Second Edition

COMPUTERS TODAY

Donald H. Sanders

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Educational Consultant

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About the Author

DONALD H. SANDERS is the author of six books about computers—their uses and their impact—spanning 25 years. His books have been widely used by training programs in industry and government as well as by colleges and universities.

After receiving degrees from Texas A & M University and the University of Arkansas, Dr. Sanders was a professor at the University of Texas at Arlington, at Memphis State University, and at Texas Christian University. In addition to his books, Dr. Sanders has contributed articles to journals such as *Data Management, Automation, Banking, Journal of Small Business Management, Journal of Retailing,* and *Advanced Management Journal.* He has also encouraged his graduate students to contribute computer-related articles to national periodicals, and over 70 of these articles have been published. Dr. Sanders chairs the "Computers and Data Processing" Subject Examination Committee, CLEP Program, College Entrance Examination Board, Princeton, N.J.

Preface

Remember . . . when you thought a silicon chip was a new kind of snack food? Does it seem like only yesterday? It was.

Inc. magazine, April 1984.

In a figurative sense, it *was* only yesterday that components such as silicon chips were first introduced into strange machines called computers. But now it's today, and the pace from yesterday to today has been frenetic. In Lewis Carroll's *Through the Looking Glass,* Alice met the Red Queen in the garden. "Faster! faster!" the Queen urged, but "however fast they went they never seemed to pass anything." Finally, Alice observed that "in our country, . . . you'd generally get to somewhere else—if you ran very fast for a long time as we've been doing." "A slow sort of country!" replied the Queen. "Now, here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that."

Computer scientists and users have been running many times faster than that in the last few years, and we've now entered what has been termed the Information Age or the Age of the Computer. Computers, like automobiles and electricity, are now exerting a daily—and rapidly growing—influence on all of us. Thus, an essential outcome of the educational process today must be computer literacy. Computer literacy is "knowing" computers. It's knowing what they are, what they can and cannot do, how they are put to work, and how their use in homes, schools, and workplaces can affect society. It's vital, of course, to continue to educate the many thousands of people who will become computer specialists. And this book certainly contains the information required to introduce these future specialists to the subject of computers and data processing. But computer literacy is now needed by *all* students so that they will not be intimidated by daily life, but will instead feel a sense of belonging in a computer-rich society.

THE DEVELOPMENT AND PURPOSE OF THIS EDITION

To paraphrase the Red Queen, it takes a significant effort or "run" in today's computing environment just to keep a text in the same relative place. But to move forward and make improvements, an author and publisher may need to "run at least twice as fast as that."

Work on the *development* of this edition of *Computers Today* began almost immediately with the release of the first edition. Research was carried out and plans were made to produce a new text—one that would not only move forward with the technology, but would also be improved in other ways. For example, the new chapter on personal computers has been acclaimed by reviewers for the thorough way it considers hardware capabilities and software packages. But personal computer concepts are also integrated throughout the text, and an extensive new art program featuring the use of personal computer systems has been created. Many other improvements are detailed later in this Preface. These improvements were required by the technology, demanded by the title of this book, and expected by its readers. The Red Queen would understand the need to thoroughly update a best-selling text in just two years!

Computers Today is designed for use in the introductory

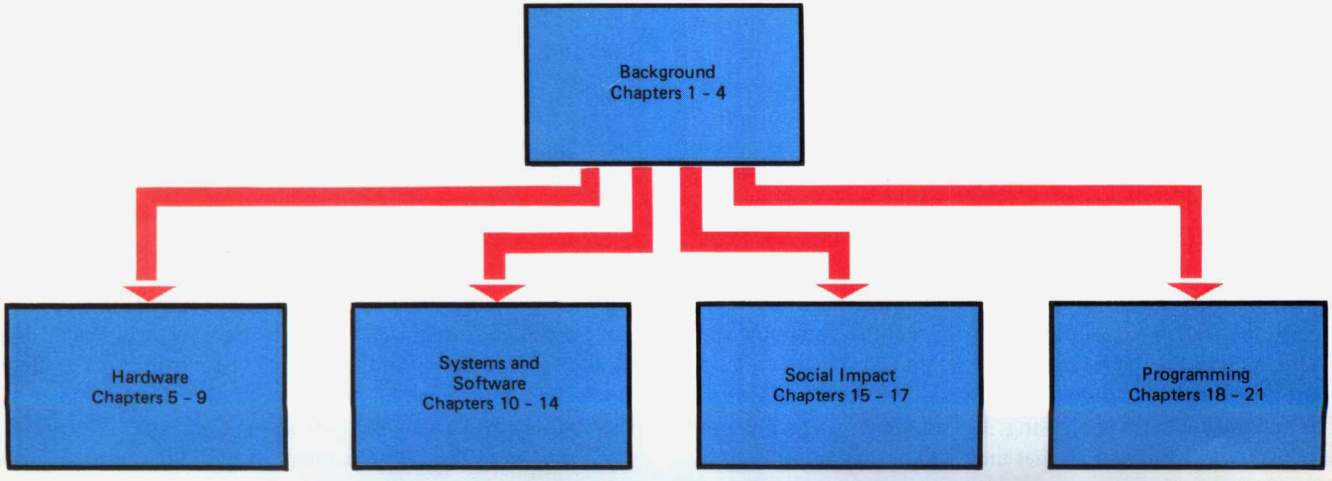
one-term course in computer data processing that's now taught throughout the world. Thus, it's suitable for computer literacy courses, for technically oriented programming courses, and for courses that attempt to strike a balance. This is true because the *purpose* of this book is to acquaint readers with *all four* of the following related areas of knowledge required for computer literacy:

