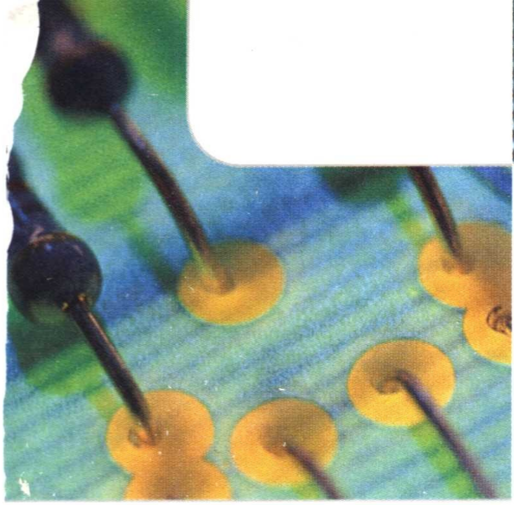
Computers in your Future 4

Bryan Pfaffenberger

PH it
shaping generation IT

Prentice Hall, Committed to Shaping the Next Generation of IT Experts.



FOURTH EDITION

Computers in Your Future

Bryan Pfaffenberger
University of Virginia

Prentice Hall
Upper Saddle River, New Jersey

Library of Congress Cataloging-in-Publication Data

Pfaffenberger, Bryan
Computers in your future / Bryan Pfaffenberger.—4th ed.
p. cm.
Includes index.
ISBN 0-13-089815-5
1. Computers. I. Title.
QA76.5 .P3982 2002
004—dc21 00-053057

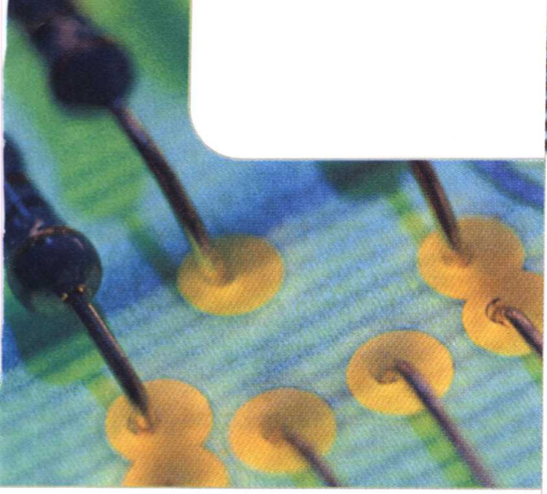
Acquisitions Editor: Lucinda Gatch
Editor-in-Chief: Mickey Cox
Managing Editor: Monica Stipanov
Assistant Editor: Jennifer Cappello
Editorial Assistant: Mary Toepfer
Senior Development Editor: Rebecca Johnson
Media Project Manager: Cathleen Profitko
Senior Marketing Manager: Sharon Turkovich
Marketing Assistant: Jason Smith
Production Manager: Gail Steier de Acevedo
Production Editors: Lynne Breitfeller, April Montana, and Kelly Warsak
Permissions Coordinator: Suzanne Grappi
Associate Director, Manufacturing: Vincent Scelta
Manufacturing Buyer: Natacha St. Hill Moore
Creative Director: Pat Smythe
Art Director: Cheryl Asherman
Interior and Cover Design: Amanda Kavanagh
Interior Illustration: Precision Graphics
Composition: Carlisle Communications
Full-Service Project Management: Carlisle Publishers Services
Printer/Binder: World Color/Quebecor

Credits and acknowledgments borrowed from other sources and reproduced, with permission, in this textbook appear on page C-1.

Prentice Hall

10 9 8 7 6 5 4 3 2 1
ISBN 0-13-089815-5

To Suzanne, Michael, and Julia,
for their love, patience,
understanding, and inspiration



PREFACE

ARE YOU HUNGRY FOR A BETTER COMPUTER CONCEPTS TEXT?

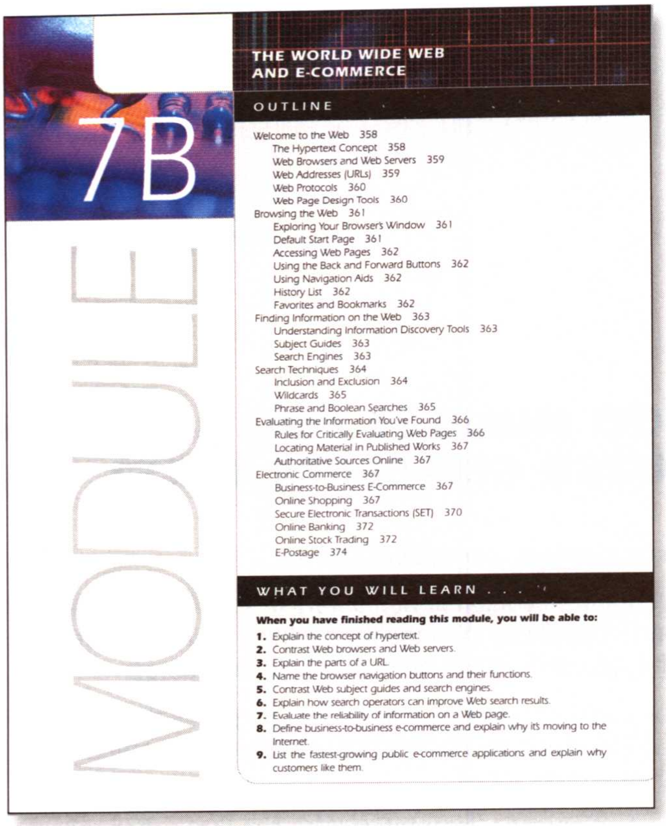
You've made suggestions, and we've listened.

- You want the fourth edition of *Computers in Your Future* to be more current and streamlined than the third edition—but without forcing changes in the way you're teaching the course.
- You want a concepts book with great learning tools that hold your students' interest and reinforce critical material—but without causing them to lose focus.
- You want a text-specific, interactive Web site that enhances your students' learning ability—as long as they are lead intuitively to key information that is concise, intelligent, and clearly laid out.

SO YOU WANT TO HAVE YOUR CAKE AND EAT IT TOO?

Well, open up (the book that is), because at Prentice Hall we're serving *Computers in Your Future*, 4th Edition!

With a clean new design, revised content, and updated coverage, this text is ready for the challenge of teaching even your most diversified class—without sacrificing quality, integrity, or taste. A new recipe for success—*Computers in Your Future*, 4th ed., is low in fat, high in flavor, and with all the right ingredients for computer novices and naturals alike.



7B

MODULE

THE WORLD WIDE WEB AND E-COMMERCE

OUTLINE

Welcome to the Web 358
- The Hypertext Concept 358
- Web Browsers and Web Servers 359
- Web Addresses (URLs) 359
- Web Protocols 360
- Web Page Design Tools 360

Browsing the Web 361
- Exploring Your Browser's Window 361
- Default Start Page 361
- Accessing Web Pages 362
- Using the Back and Forward Buttons 362
- Using Navigation Aids 362
- History List 362
- Favorites and Bookmarks 362

Finding Information on the Web 363
- Understanding Information Discovery Tools 363
- Subject Guides 363
- Search Engines 363

Search Techniques 364
- Inclusion and Exclusion 364
- Wildcards 365
- Phrase and Boolean Searches 365

Evaluating the Information You've Found 366
- Rules for Critically Evaluating Web Pages 366
- Locating Material in Published Works 367
- Authoritative Sources Online 367

Electronic Commerce 367
- Business-to-Business E-Commerce 367
- Online Shopping 367
- Secure Electronic Transactions (SET) 370
- Online Banking 372
- Online Stock Trading 372
- E-Postage 374

WHAT YOU WILL LEARN . . .

