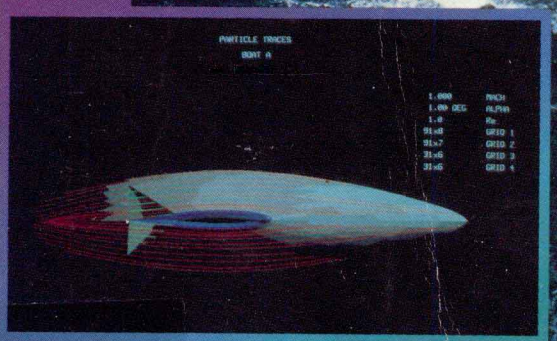
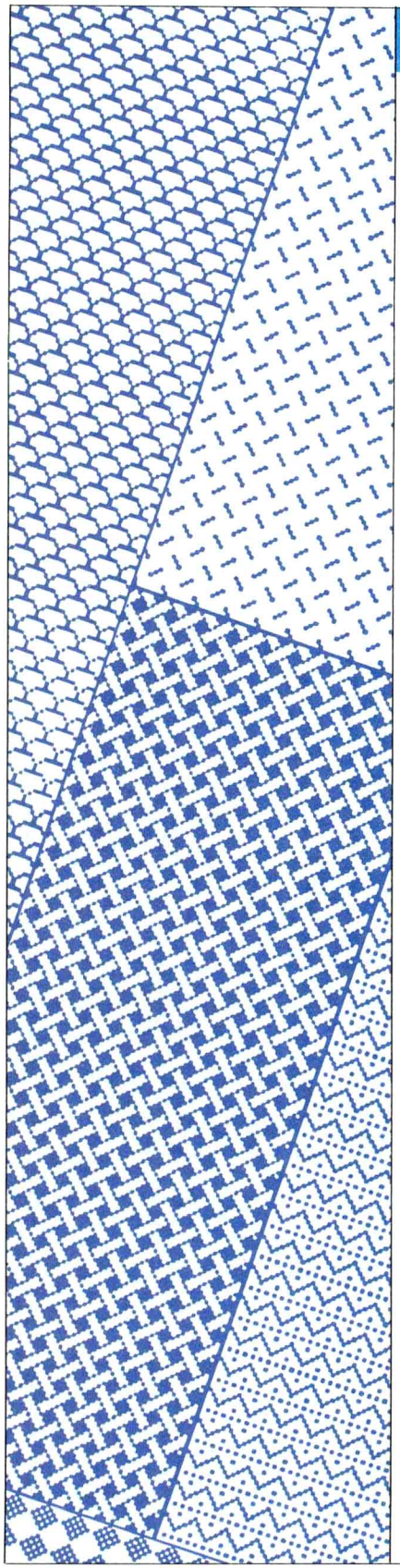
COMPUTERS & APPLICATIONS



Second Edition



Second Edition

COMPUTERS & APPLICATIONS

AN INTRODUCTION TO DATA PROCESSING

Daniel L. Slotnick

Evan M. Butterfield
George Washington University

Ernest S. Colantonio
University of Illinois

Daniel J. Kopetzky
Supercomputing Research Center

Joan K. Slotnick

D. C. HEATH AND COMPANY

Lexington, Massachusetts Toronto

To the memory of Dan Slotnick.

Acquisitions Editor: Peter C. Gordon
Developmental Editor: Katherine T. Sheehan
Production Editor: Jill E. Hobbs
Designer: Cornelia L. Boynton
Production Coordinator: Mike O'Dea
Photo Researcher: Martha L. Shethar
Text Permissions Editor: Margaret Roll
Cover: Sharon Green/The Stock Market
Inset: Cray Research, Inc.

Published simultaneously in Canada.

Printed in the United States of America.

International Standard Book Number: 0-669-19938-9

Library of Congress Catalog Card Number: 88-82326

10 9 8 7 6 5 4 3 2 1

Preface

The second edition of *Computers and Applications* is designed to reflect the changes in the technology and use of computer systems since the publication of the first edition. These changes in the software, hardware, and applications of computer systems are exciting. The end user can revel in the power, flexibility, and productivity gains made available at an increasingly modest price by these new systems.