1. ***Computers themselves.*** The organization, function, capabilities, and limitations of the equipment in modern computer systems of *all sizes* (personal, mini, mainframe, and supercomputer) are presented.
2. ***What computers do.*** Common data processing uses or applications of computers in today's society are treated. The focus is generally on business data processing applications, but many of the selected applications are also processed by not-for-profit organizations such as governments, hospitals, and schools.
3. ***How computers are put to work.*** The techniques used in the analysis and design of information systems are explained, and the procedures that are used to prepare programs are outlined. Programs for a number of the common data processing applications that have been identified earlier are then coded using the constructs of the BASIC language.
4. ***The social impact of computers at work.*** The ways in which people and organizations may be affected by present and future computer applications are presented.

FLEXIBLE ORGANIZATION AND INTEGRATED PROGRAMMING EXAMPLES

Two popular features unique to the first edition have been carried over to this revision. The *first* of these is the *modular organization* that permits the book to meet the needs of courses with different subject emphases and with different presentation sequences. This flexibility is possible because *Computers Today* is organized into five modules. An overview of the four areas of knowledge mentioned above is presented in the four chapters of the first Background Module. Students should read these chapters (1 through 4) in sequence, but once they have completed them, they can turn *immediately to any of the remaining modules* to meet whatever sequence and depth requirements are needed in a particular course (see the chart below). For example, after completing Chapter 4 they can then go directly to the Programming Module chapters (18 through 21) that are conveniently placed in this edition at the back of the book. Or, readers may be more motivated to study computer data processing if some time is spent on the Social Impact chapters (15 through 17) after Chapter 4 is completed. Of course, it's also logical to consider computing equipment in more detail (Chapters 5 through 9) and then move to the Systems and Software Module (Chapters 10 through 14) prior to studying programming concepts.

But you get the idea: *Computers Today* gives you the flexibility to choose the sequence that is best for your needs. It also permits you to vary the depth of the material covered in a one-term course. Although it's unlikely that you'll be



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able to cover all 21 chapters in a single term, you'll have the freedom to select those topics that are most appropriate for your needs.

A *second* unique feature of *Computers Today* retained in this edition is the use of *integrated programming examples*. This innovative approach introduces readers to the methodology and techniques of computer programming. The programming examples used in most texts involve a series of unrelated data processing applications at a number of separate organizations. Since readers are often unfamiliar with common data processing systems and with the interrelated nature of the outputs produced by those systems, these examples are often viewed as random and boring exercises. To counter this problem, an enterprise created by two college students is presented and discussed in the early chapters. Some of the information needs of this business—R-K Enterprises—are outlined in a number of applications examples in Chapter 2. This theme of an "actual" business with realistic interrelated data processing needs is then carried to Chapters 18 through 21 in the Programming Module. Readers will see in Chapters 18 and 20 how the R-K Enterprises' applications presented in Chapter 2 are analyzed, flowcharted, and coded in the BASIC language. Chapter 20 provides sufficient material so that students can develop BASIC programming skills at a fundamental level. But if further development of programming skills is an objective of the course, additional R-K Enterprises' applications are then analyzed, flowcharted, and coded in an all-new Chapter 21 that explains more advanced features of the BASIC language. And *over two-dozen new end-of-chapter flowcharting/programming problems* built around R-K Enterprises' processing needs have been created for this edition. In fact, there's now a total of *over 50* BASIC programs tied to the R-K theme. Creating a realistic enterprise that students can identify with, discussing a number of the most common applications that such a business must process, and then carrying these interrelated applications through the analysis, flowcharting, and BASIC coding steps is unique to *Computers Today*.

