Preface

Welcome to Apple’s new Swift programming language and Swift for Programmers! This book presents leading-edge computing technologies for software developers. It’s designed primarily for three audiences of developers who already know object-oriented programming and are considering using Swift:

- Objective-C programmers who are developing new iOS and/or OS X apps and who want to quickly begin using Swift in their apps.
- Objective-C programmers who are enhancing existing iOS and/or OS X apps and who want to quickly begin using Swift in their apps.
- Java, C++, and C# programmers who are new to iOS and OS X development and who want to start developing iOS and/or OS X apps in Swift.

Chapters 1 through 12 focus on Swift programming, then Chapters 13 and 14 briefly introduce iOS 8 app development. The iOS 8 chapters are condensed versions of Chapters 2 and 3 of our book, iOS® 8 for Programmers: An App-Driven Approach with Swift™, in which we focus on building many complete iPhone® and iPad® apps.1

We emphasize software engineering best practices. At the heart of the book is the Deitel signature “live-code approach.” Rather than using only code snippets, we present most concepts in the context of complete working Swift programs that run on OS X® and—in the last two chapters—iOS® 8. Each complete code example is accompanied by one or more live sample executions. In the few cases where we use code snippets, we always extract them from compiled, correctly executing, live-code examples. All of the book’s source code is available at

http://www.deitel.com/books/SwiftFP

Some complete live-code programs might appear to be code snippets—this is because Swift eliminates various items that are common in many C-based languages, such as the need for a main method. For example, the following is actually a complete Swift program:

```
println("Welcome to Swift Programming!")
```

Swift Programming Language

Swift was a surprise announcement at Apple’s WWDC (Worldwide Developer Conference) in June 2014. Because the language is so new, it’s likely to evolve quickly over the next few years. Here’s some key aspects of Swift:

1. Swift is a young language that’s evolving rapidly. We plan to post bonus content covering important new features as they emerge. See http://www.deitel.com/books/SwiftFP for details.

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- **Apple’s Language of the Future**—Apple is the most valuable technology company in the world, and they’ve declared that Swift is their language of the future for app and systems programming.

- **Popular Language Features**—Swift is a contemporary language with simpler syntax than Objective-C. Because Swift is new, its designers were able to include popular features like those in Objective-C, Java, C#, Ruby, Python and many others. These features (which are listed in Fig. 1.1) include type inference, tuples, closures (lambdas), generics, operator overloading, functions with multiple return values, optionals, String interpolation, switch statement enhancements and more. We’ve found it easier and faster to develop iOS and OS X apps in Swift than in Objective-C.

- **Performance**—Swift was designed for better performance than Objective-C. Apple has observed that Swift code is about 1.5 times faster than Objective-C code on today’s multi-core systems.

- **Error Prevention**—Swift eliminates many common programming errors, making your code more robust and secure. Some of these error prevention features (which are listed in Fig. 1.2) include automatic memory management, no pointers, required braces around every control statement’s body, assignment operators that do not return values, requiring initialization of all variables and constants before they’re used, array bounds checking, automatic checking for overflow of integer calculations, and more.

- **Interoperability with Objective-C**—You can combine Swift and Objective-C in the same app. This enables you to enhance existing Objective-C apps without having to rewrite all the code. Your apps will easily be able to interact with the Cocoa/Cocoa Touch frameworks, which are largely written in Objective-C.

- **Playgrounds**—A playground is an Xcode window in which you can enter Swift code that compiles and executes as you type it. This allows you to see and hear your code’s results as you write it, to quickly find and fix errors, and to experiment with features of Swift and the Cocoa/Cocoa Touch frameworks.

