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Advanced BASIC Scientific Subroutines

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and

D. J. Chamund

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Every care has been taken in the writing and testing of the programs contained in this book. It has not been possible, however, to test the programs under all conditions and with the many machines that are available. There will also be interaction between the user's own program and the subroutines taken from this book. Users should therefore satisfy themselves that the operation of the programs and subroutines is suitable for the intended application. No liability for any damage or injury that may result from the use of the material contained in this book can be accepted by the authors or the publishers.

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Preface

The use of computers today for scientific and engineering purposes is commonplace. School pupils studying science-based subjects will almost certainly have had some hands-on experience of computing by the time they are ready to sit their final examinations. Those leaving university with a science or engineering degree are likely to have a working knowledge of more than one high-level language.

In the mid 1960s computer programming was just beginning to feature in the syllabuses of some undergraduate courses. The emphasis on programming at that time was to save memory, increase speed and if possible make the program code understandable to the author and perhaps even other users. Advances in micro-electronics have today made possible the production of machines of such memory capacity and speed that under many conditions of use, memory space limitations and computing time place little constraint on the programmer. The current emphasis is on structure and style of programming.

What has not changed so dramatically is the effort required to design and develop computer software, and this is reflected in the changes in the relative costs of software and hardware over the same interval. Every machine requires software to drive it, and for large jobs or tasks of a specialist nature there is probably no real alternative to the purchase of commercial software or its production by those highly proficient in this task. Commercial software, however well written, is likely to suffer from several limitations: it is first of all expensive; it tends to be machine specific and so can suffer from limited portability and is often accompanied by copyright restrictions; it is rigid and not generally amenable to modification by the user and input and output are predetermined. The software, to obtain wider marketability, is often far more powerful and consequently complex than the user requires. If it has to be purchased, then the right type of software has to be found and studied — all points that make it difficult to justify for those smaller jobs. It is these and other limitations that contribute towards the reasons why many engineers and scientists write some software themselves — the need to do this is implicitly recognised by the proportion of time devoted to this task in the formal training that they currently receive.

What we have attempted to do in this book is to provide a collection of sub-routines which can function as the building blocks for scientific programs of the user's own creation. We have written them in a uniform style and presented them in a manner which we anticipate will make them easy to use. BASIC has been

selected as we believe it is the language with which potential readers are still most likely to be familiar and the one that will be compatible with their computer both at home and in the workplace.

One of the problems encountered in compiling a book of this nature is to know what material to include and what to exclude. Subroutines which would be relevant but which only occupy a few lines of code and which also are likely to cause no problem to the user have been omitted, as have those which would be regarded as trivial by the anticipated readership. Other work has had to be eliminated through restrictions on space, or because it was thought to be too narrow in its application. We have attempted to retain only what we consider to be the most generally useful material.

In the preparation of this book, help has been received from several sources. Here we should like to acknowledge with gratitude the assistance of Michael J. Morris of the School of Economic and Social Studies, University of East Anglia; Martin Wilson of the Department of Statistics and Operational Research, Coventry Polytechnic, for assistance with the details of some of the statistical subroutines; and Juliet Davison for her help in kindly typing the manuscript.