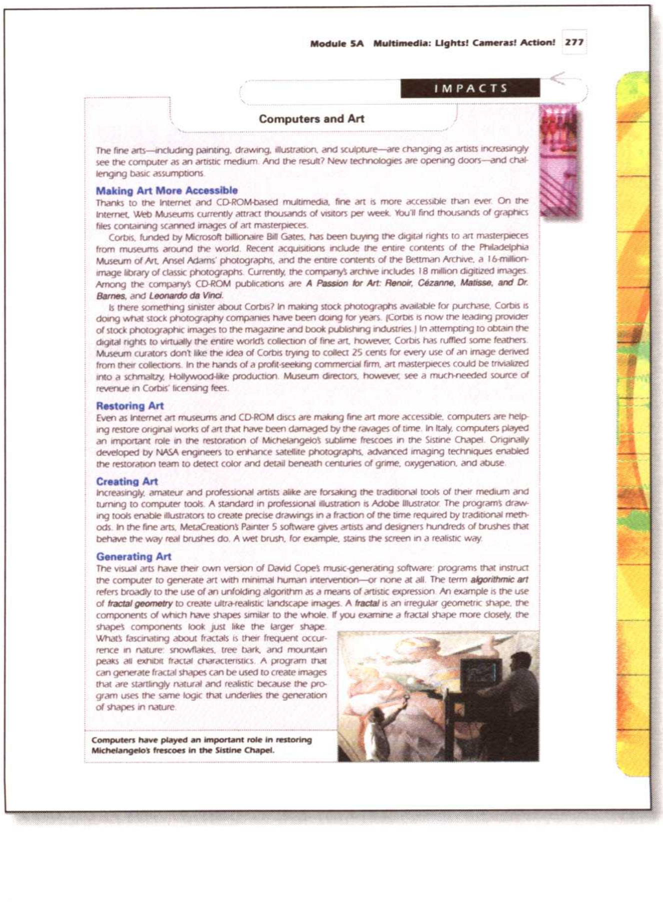
When you have finished reading this module, you will be able to:

1. Explain the concept of hypertext.
2. Contrast Web browsers and Web servers.
3. Explain the parts of a URL.
4. Name the browser navigation buttons and their functions.
5. Contrast Web subject guides and search engines.
6. Explain how search operators can improve Web search results.
7. Evaluate the reliability of information on a Web page.
8. Define business-to-business e-commerce and explain why it's moving to the Internet.
9. List the fastest-growing public e-commerce applications and explain why customers like them.

The fourth edition is streamlined and shortened (*low in fat!*)

▶ **A streamlined book with contents keyed to the order in which you present material.** For example, former Module 3B (Programming Languages) now appears within Chapter 8, Creating Information Systems. Chapters 7 and 8 (the Internet and the World Wide Web) in the third edition have been combined into one chapter (Chapter 7) in the fourth edition.

▶ **A shorter book that omits modules you couldn't cover before due to time constraints.** The best of the critically praised coverage of computer impacts in the third edition (formerly Chapter 11) now appears in optional **IMPACTS** boxes within each chapter. This feature deepens and broadens each chapter's coverage—but without adding to overall length.



Module 5A Multimedia: Lights! Cameras! Action! 277

IMPACTS

Computers and Art

The fine arts—including painting, drawing, illustration, and sculpture—are changing as artists increasingly see the computer as an artistic medium. And the result? New technologies are opening doors—and challenging basic assumptions.

Making Art More Accessible

Thanks to the Internet and CD-ROM-based multimedia, fine art is more accessible than ever. On the Internet, Web Museums currently attract thousands of visitors per week. You'll find thousands of graphics files containing scanned images of art masterpieces.

Corbis, funded by Microsoft billionaire Bill Gates, has been buying the digital rights to art masterpieces from museums around the world. Recent acquisitions include the entire contents of the Philadelphia Museum of Art, Ansel Adams' photographs, and the entire contents of the Bettman Archive, a 16-million-image library of classic photographs. Currently, the company's archive includes 18 million digitized images. Among the company's CD-ROM publications are ***A Passion for Art: Renoir, Cézanne, Matisse, and Dr. Barnes***, and ***Leonardo da Vinci***.

Is there something sinister about Corbis? In making stock photographs available for purchase, Corbis is doing what stock photography companies have been doing for years. (Corbis is now the leading provider of stock photographic images to the magazine and book publishing industries.) In attempting to obtain the digital rights to virtually the entire world's collection of fine art, however, Corbis has ruffled some feathers. Museum curators don't like the idea of Corbis trying to collect 25 cents for every use of an image derived from their collections. In the hands of a profit-seeking commercial firm, art masterpieces could be trivialized into a schmaltzy, Hollywood-like production. Museum directors, however, see a much-needed source of revenue in Corbis' licensing fees.

Restoring Art

Even as Internet art museums and CD-ROM discs are making fine art more accessible, computers are helping restore original works of art that have been damaged by the ravages of time. In Italy, computers played an important role in the restoration of Michelangelo's sublime frescoes in the Sistine Chapel. Originally developed by NASA engineers to enhance satellite photographs, advanced imaging techniques enabled the restoration team to detect color and detail beneath centuries of grime, oxygenation, and abuse.

Creating Art

Increasingly, amateur and professional artists alike are forsaking the traditional tools of their medium and turning to computer tools. A standard in professional illustration is Adobe Illustrator. The program's drawing tools enable illustrators to create precise drawings in a fraction of the time required by traditional methods. In the fine arts, MetaCreation's Painter 5 software gives artists and designers hundreds of brushes that behave the way real brushes do. A wet brush, for example, stains the screen in a realistic way.

Generating Art

The visual arts have their own version of David Cope's music-generating software: programs that instruct the computer to generate art with minimal human intervention—or none at all. The term ***algorithmic art*** refers broadly to the use of an unfolding algorithm as a means of artistic expression. An example is the use of ***fractal geometry*** to create ultra-realistic landscape images. A ***fractal*** is an irregular geometric shape, the components of which have shapes similar to the whole. If you examine a fractal shape more closely, the shape's components look just like the larger shape. What's fascinating about fractals is their frequent occurrence in nature: snowflakes, tree bark, and mountain peaks all exhibit fractal characteristics. A program that can generate fractal shapes can be used to create images that are startlingly natural and realistic because the program uses the same logic that underlies the generation of shapes in nature.

Computers have played an important role in restoring Michelangelo's frescoes in the Sistine Chapel.

The fourth edition is packed with ingredients to engage your students (*high in flavor!*)

- **A new electronic commerce Web case, E-COMMERCE IN ACTION, appears at the end of every chapter!** Readers learn about PFSWeb, Inc., a company based in Plano, Texas, that helps e-commerce companies keep up with the online buying and selling marketplace. Each case includes a Web-based research task and motivates students to think critically about electronic commerce issues and strategies.


Module 3B Application Software: Essentials for Knowledge Workers 185

PFSweb, Inc.

If there was one word to sum up the incredible growth of e-commerce on the Web, what would it be? Graphics? Choice? Bandwidth? How about "standards"? It may not sound very flashy, but standards for everything from communications to how Web pages display have helped to streamline business activity on the Web.

