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computers and data processing

*H.L. Capron
Brian K. Williams*



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*Dedicated to my children, Sylvia and Kirk,
for whom the computer will be no stranger.*
—B. K. W.

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preface

The Purpose of This Book

For the rest of their lives, your students will live in the Computer Age. Whatever careers they choose, therefore, their futures depend on knowing something—perhaps knowing a great deal—about computers and data processing. To learn what computers do and how they affect society and their lives, to be able to find their way between the rosy and the dismal forecasts about computer technology, students need to achieve some semblance of computer literacy. That is a major purpose of this book: to begin to help them become computer literate.

This book was designed as a textbook for an introductory course in computers and data processing, but it will also be of interest to anyone who wants to learn about computers. Whether your students are in the course as majors in business or a computer-related field or are there as general education students, you will find this book suitable. We have tried to present a complete, substantive discussion of computers and data processing, yet avoid a heavy technical treatment. Our purpose is not to overindulge in numbers and small details, most of which are made obsolete anyway by fast-moving technological changes. Our purpose, rather, is to show the breadth, depth, and fascination—in a word, the excitement—of computers.

Why Adopt This Book?

There are five reasons why we urge you to adopt this book:

1. Instructors provided input to the book's content. Before we wrote this book, our publisher sent out more than 3,000 detailed questionnaires to data processing instructors all over the country in all kinds of academic institutions. We also invited instructors to participate in discussion panels to consider important topics for inclusion in the book. Finally, we asked a wide variety of people to review the manuscript. The resulting book, we believe, reflects the most current needs and preferences of instructors and students nationwide. For instance, you will find appropriate coverage of up-to-date programming methods, data base systems, distributed data processing, microcomputers, computer careers, and other areas our respondents urged us to include.

2. We have used state-of-the-art manuscript and book production techniques to assure that our book is as up to date and technically accurate as possible. Every new issue of the computer and data processing trade press seems to bring news of developments that the author of an introductory text wishes could be included. Aware of this difficulty, our publisher put the book on a special production schedule using state-of-the-art tools for rapid and accurate results. Word processing, interfaced with computerized typesetting, enabled us to include fast-breaking late developments and reduce errors. Indeed, writing and production *together* took just 15 months—about one-third of the usual time!

3. We offer distinctive coverage. This text covers subjects offered in part in some books but not, we think, all in one book; for example, structured programming, data communications and teleprocessing, personal computers, word processing, operating systems, robotics, data bases, management information systems, security and privacy, and computer and data processing careers. We also present, in Appendix A, enough material for a complete mini-course in BASIC.

4. We have tried to write with liveliness and style. There is no reason, we feel, why a textbook cannot have some sort of impact on people's lives for reasons other than "required reading." We want students to enjoy reading this book. Thus, we have tried to write in an engaging, conversational style and to offer information in easily consumable, "bite-sized" amounts. We have also used many journalistic devices to hold readers' interest, and we have taken pains to tell readers where they are headed and the meaning of what they are reading.

5. We have included an extensive and varied assortment of examples and applications that stress human interaction with computers. Because computers and data processing have permeated life in the twentieth century, we have shown applications and examples not only in business, science, and engineering but also in the arts, farming, and law. We have shown computers being used not only as serious research and organizational tools, but also for sometimes fanciful and entertaining purposes. Throughout the book we have shown not only how computers work but also the impact they have on our lives. And we have tried to present these applications in the most effective, dramatic ways:

- **Through the use of "galleries."** Color photographs grouped in themes, or "galleries," vividly illustrate particular subjects, such as the uses of computers or what it is like to work for a computer manufacturer. (See page xv for details about the galleries.)

- **Through margin notes.** The immediacy and pervasiveness of computers is often best conveyed in press accounts and similar reports. Thus, we have included many excerpts in the margins of our book from a wide range of periodicals. (See the Detailed Table of Contents for a chapter-by-chapter listing of the margin notes.)
- **Through in-depth boxes.** Throughout we have presented material boxed off from the text, such as case studies, how-to tips, and analyses, in order to involve readers more deeply in the material. (See the Detailed Table of Contents for a chapter-by-chapter listing of the boxes.)
- **Through vivid in-text examples and illustrations.** Wherever we have introduced a concept, we have tried to illustrate it through examples that show the extensive involvement of the computer in modern life—and in the reader's life.

Scope and Sequence: How to Use This Book

Computers and Data Processing is divided into five parts. **Part 1, "You and Computer Literacy,"** describes the tremendous presence and influence of computers in our lives and gives a brief overview of what computer systems consist of. **Part 2, "Hardware,"** presents a one-chapter history of computers and data processing, then goes on to cover the four principal facets of a computer system: the central processor, input, output, and storage and file processing. **Part 3, "Software,"** covers some of the nonhardware side of computing, including programming, systems analysis, and the various programming languages. **Part 4, "The New Story of Computing,"** branches out to explore the computer industry, personal computers, data communication systems, management information systems, and data bases. **Part 5, "Computers and Us,"** concludes with an examination of the computer in relation to society: careers in the field, security and privacy issues, and the future of computing in the next two decades. A mini-course in BASIC and a brief coverage of number systems are presented in **Appendixes A and B**, respectively.