ADDITIONAL REVISION FEATURES AND AIDS TO LEARNING

Included among the numerous revision features and learning aids found in this edition are:

- A careful reorganization of chapters and modules has been carried out to meet changing conditions. For example, the chapters dealing with data communications and word processing/electronic mail systems have been moved to a restructured Systems and Software Module. The Social Impact Module has been repositioned, and, as noted earlier, the Programming Module is located at the back of the book.
- Hundreds of *full-color* photographs, drawings, and illustrations are provided, and a high percentage of these are new. For example, new photo galleries are presented in a number of chapters (e.g., 1, 8, 9), new drawings featuring the use of a personal computer system to process R-K Enterprises' applications are found in Chapter 2, and new art depicting the spreadsheet, graphic, word processing, and data base capabilities of integrated software packages are found in Chapter 4 and elsewhere.
- Although there are still 21 chapters in the book, some earlier material has been condensed, reorganized, and repositioned to make room for *four* new chapter titles. These new chapters are "Personal Computers: The Micro Miracles" (8), "Minis, Mainframes, and 'Monsters'" (9), "System Software Packages: Operating Systems and Data Base Management Systems" (13), and "More about BASIC" (21).
- A wealth of new and up-to-the-minute material has been added on dozens of topics including integrated software packages, primary and secondary storage components, I/O devices, the selection of personal computer applications programs, the international race to develop "fifth-generation" supercomputers, telecommuting systems, voice mail, local-area and digital PBX networks, expert systems, organizational information centers, micro-to-mainframe linkages, artificial intelligence research—this list could go on and on!
- Most of the following aids to learning are either all new or substantially revised: (1) The *vignettes* used to open a chapter and highlight some aspect of its contents; (2) the *boxed inserts* included in each chapter to provide applications, cases, and items of interest to support chapter material and stimulate discussions; (3) the *Closer Look* reading following each chapter that provides additional information on selected topics.

- A new *Projects to Look Into* section has been added at the end of most chapters to suggest student research topics that are based on material presented in the chapters. Some projects may be completed at a library, while others require visits to computer stores and/or computer-using organizations.
- Learning aids carried over from the first edition include *Chapter Outlines, Looking Ahead learning objectives, Feedback and Review sections* with answers, *Looking Back chapter summaries,* listings of *Key Terms and Concepts, Topics for Review and Discussion,* and a *Glossary.*

SUPPLEMENTS FOR THIS EDITION

Numerous supplements have been prepared to make the *Computers Today* package a complete teaching/learning tool. They include:

- ***Inside Computers Today.*** This student Study Guide is designed to provide extensive self-tests for each corresponding chapter in *Computers Today.* Each Study Guide chapter contains learning objectives; a chapter overview and summary; and varied self-test sections including key term matching, multiple choice, true or false, and completion exercises. Answers for all exercises are included in the Study Guide. *Inside Computers Today* is an instrument planned to reinforce and integrate text concepts. It is designed for success—no "tricky" questions have been included intentionally. Successfully completing the Study Guide exercises should increase the confidence of all levels of students. It is a straightforward, no-frills, self-testing implement written for students, not for teachers.
- ***The Computers Today Software Supplement.*** This new applications software is designed to give students hands-on experience with an integrated software package. Using examples from R-K Enterprises, students learn word processing, database management, spreadsheeting, and graphics. In addition to the student disks, McGraw-Hill will provide adopters with an instructor's gradebook disk. Features of the gradebook include checking attendance and computing grades.
- ***Instructor's Resource Kit.*** The components of this Kit provide instructors with extensive support materials for teaching a course with *Computers Today.* The following supplements are included:

