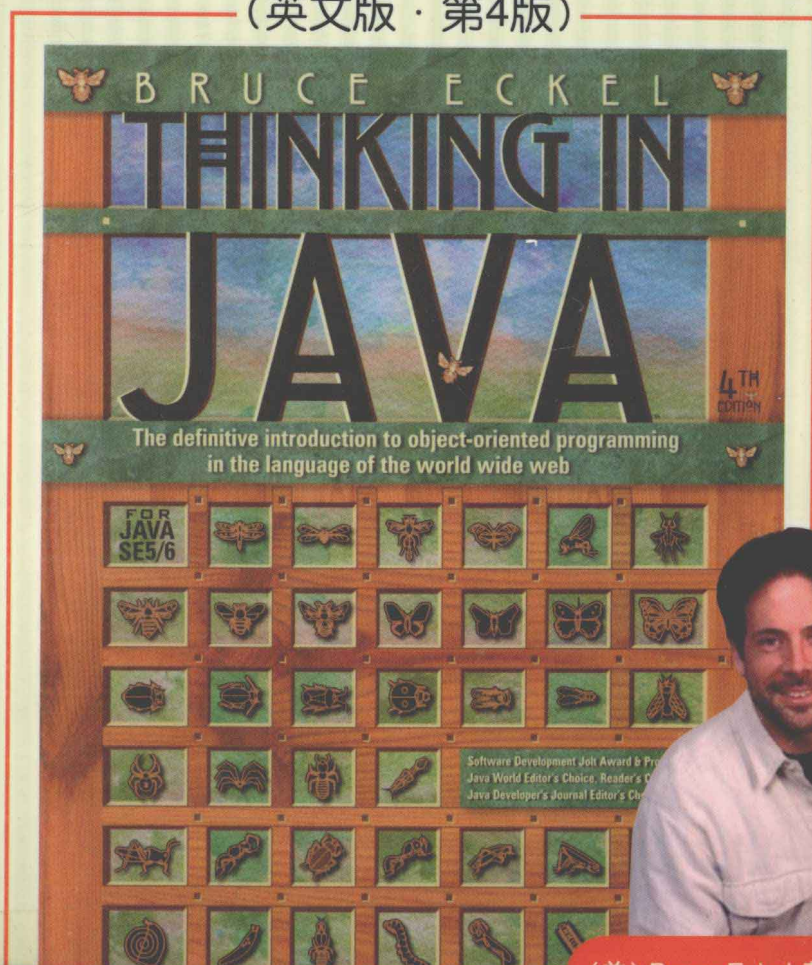


# Java编程思想

(英文版·第4版)



(美) Bruce Eckel 著

经典原版书库

# Java编程思想

(英文版·第4版)

Thinking in Java

(Fourth Edition)

(美) Bruce Eckel 著



机械工业出版社  
China Machine Press

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# 出版者的话

文艺复兴以降，源远流长的科学精神和逐步形成的学术规范，使西方国家在自然科学的各个领域取得了垄断性的优势；也正是这样的传统，使美国在信息技术发展的六十多年间名家辈出、独领风骚。在商业化的进程中，美国的产业界与教育界越来越紧密地结合，计算机学科中的许多泰山北斗同时身处科研和教学的最前线，由此而产生的经典科学著作，不仅擘划了研究的范畴，还揭橥了学术的源变，既遵循学术规范，又自有学者个性，其价值并不会因年月的流逝而减退。

近年，在全球信息化大潮的推动下，我国的计算机产业发展迅猛，对专业人才的需求日益迫切。这对计算机教育界和出版界都既是机遇，也是挑战；而专业教材的建设在教育战略上显得举足轻重。在我国信息技术发展时间较短、从业人员较少的现状下，美国等发达国家在其计算机科学发展的几十年间积淀的经典教材仍有许多值得借鉴之处。因此，引进一批国外优秀计算机教材将对我国计算机教育事业的发展起积极的推动作用，也是与世界接轨、建设真正的世界一流大学的必由之路。

机械工业出版社华章图文信息有限公司较早意识到“出版要为教育服务”。自1998年开始，华章公司就将工作重点放在了遴选、移译国外优秀教材上。经过几年的不懈努力，我们与Prentice Hall, Addison-Wesley, McGraw-Hill, Morgan Kaufmann等世界著名出版公司建立了良好的合作关系，从它们现有的数百种教材中甄选出Tanenbaum, Stroustrup, Kernighan, Jim Gray等大师名家的一批经典作品，以“计算机科学丛书”为总称出版，供读者学习、研究及度藏。大理石纹理的封面，也正体现了这套丛书的品位和格调。

“计算机科学丛书”的出版工作得到了国内外学者的鼎力襄助，国内的专家不仅提供了中肯的选题指导，还不辞劳苦地担任了翻译和审校的工作；而原书的作者也相当关注其作品在中国的传播，有的还专程为其书的中译本作序。迄今，“计算机科学丛书”已经出版了近百个品种，这些书籍在读者中树立了良好的口碑，并被许多高校采用为正式教材和