**Software Used in Swift for Programmers**

To execute our Swift examples and write your own Swift code, you must install Xcode 6, which is available free from the Mac App Store. When you open Xcode for the first time, it will download and install additional features required for development. For the latest information about Xcode, visit

https://developer.apple.com/xcode

**Swift Fundamentals: Parts I, II and III LiveLessons Video Training**

Our *Swift Fundamentals: Parts I, II and III* LiveLessons video training product shows you what you need to know to start building robust, powerful software with Swift. It includes approximately 20 hours of expert training synchronized with *Swift for Programmers*. For additional information about Deitel LiveLessons video products, visit

http://www.deitel.com/livelessons

or contact us at deitel@deitel.com.
You also can access our books and LiveLessons videos on Safari Books Online

if you have an appropriate subscription. A limited free-trial is available. Safari is popular
with large companies, colleges, libraries and individuals who would like access to video
training and electronic versions of print publications.

Explosive Growth of the iPhone and iPad Is Creating Opportunity
for Developers

iPhone and iPad device sales have been growing exponentially, creating significant oppor-
tunities for iOS app developers. The first-generation iPhone, released in June 2007, sold
6.1 million units in its initial five quarters of availability.\(^2\) The iPhone 5s and the iPhone
5c, released simultaneously in September 2013, sold over nine million combined in the first
three days of availability.\(^3\) The most recent iPhone 6 and iPhone 6 Plus, announced in Sep-
tember 2014, pre-sold four million combined in just one day—double the number of
iPhone 5 pre-sales in its first day of pre-order availability.\(^4\) Apple sold 10 million iPhone 6
and iPhone 6 Plus units combined in their first weekend of availability.\(^5\)

Sales of the iPad are equally impressive. The first generation iPad, launched in April
2010, sold 3 million units in its first 80 days of availability\(^6\) and over 40 million worldwide
by September 2011.\(^7\) The iPad mini with Retina display (the second-generation iPad
mini) and the iPad Air (the fifth-generation iPad) were released in November 2013. In just
the first quarter of 2014, Apple sold a record 26 million iPads.\(^8\)

There are over 1.3 million apps in the App Store\(^9\) and over 75 billion iOS apps have
been downloaded.\(^10\) The potential for iOS app developers is enormous. It’s likely that
most new iOS and OS X development soon will be done in Swift, so there are great oppor-
tunities for Swift programmers.

Our Research Sources

Due to Swift’s similarities with many of today’s popular programming languages, we were
able to repurpose and customize examples from many of our other programming text-
books and professional books. Because Swift is new, we performed most of our research
using the Apple resources listed on the next page.

\(^3\) https://www.apple.com/pr/library/2013/09/23First-Weekend-iPhone-Sales-Top-Nine-
Million-Sets-New-Record.html.
\(^4\) http://techcrunch.com/2014/09/15/apple-sells-4m-iphone-6-and-6-plus-pre-orders-
in-opening-24-hours/.
\(^5\) http://www.apple.com/pr/library/2014/09/22First-Weekend-iPhone-Sales-Top-10-
Million-Set-New-Record.html.
\(^6\) http://www.ipadinsider.com/tag/ipad-sales-figures/.
\(^7\) http://www.statista.com/statistics/180656/sales-of-tablets-and-ipads-in-the-us-
until-2012/.
\(^8\) http://www.theverge.com/2014/1/27/5350106/apple-q1-2014-earnings.
\(^10\) http://techcrunch.com/2014/06/02/itunes-app-store-now-has-1-2-million-apps-has-seen-75-billion-downloads-to-date/.
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- *The Swift Programming Language*—available in the iBooks store and at:

- *Using Swift with Cocoa and Objective-C*—available in the iBooks store and at:

- *The Swift Standard Library Reference*:

- The Swift Blog:
  https://developer.apple.com/swift/blog/

- World Wide Developers Conference (WWDC) 2014 videos:

**Teaching Approach**

*Swift for Programmers* contains numerous complete working code examples. We stress program clarity and concentrate on building well-engineered, high-performance software.

