
Preface

Live in fragments no longer. Only connect.
Edward Morgan Forster

*We wove a web in childhood,
A web of sunny air.*
Charlotte Brontë

Wow! Many of our readers will say, “I had no idea that this wireless stuff was so significant. I have been using cell phones for years, but I never viewed cell phones as vehicles for connecting to the Internet and browsing the Web. Now, all of a sudden, I learn the amazing statistic that the number of people accessing the Web through wireless devices by 2002/2003 will be larger than the number who access the Web through desktop computers! Who could have imagined this?”

So here you are—following the explosive development of the Internet fostered by the World Wide Web. Yes, the world got a dose of reality in 2000/2001 as the stock market lunacy of 1999–2000 discovered gravity and fell back to Earth. For speculators—of which there were far too many in 1999–2000—this was a devastating crash. People “got hurt.” But for people following the long-term trends, it is absolutely clear that an increasing portion of business will be done on the Web, and more of your personal lives will become Web-centric. Young people have not seen the ebb and flow of business cycles. Their view is short-term. Older folks have experienced business cycles. We see forecasts that e-business will be \$5–\$6 trillion by 2004/2005; more than eighty percent of that will be business-to-business (B2B) transactions.

This book has been a true labor of love. Although there are four authors on the cover, probably 30 people at Deitel & Associates, Inc. made significant contributions. We attended many trade shows to be sure we were current with what is happening in the wireless field. Four of us—Harvey and Abbey Deitel, Kate Steinbuhler and Matt Kowalewski—spent a week at the CTIA (Cellular Telecommunications and Internet Association) trade

show in Las Vegas. What a wonderful educational experience for us all—and a fun time. We visited every one of the 1000 (!) exhibitors at the show. While we were there, though, we noticed something unusual—there were no publishers exhibiting their books, nor was there a book store as there normally is at a major trade show. The realization reinforced our commitment to this book.

We see a global explosion in the so-called “wireless Internet,” but we do not see books geared to preparing computer-science students, information technology students and professionals for the wireless Web revolution. *Wireless Internet & Mobile Business How to Program* is intended for the student or professional who sees the enormous potential of this exploding field.

Just look at the bullets on the front cover or the Table of Contents. There is an amazing range of topics covered in this book. Every major technical thrust in wireless Internet programming is covered in these pages.

1. i-mode. The Japanese i-mode system with over 24 million subscribers is the leading wireless Internet system in the world by a factor of three. You will learn the history of i-mode and how to mark up text using cHTML.

2. Wireless Application Protocol (WAP) dominates wireless Internet access in the U.S. and Europe, and also is popular in Japan. You will learn how to mark up text using the Wireless Markup Language (WML) and how to create dynamic content on wireless clients with WMLScript.

3. Java 2 Micro Edition (J2ME). You will learn Sun’s newest addition to the Java platform that many people feel will eventually dominate in the wireless world. You may have heard the terms “applets” and “servlets;” you will be introduced to MIDlets—a MIDP (Mobile Information Device Profile) application.

4. XHTML. Most programmers have developed HTML-based Web pages. However, the W3C (World Wide Web Consortium) has declared HTML to be a legacy technology that will undergo no further development. HTML is being replaced by XHTML—an XML-based technology certain to become the standard in the development of Web clients over the next few years. However, XHTML, like HTML, is far too rich for wireless clients with their small displays and bandwidth limitations, so the W3C has developed a concise subset of XHTML for wireless clients—XHTML Basic. Both WAP and i-mode are converging on XHTML Basic in impending versions, so we cover XHTML Basic markup in Chapters 24 and 25.

But the client side is only half the picture. What about the server side—where “heavy-duty” business logic is implemented? Active Server Pages (ASP) is popular for implementing business logic on Microsoft Web servers and Java dominates the world of non-Microsoft Web servers. We explore these powerful technologies by presenting two large, fully implemented and carefully documented case studies. The ASP case study in Chapter 26 prepares wireless content for i-mode (cHTML), WAP (WML and WMLScript) and XHTML clients. The J2ME Java case study uses Java on the server side to prepare content for i-mode, WAP, XHTML and J2ME clients. It was reported at the June 2001 Java-One trade show that 98% of i-mode server-side programming is done in Java—a stunning amount, given the abundance of server-side programming technologies. Many people believe that the wireless world will converge on Java and XML, so we have included Appendix A, Java Programming, and Appendix H, XML.

If you are tired of tripping over wires and installing wired networks in your offices and your homes, get ready for the Bluetooth wireless technology revolution. Bluetooth

technology can remove the wires connecting your mouse, your printer or any other peripheral device connections to your computer. Not only this, but you will be able to network your office without wires, and your car—becoming ever more electronic- and gadget-intensive—will no longer need complex wiring. You will be able to use your cell phone to buy products from vending machines, to check into hotels and gain access to your hotel room. The possibilities are endless. Already 2200 companies belong to the Bluetooth Consortium.

