ments of the older, more conventional segments of the ceramic industry. The inadequate supply of college graduates can be traced to the fact that the general public, and especially junior and senior high school students and their guidance counselors, are not aware of the meaning of ceramics and its possible impact on their careers or mode of living. *Ceramics: Stone Age to Space Age* will provide the high school student who is interested in science or engineering with a broad concept of the field and a basis for making decisions about a career. Other high school students as well as high school teachers should find it a valuable source of information.

Mitchell has seriously attempted an impossible task: that of covering all aspects of ceramics in ten chapters. The last two chapters, "Carbon ceramics" and "The new ceramics," constitute an excellent introduction to the new requirements made by the electronics, nuclear, and space age industries, but these chapters must be supplemented by other current literature—for example, the article (in two parts) "U.S. in space" published in *Chemical and Engineering News* (23 and 30 September 1963).

The illustrations are excellent, especially those in the last two chapters. The glossary is valuable, because many high school students and teachers are not familiar with the special language of ceramics. The very limited bit of "selected readings" provided at the end of the book should have been greatly expanded for well-qualified students and high school teachers who are eager to learn about "the new ceramics."

F. A. HUMMEL
Department of Ceramic Technology, Pennsylvania State University

Operations Research

Models for Production and Operations Management. Elwood S. Buffa. Wiley, New York, 1963. xii + 632 pp. Illus. $9.25.

In his preface, Buffa writes that the book "is designed for the individual or for a course where the objective is to develop a comprehension of these new methods so that in operations situations one can make intelligent decisions based on the results of analysis by staff specialists." He hits this target somewhat off center. For nonstaff specialists there is too much "this is what your technical staff should do," and not enough "this is what your technical staff should be trying to accomplish and this is why they should go about it this way." For example, in part 5, "Linear Programming," there is an excellent three-page discussion entitled "Linear programming—distribution methods," but he then devotes 26 pages to calculating techniques, including nine pages on short cuts which are of no interest to managers and of doubtful value to anyone else, since such problems almost inevitably are run on computers. The next chapter, on simplex, does not have initial pages on uses and is wholly devoted to the algorithm.

Perhaps Buffa's selection of material may be described as conventional, since it so nearly agrees with that used by Bowman and Fetter in *Analysis for Production Management*. However, the sequence and grouping are somewhat different, and they are perhaps better. Part 2, "Models of Flow and Man-Machines Systems," contains a load of tabulated data, helpful in indicating what is available: the dimensions of average men and women, comfort ranges for temperature and humidity, and the like, all of which is more suitable for a reference volume than for a textbook. Part 3, "Statistical Methods," seems lopsided—too much on quality control compared with the space devoted to the vastly more important experimental design. Part 4, "Waiting Lines," is rather more adequate than most treatments found in general works. It exhibits a greater variety of applications and is really very well done. I could wish for less focusing on Poisson distributions and first come, first served, queue discipline. Part 6, "Investment Policy," seems somewhat overly concerned with calculating techniques. Part 7, "Inventories Models," seems a first-rate job and so does part 8, "Simulation." Part 9, "Synthesis," is only seven pages long and regrettably slight.

The mathematical level requires about a year of high school algebra. Equations are given, rarely derived, and often no effort is made to obtain intuitive acceptance. Incremental costs are stipulated and occasionally illustrated. Limitations of techniques are sometimes recognized.

The illustrative material is well chosen and adequately presented. The problems are realistic and some of the best I have seen. The references for further reading are excellent. The section entitled "Review questions" seems useful to readers for self-testing and to teachers for use in pushing students into study. I prefer thought-provoking questions that lead to the exploration of managerial purposes and problems and perhaps to social implications and ethics.

Buffa's style is clean, lucid, matter-of-fact—and not very exciting. At times a bit superficial, more often somewhat dogmatic, the book could do more to explain *why* models succeed, *why* they are designed as they are.

On the whole, Buffa's book stands up well in comparison with competing textbooks. I expect it will be widely adopted and generally liked. While much more a textbook than a trade book, managers may well buy it and browse to get some idea as to what the "new management" is all about.

BILLY E. GOETZ
School of Industrial Management, Massachusetts Institute of Technology

Geological Society Memoir

Supai Formation (Permian) of Eastern Arizona. Geological Society of America Memoir 89. Stephen S. Winters. Geological Society of America, New York, 1963. viii + 99 pp. Illus.

The Supai Formation of east-central Arizona is strategically situated between well-known and documented Permian sections of West Texas and those of the Grand Canyon region. Winters has made an excellent contribution in providing objective stratigraphic and paleontologic information about this important area and in making a logical synthesis and interpretation of its paleogeography. His purpose in providing lithologic and paleontologic data and thereby contributing to an understanding of the transition between the Colorado Plateau and the New Mexico–Texas Permian sedimentary rocks was realized.

From his 13 detailed surface stratigraphic sections, strategically located in the Fort Apache Indian Reservation, Winters obtained lithic and faunal information that permitted recognition of four members in the Supai Formation: Amos Wash (at the base), Big A Butte, Fort Apache, and Corduroy; with the exception of the Fort Apache Member, all are proposed as new. The author points out that the Supai Formation totals about 1300 feet of reddish-brown