Mike Willoughby, Vice President of E-Commerce Technologies at PFSweb, has been part of the e-commerce movement from its inception. Prior to the mid-90s, companies that wanted to do business online often found that they had to create the software from scratch to do what they wanted. Mike has been there, done that. The "from scratch" approach was expensive, and proved to be affordable only to a few large organizations. Then, around the late 1990s, standards for Internet communications emerged. ActiveX and Java became popular for Web-based interactivity, allowing customers to perform inventory queries ("Is Aerosmith's latest CD in stock?") and check order status in real time ("When was my CD shipped?"). Today, a new standard for Web-based communications has emerged called XML. XML-based communications packaging lets computers seamlessly pass data such as customer order information or queries between servers and systems in different locations. This means time and money saved in both creating and operating e-commerce Web sites.

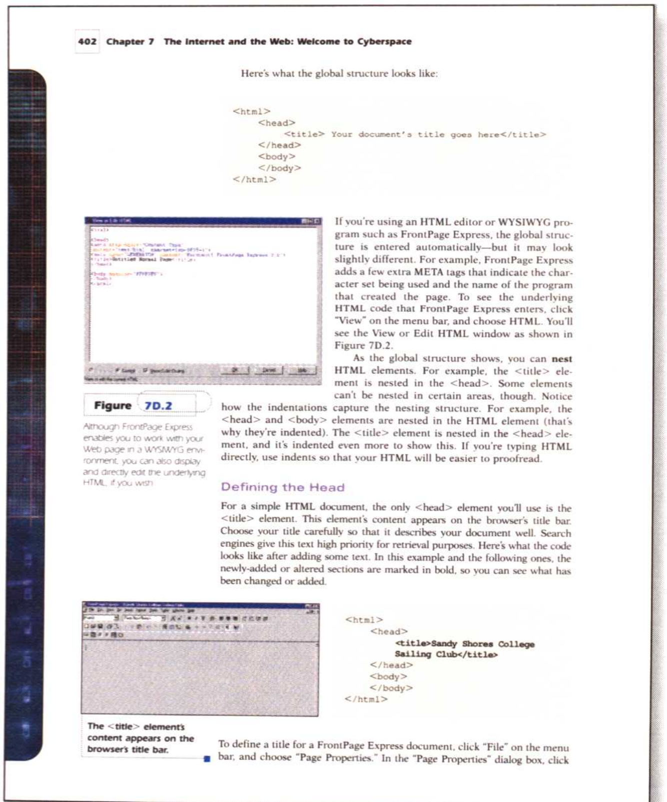
PFSweb runs a lot of different software programs on its computer hardware. There is software for hosting Web sites. Special software is used for credit card authorizations and fraud checks. Tax calculations and reporting have their own software programs. Freight calculations for shipping require separate program instructions. Programs for shipping with FedEx, UPS, Airborne, and USPS also exist. The back-end inventory management and customer order management is handled by yet another program. The Memphis distribution center (where all the physical goods people buy on the Web come from) requires special software for its management. And of course, there are e-mail and chat programs. Every last program relies on standards to function properly.

For actually running PFSweb's own business, separate AS/400 computers run enterprise resource planning software by JD Edwards. Separate software modules for accounts receivable and payable, invoicing, cash management, customer sales reporting, and more are in place. All told, there are dozens of different software programs running on PFSweb's computer hardware in the data center.

What do you think? Why are so many different software programs needed to operate an e-commerce Web site? Why doesn't software companies write one big e-commerce program that does everything? What effect might e-commerce Web site buyers see if standards such as XML were not in place?

WebLink Go to **www.prenhall.com/pfaffenberger** to see the video of Mark Willoughby and explore the Web.

E-COMMERCE IN ACTION


402 Chapter 7 The Internet and the Web: Welcome to Cyberspace

Here's what the global structure looks like:

```
<html>
    <head>
        <title> Your document's title goes here</title>
    </head>
    <body>
    </body>
</html>
```

If you're using an HTML editor or WYSIWYG program such as FrontPage Express, the global structure is entered automatically—but it may look slightly different. For example, FrontPage Express adds a few extra META tags that indicate the character set being used and the name of the program that created the page. To see the underlying HTML code that FrontPage Express enters, click "View" on the menu bar, and choose HTML. You'll see the View or Edit HTML window as shown in Figure 7D.2.

As the global structure shows, you can **nest** HTML elements. For example, the <title> element is nested in the <head>. Some elements can't be nested in certain areas, though. Notice how the indentations capture the nesting structure. For example, the <head> and <body> elements are nested in the HTML element (that's why they're indented). The <title> element is nested in the <head> element, and it's indented even more to show this. If you're typing HTML directly, use indents so that your HTML will be easier to proofread.

Figure 7D.2
Although FrontPage Express enables you to work with your Web page in a WYSIWYG environment, you can also display and directly edit the underlying HTML, if you wish.

Defining the Head

For a simple HTML document, the only <head> element you'll use is the <title> element. This element's content appears on the browser's title bar. Choose your title carefully so that it describes your document well. Search engines give this text high priority for retrieval purposes. Here's what the code looks like after adding some text. In this example and the following ones, the newly-added or altered sections are marked in bold, so you can see what has been changed or added.

```
<html>
    <head>
        <title>Sandy Shores College
        Sailing Club</title>
    </head>
    <body>
    </body>
</html>
```

The <title> element's content appears on the browser's title bar.

To define a title for a FrontPage Express document, click "File" on the menu bar, and choose "Page Properties." In the "Page Properties" dialog box, click

- **The Web publishing chapter (Module 7D) now features "what-you-see-is-what-you-get" (WYSIWYG) software—with an emphasis on Microsoft Front Page and Front Page Express.** You don't have time to teach HTML—and with today's WYSIWYG software, there's less need to do so.

- **New SPOTLIGHT boxes highlight innovative thinking in each module subject area.** For example, the Module 1A **SPOTLIGHT** features composer David Cole, whose EMI software processes musical motifs characteristic of classical composers. The result? "New" compositions by composers who have been dead for a century or more—and new controversies concerning computer applications.

Module 1A Becoming Fluent with Computers and the Internet 9

SPOTLIGHT — ROLL OVER, BEETHOVEN

In the spring of 1997, an orchestra in Santa Cruz, California performed Mozart's 42nd symphony—a remarkable event, considering that Mozart only wrote 41 symphonies. Concert-goers agreed that the symphony indeed sounded Mozartean, even if it wasn't the equal of the composer's greatest works. But where did the score come from? Mozart, after all, had been dead for more than 200 years, and there's no evidence of a freshly-discovered symphony that had somehow evaded discovery.

Mozart didn't write the symphony that was performed that afternoon. In fact, nobody wrote it. It was created by a computer program, called Experiments in Musical Intelligence (EMI), authored by Santa Cruz-based composer and music theory professor David Cope.

Cope started developing EMI to help him overcome the composer's equivalent of writer's block. He wanted to write a program that could analyze his own style as a composer; originally, Cope intended to use the program as a source of insight and inspiration.

Listening to EMI's output, Cope soon realized that he had developed a powerful new algorithm—a step-by-step procedure—for analyzing a composer's style. By analyzing all of a composer's works, EMI can isolate what Cope calls the composer's "signature": the distinctive, melodic patterns that a composer tends to use repeatedly. These patterns are like a signature on a letter or a bank check in that they uniquely identify the person who wrote it. When music-literate people hear these melodic patterns in a composition that they don't recognize, these patterns—the composer's signature—tip them off. They say, "Oh, that's Beethoven."

EMI doesn't use any intelligence when it analyzes a composer's works. Actually, it uses nothing more than the computer's simple, built-in capabilities, such as adding up and comparing numbers. But it does these tasks very quickly, so that before long the composer's distinctive melodic patterns begin to emerge.