We present yet another leading-edge technology—BREW—the Binary Runtime Environment for Wireless—created by Qualcomm. BREW enables wireless application developers to solve the complex problem of developing applications that will run on disparate platforms. Developers need only “write to” BREW which will enable disparate devices with BREW hardware and software installed to run these applications despite the fact that the underlying hardware and software might be quite different.

Although wireless devices have limitations, multimedia developers have nevertheless created impressive wireless capabilities. Chapter 30, Multimedia: Audio, Video and Speech Recognition, and Chapter 31, Flash, detail these interactive elements.

We have all experienced the e-business revolution. Next up is the m-business (mobile business) revolution. In addition to our coverage of wireless technologies, we have included a dozen chapters to help you prepare for m-business, including Introduction to m-Business; Location-Identification Technologies and Location-Based Services; e-Marketing and m-Marketing; e-Payments and m-Payments; Security; Legal and Social Issues; International Wireless Communications; two chapters of Wireless Communications Technologies; Palm™ and Palm™ OS®; and Microsoft CE, Pocket PC and Stinger.

The m-business topics we introduce apply many of the programming technologies you learn in *Wireless Internet and Mobile Business How to Program*. Companies are equipping their mobile workers with cell phones and PDAs to provide their employees “anywhere, anytime” access to business-critical information. With location-identification technologies and location-based services, companies can track deliveries; marketers can use the mobile communications explosion as a new and effective way to reach mobile customers because they know where the customers are at a given time. Location-tracking capabilities also raise the issue of whether the applications constitute an invasion of privacy. If used in certain arenas, it could indeed be intrusive. On the other hand, tracking cell-phone users could save lives when accident victims cannot communicate.

Imagine if you could use your cell phone to beam payment information when buying merchandise at a local store. M-commerce success hinges on whether cell phones will become widely used payment mechanisms and whether payments can be sent and received securely. Payment and security are discussed in Chapters 5 and 6.

The international community is the leader of wireless communications technology and use. In a few countries, as many as three-quarters of the people own cell phones. For some people, cell-phone calls are the first calls they make because of the relatively high cost of wired telephone service outside the United States. International wireless communications is presented in Chapter 8.

Wireless communications encompasses numerous technologies that we discuss in Chapters 9 and 10. These chapters provide you with an understanding of the breadth of technologies used around the world—hardware, cell-phone networks and wireless platforms—for wireless communications.

Soon your cell phone will be your electronic address book and calendar—as personal digital assistants (PDAs) and cell phones converge. Chapter 11 details the Palm™ handheld and its applications and Chapter 12 details the Pocket PC handheld and the “smart phone,” the so-called “convergence device.”

Well, there you have it. You are about to begin what we hope will be an interesting, entertaining and challenging learning experience. As you study from this book, if you have any questions, just send us an e-mail at deitel@deitel.com and we will get back to you promptly. We sincerely hope you enjoy learning from *Wireless Internet & Mobile Business How to Program* as much as we enjoyed writing it. Our best wishes to you.

Objectives of *Wireless Internet & Mobile Business How to Program*

Many books about the Web are reference manuals that provide exhaustive listings of features. That is not our style—we concentrate on creating real applications. The live-code™ examples provided on our Web site (www.deitel.com) enable students to run the applications that we discuss. One of the most appealing features of this text is that it introduces a wide variety of wireless programming languages and technologies.

We are excited about the enormous range of possibilities offered by the wireless Internet and m-business. We performed extensive research for this book and, in doing so, have located hundreds of Internet and Web resources. The resources include general information sites, tutorials and demonstrations of the technologies in this book. Many of the demos are fun to try and can increase students' understanding of topics and technologies.

This book is appropriate for any student or professional with a desire to learn wireless programming. Many of the Internet and Web resources that we include point readers to turn-key solutions (some fee-based and some free) for the creation of m-business applications. However, readers can use the programming technologies presented here to create these applications themselves. Please read the tour of the book in Chapter 1, *Introducing the Internet, the Web and Wireless Communications*, to familiarize yourself with the technologies that we present.

We have worked hard to create numerous live-code™ examples to help students master wireless Internet and Web programming quickly and effectively. All of the code examples are available for free download from our Web sites:

www.deitel.com
www.prenhall.com/deitel

Some Notes to Instructors

Why We Wrote *Wireless Internet & Mobile Business How to Program*

Today, the wireless Internet, m-business and m-commerce are experiencing explosive growth; as technologies and applications advance from their infant stages, the possibilities for the wireless industry seem endless. Because wireless technologies allow businesses to reach their markets in ways that were never before possible, professionals are eager to incorporate m-business technology—and hire employees who understand wireless marketing—into their organizations. College professors are including m-business and m-commerce in their undergraduate and graduate Internet and business curricula, and students look forward to mastering leading-edge technologies.

