lation is given. Then the authors obtain the projected dynamical systems model and give an interpretation of it. Also stability analysis is conducted by applying and extending the results of Chapter 3, and an algorithm is proposed, together with the corresponding convergence results. Finally, numerical examples illustrate the theory. The authors have implemented the numerical schemes on (massively) parallel architectures. This last fact is important for both the book and the reader because spatial price equilibrium problems can be large-scale in real problems.

Chapter 7 and Chapter 8 are devoted to the study of the traffic network equilibrium problem. Starting from the variational inequality formulations known as the Wardropian equilibrium conditions, the authors derive projected dynamical systems models in the case of elastic demands and then fixed demands in Chapter 7 and 8 respectively. Stability results are also obtained by means of the theory of Chapter 3. The authors present algorithms based on the general iterative scheme both for the elastic demand models of Chapter 7 and for the fixed demand model of Chapter 8. Again convergence results are given, as well as numerical examples. All the applications are carefully selected by the authors. They are problems of general interest which parallel, illustrate different equilibrium concepts. Moreover they highlight in the best possible way the theory presented here. Enough figures are included in the text helping the reader to understand the basic concepts. Sources and notes follow each chapter. References are also given after each chapter for the reader's convenience. Another strong point of the book is that each application chapter in the second part of it is selfcontained. The present book is addressed to an audience of students, researchers and practitioners in management science, operations research, and economics, who are interested in the formulation, analysis, and computation of equilibrium problems in a dynamical setting.

The results of the book are original, very interesting and significantly adding to the related published works. The book is properly structured, is written with accuracy and clarity, and has appropriate referencing. It should therefore be considered an essential piece of work for everyone in the relevant fields to read.

P.D. Panagiotopoulos
Institute of Steel Structures,
Aristotle University,
Thessaloniki, Greece

Donald H. Hyers, George Isaac and Themistocles M. Rassias, *Topics in Nonlinear Analysis and Applications*. World Scientific Publishing Co., Singapore–New Jersey–London–Hong Kong, 1997, XIII+699 pp.

The book explores several new interconnections and interrelations between mathematical analysis and topology and their applications. Main emphasis is given to mathematical research that has been carried through, at an international level, mainly during the last years. It presents an impressive body of research in nonlinear

analysis problems, methods and theories that can be useful for the specialist mathematician but also for those researchers and graduate students, who use nonlinear analysis as a tool. The book contains five chapters. Each chapter begins with an introduction, and ends with a list of references. Some 500 references have been cited here, including preprints. The book concludes with a symbol index and a subject index.

The first chapter is devoted to convex cones and to the nonlinear complementarity theory. The most important kinds of convex cones considered in the nonlinear complementarity theory as well as in a variety of other problems in nonlinear analysis are studied. In particular emphasis is given to the complementarity theory that is a cross-point of several theories of nonlinear analysis and of applied mathematics.

In Chapter 2 emphasis is given to the problem: how the ordering defined by a convex cone can be applied to define a metric on the cone or on certain of its characteristic subsets. Emphasis is given to the study of the Hilbert's projective metric, the Thompson's metric, a metric defined by two cones, and a metric defined by some monotone semigroups acting on the cone.

Chapter 3 presents an excellent study of zero-epi mappings. It is the first time that the concept of zero-epi mapping is presented in a book form. The concept of zero-epi mapping that was introduced by the Italian school two decades ago, is similar to the concept of topological degree. However, the notion of zero-epi mapping is strictly more refined and simpler as well as a very powerful mathematical instrument. Some applications presented in this chapter include the study of Nash equilibrium for a couple of mappings, the study of nonlinear complementarity problems in infinite dimensional space, and the study of nonlinear complementarity problem depending of multi-parameters.

Chapter 4 deals with some of the most important variational principles that have been obtained recently. In particular the authors have presented in a unified manner the Ekeland's variational principle, its variants and its generalizations. In fact the Ekeland's principle has been treated as a special case of a generalized principle that is concerned with stationary points for a generalized dynamical system. The Ekeland's principle for vector-valued functions and for general topological vector spaces is presented. The second part of the chapter is devoted to applications to the study of coercivity, the study of fixed points, some density results, the study of surjectivity, to mention a few.

In addition, among other things, in this chapter is presented a global variational principle on cones, the Bishop-Phelps theorem, the-Clarke's fixed point theorem, the mountain pass lemma, the Zabreiko-Krasnoselskii theorem, the drop property and its applications to the geometry of Banach spaces.

Chapter 5 presents the main maximal element principles that have been obtained in Nonlinear Analysis only recently. The chapter begins with a variation of Zorn's lemma and a fundamental characterization of the fixed point property by ordering. Several maximal element principles are studied such as the Brøndsted principle, the Brezis–Browder principle, the Altman principle, the Turiici principle and others.

In addition some applications to the study of the solvability of abstract equations, some general Newton–Kantorovich numerical processes and the Pareto efficiency are discussed.

Most of the applications treated in this book have never been presented before in a single unified source. This book will be treasured both by graduate students and experienced nonlinear analysts. I believe that this book will be a very useful guide and indispensable reference for researchers as well as graduate students in the very active subject of Nonlinear Analysis and their Applications. This provides an interplay of Functional Analysis, Differential Equations and Geometry which are associated with mathematical models that are defined in Physics, Economics, Biology, Chemistry, Engineering, etc. I strongly recommend it to everyone who wants to learn both old but mainly recent developments in Nonlinear Analysis.

P. M. Pardalos
University of Florida,
Gainesville, FL 32611, USA