Intrigued, Cope gave EMI the works of long-dead classical composers such as Bach and Chopin, just to see what would happen. The results astonished Cope. EMI's better compositions sounded like they really were written by the likes of Bach, Chopin, and Scott Joplin. And the best of them not only sounded like they had been written by these composers, they were beautiful works, capable of engaging listeners and drawing them into the joy of beautiful music. If a computer can produce those kinds of results, what does this say about the meaning of human creativity? Is the genius of Bach, Mozart, and Beethoven nothing more than the repetitive use of a few, idiosyncratic melodies?

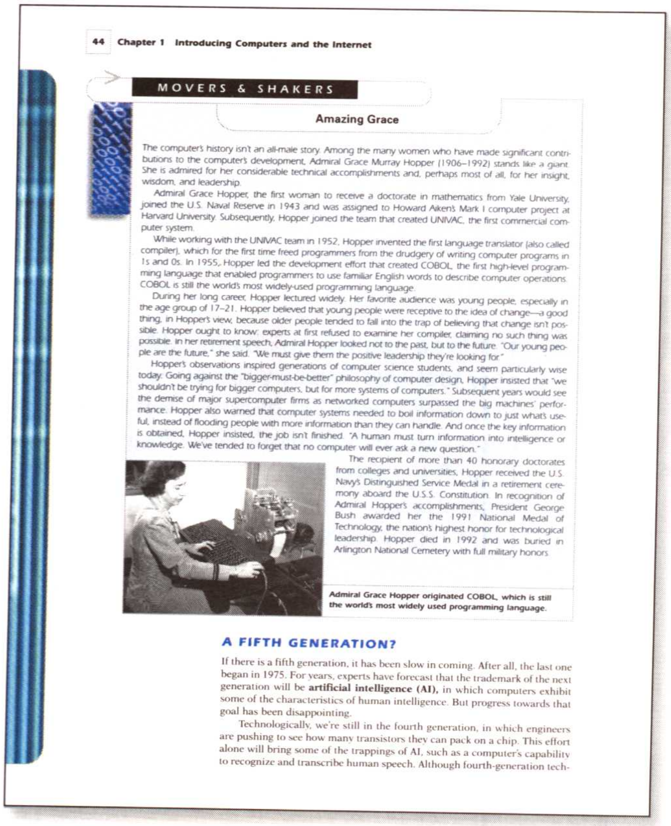
Initially, Cope wouldn't let anyone but a few close friends listen to EMI's creations, fearing that the musical world would be deeply threatened by his discovery. Cope's friends persuaded him to let others in on EMI's achievements.

EMI's first concert was held at the University of Illinois in 1987. Cope explained how EMI worked, and turned the stage over to EMI. When the composition finished playing, the audience didn't budge—no clapping, no laughter, nothing. Cope feared that they'd hated the piece. But then it came out. One member of the audience told Cope that they'd sat there like stones because they were thunderstruck by the composition's quality and beauty. And anyway, would a computer appreciate a round of applause?

Cope introduced EMI to a broader public by means of a 1994 CD, titled *Bach by Design*, but that's when the backlash started. After all, the great composers—the likes of Bach, Beethoven, and Mozart—are considered to be among the greatest of all human geniuses. Is what they accomplished really so simple that it could be captured and imitated by a computer program? At an EMI performance in Germany, an enraged member of the audience shouted "Music is dead!" and tried to punch Cope in the nose.

Since then, a more balanced view has emerged, one that Cope himself endorses: EMI can imitate Bach, but Bach is better. Even at its best, EMI's compositions always sounded like one of the composer's lesser works. And Bach, after all, did something that EMI can't do: he created a new musical style that we instantly recognize and associate with one of the greatest composers of all ages. No computer's done that . . . yet.

Imagine being able to listen to completely "new" works from long-dead composers such as Bach and Chopin. Thanks to computer technology, you can!



44 Chapter 1 Introducing Computers and the Internet

MOVERS & SHAKERS

Amazing Grace

The computer's history isn't an all-male story. Among the many women who have made significant contributions to the computer's development, Admiral Grace Murray Hopper (1906–1992) stands like a giant. She is admired for her considerable technical accomplishments and, perhaps most of all, for her insight, wisdom, and leadership.

Admiral Grace Hopper, the first woman to receive a doctorate in mathematics from Yale University, joined the U.S. Naval Reserve in 1943 and was assigned to Howard Aiken's Mark I computer project at Harvard University. Subsequently, Hopper joined the team that created UNIVAC, the first commercial computer system.

While working with the UNIVAC team in 1952, Hopper invented the first language translator (also called compiler), which for the first time freed programmers from the drudgery of writing computer programs in 1s and 0s. In 1955, Hopper led the development effort that created COBOL, the first high-level programming language that enabled programmers to use familiar English words to describe computer operations. COBOL is still the world's most widely-used programming language.

During her long career, Hopper lectured widely. Her favorite audience was young people, especially in the age group of 17–21. Hopper believed that young people were receptive to the idea of change—a good thing, in Hopper's view, because older people tended to fall into the trap of believing that change isn't possible. Hopper ought to know: experts at first refused to examine her compiler, claiming no such thing was possible. In her retirement speech, Admiral Hopper looked not to the past, but to the future. "Our young people are the future," she said. "We must give them the positive leadership they're looking for."

Hopper's observations inspired generations of computer science students, and seem particularly wise today. Going against the "bigger-must-be-better" philosophy of computer design, Hopper insisted that "we shouldn't be trying for bigger computers, but for more systems of computers." Subsequent years would see the demise of major supercomputer firms as networked computers surpassed the big machines' performance. Hopper also warned that computer systems needed to boil information down to just what's useful, instead of flooding people with more information than they can handle. And once the key information is obtained, Hopper insisted, the job isn't finished. "A human must turn information into intelligence or knowledge. We've tended to forget that no computer will ever ask a new question."

The recipient of more than 40 honorary doctorates from colleges and universities, Hopper received the U.S. Navy's Distinguished Service Medal in a retirement ceremony aboard the U.S.S. Constitution. In recognition of Admiral Hopper's accomplishments, President George Bush awarded her the 1991 National Medal of Technology, the nation's highest honor for technological leadership. Hopper died in 1992 and was buried in Arlington National Cemetery with full military honors.

Admiral Grace Hopper originated COBOL, which is still the world's most widely used programming language.

A FIFTH GENERATION?

If there is a fifth generation, it has been slow in coming. After all, the last one began in 1975. For years, experts have forecast that the trademark of the next generation will be **artificial intelligence (AI),** in which computers exhibit some of the characteristics of human intelligence. But progress towards that goal has been disappointing.

Technologically, we're still in the fourth generation, in which engineers are pushing to see how many transistors they can pack on a chip. This effort alone will bring some of the trappings of AI, such as a computer's capability to recognize and transcribe human speech. Although fourth-generation tech-

- **New! MOVERS & SHAKERS boxes showcase the people who created computing—and are redefining it.** These biographies bring computing to life. They also show that computing attracts an increasingly diverse group of people. Featured portraits include Greg Lowney (Microsoft), Parry Aftab (Cyberangels), Linus Torvalds (Linux creator), and T.V. Raman (IBM programmer and developer of Emacspeak).

▶ **New! CURRENTS boxes examine issues in computing as well as cutting-edge computer technology.** Students learn about what's going to change the face of computing by the time they become professionals. **CURRENTS** boxes include Chapter 1, The U.S. Software Industry and Software Quality: Another Detroit in the Making?; Chapter 6, Universal Service: The End of an Era?; Chapter 8, Telemedicine; Chapter 9, Spies in the Sky; and Chapter 10, Is There an Acute Shortage of IT Workers—or just Rampant Age Discrimination?