Dr. Harvey M. Deitel taught introductory programming courses in universities for 20 years with an emphasis on developing clearly written, well-designed programs. Much of what is taught in these courses represents the basic principles of programming, but concentrates on the effective use of data types, control structures, arrays and functionalization. Our experience has been that students handle the material in this book in about the same way that they handle other introductory and intermediate programming courses. There is one noticeable difference, though: students are highly motivated by the fact that they are learning technologies that will be immediately useful to them as they enter a business world in which the Internet, the World Wide Web and wireless communications have a massive new prominence.

Multimedia-Intensive Communications

People want to communicate. Sure, they have been communicating since the dawn of civilization, but the potential for information exchange has increased drastically with the evolution of various technologies. Until recently, even computer communications have been limited mostly to digits, alphabetic characters and special characters. The next major wave of communication technology is multimedia. People want to transmit color pictures, voices, audio clips and even full-motion color video over the Internet. At some point, they will insist on three-dimensional, moving-image transmission. Current wireless devices and bandwidth severely limit the potential of multimedia. Small screen sizes, black-and-white screens, slow connections and high access costs have proved to be major impediments to graphics and video presentation on wireless devices. However, as wireless technologies progress and the wireless world migrates to 3G technologies, multimedia capabilities now mostly limited to PCs will become a reality on wireless devices. Current wireless devices, which connect to the Internet at speeds as low as 9.6Kbps, will soon be replaced by devices that connect at speeds 50 times faster—appropriate for streaming media and other enhanced multimedia.

Focus of the Book

Our goal was clear: Produce a textbook for college-level courses in programming and business aimed at students with little or no programming experience, yet offer the depth and the rigorous treatment of theory and practice demanded by professionals and students in traditional, upper-level programming and business courses. To meet these objectives, we produced a comprehensive book that patiently teaches the concepts of wireless programming, as well as the principles of control structures, object-based programming and various markup languages (WML, cHTML, XHTML Basic and XML) and scripting languages (WML-Script). We include detailed appendices on Java and XML—the two technologies that are certain to dominate the future of wireless applications development. After mastering the material in this book, students will be well prepared to take advantage of the wireless Internet and the Web as they venture into the rapidly changing business world.

Enabling Multimedia-Based Applications and Communications

Many books about the wireless Internet concentrate on such simple applications for wireless devices as phone books and calendar programs. We do that too, but, as you move towards the back of the book, you will start to see more visually appealing applications involving i-mode and BREW technology. Already, we are starting to see the shift to color displays and more robust devices, which will enable a new generation of wireless applications. Moreover, the key focus of this book is on Web-based applications development. Our

audiences want to build real-world, industrial-strength, Web-based applications. Although these audiences are interested in appealing WAP applications, they also care about client/server systems, databases and distributed computing. Through our explanations and live-code™ examples, we help students master a wide variety of programming and Internet tools that will maximize their creativity and development abilities.

There have been predictions that the Internet will eventually replace radio and television as we know them today. Similarly, it is not hard to imagine newspapers, magazines and books delivered to “the palm of your hand” via wireless communications. Many newspapers and magazines already offer Web-based versions, and those same services will soon spread to the wireless world. When cellular phones were first introduced, they were large, cumbersome and unmanageable. Today, they are small devices that fit in our pockets and many are equipped with Internet access. Given the current rate of advancement, wireless technology could offer such impressive services as video conference calls and high-power, multi-player video games in the coming years.

Teaching Approach

Wireless Internet & Mobile Business How to Program contains a rich collection of examples, exercises and projects that give students the opportunity to solve interesting real-world problems. The book concentrates on the principles of m-business and good software engineering, stressing program clarity. We avoid arcane terminology and syntax specifications in favor of teaching by example. The book is written by educators who spend most of their time writing about revolutionary, cutting-edge programming topics—in addition to teaching these technologies in industry classrooms worldwide. The text emphasizes good pedagogy.

Live-Code™ Teaching Approach

Wireless Internet & Mobile Business How to Program is loaded with numerous live-code™ examples. This style exemplifies the way we teach and write about programming, as well as being the focus of our multimedia *Cyber Classrooms*. Each new concept is presented in the context of a complete, working example that is immediately followed by one or more windows showing the program’s input/output dialog. We call this method of teaching and writing our **live-code™ approach**. *We use programming languages to teach programming languages*. Reading the examples in the text is much like entering and running them on a computer.

This book begins by explaining cutting-edge technologies and business models that are changing the way that e-commerce is conducted. It then proceeds to explore the creation of m-business applications, starting with WAP/WML and continuing on to programming with Web Clipping, i-mode, XHTML Basic, ASP, J2ME and BREW. There is great stuff to be done in all these languages, so let’s get right to it! Wireless programming is not trivial by any means, but it’s fun, and students can see immediate results.