The chapters may be covered other than in chronological order, if that suits your particular course organization. Chapters are often modular, which is to say that to some degree they may be taken out of sequence and read independently of other chapters. The history chapter (Chapter 3), for example, may be taught at any time. For instructors who wish to teach programming early in their course, we have written Chapter 8 so that it may be taught immediately after Chapter 2. We recommend that Appendix A on BASIC be taught

only after Chapter 8 is covered. Chapters 9 through 19 may all be taught out of order; also, any of these chapters may be omitted without loss of continuity. These chapters are meant only as *brief* introductions to their respective subjects.

Detailed course outlines and further discussion of chapter interdependence may be found in the Instructor's Guide supplement available from our publisher.

In-Text Learning Aids

This book includes several features that help the students grasp the material:

In This Chapter A preview appears above the title of each new chapter, which helps to orient the reader by presenting a brief list of the main topics to follow.

Summary and Key Terms This section, which appears at the end of each chapter, is especially complete, and we think it is a valuable study aid, particularly for reviewing material before examinations. All material covered in the chapter is summarized in very specific terms. In addition, this section lists key terms in boldface type; these are the same key terms that appeared in boldface throughout the text.

Review The questions that appear at the end of each chapter are designed for self-testing before examinations. They may also be used for group discussion.

Suggested Readings Most chapters include a list of appropriate books for those who want to expand their knowledge. Many readings are suitable for "extra credit" or other such projects.

Glossary/Index The Glossary/Index at the back of the book provides a concise definition of each key term. It also refers to appropriate discussions of these terms and other key concepts in the text. We have tried to make this index as complete and detailed as possible.

Supplements

Our supplements package offers a complete system of instruction that is sensitive to the needs of part-time instructors and teaching assistants as well as full-time instructors.

Guide for Instructors

To help the instructor, particularly the part-time instructor and teaching assistant, the *Guide for Instructors* by H. L. Capron offers many practical suggestions for using this textbook in the classroom. In addition to alternative schedules for quarter and semester courses, the guide includes for each chapter in the text:

- Learning objectives
- Chapter overview
- Suggested materials, such as transparency masters keyed into the text
- Glossary terms
- Lecture outline, with suggestions for time priorities for each topic
- Chapter enhancements, such as additional material similar to the margin notes and boxed material in the textbook.

Guide for Students

The *Guide for Students* is available for students interested in more directed and intensive study of the textbook's content. More than the usual student guide, it includes what we believe to be *useful* aids for study. For each chapter we include:

- Learning Objectives
- Chapter Outline
- Chapter Digest—a few paragraphs summarizing the chapter
- True/False Chapter Test
- Multiple Choice Chapter Test
- Matching Chapter Test
- Fill-in Chapter Test
- Answers to Chapter Tests

This guide was written by Raymond Fanselau, of American River College.

Guide for Testing

The *Guide for Testing* includes more than 3500 items in the following test formats:

- True/False
- Multiple Choice
- Matching
- Sentence Completion
- Essay

A computerized testing service is available from our publisher for all adopters. Contact your Benjamin/Cummings representative.

Guide to Transparency Masters

The *Guide to Transparency Masters* contains transparency masters of three types:

- Key graphics that appear in the textbook
- Adaptations of the textbook graphics
- Totally new art that does not appear in the textbook

All the transparency masters, including the ones that also appear in the textbook, have been drawn with thick lines and large-sized type for highly readable projection.

Guide to Videotapes, Films, and Subscriptions

The *Guide to Videotapes, Films, and Subscriptions* has been compiled from more than 200 suppliers of videotapes, films, and film strips, and many periodical publishers. The audiovisuals are keyed to the part number of the textbook for which they are most appropriate.

Acknowledgments

We are grateful to a great many hardware and software companies and computer and data processing users (listed on pages 501–502), without whose generosity we could not have provided the pictorial treatment we have attempted. Our thanks also to those who were kind enough to grant permission to reprint excerpts from previously published material (listed on page 497).

More than 400 instructors responded to our questionnaire, participated in discussion groups, or reviewed the material in manuscript form. We are very grateful for their suggestions. We are especially appreciative of the efforts of those who were consultants and reviewers. In particular, we want to single out—and profusely thank—Marilyn Bohl of IBM. Her forceful and voluminous comments on the manuscript unquestionably made a special contribution to the quality of the book and to student learning.

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We hope **Computers and Data Processing** will be useful to both you and your students. Any comments, favorable or unfavorable, will be welcomed and will be read with careful attention. Write to us in care of the publisher.

H. L. Capron
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