138 Chapter 2 Exploring Computer Hardware: What's in the Box?

CURRENTS

Which Computer Would You Like to Wear Today?

Anyone who has grown up in the age of electronics knows that every electronic device keeps shrinking. Radios that took up space in the corner now fit on a wristwatch. Televisions have followed suit, and can now easily fit into your shirt pocket. Telephones will keep getting smaller and lighter, until you can conceal a cell phone just about anywhere.

Computers are no different. In their early days, computers took up entire rooms. Now you can fit just as much computing power into the palm of your hand. Why stop there? If you can make computers even smaller and more powerful, you can wear them like clothing or jewelry.

Those days are now here. Powerful computers are being designed into rings, stuffed in brooches, and concealed in eyeglasses. Computers are even being placed inside prosthetics that replace amputated arms or legs.

The effects of these wearable computers have not fully hit society yet but are poised to do so in the next few years. Business people will be able to augment their memory with a wearable computer that keeps track of their contacts and recalls information without visible prompting. Journalists can record what goes on around them and annotate the information as necessary to accomplish their jobs.

Imagine how wearable computers can affect the lives of maintenance workers. A computer on the belt could easily be connected to a display monitor concealed in an ordinary pair of eyeglasses. As the worker looks at the inside of some equipment being fixed, the computer pops up a schematic for the equipment. The schematic, shown on the inside of the eyeglass lens, can be positioned over the real layout for the equipment. The result is the ability to quickly pinpoint the name, purpose, and condition of each component in the equipment.

This blending of virtual reality with the real world, known as ***augmented reality***, is not science fiction. It's already underway in some large corporations. Taken to another level, the schematics shown in the worker's field of vision can be interfaced with motion and position sensors so that when the worker moves his or her head, the schematics projected by the computer change to reflect whatever is being looked at.

New uses for augmented reality are being discovered all the time. For instance, agents for the U.S. Customs Service are using special wearable computers that utilize voice-recognition software and full-color monitors. The agents, looking for stolen vehicles, use the computers to recall the license number of any vehicle in the United States. This happens as the agent strolls through a parking lot or along a lane of traffic.

The biggest drawbacks in wearable computers at the present time are twofold: batteries and communications. Batteries, which must be used to power wearable computers, are still large and bulky for any extended use of the electronics. The classic tradeoff is to either limit the usable life of the electronics (without recharging) or wear a large battery pack on the belt or in a backpack.

Wearable computers are often configured as a collection of small components, and communications between those components can be a problem. For instance, when a belt-worn computer needs to communicate with a head-mounted monitor, the natural way is through a cable running between the two. Although this may make electrical sense, it may not be acceptable in some surroundings and for some uses. Some cutting-edge wearable computers are now using wireless components, but this adds to power consumption and potentially shortens battery life.

The potential uses for wearable computers are unlimited. As components continue to shrink, capabilities continue to expand, and technology rushes to meet imagination, each of us may add a computer to our wardrobe.

A wearable computer.

variety of technologies, including **tactile displays** that stimulate the skin to generate a sensation of contact. Stimulation techniques include vibration, pressure, and temperature changes. When used in virtual reality environments, these technologies enhance the sense of "being there" and physically interacting with displayed virtual objects.

Module 6A Telecommunications: Exchanging Data via the Telephone System 307

CURRENTS

Universal Service: The End of an Era?

It's called ***universal service***—and thanks to the rise of Internet telephony, it may very well be coming to an end. An outgrowth of Depression-era New Deal legislation, universal service has long been a cornerstone of U.S. telecommunications policy. In the telecommunications industry, universal service assures that people in all parts of the country have equal access to "reasonably-priced" telephone services.

There's just one problem: it's much more expensive to provide telephone service in lightly-populated rural areas, where wires must be strung dozens or hundreds of miles just to serve a few houses. To pay for local phone service, long-distance companies collect surcharges from their customers, and kick back most of these surcharges to local telephone companies in the form of ***access fees***. In turn, the local telephone companies use these fees—more than $25 billion per year—to hold down the cost of residential telephone services.

But all that's changing. Thanks to the U.S. Telecommunications Act of 1996, competitive access providers (CAPs) can sell direct access to the long-distance market without paying access fees—and that's one of the reasons Internet telephony is booming. Internet telephony service providers (ITSPs) such as Net2Phone don't pay access fees. According to conventional long-distance providers, that isn't fair. Long-distance, regional, and local telephone companies want the U.S. Congress to hit ITSPs with access fee charges—or abandon the idea of universal service altogether.

The 1996 Telecommunications Act does give telephone companies a break. The legislation calls for gradual reductions in access fees until they're completely eliminated. But it doesn't let consumers off the hook. Universal service must still be paid for somehow, so the Telecommunications Act extended the concept of universal service to digital-based services such as the Internet. For now, consumers are taking the hit, as you'll discover if you examine your next phone bill: there's a welter of incomprehensibly-named taxes, such as the Presubscribed Interexchange Carrier Charge, the Federal Access Charge, state-imposed Universal Service charges, and—chances are—several more. The various taxes and fees can add up to 60% to the cost of your monthly phone bill.

At least there's one tax you won't be paying any more. In 2000, the U.S. Congress voted to terminate the Federal Excise Tax on telephone service—a tax that was initially created in 1898 to pay for the Spanish-American War.

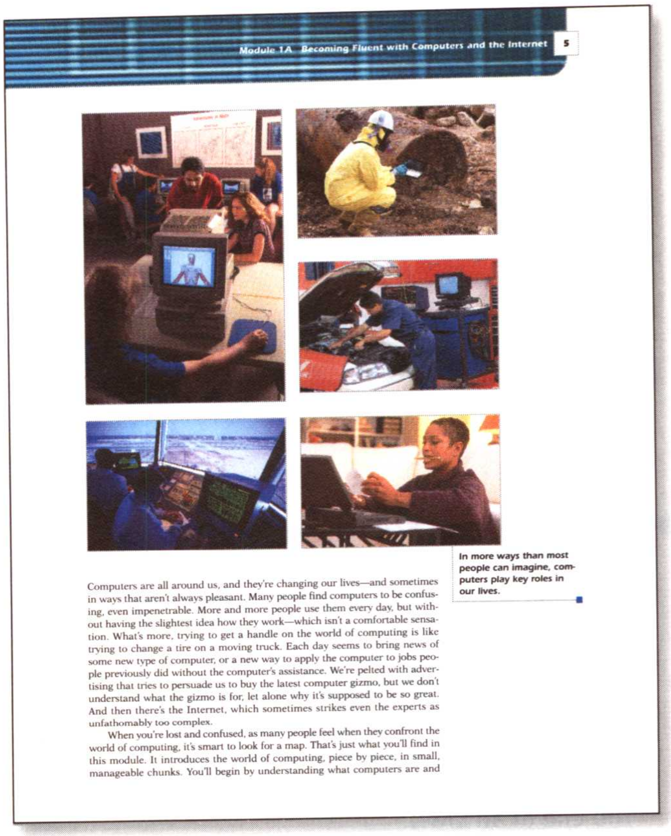
Internet Faxing

If the Internet isn't perfect for voice calls, it has none of those shortcomings for faxes. Faxes don't have to be delivered in real time, like voice does, so slight service delays don't cause a problem. But faxing through the PSTN is expensive, particularly for international calls. With annual worldwide fax volume nearing the 400 billion page mark in 1998, it's clear that many organizations could save a great deal of money by routing faxes over the Internet.

How does Internet faxing work? You'll need an Internet connection and an account with an Internet fax service provider. From a fax machine or computer, you can send the fax through the Internet to the fax service provider, which then automatically routes the fax through the Internet to a local telephone near your fax's destination. The service isn't free, but it's 25- to 50-percent cheaper than sending the fax through the phone system.

