PREFACE TO THE FIRST EDITION

This book is concerned with the mechanics of rigid and deformable solids in equilibrium. It has been prepared by members of the Mechanical Engineering Department at the Massachusetts Institute of Technology for use as a text in the first course in applied mechanics.

The central aim has been to treat this subject as an *engineering science*. To this end we have clearly identified three fundamental physical considerations which govern the mechanics of solids in equilibrium, and we have explicitly related all discussion and theoretical development to these three basic considerations. We have focused on these fundamentals in an effort to bring unity to an elementary presentation of our subject.

A further aspect upon which we have put considerable emphasis is the process of constructing idealized models to represent actual physical situations. This is one of the central problems of engineering, and throughout the book we have attempted to give it attention commensurate with its importance.

We have assumed that the reader has already studied mechanics as part of a program in physics and that he is familiar with the differential and integral

calculus. We further assume that the reader is acquainted with vector notation and with the algebraic operations of addition and multiplication of vectors.

The first chapter is devoted to a discussion of the fundamental principles of mechanics and to an exposition of the requirements of equilibrium. In the second chapter the basic principles are stated explicitly in Eq. (2.1) in the form of three steps and are illustrated by application to lumped parameter models and one-dimensional continua. The next three chapters are devoted to extending the depth of meaning contained in the basic principles. An important facet of this development is the extension of the fundamental concepts to three-dimensional continuous media. In the final four chapters, simple but important problems involving these concepts are solved. There are problems for the reader at the end of each chapter. Some of these include extensions of the text material. Answers to approximately one-third of the problems are given at the rear of the book.

In endeavoring to emphasize the basic principles, we have, of necessity, had to omit many interesting applications. We have not attempted to provide a compendium of useful results, but rather we have selected a limited number of particular applications and have examined these with more than usual care. It is our opinion that a course based on this text will provide an appropriate introduction to the more advanced disciplines of elasticity and plasticity. With equal conviction we believe that a course based on this text will provide a firm foundation for subsequent design courses in this field.

Many people have participated directly and indirectly in the preparation of this book. In addition to the authors, many present and former members of our staff have contributed ideas concerning methods of presentation and problems from examinations. We wish to acknowledge, in particular, the cooperation of R. J. Fitzgerald in working out problem solutions and the help of Miss Pauline Harris in typing the manuscript.

There was a preliminary edition in 1957 (with a supplement in 1958); it enabled us to experiment with presenting this material in semipermanent book form. We wish to thank those members of the M.I.T. classes of 1960 and 1961 who used the preliminary editions and who by their comments and criticisms helped to make this book better than it otherwise would have been.

STEPHEN H. CRANDALL
NORMAN C. DAHL