It is for the end-user that this book was written. As with the first edition, the approach remains one of learning and application. This practical approach will appeal to a broad spectrum of students. Readers of this text may be enhancing their career prospects, looking for ways to utilize their personal computer systems, fulfilling a requirement, or simply satisfying their curiosity. Whatever the readers' goals, our goal in writing this book was to present enough detail about the actual working of computer system hardware and software and their uses to dispel the mystery without overwhelming readers with more technical detail than is needed for competency. Competency is a first step to confidence and enthusiasm for the subject. We hope that readers will enjoy learning information from this text as well as developing skills useful in academic, home, or business endeavors.

Text Content and Organization

This text has been carefully designed for use in any first course in computer data processing or for any individual who is learning more about computers. It meets or exceeds most of the requirements for an introductory course as proposed by the Data Processing Management Association (DPMA); the American Assembly of Collegiate Schools of Business (AACSB); and the Association for Computing Machinery (ACM). It is also intended to prepare students in two-year colleges who plan to transfer to curricula in four-year institutions, as well as those taking courses offered at four-year schools.

Variety As evidenced by the table of contents, the text lends itself to a wide range of courses, from those that deal only lightly with programming to hands-on applications courses and more traditional surveys, from the business-oriented to the technical. Note, too, that the materials in the text require neither computer skills nor mathematical skills beyond high school algebra.

Flexibility As with the previous edition, the text has been organized for maximum flexibility. Its 18 chapters are divided into six modules that can, with some exceptions, be taught in any order. We recommend covering Part 1, Overview (Chapters 1 and 2) first. After that, Part 2, Hardware (Chapters 3 through 6); Part 3, Software (Chapters 7 through 10); Part 4, Systems (Chapters 11 through 13); Part 5, Applications (Chapters 14 through 16); and Part 6, Implications (Chapters 17 and 18) can be read in any order. Those teaching the course in combination with an applications software or programming laboratory may wish to cover Part 3 earlier.

Text Learning Aids

Computers and Applications, second edition combines a relaxed writing style with an outstanding array of pedagogical features to facilitate understanding and encourage reader enthusiasm.

Chapter Preview and Review Materials Since we believe that repetition of key ideas in preview and review materials helps a student to learn more effectively and to study for exams, we have structured each chapter around such materials. Each chapter opens with *In This Chapter,* a preview outline of the chapter's headings annotated with easily remembered study phrases. These study phrases are then repeated for guided study in the text margins. Finally, the chapter *Summary* is structured for review around the same outline of chapter headings.

Computer Use and Users Each chapter opens with a *Focus* on a real-world situation closely related to the chapter content. These selections have been chosen from popular computer magazines and from other nonfiction views of the computer world. They are designed to give the reader a taste of the real, if somewhat eccentric, world of the computer literate.

Boxed Features Chapters include *Issues in Technology* boxes within the running text to encourage the student to pause and reflect, and to take a stand on an ethical question related to the chapter content.

Case Studies At the end of 12 chapters of the text are vignettes where applications software is used to tie the text concepts to a real world application. These *A Closer Look* features are a natural extension of the theme of the text.

Readability The text's engaging writing style ensures that concepts are explained clearly and simply. To ensure accessibility for students, the reading level has been carefully monitored by the editors, course instructors and reviewers.

Design and Illustrations Students prefer a textbook that will hold their interest. Since today's students are part of a visually-oriented society, we have created a full-color design that reflects the excitement and dynamism of the field. We have made a studied effort to illustrate the second edition liberally with actual screen illustrations that are both realistic and instructive.

End-of-Chapter Materials A carefully graded set of chapter review materials is provided at the end of each chapter. First, *Computer Concepts* review vocabulary, providing page references to the chapter's boldfaced glossary terms. From 15 to 20 *Review Questions* follow, providing a rote review of the chapter's major topics and paralleling the chapter outline. New to this edition are *True or False* and *Multiple Choice* questions designed specifically to help the students prepare for examinations. *A Sharper Focus* questions challenge students to apply what they have learned. Finally, special *Projects* encourage students to stretch their learning beyond the chapter content.