World Wide Web Access

All of the examples for *Wireless Internet and Mobile Business How to Program* (and our other publications) is available on the Internet as downloads from the Web sites:

www.deitel.com
www.prenhall.com/deitel

We suggest downloading all the examples and then running each program as you read the text. Make changes to the examples and immediately see the effects of those changes—it's a great way to learn programming. As we introduce new technologies in the book, we provide setup instructions for the appropriate wireless simulators and emulators.¹ Each set of instructions assumes that the user is running Windows 2000 and is using Internet Information Services (IIS). Additional setup instructions for Web servers and other software can be found at our Web site along with the examples. [*Note:* You must respect the fact that this is copyrighted material. Feel free to use it as you study, but you may not republish any portion of it in any form without explicit permission from Prentice Hall and the authors.]

Objectives

Each chapter begins with *Objectives* that tell students what to expect and give them an opportunity, after reading the chapter, to determine whether they have met the intended goals. The objectives serve as confidence builders and as a source of positive reinforcement.

Quotations

The chapter objectives are followed by sets of *Quotations*. Some are humorous, some are philosophical and some offer interesting insights. We have found that students enjoy relating the quotations to the chapter material. Many of the quotations are worth a “second look” after you read each chapter.

Outline

The chapter *Outline* enables students to approach the material in top-down fashion. Along with the chapter objectives, the outline helps students anticipate what is to come and set a comfortable and effective learning pace.

11,026 Lines of Code in 137 Examples (with Outputs)

We present features in the context of complete, working examples and server-side programs in ASP/VBScript and Java. Ranging from a few lines of code to several hundred, each document is followed by the outputs produced when the document is rendered in a simulator and its scripts are executed. This enables students to confirm that the documents are rendered as expected. (We use a variety of simulators, including Openwave, Nokia and Pico.) Reading the book carefully is much like entering and running these examples on a computer. Students should download all the code for the book from our Web site and should run each program while studying that program in the text.

523 Illustrations/Figures

An abundance of charts, line drawings and program outputs is included. Screen captures help explain concepts related to wireless technology, such as location-identification and transmission protocols. Other images convey the differences between wireline and wireless clients.

38 e-Facts

The *e-Facts* offer interesting facts and statistics on the Internet the World Wide Web and e-business.

1. Most Deitel books have companion CDs containing software and examples. However, the wireless industry is evolving rapidly, so the simulator and emulator vendors were reluctant to provide software for a CD. You will have to visit the Web sites we provide in the book to download the appropriate software to execute the examples.

58 *m-Facts*

Similar to e-Facts, our *m-Facts* relate to topics covered in the text and contain interesting facts and statistics on mobile communications and mobile business.

282 *Programming Tips*

We have included programming tips to help students focus on important aspects of program development. We highlight hundreds of these tips in the form of *Good Programming Practices*, *Common Programming Errors*, *Testing and Debugging Tips*, *Performance Tips*, *Portability Tips*, *Software Engineering Observations* and *Look-and-Feel Observations*. These tips and practices represent the best of the knowledge we have gleaned over decades of programming and teaching experience. One of our students—a mathematics major—told us that she feels this approach is like the highlighting of axioms, theorems and corollaries in mathematics books; it provides a foundation on which to build good software.



75 Good Programming Practices

Good Programming Practices are highlighted in the text. These tips call attention to techniques that will help students produce better programs. When we teach introductory courses to nonprogrammers, we state that the “buzzword” of each course is “clarity,” and we tell the students that we will highlight (in these *Good Programming Practices*) techniques for writing programs that are clearer, more understandable and more maintainable.



88 Common Programming Errors

Students learning a language—especially in their first programming course—tend to make certain kinds of errors frequently. Pointing out these *Common Programming Errors* reduces the likelihood that students will make the same mistakes. It also cuts down on long lines outside instructors’ offices during office hours!



29 Performance Tips

In our experience, teaching students to write clear and understandable programs is by far the most important goal of a first programming course. But students want to write programs that run the fastest, use the least memory, require the smallest number of keystrokes or dazzle in other nifty ways. Students really care about performance, and they want to know what they can do to “turbo charge” their programs. For the benefit of such students, we have included *Performance Tips* that highlight opportunities for the improvement of program performance.



14 Portability Tips

Software development is a complex and expensive endeavor. Organizations that create software often must produce versions customized to a variety of computers and operating systems. This has excited strong interest in portability (i.e., producing software that will run on various computer systems with few, if any, changes). Achieving portability requires careful and cautious design, and there are many pitfalls. We include *Portability Tips* to help students write portable code.



