Preface

Recent discoveries of new materials, together with improved calorimetric techniques capable of precise and accurate measurements of very small samples, have given new impetus to the subject of specific heat. Moreover, as several companies have now marketed measuring systems, the technique is rapidly becoming a standard research tool. Despite this the author knows of only two books on the subject. The earlier one by E. S. R. Gopal was published in 1966, while that edited by C. Y. Ho (1988), although exhaustive in its treatment of experimental methods, deals only with the lattice, electronic and magnetic specific heats of solids. The major review article by Norman E. Phillips (1972) also belongs to the period prior to the discovery of high temperature superconductors and heavy fermions and, again, deals only with the electronic, lattice and magnetic specific heats of solids.
The present book sets out to cover in some detail the specific heat of a wide variety of substances, ranging from the conventional to the recently discovered materials: heavy fermions, high-T_c superconductors, spin glasses as well as exchange-enhanced systems. It also includes some recent developments in the field.

In principle, any temperature-dependent phenomenon can contribute to the specific heat of a system since it affects the energy levels of particles or modes that determine the mean energy. These levels may arise from translational, rotational or vibrational motion of the atoms or molecules, or from electronic or spin excitations and so on. Hence the subject of specific heat covers a very broad field. It is, therefore, impossible - and for a monograph of this nature impractical - to discuss in sufficient detail all the phenomena that bear some relation to it. The approach here therefore, has been to provide a reasonably comprehensive description of the specific heat of a number of materials at ordinary temperatures. Although simple enough to be used by a newcomer to the subject, the book contains a large amount of material discussed in some detail as well as a comprehensive reference list after each chapter, which makes it useful for researchers and teachers.

In writing the book I received constant help from Dr. R. L. Jacobs to whom I am particularly indebted. I am also indebted to Drs. D. St. P. Bunbury, S. W. Zochowski and Professor J. Hook for their comments on various chapters and to A. Parvin, and my son Jan for their help with the intricacies of using the computer. Responsibility for any errors, however, rests entirely with the author.