

BOOK REVIEWS

Principles of Combinatorics by Claude Berge. Academic Press, New York, 1971. 176 pp. First published in the French language under the title *Principes de Combinatoire*, Dunod, Paris, 1968.

The current resurgence of combinatorics (also known as combinatorial analysis and combinatorial theory) is by now recognized by all mathematicians. Scoffers regard combinatorics as a chaotic realm of binomial coefficients, graphs, and lattices, with a mixed bag of *ad hoc* tricks and techniques for investigating them. In reality, there has been a tremendous unifying drive to combinatorics in recent years. We now have a broad and sophisticated understanding of such standard combinatorial concepts as inversion, composition, generating functions, finite differences, and incidence relations.

Another criticism of combinatorics is that it "lacks abstraction." The implication is that combinatorics is lacking in depth and all its results follow from trivial, though possible elaborate, manipulations. This argument is extremely misleading and unfair. It is precisely the "lack of abstraction," i.e., the concrete visualization of the concepts involved, which helps to make combinatorics so appealing to its adherents. On the other hand, the "depth" of the subject is rapidly increasing as it increasingly draws upon more and more techniques and concepts from other branches of mathematics, such as group representation theory, statistical mechanics, harmonic analysis, homological algebra, and algebraic topology, to say nothing of the increasing sophistication of various new purely combinatorial techniques.

The reader whose only contact with combinatorics has been an occasional binomial coefficient summation or a particularly hideous looking graph will want to know where he can get an idea of the current flavor of the subject. I can think of no better way than to recommend Berge's book. Of course only a small selection of topics can be included in a single volume, and none of them can be explored in full generality. Berge manages, however, to choose his topics with impeccable taste, and his exposition is masterful. Particularly noteworthy is the inclusion of some recent results on permutations discovered by the current French school of combinatorialists. Moreover, the use of simple explicit examples throughout greatly facilitates comprehension. The reader's appetite will in all likelihood be whetted for further study.

Berge regards combinatorics as the study of *configurations*, i.e.,