1. ***Instructor's Manual.*** Beyond supplying resource material for each chapter of the text, this Manual contains FORTRAN, COBOL, and Pascal programs dealing with R-K Enterprises applications. (The logic of each program is analyzed in text Chapter 18.) These programs use the same input data and produce the same output results as the BASIC programs discussed in Chapter 20 of the text. The Manual also supplies transparency masters and a bibliography of selected references.
2. ***Overhead Transparencies.*** A set of 64 color transparencies serves as a visual classroom aid which can be used to further explain text concepts.
3. ***Test Bank.*** This completely reworked set of more than 2,600 questions covers the important ideas and definitions in *Computers Today.* For your convenience the test bank is available for use with the computer. *MicroExaminer* allows you to generate tests using your Apple IIc or II+, IBM PC, or TRS 80 microcomputer. Questions can be scrambled into two versions, allowing you to create alternative exams for multiple sections of the same course. You also have the option of adding your own questions to the test bank. *The EXAMINER System* contains a magnetic tape which can be installed in your computer center, and offers the same features as *MicroExaminer.*

- ***Structured COBOL: A Beginner's Guide.*** This revised manual is intended to be a beginner's guide to solving and coding COBOL programs. The revision covers most of the basic formats and commands recommended by the American National Standards Institute (ANSI), with modifications for the beginning student. The authors of this manual are Frederick R. Prisco and Charles J. McNerney, both of Bergen Community College.
- ***Pascal Supplement.*** This supplement to accompany *Computers Today* parallels wherever possible the material presented in text chapters 20 (Programming with BASIC) and 21 (More about BASIC). All the

programs appearing in these chapters are rewritten in Pascal. The author of this manual is Philip Drummond of Queens College.

- ***Slide Package.*** This set of 36 color slides will give your students a visual orientation to the course. This package contains new photographs, many not found in the text, that introduce your students to computers.
- ***BASICard.*** This convenient pocket-sized card enables students to have important BASIC commands and codes always at their fingertips. A great aid for student programming.

ACKNOWLEDGMENTS

It's customary for authors to conclude a preface by acknowledging the contributions and suggestions received from numerous sources. This is particularly appropriate in the case of *Computers Today* because a colorful package of this scope just doesn't happen without the input of many people.

The authorities who responded to a research study and helped reshape the content and organization of *Computers Today*, and the professionals who reviewed the manuscript and made many helpful suggestions are acknowledged separately following this Preface.

Another word of thanks must go to the equipment manufacturers, publishers, and photo agencies who furnished materials, excerpts, and photographs for this text. Their individual contributions are acknowledged in the body of the book.

The final tribute and greatest appreciation, however, is reserved for these few: to Barbara Brooks, who somehow found time in the midst of new responsibilities to turn in another incredible developmental editing job—her inspired ideas and creative talents are visible on almost every page; to Mel Haber, whose last design, you're convinced, can't be topped—and then you see his next one; to Phil Galea and Lorinda Morris, whose production and photo research efforts continue to surprise a critical author; to Ed Hanson, who efficiently manages complex projects without a hitch; to Eric Munson and Christina Mediate for their editorial support; to Rob Fry for his efforts on the supplements; to Hal Sackman for his time and efforts on the test manual; to Anne Green for her artistic talents; to Gary D. Sanders, University of Illinois, for his additional program contributions and suggestions; and to Joyce Sanders for her continuing suggestions and encouragement.

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Contents in Brief

Preface xvii

Module 1 Background 1

1 Hardware, Systems, and Software Concepts: Introduction and Impact 3
2 Computers at Work: An Overview of Applications 36
3 Putting the Computer to Work: Systems and Software Development 63
4 The Impact of Computers at Work: A Preview 77

Module 2 Hardware 95

5 Central Processor Concepts, Codes, and Components 97
6 Data Entry 129
7 Secondary Storage and Output 170
8 Personal Computers: The Micro Miracles 206
9 Minis, Mainframes, and "Monsters" 231

Module 3 Systems and Software 249

10 Data Communications Systems and Distributed Data Processing Networks 251
11 Word Processing and Electronic Mail/Message Systems 286
12 System Analysis, Design, and Implementation Considerations 305
13 System Software Packages: Operating Systems and Data Base Management Systems 333
14 Management Information Systems 357

Module 4 Social Impact 389

15 The Impact of Computers on People 391
16 The Impact of Computers on Organizations 423
17 Computers Tomorrow 452

Module 5 Programming 475

18 Programming Analysis 477
19 Preparing Computer Programs: An Overview 511
20 Programming in BASIC 542
21 More about BASIC 584

Glossary 625

Index 633

Contents

Preface xvii

Module 1 Background

Chapter 1 Hardware, Systems, and Software Concepts: Introduction and Impact 3

Looking Ahead 6

What to Expect 6
How This Book Is Organized

Introducing the Computer 8
Computer Capabilities: Speed and Accuracy
The Computer's Processing Abilities
Feedback and Review 1-1