Career Guidance Because many readers will be interested in job opportunities in the computer industry, Appendix B, Careers in Technology, provides a number of job descriptions, qualifications, and outlooks, as well as suggestions for career paths and some basic help on résumé preparation.

Glossary and Index A complete glossary includes clear definitions for the boldfaced terms in the text. In addition, an extensive index provides a handy reference for both student and instructor.

Changes to this Edition

Many of you who used the first edition of this text will note that substantial changes have been made to this edition. These changes reflect the changing technology, use, and availability of smaller, yet more powerful, systems. These changes also reflect the increasing influence of end-users in determining their own information and equipment needs.

Microcomputer-Integrated The reader will notice that the material in Part 5 of the first edition, called "The Miraculous Micro," is now integrated throughout all chapters and is greatly expanded. The text properly treats all aspects of both large and small systems in parallel.

Text and Chapters Consolidated We have resisted the temptation common in text revision to expand the length without concern for the students or the instructor. Instead, the number of chapters has been reduced from 23 to 18, with two appendices. This decision was made for two reasons. First, 18 chapters fit the length of most courses better. Second, students' increasing familiarity and exposure to computers makes some of the topics previously included of less critical import. The more manageable length now matches the ideal recommended by users and reviewers for a text of this type.

Other changes that may be of particular interest are the following. Every effort has been made to include the most up-to-date information possible.

Chapter 3: The CPU and Memory
Material on data representation moved to the appendix.
Expanded coverage of workstations.
Microcomputer perspective expanded.

Chapter 4: Input and Output
Now approached from a device viewpoint rather than a process viewpoint.
Separate first edition chapters 4 and 6 (Input and Output) consolidated.

Chapter 5: Secondary Storage and File Organization
More emphasis on disk storage.

Chapter 6: Data Communication
Expanded coverage of LANs and WANs.

Chapter 7: Program Development
Increased emphasis on pseudocode.

Chapter 8: Programming Languages
New coverage of Modula-2.

Chapter 9: Application Packages
Expanded coverage of all major applications, including word processing, spreadsheets, data bases, graphics, and communications.

Chapter 10: Operating Systems
New coverage of OS/2 and expanded material on UNIX.

Chapter 12: Data Base Systems
New material on SQL.

Chapter 14: Computers in the Office
New coverage of desktop publishing.

Chapter 17: Privacy, Security, and Other Concerns
New coverage of viruses and vaccines.

BASIC and Pascal Programming Texts Users and reviewers suggested that no appendix can give adequate coverage of a programming language. These appendices can also add to the length and expense of a book. In practice, it appears that most instructors who teach programming have their students purchase a separate text. Therefore, we have deleted the BASIC appendix, offering instead separate—and more complete—texts on BASIC and Pascal to introduce students to these programming languages.

Applications Software In the first edition, application software packages were covered in one chapter (Chapter 10). Coverage of these very powerful tools has been radically expanded. In addition to a full chapter of coverage (Chapter 9) in the second edition, application software case studies called *A Closer Look* have been added. These features offer realistic demonstrations of some of today's most popular application packages. They include: Using CROSSTALK (Chapter 6), Prototyping (Chapter 7), Applications Generators (Chapter 8), Lotus 1-2-3 (Chapter 9), MS-DOS (Chapter 10), Microsoft Project (Chapter 11), dBASE III PLUS (Chapter 12), VP-Expert (Chapter 13), and WordPerfect 5.0 (Chapter 14).

More Applications Software for Your Laboratory Today's students must be conversant with a wide variety of applications and many packages in order to be fully computer literate. Additionally, the school and the instructor, faced with limited resources, may not always have the variety of software tools the interested student may desire. Therefore, in order to allow maximum flexibility, we are also offering inexpensive laboratory supplements that cover 14 commonly used software tools.

Supplements

An extensive supplements package is offered with the text to help both student and instructor cover the material. Each supplement has been prepared by an experienced teacher/author.