**Syntax Coloring.** For readability, we syntax color all the Swift code, similar to the syntax coloring in the Xcode 6 integrated-development environment. Our conventions are:

- comments appear in green
- keywords appear in dark blue
- constants and literal values appear in light blue
- all other code appears in black

**Code Highlighting.** We place colored rectangles around key code segments.

**Using Fonts for Emphasis.** We place key terms and the index’s page reference for each term’s defining occurrence in bold colored text for easier reference. We emphasize on-screen components in the **bold Helvetica** font (e.g., the *File* menu) and emphasize Swift program text in the Lucida font (for example, `println()`).

**Objectives/Outline.** Each chapter begins with a list of objectives and a chapter outline.

**Illustrations/Figures.** Abundant tables, programs and program outputs are included.

**Programming Tips.** We include programming tips to help you focus on important aspects of program development. These tips and practices represent the best we’ve gleaned from a combined eight decades of programming experience.

**Good Programming Practices**

*The Good Programming Practices call attention to techniques that will help you produce programs that are clearer, more understandable and more maintainable.*

**Common Programming Errors**

*Pointing out these Common Programming Errors reduces the likelihood that you’ll make them.*
Academic Bundle iOS® 8 for Programmers and Swift™ for Programmers

The Academic Bundle iOS® 8 for Programmers and Swift™ for Programmers is designed for professionals, students and instructors interested in learning or teaching iOS 8 app development with a broader and deeper treatment of Swift. You can conveniently order the Academic Bundle from pearsonhighered.com with one ISBN: 0-13-408775-5. The Academic Bundle includes:

- Swift™ for Programmers (print book)
- iOS® 8 for Programmers: An App Driven Approach with Swift™, Volume 1, 3/e (print book)
- Access Code Card for Academic Package to accompany Swift™ for Programmers
- Access Code Card for Academic Package to accompany iOS® 8 for Programmers: An App Driven Approach with Swift™, Volume 1, 3/e

The two Access Code Cards for the Academic Packages (when used together) give you access to the companion websites, which include self-review questions (with answers), short-answer questions, programming exercises, programming projects and selected videos chosen to get you up to speed quickly with Xcode 6, visual programming and basic Swift-based, iOS 8 programming.

Ordering the Books and Supplements Separately

The print books and Access Code Cards may be purchased separately from pearsonhighered.com using the following ISBNs (email deitel@deitel.com if you have questions):

- Standalone access code card for Academic Package to accompany Swift™ for Programmers: ISBN 0-13-405818-6

Instructor Supplements
Instructor supplements are available online at Pearson’s Instructor Resource Center (IRC). The supplements include:

- Solutions Manual with selected solutions to the short-answer exercises.
- Test Item File of multiple-choice examination questions (with answers).
- PowerPoint® slides with the book’s source code and tables.

Please do not write to us requesting access to the Pearson Instructor’s Resource Center. Certified instructors who adopt the book for their courses can obtain password access from their regular Pearson sales representatives (www.pearson.com/relocator). Solutions are not provided for “project” exercises.

Acknowledgments

Deitel Team
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Pearson Education Team
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Reviewers
We wish to acknowledge the efforts of our reviewers. They scrutinized the text and the programs and provided countless suggestions for improving the presentation.

- Scott Bossack, Lead iOS Developer, Thrillist Media Group
- René Cacheaux, iOS Architect, Mutual Mobile
- Ash Furrow, iOS Developer, Artsy
- Rob McGovern, Independent Contractor
- Abizer Nasir, Freelance iOS and OS X Developer, Jungle Candy Software Ltd.
- Rik Watson, Technical Team Lead for HP Enterprise Services (Applications Services)
- Jack Watson-Hamblin, Programming Writer and Teacher, MotionInMotion (https://motioninmotion.tv/)

A Special Thank You to Reviewer Charles Brown
When Swift was announced in June 2014, within days our publisher, Prentice Hall/Pearson, agreed to publish our Swift book, which at the time was just an idea. One key prob-
lem—where would we find Swift reviewers when the language was so new? We asked for help from our 75,000 social media and newsletter followers. Charles E. Brown, Independent Contractor affiliated with Apple and Adobe, was the first to respond and became the core member of our review team. He mentored us throughout the project, providing insights, encouragement, answers to our technical questions and appropriate cautions.