Computer System Organization 14
The System Concept
Organization of Computer System Components
Feedback and Review 1-2

The Stored Program Concept: An Example 20
Processing the Payroll Application
Software Is the Driving Force
Feedback and Review 1-3

Some Computer System Differences 23
Size Differences
Architectural Differences

Some Computer Limitations 27
Programs Must Be Reliable
Application Logic Must Be Understood
Applications Must Be Suitable

Looking Back 28

A Closer Look 31
Our Debt to the Past: The Evolution of Data Processing

Chapter 2 Computers at Work: An Overview of Applications 36

Looking Ahead 37

Organizing Data for Computer Processing 37

What Computers Do: An Introduction to Applications 39
R-K Enterprises
An Input/Output Application: The Mailing List
Calculation Applications
Sequential and Direct-Access Processing
Feedback and Review 2-1
A Logic/Comparison Application
How They Keep Smurfs under Control
After Billing: Some Important Follow-Up Applications
A Storage and Retrieval Application: Word Processing
Feedback and Review 2-2

Looking Back 59

A Closer Look 62
An Application for a DBMS Package

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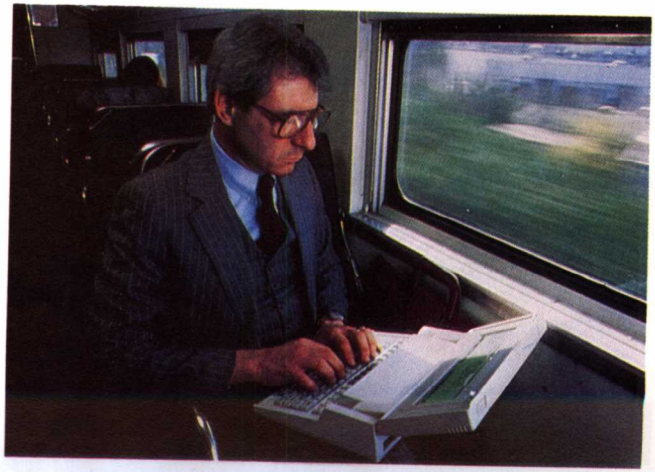

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Chapter 3 Putting the Computer to Work: Systems and Software Development 63

Looking Ahead 64
The Data Processing System: Introduction and Review 64
The Steps in a System Study 66
Step 1: Defining the Need
Step 2: System Analysis
Step 3: System Design
Software, Software Everywhere
Step 4: Programming Analysis
Step 5: Program Preparation
Step 6: Implementation and Maintenance
Feedback and Review 3-1
Looking Back 74
A Closer Look 76
IBM's Information Center

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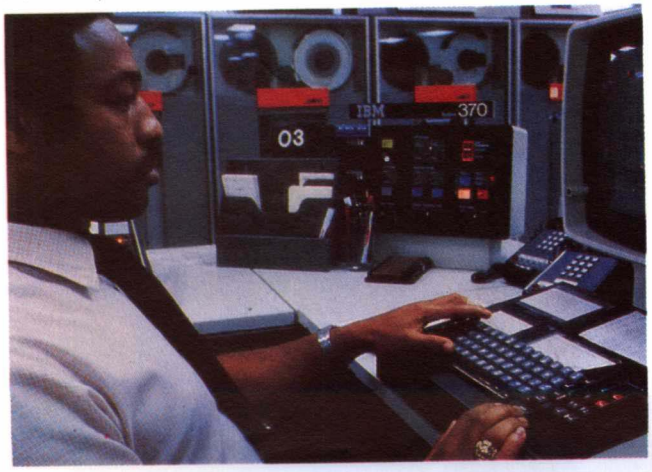

Chapter 4 The Impact of Computers at Work: A Preview 77

Looking Ahead 78
The Technological Underpinnings 78
Hardware Advances
Software Advances
Advances in Information Systems
The Impact of Computers on People 84
Positive Implications
Banking on Personal Computers
Potential Problems
The Impact of Computers on Organizations 87
Positive Implications
Potential Problems
Feedback and Review 4-1
A Recap of This Background Module 90
Looking Back 90
A Closer Look 93
The "Whatchamacallit"

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Module 2 Hardware

Chapter 5 Central Processor Concepts, Codes, and Components 97

Looking Ahead 98

How Computers Are Classified 98
- Digital, Analog, and Hybrid Computers
- Special-Purpose and General-Purpose Digital Computers