51 Software Engineering Observations

The *Software Engineering Observations* highlight techniques, structural issues and design issues that affect the architecture and construction of software systems, especially large-scale systems. Much of what the student learns here will be useful in upper-level courses and in industry as the student begins to work with large, complex real-world systems.



13 Testing and Debugging Tips

This “tip type” is somewhat misnamed. When we first decided to incorporate *Testing and Debugging Tips*, we thought that the tips would contain suggestions for testing programs to expose bugs and suggestions for removing those bugs. In fact, many of these tips are observations about capabilities and features that prevent bugs from getting into programs in the first place.



12 Look-and-Feel Observations

We provide *Look-and-Feel Observations* to highlight graphical user interface (GUI) conventions. These observations help students design their own graphical user interfaces to conform with industry norms.

Summary (1392 Summary bullets)

Each chapter ends with additional pedagogical devices. We present a thorough, bullet-list-style *Summary* of the chapter. On average, there are 39 summary bullets per chapter, and summaries also are included in several of the appendices. This helps students review and reinforce key concepts.

Terminology (2312 Terms)

We include in a *Terminology* section an alphabetized list of the important terms defined in the chapter. Again, this serves as further reinforcement. On average, there are 59 terms per chapter.

482 Self-Review Exercises and Answers (Count Includes Separate Parts)

Self-Review Exercises and Answers are included for self-study. These questions and answers give students a chance to build confidence with the material and prepare for the regular exercises. Students should attempt all the self-review exercises and check their answers.

561 Exercises (Solutions in Instructor’s Manual; Count Includes Separate Parts)

Each chapter concludes with a set of exercises that involve simple recall of important terminology and concepts, writing individual statements, writing small portions of functions, writing complete functions and scripts and working on larger projects. The exercises cover a wide variety of topics, enabling instructors to tailor their courses to the unique needs of their audiences and to vary course assignments each semester. Instructors can use these exercises to form homework assignments, short quizzes and major examinations. The solutions for the vast majority of the exercises are included in the *Instructor’s Manual* and the *Instructor’s Manual CD* which is available only to instructors through their Prentice-Hall representatives. Solutions to approximately half the exercises are included on the *Wireless Internet & Mobile Business How to Program Multimedia Cyber Classroom CD* (available in bookstores and computer stores; please see the last few pages of this book or visit our Web site at www.deitel.com for ordering instructions).

Approximately 5443 Index Entries (with approximately 7635 Page References)

We have included an extensive *Index* at the back of the book. Using this resource, students can search for any term or concept by keyword. The terms in the *terminology* sections generally appear in the *index* (along with many more index items from each chapter). Students can use the *index* in conjunction with the *terminology* sections to ensure that they have covered the key material in each chapter.

“Double Indexing” of All Live-Code™ Examples and Exercises

Wireless Internet & Mobile Business How to Program has 137 live-code™ examples and 561 exercises (including parts). We have “double indexed” each of the live-code™ examples. For every source-code program in the book, we took the figure caption and indexed it both alphabetically and as a subindex item under “Examples.” This makes it easier to find examples that use particular features.

Ancillary Package for Wireless Internet & Mobile Business How to Program

[NOTE: Please do not write to us requesting the instructor’s manual. Distribution of this publication is strictly limited to college professors teaching from the book. Instructors may obtain the solutions manual only from their regular Prentice Hall representatives. We regret that we cannot provide the solutions to professionals.] *Wireless Internet & Mobile Business How to Program* has extensive ancillary materials available to instructors teaching from the book. The Instructor’s Manual CD contains solutions to the vast majority of the end-of-chapter exercises. In addition, we provide PowerPoint® slides containing all the code and figures in the text. You are free to customize these slides to meet your own classroom needs. Prentice Hall provides a *Companion Web Site* (www.prenhall.com/deitel) that includes resources for instructors and students. For instructors, the Web site has a Syllabus Manager for course planning, links to the PowerPoint slides and reference materials from the appendices of the book (such as the operator precedence chart, character sets and Web resources). For students, the Web site provides chapter objectives, true/false self-review exercises and answers, chapter highlights and reference materials.

Wireless Internet & Mobile Business Programming Multimedia Cyber Classroom and The Complete Wireless Internet and Mobile Business Programming Training Course

We have prepared an optional interactive, CD-ROM-based, software version of *Wireless Internet & Mobile Business How to Program* called the *Wireless Internet and Mobile Business Programming Multimedia Cyber Classroom*. This resource is loaded with features that are ideal for learning and reference. The *Cyber Classroom* is wrapped with the textbook at a discount in *The Complete Wireless Internet & Mobile Business Programming Training Course*. If you already have the book and would like to purchase the *Wireless Internet & Mobile Business Programming Multimedia Cyber Classroom* separately, please call 1-800-811-0912 and ask for ISBN# 0-13-062337-7.