Keeping in Touch with the Authors

As you read the book, if you have questions, comments or suggestions, send an e-mail to us at

deitel@deitel.com

and we’ll respond promptly. For updates on this book, visit

http://www.deitel.com/books/SwiftFP

subscribe to the Deitel® Buzz Online newsletter at

http://www.deitel.com/newsletter/subscribe.html

and join the Deitel social networking communities on

• Facebook® (http://facebook.com/DeitelFan)
• Twitter® (@deitel)
• Google+™ (http://google.com/+DeitelFan)
• YouTube® (http://youtube.com/DeitelTV)
• LinkedIn® (http://linkedin.com/company/deitel-&-associates)

Well, there you have it! As you read the book, we’d appreciate your comments, criticisms, corrections and suggestions for improvement. Please address all correspondence to:

deitel@deitel.com

We’ll respond promptly. We hope you enjoy working with Swift for Programmers as much as we enjoyed writing it!

Paul and Harvey Deitel

About the Authors

Paul Deitel, CEO and Chief Technical Officer of Deitel & Associates, Inc., is a graduate of MIT, where he studied Information Technology. He holds the Java Certified Programmer and Java Certified Developer designations, and is an Oracle Java Champion. Paul was also named as a Microsoft® Most Valuable Professional (MVP) for C# in 2012–2014. Through Deitel & Associates, Inc., he has delivered hundreds of programming courses worldwide to clients, including Cisco, IBM, Siemens, Sun Microsystems (now Oracle), Dell, Fidelity, NASA at the Kennedy Space Center, the National Severe Storm Laboratory, White Sands Missile Range, Rogue Wave Software, Boeing, SunGard, Nortel Networks, Puma, iRobot, Invensys and many more. He and his co-author, Dr. Harvey M. Deitel, are the world’s best-selling programming-language textbook/professional book/video authors.

Dr. Harvey Deitel, Chairman and Chief Strategy Officer of Deitel & Associates, Inc., has over 50 years of experience in the computer field. Dr. Deitel earned B.S. and M.S. degrees in Electrical Engineering from MIT and a Ph.D. in Mathematics from Boston University. He has extensive college teaching experience, including earning tenure and serving as the Chairman of the Computer Science Department at Boston College before founding Deitel & Associates, Inc., in 1991 with his son, Paul. The Deitels’ publications have earned international recognition, with translations published in Japanese, German, Russian, Spanish, French, Polish, Italian, Simplified Chinese, Traditional Chinese, Korean, Portuguese, Greek, Urdu and Turkish. Dr. Deitel has delivered hundreds of programming courses to corporate, academic, government and military clients.

About Deitel® & Associates, Inc.
Deitel & Associates, Inc., founded by Paul Deitel and Harvey Deitel, is an internationally recognized authoring and corporate training organization, specializing in mobile app development, computer programming languages, object technology and Internet and web software technology. The company’s training clients include many of the world’s largest companies, government agencies, branches of the military and academic institutions. The company offers instructor-led training courses delivered at client sites worldwide on major programming languages and platforms, including Swift and iOS app development, Java™, Android app development, C++, C, Visual C#®, Visual Basic®, Python®, object technology, Internet and web programming and a growing list of additional programming and software development courses.

Through its 39-year publishing partnership with Pearson/Prentice Hall, Deitel & Associates, Inc., publishes leading-edge programming textbooks and professional books in print and a wide range of e-book formats, and LiveLessons video courses. Deitel & Associates, Inc. and the authors can be reached at:

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To learn more about Deitel’s Dive-Into® Series Corporate Training curriculum, visit:

http://www.deitel.com/training

To request a proposal for worldwide on-site, instructor-led training at your organization, e-mail deitel@deitel.com.

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