New subject coverage puts this book ahead of the pack

- **The fourth edition emphasizes computer fluency.** It's one thing to be computer literate, but it's quite another to be computer fluent. Computer literate people are skilled computer and Internet users; computer fluent people are able to navigate the digital world easily. Their knowledge of the underlying concepts and principles of computers and the Internet gives them a tremendous advantage. The more computer fluent people work with computer technology, the deeper and richer their understanding grows. They also understand enough about computing to recognize the technology's risks as well as its benefits.


Module 1A Becoming Fluent with Computers and the Internet 5

In more ways than most people can imagine, computers play key roles in our lives.

Computers are all around us, and they're changing our lives—and sometimes in ways that aren't always pleasant. Many people find computers to be confusing, even impenetrable. More and more people use them every day, but without having the slightest idea how they work—which isn't a comfortable sensation. What's more, trying to get a handle on the world of computing is like trying to change a tire on a moving truck. Each day seems to bring news of some new type of computer, or a new way to apply the computer to jobs people previously did without the computer's assistance. We're pelted with advertising that tries to persuade us to buy the latest computer gizmo, but we don't understand what the gizmo is for, let alone why it's supposed to be so great. And then there's the Internet, which sometimes strikes even the experts as unfathomably too complex.

When you're lost and confused, as many people feel when they confront the world of computing, it's smart to look for a map. That's just what you'll find in this module. It introduces the world of computing, piece by piece, in small, manageable chunks. You'll begin by understanding what computers are and

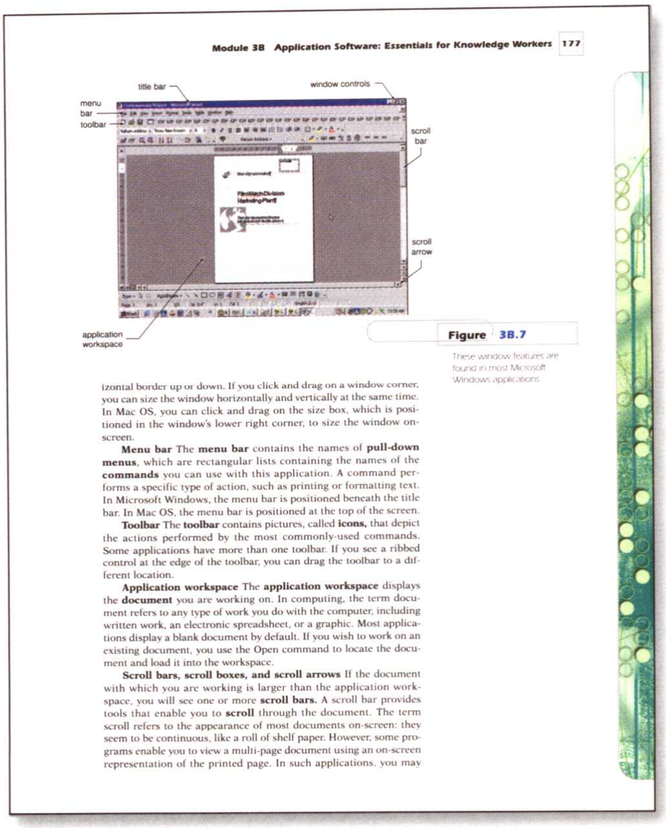

Module 3B Application Software: Essentials for Knowledge Workers 177

Figure 3B.7

These window features are found in most Microsoft Windows applications

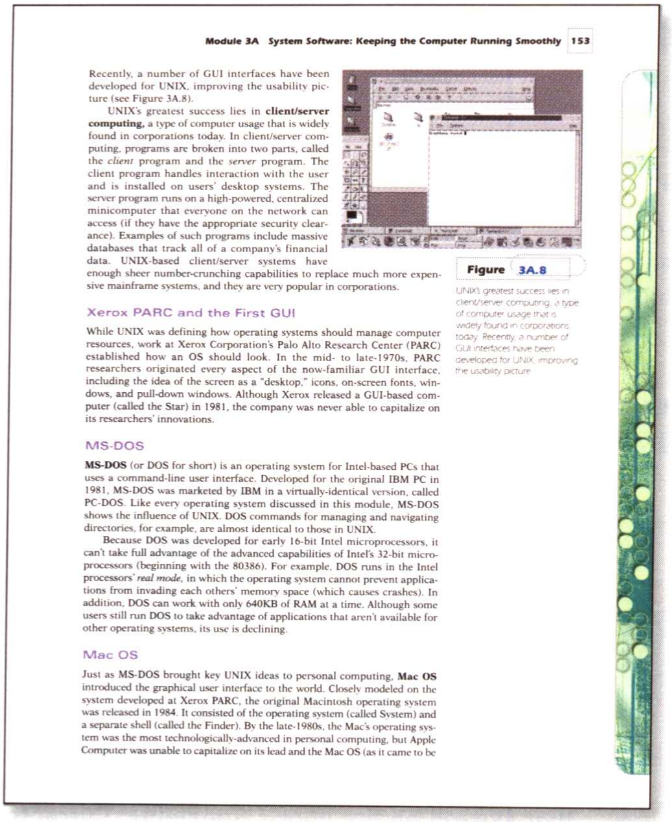
izontal border up or down. If you click and drag on a window corner, you can size the window horizontally and vertically at the same time. In Mac OS, you can click and drag on the size box, which is positioned in the window's lower right corner, to size the window on-screen.

Menu bar The **menu bar** contains the names of **pull-down menus**, which are rectangular lists containing the names of the **commands** you can use with this application. A command performs a specific type of action, such as printing or formatting text. In Microsoft Windows, the menu bar is positioned beneath the title bar. In Mac OS, the menu bar is positioned at the top of the screen.

Toolbar The **toolbar** contains pictures, called **icons,** that depict the actions performed by the most commonly-used commands. Some applications have more than one toolbar. If you see a ribbed control at the edge of the toolbar, you can drag the toolbar to a different location.

Application workspace The **application workspace** displays the **document** you are working on. In computing, the term document refers to any type of work you do with the computer, including written work, an electronic spreadsheet, or a graphic. Most applications display a blank document by default. If you wish to work on an existing document, you use the Open command to locate the document and load it into the workspace.

Scroll bars, scroll boxes, and scroll arrows If the document with which you are working is larger than the application workspace, you will see one or more **scroll bars.** A scroll bar provides tools that enable you to **scroll** through the document. The term scroll refers to the appearance of most documents on-screen: they seem to be continuous, like a roll of shelf paper. However, some programs enable you to view a multi-page document using an on-screen representation of the printed page. In such applications, you may



Module 3A System Software: Keeping the Computer Running Smoothly 153

Recently, a number of GUI interfaces have been developed for UNIX, improving the usability picture (see Figure 3A.8).

UNIX's greatest success lies in **client/server computing,** a type of computer usage that is widely found in corporations today. In client/server computing, programs are broken into two parts, called the *client* program and the *server* program. The client program handles interaction with the user and is installed on users' desktop systems. The server program runs on a high-powered, centralized minicomputer that everyone on the network can access (if they have the appropriate security clearance). Examples of such programs include massive databases that track all of a company's financial data. UNIX-based client/server systems have enough sheer number-crunching capabilities to replace much more expensive mainframe systems, and they are very popular in corporations.