Primary Storage Concepts 101
- Storage Locations and Addresses
- Use of Storage Locations
- Capacity of Storage Locations
- Feedback and Review 5-1

Coding Data in Storage 107
- The Binary Numbering System
- Computer Codes
- Feedback and Review 5-2

Storage Components in the CPU 111
- Primary Storage Components in the Past
- Primary Storage Components in the Present
- Primary Storage Components in the Future
- Specialized Storage Elements in the CPU
- A Brief History of the EEPROM
- Feedback and Review 5-3

Executing Stored Instructions: The Arithmetic-Logic and Control Functions 117
- The Arithmetic-Logic Section
- The Control Section
- Feedback and Review 5-4

Looking Back 123

A Closer Look 126
- Silicon Compilers Ease Design of Computer Circuits

Chapter 6 Data Entry 129

Looking Ahead 130

Data Entry: Some Basic Concepts 130
- Sources of Input Data
- Data Entry Approaches
- Costs of Data Entry
- Importance of Input Accuracy
- Detecting Errors in Data Entry
- Feedback and Review 6-1

Input Media and Devices for Sequential Processing 138
- Punched Cards and Punched Paper Tape: Two Fading Media
- Magnetic Tape
- Floppy Disks
- Direct Data Entry Devices for Sequential Processing
- Feedback and Review 6-2

Data Entry Devices for Direct-Access Processing 153
- Teleprinter Terminals
- Portable Data Entry Terminals
- Point-of-Sale Terminals
- Financial Transaction Terminals
- Visual Display Terminals
- Intelligent Terminals
- Executive Workstations
- Voice Input Systems
- Talk to Your Computer
- Feedback and Review 6-3

Looking Back 165

A Closer Look 168
- Smart Card—Makes Smart Sense

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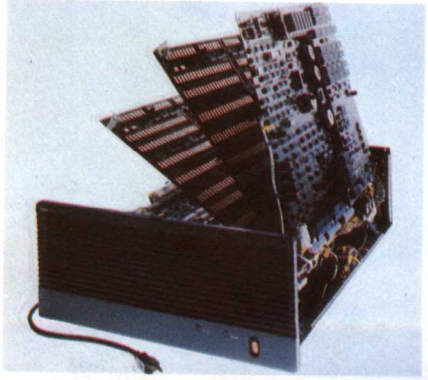

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Chapter 7 Secondary Storage and Output 170

Looking Ahead 171

The Storage Hierarchy: An Overview 172
- Elements in the Storage Hierarchy
- Storage Selection

Secondary Storage for Sequential Access 173
- Punched Paper Media Storage
- Magnetic Tape Storage
- Disk Storage for Sequential Access

Secondary Storage for Direct Access 175
- Disk Storage for Direct Access
- Direct Access with RAM "Disks" and Magnetic Bubbles
- Direct Access with Optical Disks and Tape Strips
- Feedback and Review 7-1

Computer Output: Some Basic Concepts 185
- Why Computer Output Is Needed
- Types of Computer Output

Printed and Filmed Output 189
- Printed Output
- Filmed Output

Displayed Output, Computer Graphics, and Voice Response 195
- Displayed Output and Computer Graphics
- Taking It on the Road
- Voice Response
- Feedback and Review 7-2

Looking Back 200

A Closer Look 203
- Beware of "Visiknowledge"

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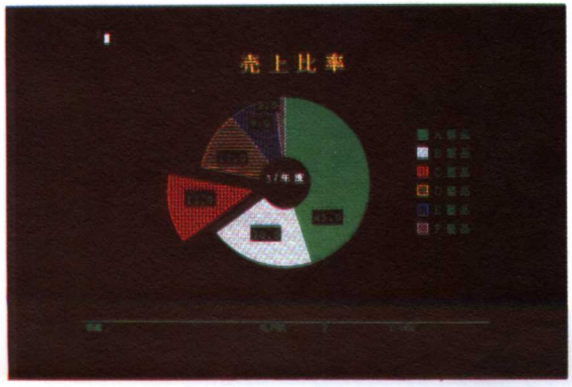

Chapter 8 Personal Computers: The Micro Miracles 206

Looking Ahead 207

The Classification Dilemma 207

Personal Computer Systems 209
- Personal Computer Development

General Characteristics of Personal Computers 211
- CPU Characteristics
- Factors Affecting CPU Performance
- Characteristics of Peripherals
- The Issue of Hardware Standards
- Micro International
- The Issue of Operating System Standards
- Personal Computing Systems in the Home
- Personal Computing Systems in the Office