Software Supplements The *Heath Software Guide Series* includes the following student software laboratory manuals, most available with software:

Word Processing

- Using WordStar 5
- Using WordPerfect 5.0
- Using PC-Write
- Using PC-Type+

Spreadsheet

- Using SuperCalc5
- Using Lotus 1-2-3
- Using VP-Planner Plus
- Using PC-Calc+

Expert Systems

- Using VP-Expert

Data Base

- Using PC-File+
- Using dBASE III PLUS

Communications

- Using PC-Dial

Macintosh Software

- Using Macintosh Software

Operating Systems

- Using PC/MS-DOS and OS/2

These manuals provide the student with instructions, examples, and exercises to get them started using microcomputers quickly and confidently. Each begins with a DOS or Macintosh Operating System tutorial.

Study Guide Prepared by Fred L. Head of North Orange County Community College District, and Richard E. Morel and Beth H. Morel, the *Study Guide* has been designed as a thorough review and self-test of text concepts and information. Included for each chapter are:

- Learning objectives written especially for the guide.
- *Making the Chapter Work:* Learning and study tips for making the most of each chapter.
- *Chapter Review:* A summary of the chapter organized by text headings and written from a new angle.
- A variety of exercises, including a true-false pretest and a multiple-choice posttest. Each chapter has an average of 118 exercises.

Instructor's Supplements The supplements designed for instructors include an *Instructor's Guide* with transparency masters, a *Test Item File, HeathTest+* (a computerized test generator), and *Transparencies.*

- **Instructor's Guide.** Prepared by Marilyn Meyers of Fresno City College, the *Instructor's Guide* includes a wealth of materials for busy instructors. For each chapter, we provide learning objectives, a chapter overview, annotated lecture outlines, answers to text questions, additional classroom and lecture materials, and transparency masters.
- **Test Item File.** A new *Test Item File* developed by Richard E. Morel includes approximately 3000 test questions: 40% true-false, 50% multiple choice, and 10% fill-in.
- **HeathTest+.** A computerized test generator for microcomputers is also available. Instructors can produce chapter tests, mid-terms, and final exams easily and accurately. The instructor can also edit existing questions or add new ones as desired, or preview questions on screen and add them to the test with a single keystroke.
- **Transparencies.** The transparency package includes 50 transparency acetates.

Acknowledgments

The number of individuals contributing to a textbook like this is, of course, countless. We do want to give special thanks to C. Brian Honess of the University of South Carolina for his significant contributions to the end-of-chapter projects and to Gayle M. Ross of Copiah-Lincoln Junior College for her ideas.

We would also like to thank our colleagues who reviewed the second edition manuscript: Mike Brown, Clemson University; Anthony C. Connor, Clemson University; Louise Darcy, Texas A & M University; Henry Etlinger, Rochester Institute of Technology; Dennis Guster, St. Louis Community College at Meramec; Grace Hertlein, California State University, Chico; Betty Jehn, University of Dayton; Antonio M. Lopez, Jr., Loyola University; Donna McClelland, Montana State University; Marilyn Wertheimer Meyers, Fresno City College; Mike Michaelson, Palomar College; Randy Molmen, University of North Dakota; Marlon Sampson, Southeast Community College; Paul Ross, Millersville University; Ken Walter, Weber State College; and Ron Willard, Bowling Green-Firelands.

Finally we would like to thank the hundreds of instructors and thousands of students who used the first edition. Many of your comments have been incorporated in this edition to create a better, more exciting book.

About The Authors

Daniel L. Slotnick

Before his death in 1985, Dr. Daniel L. Slotnick was a Professor of Computer Science at the University of Illinois at Urbana-Champaign. His early academic experience included participation in the development of the IAS machine, the earliest general purpose computer, from 1952 to 1954.

Evan M. Butterfield

A professional writer and editor, Evan Butterfield brings to *Computers and Applications* a strong background in both writing and teaching. He is currently teaching writing at George Washington University.

Ernest S. Colantonio

Ernest Colantonio brings combined teaching, technical, and writing skills to this textbook. Currently a professional textbook author, he also works as a consultant and programmer for the University of Illinois Department of Psychology Instructional Computer Laboratory.

Daniel J. Kopetzky

Daniel Kopetzky is currently employed at the Supercomputing Research Center, a major institution in the research, development, and applications of supercomputers.

Joan K. Slotnick

Joan Slotnick, an experienced textbook author and project coordinator of this text.

Brief Contents

Contents