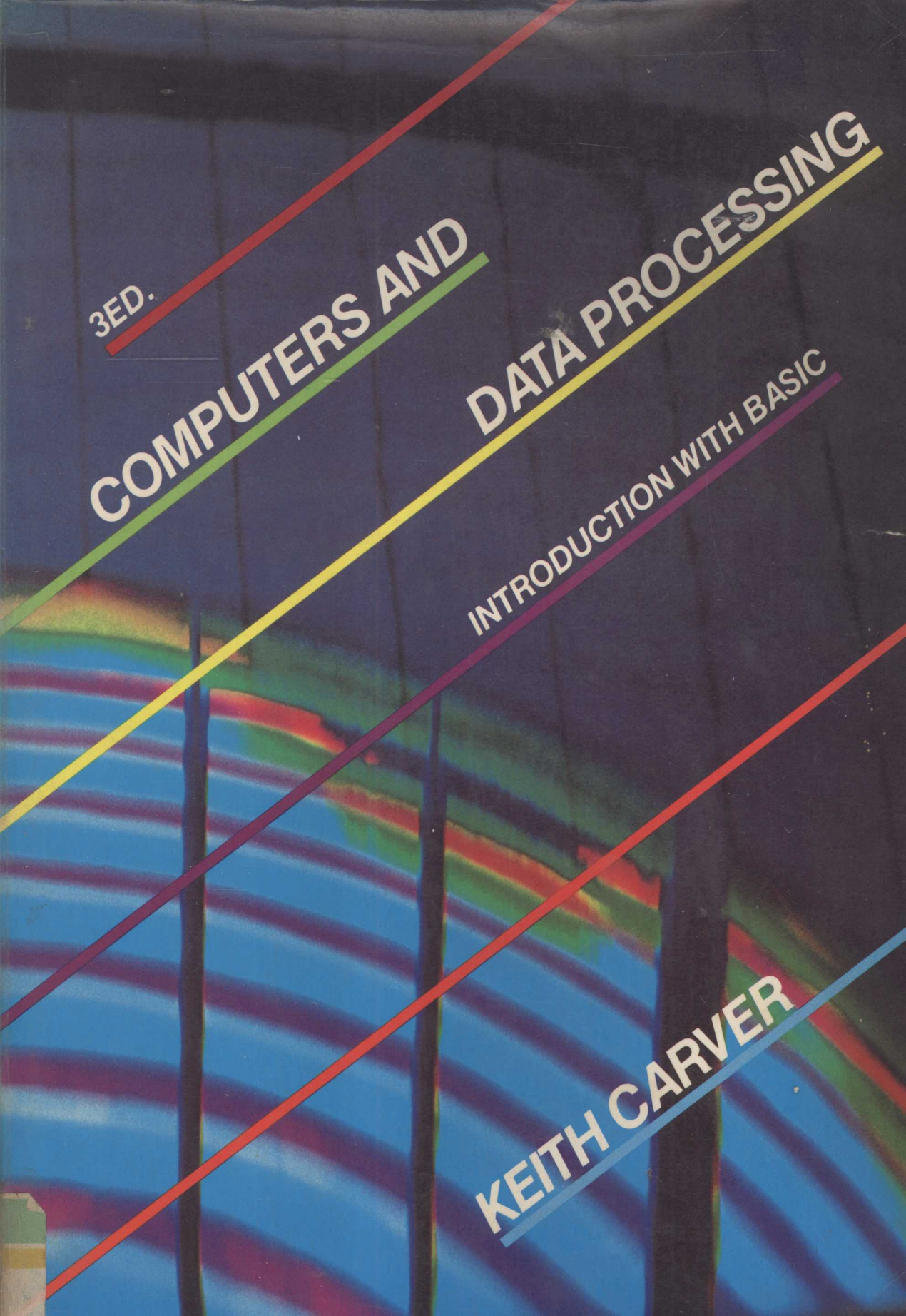
3ED.
COMPUTERS AND
DATA PROCESSING
INTRODUCTION WITH BASIC
KEITH CARVER

COMPUTERS AND DATA PROCESSING: Introduction with BASIC

THIRD EDITION

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COMPUTERS AND DATA PROCESSING: Introduction with BASIC

To my wife June, who did all the typing and most of the suffering through this book.

