

# Contents

Foreword		ix
<b>Chapter 1</b>	<b>Introduction to Biological Computing</b>	<b>1</b>
1.1	Biological applications of computers	1
1.2	Elements of computer science	3
1.3	Number systems	4
1.4	Computer hardware	5
1.5	Summary	12
<b>Chapter 2</b>	<b>Programming Languages</b>	<b>13</b>
2.1	Introduction	13
2.2	Machine language programs	14
2.3	High level languages	16
<b>Chapter 3</b>	<b>Introduction to BASIC</b>	<b>20</b>
3.1	Program development	20
3.2	BASIC programs	21
3.3	The problem	22
3.4	The program structure	23
3.5	The complete program	31
3.6	Summary	32
3.7	Problems	33
<b>Chapter 4</b>	<b>Loops and Arrays</b>	<b>35</b>
4.1	The simple FOR ... NEXT loop	35
4.2	Numeric arrays	40
4.3	Nested FOR ... NEXT loops and two dimensional arrays	45
4.4	Summary	50
4.5	Problems	51
<b>Chapter 5</b>	<b>Functions</b>	<b>52</b>
5.1	Outline of BASIC functions	52
5.2	The use of BASIC functions in programs	53
5.3	Example programs using BASIC functions	56
5.4	User defined functions	60
5.5	Summary	61
5.6	Problems	62

<b>Chapter 6</b>	<b>Program Control Structures</b>	<b>64</b>
6.1	Introduction	64
6.2	Unconditional commands	64
6.3	Conditional commands	67
6.4	Summary	75
6.5	Problems	76
<b>Chapter 7</b>	<b>Strings</b>	<b>77</b>
7.1	Introduction	77
7.2	BASIC string commands	77
7.3	Print formatting	82
7.4	Example programs	83
7.5	Summary of commands	86
7.6	Problems	87
<b>Chapter 8</b>	<b>Disks, Files and Operating Systems</b>	<b>89</b>
8.1	Introduction	89
8.2	Disks	89
8.3	Files	93
8.4	Operating systems	97
<b>Chapter 9</b>	<b>Computer Graphics and Image Processing</b>	<b>102</b>
9.1	Introduction	102
9.2	Hardware review	102
9.3	Programming principles	106
9.4	Biological applications	110
9.5	Summary	114
<b>Chapter 10</b>	<b>Structured Programming</b>	<b>115</b>
10.1	Historical background	115
10.2	What is structured programming?	115
10.3	Structured commands in BASIC	116
10.4	Writing structured programs	117
10.5	Example	119
10.6	Summary	123
10.7	Problems	123
<b>Chapter 11</b>	<b>Computer Models</b>	<b>124</b>
11.1	Introduction	124
11.2	Model 1 – energy balance in living organisms	124
11.3	Model 2 – selection against a recessive allele	131
11.4	Model 3 – competition between two species of animal	134
11.5	Summary	139
<b>Chapter 12</b>	<b>Information Technology</b>	<b>140</b>
12.1	Introduction	140
12.2	Computer communications	140
12.3	Local area networks	142
12.4	Databases	144



12.5	Online information retrieval	146
12.6	DNA databases	149
12.7	Summary	151
<b>Chapter 13</b>	<b>Working with Mainframe Computers</b>	<b>152</b>
13.1	Introduction	152
13.2	MINITAB	154
13.3	SPSS-X	156
<b>Chapter 14</b>	<b>Program Optimisation</b>	<b>161</b>
14.1	Introduction	161
14.2	Optimisation of BASIC programs	162
<b>Chapter 15</b>	<b>Summary</b>	<b>165</b>
<b>Appendix A</b>	<b>Number Storage Systems and Sources of Error</b>	<b>169</b>
<b>Appendix B</b>	<b>ASCII Conversion Table</b>	<b>174</b>
<b>Appendix C</b>	<b>Microcomputer Interfacing</b>	<b>176</b>
<b>Appendix D</b>	<b>Answers to selected problems</b>	<b>180</b>
<b>Appendix E</b>	<b>Bibliography</b>	<b>185</b>
<b>Index</b>		<b>187</b>

The book is not based on any specific model of computer. Most of the programs written in the BASIC programming language should work on the majority of computers without amendments. This approach was adopted because there are already a large number of books related to specific computers. Also, many readers will have access to large mainframe computers. These larger computers often use versions of the BASIC language which are quite different from those found on microcomputers. These mainframe dialects frequently place constraints on the programmer which do not exist in microcomputer versions of BASIC. It would be an impossible task to test the programs on all of the popular computers. Consequently, if you have a problem with any of the programs, consult your manual and examine the syntax of the commands which have been used.

Computer science is not a subject which can be learned entirely from books. The only reliable method of developing an understanding of computers is to use one. In computing jargon (of which there is lots) this is known as gaining 'hands-on' experience. Do not be afraid of making mistakes. Unless you are delving around inside the computer you will not damage it. Making and correcting mistakes is one of the best methods available for learning about computers. Consequently, I would recommend that whenever it is possible you should type in and run the example programs. You will probably make some typing errors as you do so. These typing errors will prevent the program from working correctly, but identifying and correcting the errors will be a valuable experience. It is an unfortunate fact that, as the example programs become more complex, the