensional equation for Reynolds number in a circular pipe. It is correct, but it looks most unusual as $N_{Re} = 6.31\ W/\mu D$.

Some useful topics are included which are seldom found in conventional chemical engineering textbooks. For example: relief valves, rupture discs, vapor-liquid separators, and details on air-cooled heat exchangers. Continued, next page.

The authors are to be commended for giving stepwise procedure, followed by "sample determination" (i.e. an example), and at the end of each chapter its nomenclature, references to the particular methods and some selected readings.

This book covers the topics the authors consider important, and the published correlations they prefer. Other engineers may select different topics and correlations based upon their own experiences. I consider they have covered the most important topics and usually, acceptable correlations. However, the graphical correlation on page 42, labeled the "optimum-minimum reflux relationship . . ." and being around 1.2-1.5, must truly be the "typical design-minimum reflux relationship." The ratio of optimum to minimum reflux ratio for about 25 years has been less than 1.15, which is essentially off the graph. And this ratio is decreasing more with increasing cost of energy.

Line 4, page 277 says, "A vapor-liquid separator is a drum where entrainment is generated," a statement which I do not believe.

Where does this book fit? Possibly as an appendage to a chemical plant design course in a university, but not as a textbook. Possibly as a reference for an engineer who is away from the office, but not as a typical office-reference book. □

STATISTICS FOR EXPERIMENTERS. AN INTRODUCTION TO DESIGN, DATA ANALYSIS, AND MODEL BUILDING

By George E. P. Box, William G. Hunter, and Stuart Hunter
John Wiley and Sons, Inc. NY, 1978. xviii + 653 pp.

Reviewed by Robert J. Buehler
University of Minnesota

This book is aimed at persons who collect and analyze data, including, in particular, engineers, chemists, biologists and statisticians. It claims to be "neither a cookbook nor a textbook on mathematical statistics. It is an introduction to the philosophy of experimentation and the part that statistics plays in experimentation." The book is intended for use as a text, but could also be used for self-instruction. No knowledge of calculus is assumed.

There are four parts: I. Comparing two treatments; II. Comparing more than two treatments; III. Measuring the effects of variables; IV. Building models and using them. To give an idea of the coverage (but not the flavor) : Part I: Significance tests; confidence intervals; normal, t, binomial and Poisson distributions; randomization; replication; blocking. Part II: Analysis of variance; factorial designs; transformations; randomized blocks; incomplete blocks; Latin squares. Part III: Factorial designs at two levels; normal probability plots; fractional factorials. Part IV: Regression models; response surfaces; mechanistic models; control charts; variance components; modeling and forecasting with time series.

The flavor of this book is totally practical. New topics are invariably introduced by example. The authors draw on their very considerable real world experience to emphasize the concepts and techniques of greatest utility. Over and over they stress the importance of finding appropriate models and of checking the adequacy of any assumed model (making "diagnostic checks"), usually by inspection of residuals. Many common pitfalls are pointed out: assuming independence when serial correlation is present; mistaking association for causation; confusing statistical significance with practical significance; dangers of "happenstance data;" dangers of letting the computer replace the human brain where the brain is superior. Limitations of rigid mathematical theories such as "optimal design" are indicated (p. 472). In keeping with the more casual "data analytic" approach as opposed to a theoretical mathematical approach, hypotheses are not rejected but "discredited," and reporting observed significance levels or confidence intervals is favored over a pure accept-reject procedure.

This is clearly an authoritative book. I found it also to be tightly and clearly written, with very good use of figures, suitable problems, and adequate references for further study. The geometric concept of orthogonality in the analysis of variance is an example of a topic well described at an elementary level which is usually found only in more advanced texts.

Not wishing to imply that the book is flawless, let me say in closing that while the authors correctly emphasize the fundamental contributions of the incomparable R. A. Fisher, they need not have followed his example in spelling Gosset ("Student") both correctly (p. 15) and incorrectly (Gossett, p. 49). □