PREFACE

This edition of *Computers and Data Processing: Introduction with BASIC,* 3rd ed. is significantly different from its predecessor, Introduction to Business Data Processing, 2nd ed. As the title implies, the text recognizes that computers are no longer just the tool of business and industry. The age of the computer is rapidly becoming the "age of the microcomputer." The chances are very good that many of you already own your own computer, or certainly have access to one.

Over the years we have seen a steady increase in the level of sophistication, the computer "savvy," so to speak, of our beginning students. More of you have had access to computers prior to coming into class. This fact brings us to one of the difficulties with any beginning-level book: How do you make it suitable for both the absolute beginner and the student who has his or her own personal computer? How do you orient a text toward the student who will take only the beginning course and the student for whom this is merely the first step in a long line of courses in computers? This edition is designed to satisfy both these needs.

The key word that can be applied to the text is "exposure"—to the ideas, terminology, and methods of a science that has captured the imagination of the world. It contains the basic information that you need to be truly "computer literate" in today's society. Chapter 1, Computers and Society, describes the place of computers in our society; what it means to be computer literate; what effect automation can have on you; and what you can expect from increased computer use in our world.

Chapter 2, Data Processing in Perspective, puts the use of the computer into historical perspective. Chapter 3, Computers and the DP Cycle, describes the basic elements of a computer system and, in general, how they work. This is done early in the text so that you will observe computers in use in places and situations that you had not noticed before.

Chapter 4, Data Entry Methods, takes you to where it all begins—the entry of data into the computer. By the end of this chapter you should be able to recognize that this is where automation originates. The next two chapters—Chapter 5, The Central Processing Unit, and Chapter 6, More About the Central Processing Unit—show how the computer works internally. The point to be gained here is that this is the general way in which all computers work, whether large or small.

Chapter 7, Computer Input and Output, acquaints you with both the traditional and the newer, more sophisticated forms that are available today. Computer inputs and outputs are going through turbulent times in which each new method is improved upon so rapidly that today's technology is soon outdated. The advent of talking calculators, computers that listen, color video screens and color drawings in three dimensions are just a few examples.

Chapter 8, Auxiliary Storage Media, and Chapter 9, File Access Methods, discuss topics which, although more familiar, are still an integral and exciting area of computer use. Dynamic changes are going on in storage technology—changes that will affect you more directly than you can imagine. We are living in a time when our desire for data of all kinds has grown into an obsession. But we must have someplace to store all this data and methods to access it, otherwise all our efforts to collect and catalog it will have been wasted.

In Chapter 10, Computer Software, we explore the software or programs that make the computer do our bidding. How do you write a program? Chapter 11, Problem Solving with the Computer, takes you through the step-by-step process. In this chapter you will learn that programmers work by careful analysis of a problem and great attention to detail.

Chapter 12, BASIC Programming—Part I, and Chapter 13, BASIC Programming—Part II, introduce you to actual programming using the BASIC language. These two chapters amount to a complete text in BASIC themselves. There should be no need to buy a BASIC textbook as a supplement. As these two chapters explain, the BASIC language has not been standardized. This means that when you work on your own personal computer you might have to make some changes to the program, but they will be minor. Whenever you get the chance, try running the programs shown in the book, make your own variations, or try to work out the 45 BASIC problems to be solved on the Computer which are located at the end of each of these two chapters.

In Chapter 14, Small Computer Systems, you take a look at the world of small computers with its falling prices, increased capabilities, and rising speeds. Are you interested in buying your own microcomputer? Appendix B, Buying a Microcomputer, outlines some of the questions to ask yourself and the salesperson *before* you buy. In addition, this appendix briefly profiles three of the most popular microcomputers: Radio Shack, IBM, and Apple. Chapter 15, Data Communications, is a look at an area which in recent years has become difficult to distinguish from data processing.