The CD has an introduction with the authors overviewing the *Cyber Classroom*’s features. The 137 live-code™ example Web documents and server-side programs in the textbook truly “come alive” in the *Cyber Classroom*. If you want to modify a document and examine the effects of your changes, simply click the floppy-disk icon that causes the

source code to be “lifted off” the CD and “dropped into” one of your own directories so that you can edit the document and try out your new version. Click the speaker icon for an audio that talks about the document and “walks you through” the code.

The *Cyber Classroom* also provides navigational aids, including extensive hyperlinking. The *Cyber Classroom* remembers in a “history list” recent sections that you have visited and allows you to move forward or backward in that history list. The thousands of index entries are hyperlinked to their text occurrences. Furthermore, when you key in a term using the “find” feature, the *Cyber Classroom* will locate occurrences of that term throughout the text. The *Table of Contents* entries are “hot,” so clicking a chapter name takes you to that chapter.

Students like the dozens of solved problems from the textbook that are included with the *Cyber Classroom*. Studying and running these extra examples is a nice way for students to enhance their learning experience.

Students and professional users of our *Cyber Classrooms* tell us that they like the interactivity and that the *Cyber Classroom* is an effective reference because of its extensive hyperlinking and other navigational features. We recently received an e-mail from a person who said that he lives “in the boonies” and cannot take a live course at a university, so the *Cyber Classroom* provided an ideal solution to his educational needs.

Professors tell us that their students enjoy using the *Cyber Classroom*, spend more time on the course and master more of the material than in textbook-only courses. In addition, the *Cyber Classroom* helps shrink lines outside professors’ offices during office hours. We have also published *The C++ Multimedia Cyber Classroom (3/e)*, the *Visual Basic 6 Multimedia Cyber Classroom*, the *Java 2 Multimedia Cyber Classroom 4/e*, the *Internet and World Wide Web Programming Multimedia Cyber Classroom, 2/e*, the *XML Multimedia Cyber Classroom*, the *Perl Multimedia Cyber Classroom* and will soon publish the *Advanced Java Multimedia Cyber Classroom*, the *Python Multimedia Cyber Classroom* and many more.

Acknowledgments

One of the great pleasures of writing a textbook is acknowledging the efforts of the many people whose names do not appear on the cover, but whose hard work, cooperation, friendship and understanding were crucial to the production of the book.

Many other people at Deitel & Associates, Inc., devoted long hours to this book.

- Barbara Deitel managed the preparation of the manuscript and coordinated various aspects of the production of the book with Prentice Hall. She did all this in parallel with handling her extensive financial and administrative responsibilities at Deitel & Associates, Inc., including serving as Chief Financial Officer.
- Abbey Deitel, a graduate of Carnegie Mellon University’s Industrial Management program and President of Deitel & Associates, Inc., co-authored Chapter 6 and edited Chapters 1–3, 5, 7, 9–12, 21, 28–30.
- Matthew R. Kowalewski, a graduate of Bentley College with a major in Accounting Information Systems and Director of Wireless Development at Deitel & Associates, Inc., served as lead programmer. He co-authored Chapter 26 and made

significant contributions to most of the programming chapters in the book. He also reviewed Chapter 29.

- Betsy DuWaldt, a graduate of Metropolitan State College of Denver with a major in Technical Communications (Technical Writing and Editing Emphasis), and Editorial Director at Deitel & Associates, Inc., co-authored Chapters 5, 8, 22 and 23. She also co-managed (with Kate Steinbuhler) the permissions process and the Deitel technical writing staff. She and her staff edited most of the chapters in the book for smoothness and clarity.
- Laura Treibick, a graduate of the University of Colorado at Boulder with a major in Photography and Multimedia, co-authored Chapter 30 with help from Emblaze Systems, PacketVideo, Generic Media, Inc., and ActiveSky. She also co-authored Chapter 31.
- Christi Kelsey, a graduate of Purdue University with a major in Management and a minor in Information Systems, co-authored Chapters 9–12 and 30. She made contributions and provided insights on Chapters 1–8 and edited Chapters 21, 22, 28 and 29.
- Christine Connolly, a graduate of Boston College Carroll School of Management with concentrations in Marketing and Finance, co-authored Chapter 4 and edited many of the other chapters and index.
- Rashmi Jayaprakash, a graduate of Boston University with a major in Computer Science, co-authored the CallXML section of Chapter 30 and Appendix E, revised the accessibility section of Chapter 7, and edited Chapters 2, 7, 9 and 13–20.
- Jonathan Gadzik, a graduate of the Columbia University School of Engineering and Applied Science with a major in Computer Science, co-authored Chapter 27—Java-based Wireless Applications and J2ME—and contributed to Appendix A.
- Cheryl Yaeger, a graduate of Boston University with a major in Computer Science and Director of Microsoft Software Publications at Deitel & Associates, Inc., co-authored Chapter 28.
- Paul Brandano, a graduate of Boston College with a major in marketing, co-authored Chapter 3.
- Peter Brandano, a graduate of Boston College with a major in Computer Science, contributed to Chapters 13–21, and co-authored Chapter 31.