Personal Computer Applications Packages 221
- Applications Packages in the Home
- Organizational/Professional Applications Packages
- Identifying and Selecting Software Packages
- Feedback and Review 8-1

Looking Back 227

A Closer Look 229
- Supermicros

Chapter 9 Minis, Mainframes, and "Monsters" 231

Looking Ahead 232

Minicomputer Systems 232
- The Development of Minicomputers
- Some Characteristics of Typical Minis
- Many Uses for Minis

Mainframe Family Models 236
- Some Characteristics of Typical Mainframes
- Mainframe Uses and Applications

Supercomputer Systems 239
- Supercomputers Head for the Mass Market
- Some Characteristics of Supercomputers
- Feedback and Review 9-1
- Supercomputer Applications

Looking Back 244

A Closer Look 246
- Linking Micros to Mainframes

Module 3 Systems and Software

Chapter 10 Data Communications Systems and Distributed Data Processing Networks 251

Looking Ahead 252

The Computing/Communications Setting 253
- Data Communications Background
- The Converging Computing/Communications Picture

Data Communications Concepts 255
- Data Transmission Techniques
- Data Transmission Channels
- Data Communications Service Organizations
- Coordinating the Data Communications Environment
- Telephones by Land, Sea, Even by Air

Additional Systems Supported by Data Communications 269
- Real Time Processing Systems
- Timesharing and Remote Computing Service Systems
- Electronic Mail/Message Systems
- Banking Service Systems
- Data Base Retrieval Systems
- Telecommuting Systems

Distributed Data Processing Networks 274
- Examples of DDP Networks in Use
- Network Configurations
- Advantages and Limitations of DDP Networks
- Feedback and Review 10-1

Looking Back 281

A Closer Look 284
- Computer Users Make Beeline to Get On-line

Chapter 11 Word Processing and Electronic Mail-Message Systems 286

Looking Ahead 287

Technology in the Office: An Overview 287
- The Traditional Office
- The Wrong Furniture Can Be Pain in the Neck
- The Introduction of New Technology

Word Processing 291
- Word Processing Systems Today
- Some Uses of Word Processing

Electronic Mail/Message Systems 295
- Mailroom Drag and Telephone Tag
- Message Distribution Services
- Transmission of Documents and Pictures
- Computerized Conferences
- Follow-up Services
- Feedback and Review 11-1

Looking Back 301

A Closer Look 303
- What It Costs to Get into Teleconferencing

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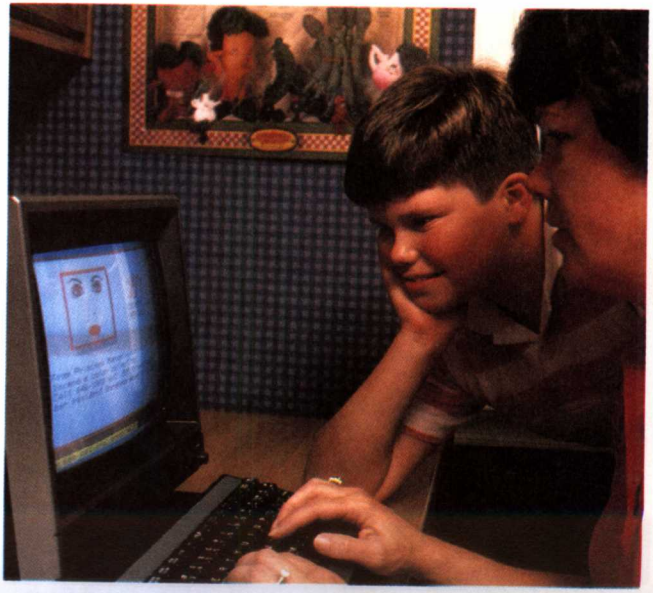

Chapter 12 System Analysis, Design, and Implementation Considerations 305

Looking Ahead 306

A System Study Review 306

Problem Definition 308
- The Problem Definition Survey
- The System Study Charter

System Analysis 310
- Data Gathering
- Analysis of the Problem
- The Analysis Report

System Design 315
- Design Tools and Techniques
- Determining Alternatives: Some Design Issues
- All I Wanted Was to Buy a Bag of Groceries
- Choosing an Alternative
- The Design Report

System Implementation 322
- The Consequences of Earlier Decisions
- Equipment Implementation
- System Conversion and Changeover
- Post-Implementation Review
- Feedback and Review 12-1