Chapter 16, Data Base Systems, deals with a topic that we have heard so much about: data banks. Here you will get a glimpse of what these are, and why business, industry, and the government are setting up systems that can access massive amounts of data.

Chapter 17, Office Automation, is particularly important because business is finally realizing that word processing and data processing

are remarkably similar—that they are two sides of the same coin. This awareness is evidenced not only in the large computer systems but in the microcomputers that can process words and data with equal ease.

Chapter 18, Systems Considerations, is directed toward management and its feeling for and use of data processing methods and facilities.

Support materials that accompany the text include an Instructor's Manual, a Student Workbook, transparencies, Slides and Slide Manual, Tests Book, and a computerized version of the Tests.

I want to express my thanks to the many users whose comments and suggestions contributed to this new edition. I especially want to thank the following reviewers for the greatly appreciated suggestions and refinements during the developmental stage of this text: Dr. David Whitney, San Francisco State University, Professor Gregory G. Hardesty, Sullivan Junior College of Business; Professor Jerry Kinard, Southeastern Louisiana University; Professor Richard Manthei, Joliet Junior College, and Professor Elvin H. "Al" Campbell, Golden West College, who also prepared the Student Workbook.

Keith Carver

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CONTENTS

CHAPTER 1 COMPUTERS IN SOCIETY

LEARNING OBJECTIVES

Upon completion of the chapter you should understand the following:

How technology has grown in recent years; the driving forces behind this phenomenom.

The impact of the technology of automation upon you individually and upon society as a whole.

The compelling need for computer literacy.

What effect automation may have upon individual privacy and what can be done about it.

The extent and nature of the problem of computer crime and what can be done about it.

What the career fields are within the data processing industry and the tasks that will be expected of you.

The current and prospective growth of information technology is the most important development society has experienced since the automobile, the cotton gin and the steam engine.

Infosystems, January 1980

CHAPTER CONTENTS

THE GROWTH OF TECHNOLOGY

Anthony J. Weiner, a noted futurist, wrote about "Computers and the Future of America" and said

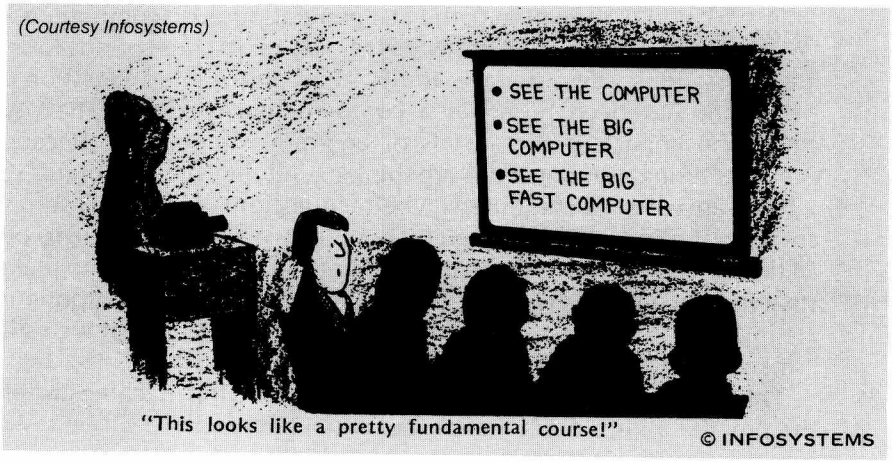
The computer revolution is the most advertized revolution in world history. Yet one of the funny things about it is that we probably still underestimate its impact.[1]

What is most interesting about that statement is that it was made in 1977. Looking back from today's position we can see that Weiner was exactly right. Despite all our best guesses about the future effect of computers upon our lives, we are still underestimating its impact. It would seem that the word "revolution" was well chosen. Visible evidence of the changes are all around us. For example, today approximately one half of the U.S. labor force is engaged in some aspect of the information industry. Over 90% of business-related jobs involve direct or indirect contact with a computer.

