PREFACE

The subject matter of this report is the work done by the author in the Physics Department of Cochin University during 1977-'81, as UGC Teacher Fellow.

The thesis is devoted to theoretical studies on the properties of hadrons on the basis of bag models. It contains some applications of the traditional MIT bag model to the spectroscopy and decay of hadrons. The inadequacies of the model are brought out and a new version of the model, called the variable pressure bag model, is developed. Some of the phenomenological applications of this model are discussed and the predictions are compared with experiment.

Chapter 1 is introductory. It contains a very brief account of the current status of elementary particle theory in terms of quarks (and gluons) with special reference to various models of hadronic structure. In chapter 2 the salient features of the MIT bag model are described. Chapter 3 deals with a bag model study of the mass spectrum of charmed mesons. Chapter 4 contains an application of the model to the study of the weak nonleptonic decays of charmed $D^0$ and $D^+$ mesons. In chapter 5 a further application of the model, the spectroscopy of gluonic bound states, is discussed. In chapter 6 the variable pressure bag model and its phenomenology are developed. The model is applied to a study of the mass spectrum of ordinary light mesons and baryons and to a detailed
analysis of the hadron mass splittings taking into account the SU(3) breaking effects. In chapter 7 the magnetic moments of stable baryons are worked out and compared with their measured values.

A part of these investigations has appeared in the form of the following publications:

