Faden goes on to apply these tools to general problems of constrained and unconstrained optimization. He presents some results on existence and uniqueness of optimal solutions, and a number of variations on "shadow-price" conditions to characterize constrained optima.

The analytical tools described and developed in the first third of the book are used to analyze various problems of spatial economics in the latter two thirds of the book. There are discussions of the real estate market, the transportation and transhipment problems, several variants on the von Thünen system mentioned earlier in this review, several models of industrial location, and discussions of a number of other topics in spatial economics. These models will no doubt stimulate some fruitful interaction between measure theorists and spatial economists; perhaps the intersection of these two disciplines may yet be of positive measure!

HAL R. VARIAN

BULLETIN (New Series) OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 1, Number 2, March 1979
© 1979 American Mathematical Society
0002-9904/79/0000-0106/$02.25

Obstruction theory on homotopy classification of maps, by Hans J. Baues, Lecture Notes in Math., vol. 628, Springer-Verlag, Berlin, Heidelberg, New York, 1977, xi + 387 pp.

In the beginning was the word, and the word was homology. The great breakthrough in the successful attempt to apply algebraic methods in topology was the discovery of the homology groups and the proof of their topological invariance. Before the homology groups were explicitly described we had the idea of the homology class of a cycle on a manifold or, more generally, a polyhedron, but the description of the collection of homology classes was arithmetical rather than algebraic. That is to say, the great pioneers spoke of Betti numbers and torsion coefficients. It is generally supposed that Emmy Noether was responsible for observing that in fact the homology classes of cycles form an abelian group and that the Betti numbers and torsion coefficients were simply the invariants of finitely generated homology groups. The topological invariance of the homology groups is a truly wonderful result. We define these groups in terms of a very specific and arbitrary combinatorial structure on the topological space and then prove that they are in fact independent of that structure.

Thus algebraic topology was born. Subsequently came the cohomology groups. At first the view was taken that the combinatorial structure on the space gave rise to chain groups and that there were two operators on these chain groups, the boundary operator, or lower boundary operator as it was sometimes called, and the coboundary operator, or upper boundary operator as it was sometimes called. Subsequently it was realized that this was not a good point of view. One should exploit the natural duality to introduce not only chain groups but cochain groups and then one obtained cohomology groups from the cochain groups by a method entirely analogous to that whereby one obtained homology groups from the chain groups. This point of