We would also like to thank the participants in our Deitel & Associates, Inc., College Internship Program.²

2. The *Deitel & Associates, Inc., College Internship Program* offers a limited number of salaried positions to Boston-area college students majoring in Computer Science, Information Technology, Marketing or English. Students work at our corporate headquarters in Sudbury, Massachusetts full-time in the summers and part-time during the academic year. Full-time positions are available to college graduates. For more information about this competitive program, please contact Abbey Deitel at deitel@deitel.com and visit our Web site, www.deitel.com.

- Lauren Trees, a graduate of Brown University with a major in English, co-authored Chapters 5 and 8 and additional sections in the front half of the book. She also edited most of the book.
- Elizabeth Rockett, a senior in English at Princeton University, edited Chapters 9–16, 23, 26, 29 and 30.
- Barbara Strauss, a senior in English at Brandeis University, co-authored Chapter 6 and edited Chapters 2–5, 7, 9–12, 21, 29–31. She completed research for Chapter 9 and contributed to the essay questions and answers for Chapters 9, 11 and 12.
- Peter Lavelle, a senior in Computer Information Systems at Bentley College, edited Chapters 14 and 15, and revised Chapters 24 and 25.
- Jennifer Wong, a senior in Electrical and Computer Engineering at Carnegie Mellon University, co-authored Chapter 29 and edited Chapters 13–22, 24 and 25.
- Christina Courtemarche, a senior in Computer Science at Boston University, co-authored Chapters 21 and 22, edited Chapters 24 and 25 and assisted in the creation of ancillary materials for Chapters 13–31.
- A. James O'Leary, a sophomore in Computer Science and Psychology at Rensselaer Polytechnic Institute, co-authored Chapter 6 and edited Chapter 4. Jim has strong interests in computer security.
- Andrew Jones, a fifth-year student at Dartmouth College, edited Chapters 13–19, 26 and 29.
- Christina Carney, a senior in Psychology and Business at Framingham State College, researched and co-authored the Internet and World Wide Web resources URLs and worked on some of the ancillary material and the Preface.
- Amy Gips, a sophomore in Marketing and Finance at Boston College, compiled the quotations for all chapters, the URLs for Chapter 6, reviewed the URLs for the e-marketing/m-marketing chapter and worked on the ancillaries.
- Carlo Garcia, a senior in Computer Science at Boston University, co-authored Chapter 28 and contributed to Chapters 21, 22 and 24–25.
- Zachary Bouchard, a junior in Economics and Philosophy at Boston College, edited Chapters 13–20. He also prepared the screenshots for the examples in Chapters 13–20.
- Varun Ganapathi, a sophomore in Computer Science and Electrical Engineering at Cornell University Engineering College, edited and contributed to Chapter 27 and reviewed Chapter 26.
- Josh Modell, a freshman at Duke University, helped generate the Instructor's Manual and compiled ancillary material for many of the chapters.
- Gary Grinev, a freshman at the University of Connecticut, syntax colored Chapter 26.

Moreover, we would like to thank Su Zhang, Marina Zlatkina, Carol Treibick, Ana Rodrigues and Muni Jayaprakash for providing translations in Appendix E.

We are fortunate to have been able to work on this project with the talented and dedicated team of publishing professionals at Prentice Hall. We especially appreciate the extraordinary efforts of our Computer Science editor, Petra Recter and her boss—our mentor in publishing—Marcia Horton, Editor-in-Chief of Prentice-Hall’s Engineering and Computer Science Division. Camille Trentacoste and her boss Vince O’Brien did a marvelous job managing the production of the book.

The *Wireless Internet & Mobile Business Programming Multimedia Cyber Classroom* was developed in parallel with *Wireless Internet & Mobile Business How to Program*. We sincerely appreciate the “new media” insight, savvy and technical expertise of our multimedia, computer-based training and Web-based training editors, Mark Taub and Karen McLean. They and project manager Mike Ruel did a wonderful job bringing the *Wireless Internet & Mobile Business Programming Multimedia Cyber Classroom* to publication under a tight schedule.

We owe special thanks to the creativity of Tamara Newnam Cavallo (smart_art@earthlink.net), who did the art work for our programming tips icons and for the cover. She created the delightful bug creature that has become our corporate mascot.

We wish to acknowledge the efforts of our reviewers and to give a special note of thanks to Crissy Statuto and Karen Schultz of Prentice Hall, who managed this extraordinary review effort. Adhering to a tight time schedule, these reviewers scrutinized the text and the programs, and made countless suggestions for improving the accuracy and completeness of the presentation.