The rate of change in computer technology is so fast that it dwarfs one's imagination. Consider some of these points.

If the same proportional increase in speed and decrease in price had taken place in the transportation industry over the same period (1950 to 1980) a coast to coast flight would now cost about two cents and take less than a second.[2]

(Courtesy Infosystems)



Another way of putting it is that in 1957, according to one report, the *total* power of all the computers in the United States was about 10 million instructions per second. By 1982, that figure could be exceeded by a *single* large-scale computer.[3]

Microelectronics have been the driving force behind this quantum technological leap. Today's microcomputer (a topic to be covered in a later chapter) that costs $100 has approximately the same computing capability of a mammoth computer that cost one million dollars in 1950. Of course, you, the reader, can sit back and say "That is all very well, but surely things will have to slow down—technology can't always progress at this rate." You are right, this growth rate could slow down, but all the evidence indicates that, if anything, this rate of change will *increase*, not decrease.

But now the important question is, How do you and I—how do all of us—deal with this change? We live in a computerized society and, whether we like it or not, it is going to become more and more computerized. Let's take a look at what this can mean to us—how all this change will affect us.

THE IMPACT ON SOCIETY

Part of the reason that the impact of computers on society is so great is the fact that computers are getting smaller, cheaper, faster, and more reliable. Already they are an indispensable way of life. They are all pervasive; i.e., they have filtered into almost every aspect of our lives, and the only safe assumption is that they will continue to do so at an even greater rate in the future.

In 1951, about 30 years ago, the first general-purpose computer was installed by the Bureau of Census. This time period corresponds to the life maturation cycle of today's adults. Thus, one whole generation of Americans has been raised in a computer environment. The psychological impact of this fact is of enormous importance because ever-increasing numbers of us are thinking in terms of computers.

How are we using computers? A better question would be to ask how are we *not* using them. Through technology we have been able to put all the functioning parts of a computer onto a single silicon chip that is smaller than a thumbnail. When this chip and its related components are installed in your car's carburetion system, you have what we call a "smart" or "intelligent" device (Figures 1.1 and 1.2).

This same technology has given us "smart" sewing machines where the press of a button determines the stitch pattern that will be sewn; low-price computer video games; hand-held devices that play chess with us (and may win more often than not); electronic typewriters that correct spelling mistakes before reproducing the letter—the list is endless.

For example, Figure 1.3 shows an electronic flash subassembly for a Eastman Kodak camera. The device is equipped with a light-sensitive integrated-circuit chip and preprogrammed intelligence. It automat-

FIGURE 1.1
Computer on a chip.

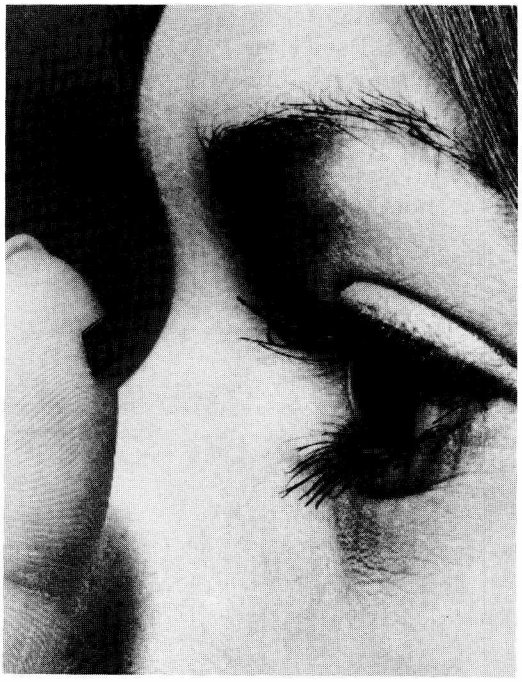


FIGURE 1.2
Computerized engine control.