Looking Back 326

A Closer Look 328
- System Design Considerations

Chapter 13 System Software Packages: Operating Systems and Data Base Management Systems 333

Looking Ahead 334

Operating Systems 334
- The Development of Operating Systems
- Control Programs in an OS
- Processing Programs in an OS
- A Snapshot of the UNIX Operating System

Data Base Management Systems 344
- Possible Problems with Departmental Applications
- Some Uses of DBMS Packages
- DBMS Structuring Techniques
- Advantages and Limitations of DBMS Packages
- Feedback and Review 13-1

Looking Back 353

A Closer Look 356
- Is "Relational" Just a New Buzzword?

Chapter 14 Management Information Systems 357

Looking Ahead 358

Management Information Concepts 358
- Information Needs of Managers
- Properties of Useful Management Information
- An MIS Orientation

Planning Issues and the MIS 362
- Issues Involved in Planning for an MIS
- How an MIS Can Help Managerial Planning
- Planning and Decision-Making Practices Supported by an MIS

Organizing Issues and the MIS 369
- The Centralization/Decentralization of Authority
- The Centralization/Dispersal of Data Processing Activities
- The Centralization/Dispersal of Stored Data
- The Location of Computing Resources in the Organization
- Organizing the MIS Department

Control Issues and the MIS 376
- Managerial Control Implications
- Internal Control Issues
- Controlling the MIS Department
- Creating a Financial Model
- Feedback and Review 14-1

Looking Back 384

A Closer Look 387
- A Case for the "Personal Info Center"

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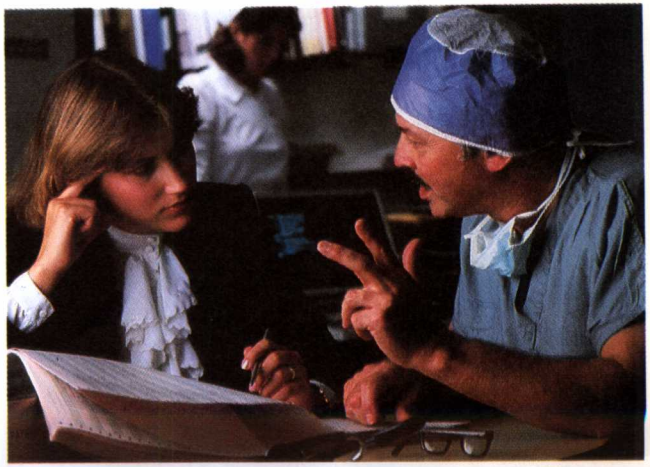

Module 4 Social Impact

Chapter 15 The Impact of Computers on People 391

Looking Ahead 392

Human Thinking and Artificial Intelligence 392
- Can Computers Think?
- AI in Action: Expert Systems

People and Computers: Potential Benefits 396
- Employment Benefits
- Benefits from Organizations Using Computers
- Think of Leonardo Wielding a Pixel and a Mouse
- Benefits from Personal Computing

People and Computers: Potential Dangers 403
- Employment Problems: Resistance, Displacement, and Unemployment
- Questionable Practices Affecting Private Lives
- The Systems Security Issue
- The Privacy Issue
- Feedback and Review 15-1

Looking Back 415

A Closer Look 418
- Careers in Computing

Chapter 16 The Impact of Computers on Organizations 423

Looking Ahead 424

The Information Processing Industry 424
- Rapid Change Is the Rule
- Summarizing the Effects of Change

Some Effects of Computers on Other Industries 427
- Effects on Productivity
- Robots and Lasers
- Threats to Security
- Computer Systems and National Borders

Computers in Government, Health Care, and Education 433
- Computers in Government
- Computers in Health Care
- Computers in Education
- Feedback and Review 16-1

Looking Back 448

A Closer Look 450
- Micros Flood Campuses

Chapter 17 Computers Tomorrow 452

Looking Ahead 453

Tomorrow's Applications 453
- Applications That Will Affect People
- Applications That Will Affect Organizations

Tomorrow's Technology 458
- Computer Hardware
- Computer Software

Tomorrow's Information Systems 466
- Quick-Response Systems
- Broader Systems

Tomorrow's Outlook 468
- The Optimistic View
- The Pessimistic View
- A Final Note
- Computer Begins a New Era
- Feedback and Review 17-1

Looking Back 472

A Closer Look 473
- The CAD/CAM Revolution

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