Figure 3A.8

UNIX's greatest success lies in client/server computing, a type of computer usage that is widely found in corporations today. Recently, a number of GUI interfaces have been developed for UNIX, improving the usability picture

Xerox PARC and the First GUI

While UNIX was defining how operating systems should manage computer resources, work at Xerox Corporation's Palo Alto Research Center (PARC) established how an OS should look. In the mid- to late-1970s, PARC researchers originated every aspect of the now-familiar GUI interface, including the idea of the screen as a "desktop," icons, on-screen fonts, windows, and pull-down windows. Although Xerox released a GUI-based computer (called the Star) in 1981, the company was never able to capitalize on its researchers' innovations.

MS-DOS

MS-DOS (or DOS for short) is an operating system for Intel-based PCs that uses a command-line user interface. Developed for the original IBM PC in 1981, MS-DOS was marketed by IBM in a virtually-identical version, called PC-DOS. Like every operating system discussed in this module, MS-DOS shows the influence of UNIX. DOS commands for managing and navigating directories, for example, are almost identical to those in UNIX.

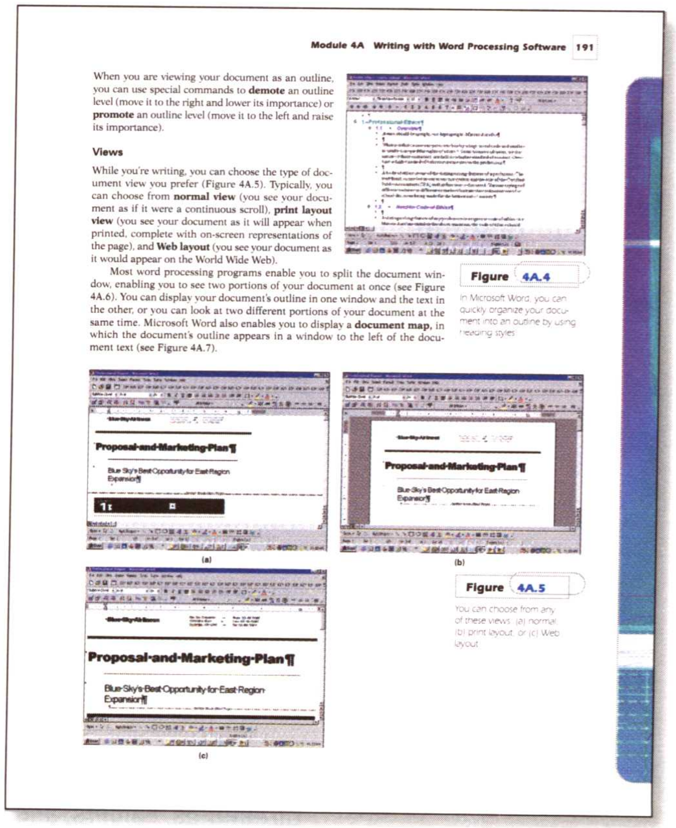
Because DOS was developed for early 16-bit Intel microprocessors, it can't take full advantage of the advanced capabilities of Intel's 32-bit microprocessors (beginning with the 80386). For example, DOS runs in the Intel processors' *real mode*, in which the operating system cannot prevent applications from invading each others' memory space (which causes crashes). In addition, DOS can work with only 640KB of RAM at a time. Although some users still run DOS to take advantage of applications that aren't available for other operating systems, its use is declining.

Mac OS

Just as MS-DOS brought key UNIX ideas to personal computing, **Mac OS** introduced the graphical user interface to the world. Closely modeled on the system developed at Xerox PARC, the original Macintosh operating system was released in 1984. It consisted of the operating system (called System) and a separate shell (called the Finder). By the late-1980s, the Mac's operating system was the most technologically-advanced in personal computing, but Apple Computer was unable to capitalize on its lead and the Mac OS (as it came to be

- **Cutting-edge topics.** Some examples: 3D hardware, new microprocessors, new operating systems (including Windows 2000 and Mac OS X), open source software (including open source development and open source software licenses), information warfare, antitrust issues, digital copyrights, software patents, and women and minorities in computing.

- **New or significantly updated chapters and modules.** These include Module 1B (emphasizes recent history and the rise of the Internet), Chapter 4 (illustrates application software concepts from the best-selling office suites), Module 7B (extensive coverage of electronic commerce and the World Wide Web), Module 7C (illustrates email concepts with Microsoft Outlook and Outlook Express), and Chapter 9 (expanded coverage of privacy, security, and intellectual property issues).



Module 4A Writing with Word Processing Software 191

When you are viewing your document as an outline, you can use special commands to **demote** an outline level (move it to the right and lower its importance) or **promote** an outline level (move it to the left and raise its importance).

Views

While you're writing, you can choose the type of document view you prefer (Figure 4A.5). Typically, you can choose from **normal view** (you see your document as if it were a continuous scroll), **print layout view** (you see your document as it will appear when printed, complete with on-screen representations of the page), and **Web layout** (you see your document as it would appear on the World Wide Web).

Most word processing programs enable you to split the document window, enabling you to see two portions of your document at once (see Figure 4A.6). You can display your document's outline in one window and the text in the other, or you can look at two different portions of your document at the same time. Microsoft Word also enables you to display a **document map,** in which the document's outline appears in a window to the left of the document text (see Figure 4A.7).

Figure 4A.4

In Microsoft Word, you can quickly organize your document into an outline by using heading styles

(a)

(b)

(c)

Figure 4A.5

You can choose from any of these views: (a) normal, (b) print layout, or (c) Web layout

SUPPLEMENTS

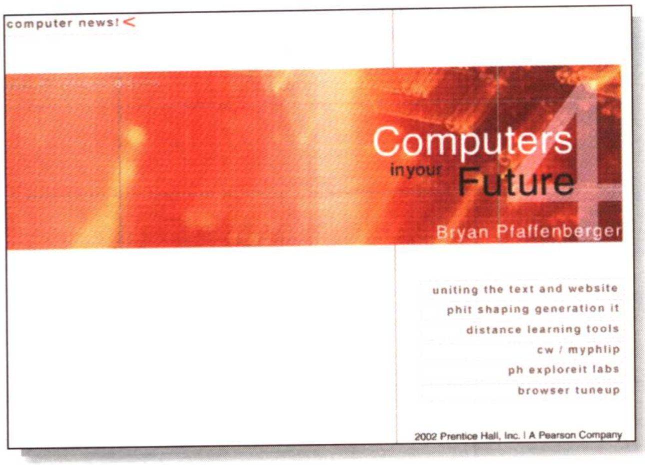
The icing on the cake!

Instructor's Manual

The comprehensive *Instructor's Manual* includes additional material on how to use the text in conjunction with the Web site to help you understand the key concepts and exercises in the text.

Test Manager

The Prentice Hall Test Manager allows faculty to organize and choose test material by providing true/false, multiple-choice, fill-in, and essay questions.



Instructor's Resource CD-ROM

One convenient disk contains all of the instructor resources needed for the text, including the IM, Test Manager, and PowerPoint slides.

Companion Web site/my PHLIP site (*www.prenhall.com/pfaffenberger*)

A complete online Web site includes chapter-specific and interactive quizzes; Web exercises that expand on the book's Spotlights, Currents, Impacts, and Movers and Shakers features; and video cases. Professors can use the site to communicate online with the class and download instructor's resource materials.

WebCT and Blackboard Content

The custom-built distance learning course features all new interactive lectures, exercises, sample quizzes, and tests.

Video

Through our partnership with *The Computer Chronicles* television series, we have developed a CIS Volume II Video compilation that features real-life computer stories and problems, and how technology is changing.

Explore IT Labs

Explore IT Lab

Twelve Labs!