We sincerely appreciate the efforts of our reviewers:

Hesham Auda (CCNY)
Larry Baker (Tsunami Wireless, Inc.)
Anders Bengtsson (Aspiro)
Bharat Bhargava (Purdue)
Ketih Bigelow (Lutris)
Chatschik Bisdikian (Author of *BlueTooth Revealed: The Insider's Guide to an Open Specification for Global Wireless Communications*)
Derek Brink (RSA Security)
Paul Brunato (US Wireless Corporation)
Carl Burnham (Southpoint)
Steve Burnett (RSA Security)
Bryan Buus (XOR)
Rob Chandhok (Qualcomm)
Q. Chung (Villanova University)
Ken Cox (Sympatico)
Jim Coyer (Wireless Knowledge)
Dinar Dalvi (Developer, Bay Area)
Chris DeHerra (Webmaster, CEwindows.net)
Andy Dornan (Author of *The Essential Guide to Wireless Communication Applications*)
Jonathan Earl (Technical Training)
Nick Evans (*Internet Week* columnist)
Amanda Farr (Virtualfx.net)

Loic Fenbeier (Accenture)
Avi Finkel (WhizBang! Labs)
Seth Fogie (Donecker's)
Victoria French (Metrosharp)
Charles Fry (thesundancekid.org)
Rich Goldberg (Bantu)
Jay Gooby (Global Wireless Forum)
Arie Hadiwidjaja (Fenstrae BV)
Bob Hansmann (Trend Micro)
Jonas Hasselberg (Microsoft: Smartphone Product Manager)
Damon Houghland (author of PTR book *Essential WAP for Web Professionals*)
Paul Howard (University of Nottingham)
Tom Hume (Global Wireless Forum)
Evelyn Jackson (Stellcom)
Andrew Jagoe (Telcontar)
Alwyn Joy (Whiz Networks Pvt. Ltd.)
Lars Knutsson (Teleca Comtec)
Apurva Kumar (IBM)
Jeff Laird (Northeast Technical Community College)
Edmund Lam (University of California)
Maxim Loukianov (Solomio Crop)
Mike McDermid (Plantnet)
Keith McIntyre (Stellcom)
Brent Miller (IBM Corporation)
Scott Mitchell (Consultant)
Mahesh Moorthy (Qualcomm)
Saurabh Nandu (mastercsharp.com)
Simon North (Synopsis)
Cyrus Peikari (Virus MD Corp.)
Steven Pemberton (CWI, Amsterdam)
Shep Perkins (Fund Manager of Fidelity Select Wireless Portfolio)
Peter Reiher (UCLA)
Scott Schneberger (University of West Ontario)
Mike Shaffer (SportsStandings)
Rahul Sharma (Metalinear Media)
Rajeev Shorey (IBM India Research Laboratory)
Rodel Simpauco (Wireless Knowledge)
Ivo Styoyanoff (Stellcom)
Keith Ten (Stellcom)
Vadim Tkachenko (Sera Nova)
Shane Weebe (Wireless Knowledge)
Jesse Wilkins (Metalinear Media)
Chris Wysopal (atstake)
Paul Yao (The Paul Yao Company)
Tina Zelaya (Education America)

We would also like to acknowledge Ericsson and Teleca, which contributed code examples, screen captures and reviewed the Bluetooth Wireless Programming chapter.

From Ericsson: “Ericsson Technology Licensing AB licenses intellectual property and offers training and consulting for the Bluetooth wireless technology. We are licensing base-band, radio and software intellectual property to many of the world's largest semiconductor companies and OEM's. No company has been working longer or harder with Bluetooth wireless technology than Ericsson. We began our research back in 1994. We helped found the Bluetooth SIG and we were the first company to put Bluetooth consumer products into mass production.”

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Deitel and Associates, Inc., would sincerely appreciate your comments, criticisms, corrections and suggestions for improving the text. Please address all correspondence to our e-mail address:

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We will respond promptly. Well, that's it for now. We sincerely hope you enjoy this look at leading-edge wireless applications development. Our best wishes to you.

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Kate Steinbuhler, Editorial Director at Deitel & Associates, Inc., and a graduate of Boston College with majors in English and Communications, served as project manager for *Wireless Internet & Mobile Business How to Program*, in addition to acting as primary author of Chapters 1–3 and 7 and Appendix B. In her time at Deitel & Associates, Inc., she has served as project manager and co-author of *e-Business and e-Commerce for Managers* and also as co-author and project manager for six business chapters in *e-Business and e-Commerce How To Program*. She would like to acknowledge the other members of the Deitel writing team for their hard work and devotion to the project. [Everyone at Deitel & Associates, Inc., wishes Kate great success as she moves on to continue her education at the University of Pittsburgh Law School.]

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