Prentice Hall's Explore Generation IT Labs illustrate, via interactivity, key computer concepts not easily covered in a lecture. These twelve labs bring challenging topics in computer concepts to life and assess students knowledge via a Quiz section, that can be emailed, saved to a floppy, or printed. The labs can be delivered via the web or on CDRom for added flexibility. The labs are as follows: Building a Web Page; Internet and WWW; E-Commerce; Introduction to Computer Programming; Application Software; Operating Systems; Multimedia; Building a Network; Buying a Computer; Hardware; Directories, Folders, and Files; and Binary Representation.

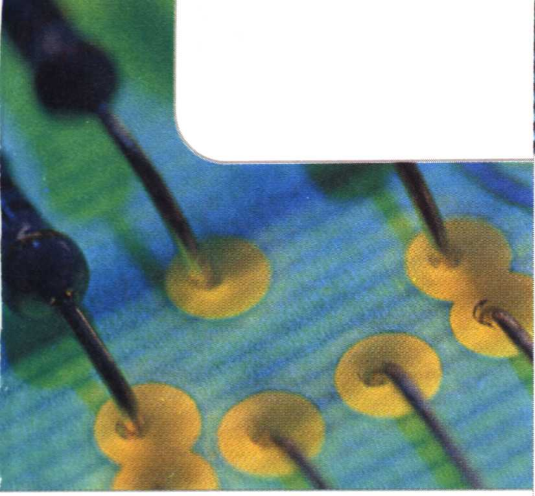
Acknowledgments

We are grateful for the assistance from the following reviewers of the fourth edition: Beverly Amer, Northern Arizona University; Dennis Anderson, Pace University; Bob Bretz, Western Kentucky University; Joseph DeLibero, Arizona State University; Mark DuBois, Illinois Central College; Said Fares, Valdosta State University; Nancy Grant, Community College of Allegheny County; Carolyn Hardy, Northwest Missouri State University; Michelle Hulett, Southwest Missouri State University; Emilio Laca, University of California at Davis; Kuber Maharjan, Purdue University; Karen Norwood, McLennan Community College; Anthony J. Nowakowski, Buffalo State College; Chuck Riden, Arizona State University; John Ross, Fox Valley Technical College; Ray Smith, Salt Lake City Community College; Steve Smith, El Paso Community College; Lynn Wermers, North Shore Community College; and Linda Woolard, Southern Illinois University.

We are also grateful for the assistance from the following reviewers of the third edition: William H. Allen, University of Central Florida; Dr. William Cornette, Southwest Missouri State University; Allen Dooley, Pasadena City College; Patricia Dreven, Community College of Southern Nevada; Susan Fry, Boise State University; Seth Hock, Columbus State College; Eric Jacobson, Peninsula College; Sann Lavallee, New Hampshire Technical College of Laconia; Anthony J. Nowakowski, Buffalo State College; Nancy Strickland, El Paso Community College; and Debbie Wenger, Blue Ridge Community College.

Special thanks go to Becky Johnson at Prentice Hall and Larry Goldberg at Carlisle Publishers Services, who made extraordinary contributions to this project. This book couldn't possibly have reached your hands in a timely way without their outstanding, beyond-the-call-of-duty contributions. I would like to add that I received the same contribution from everyone with whom I worked at Prentice Hall, including acquisitions editor Lucinda Gatch, managing editor Monica Stipanov, production editors Lynne Breitfeller, April Montana, and Kelly Warsak, and the designer Cheryl Asherman. I would like to express my deepest appreciation to everyone at Prentice Hall, which I've come to appreciate: it's a truly extraordinary company staffed with some equally extraordinary people.

Bryan Pfaffenberger

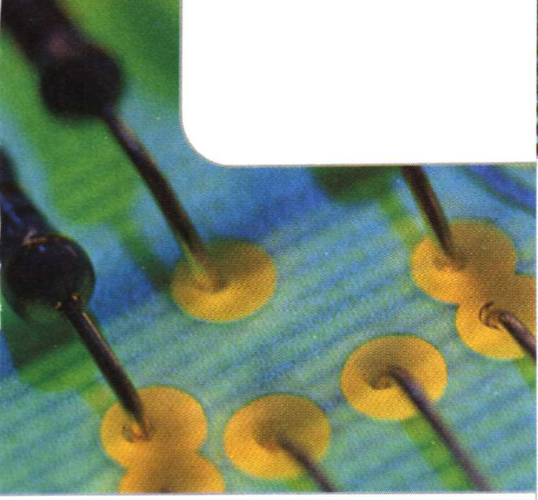


CONTENTS AT A GLANCE

Preface		vii
Chapter 1	Introducing Computers and the Internet	2
Module 1A	Becoming Fluent with Computers and the Internet	4
Module 1B	History of Computers and the Internet	30
Chapter 2	Exploring Computer Hardware	54
Module 2A	Inside the System Unit	56
Module 2B	Storing Data: Electronic Filing Cabinets	88
Module 2C	Input and Output: Data In, Information Out	112
Chapter 3	The World of Computer Software	144
Module 3A	System Software: Keeping the Computer Running Smoothly	146
Module 3B	Application Software: Essentials for Knowledge Workers	167

Chapter 4	Concepts of Application Software	186
Module 4A	Writing with Word Processing Software	188
Module 4B	Creating Electronic Spreadsheets	208
Module 4C	Designing Presentations	231
Module 4D	Building Databases	246
Chapter 5	Multimedia and Virtual Reality	266
Module 5A	Multimedia: Lights! Cameras! Action!	268
Module 5B	Virtual Environments	281
Chapter 6	Data Communications	290
Module 6A	Telecommunications: Exchanging Data via the Telephone System	292
Module 6B	Networks: Superhighways for Digital Information	312
Chapter 7	The Internet and the Web: Welcome to Cyberspace	334
Module 7A	Understanding the Internet	336
Module 7B	The World Wide Web and Electronic Commerce	357
Module 7C	Using Email	378
Module 7D	Creating a Web Page	394
Chapter 8	Creating Information Systems	420
Module 8A	Introducing Information Systems	422
Module 8B	Systems Analysis and Design	439
Module 8C	Programming Languages and Program Development	453

Chapter 9	Social and Ethical Issues of Computing	476
Module 9A	Privacy and Encryption	478
Module 9B	Computer Crime and Security	494
Module 9C	Ethics: Doing the Right Thing	514
Chapter 10	Computers and You	530
Module 10A	Buying and Upgrading Your Computer System	532
Module 10B	Avoiding Risks to Your Health	550
Module 10C	Careers and Certification	561
Module 10D	Emerging Technologies	576
Selected Solutions		S-1
Acronym Finder		A-1
Glossary		G-1
Illustration Credits		C-1
Index		I-1



CONTENTS

Preface vii

Chapter 1 **Introducing Computers to the Internet** 2

Module 1A **Becoming Fluent with Computers and the Internet** 4

The Need for Computer Fluency 6

What Is a Computer, Anyway? 7

Understanding the Computer: Basic Definitions 7

What Computers Can't Do (Yet) 8

The Information Processing Cycle in Action: Batch vs. Interactive Processing 10

So What? 11

Computer Systems 15

Introducing Hardware: The Computer's Physical Components 15

Input: Getting Data into the Computer 16

Processing: Transforming Data into Information 16

Output: Displaying the Information 17

Storage: Holding Programs and Data for Future Use 17

Communications Devices 18

Types of Computers 19

Introducing Software: Telling the Computer What to Do 21

Creating Software 21

Using Software 22

Types of Software 22

System Software 22

Operating System (OS) 22

System Utilities 22

Application Software 24

Packaged vs. Custom Software 24

Office Applications 24

The Internet 25