参考书籍，为进一步推广与发展打下了坚实的基础。

随着学科建设的初步完善和教材改革的逐渐深化，教育界对国外计算机教材的需求和应用都步入一个新的阶段。为此，华章公司将加大引进教材的力度，在“华章教育”的总规划之下出版三个系列的计算机教材：除“计算机科学丛书”之外，对影印版的教材，则单独开辟出“经典原版书库”；同时，引进全美通行的教学辅导书“Schaum's Outlines”系列组成“全美经典学习指导系列”。为了保证这三套丛书的权威性，同时也为了更好地为学校和老师们服务，华章公司聘请了中国科学院、北京大学、清华大学、国防科技大学、复旦大学、上海交通大学、南京大学、浙江大学、中国科技大学、哈尔滨工业大学、西安交通大学、中国人民大学、北京航空航天大学、北京邮电大学、中山大学、解放军理工大学、郑州大学、湖北工学院、中国国家信息安全测评认证中心等国内重点大学和科研机构在计算机的各个领域的著名学者组成“专家指导委员会”，为我们提供选题意见和出版监督。

这三套丛书是响应教育部提出的使用外版教材的号召，为国内高校的计算机及相关专业的教学度身订造的。其中许多教材均已为M. I. T., Stanford, U.C. Berkeley, C. M. U. 等世界名牌大学所采用。不仅涵盖了程序设计、数据结构、操作系统、计算机体系结构、数据库、编译原理、软件工程、图形学、通信与网络、离散数学等国内大学计算机专业普遍开设的核心课程，而且各具特色——有的出自语言设计者之手、有的历经三十年而不衰、有的已被全世界的几百所高校采用。在这些圆熟通博的名师大作的指引之下，读者必将在计算机科学的宫殿中由登堂而入室。

权威的作者、经典的教材、一流的译者、严格的审校、精细的编辑，这些因素使我们的图书有了质量的保证，但我们的目标是尽善尽美，而反馈的意见正是我们达到这一终极目标的重要帮助。教材的出版只是我们的后续服务的起点。华章公司欢迎老师和读者对我们的工作提出建议或给予指正，我们的联系方法如下：

电子邮件：[hzsj@hzbook.com](mailto:hzsj@hzbook.com)

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联系地址：北京市西城区百万庄南街1号

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# Dedication

To Dawn

# Comments from readers:

*Thinking In Java* should be read cover to cover by every Java programmer, then kept close at hand for frequent reference. The exercises are challenging, and the chapter on Collections is superb! Not only did this book help me to pass the Sun Certified Java Programmer exam; it's also the first book I turn to whenever I have a Java question. **Jim Pleger, Loudoun County (Virginia) Government**

*Much* better than any other Java book I've seen. Make that "by an order of magnitude" ... very complete, with excellent right-to-the-point examples and intelligent, not dumbed-down, explanations ... In contrast to many other Java books I found it to be unusually mature, consistent, intellectually honest, well-written and precise. IMHO, an ideal book for studying Java. **Anatoly Vorobey, Technion University, Haifa, Israel**

One of the absolutely best programming tutorials I've seen for any language. **Joakim Ziegler, FIX sysop**

Thank you for your wonderful, wonderful book on Java. **Dr. Gavin Pillay, Registrar, King Edward VIII Hospital, South Africa**

Thank you again for your awesome book. I was really floundering (being a non-C programmer), but your book has brought me up to speed as fast as I could read it. It's really cool to be able to understand the underlying principles and concepts from the start, rather than having to try to build that conceptual model through trial and error. Hopefully I will be able to attend your seminar in the not-too-distant future. **Randall R. Hawley, Automation Technician, Eli Lilly & Co.**

The best computer book writing I have seen. **Tom Holland**

This is one of the best books I've read about a programming language... The best book ever written on Java. **Ravindra Pai, Oracle Corporation, SUNOS product line**

This is the best book on Java that I have ever found! You have done a great job. Your depth is amazing. I will be purchasing the book when it is published. I have been learning Java since October 96. I have read a few books, and consider yours a "MUST READ." These past few months we have been focused on a product written entirely in Java. Your book has helped solidify topics I was shaky on and has expanded my knowledge base. I have



even used some of your explanations as information in interviewing contractors to help our team. I have found how much Java knowledge they have by asking them about things I have learned from reading your book (e.g., the difference between arrays and Vectors). Your book is great! **Steve Wilkinson, Senior Staff Specialist, MCI Telecommunications**

Great book. Best book on Java I have seen so far. **Jeff Sinclair, Software Engineer, Kestral Computing**

Thank you for *Thinking in Java*. It's time someone went beyond mere language description to a thoughtful, penetrating analytic tutorial that doesn't kowtow to The Manufacturers. I've read almost all the others—only yours and Patrick Winston's have found a place in my heart. I'm already recommending it to customers. Thanks again. **Richard Brooks, Java Consultant, Sun Professional Services, Dallas**

Bruce, your book is wonderful! Your explanations are clear and direct. Through your fantastic book I have gained a tremendous amount of Java knowledge. The exercises are also FANTASTIC and do an excellent job reinforcing the ideas explained throughout the chapters. I look forward to reading more books written by you. Thank you for the tremendous service that you are providing by writing such great books. My code will be much better after reading *Thinking in Java*. I thank you and I'm sure any programmers who will have to maintain my code are also grateful to you. **Yvonne Watkins, Java Artisan, Discover Technologies, Inc.**

Other books cover the WHAT of Java (describing the syntax and the libraries) or the HOW of Java (practical programming examples). *Thinking in Java* is the only book I know that explains the WHY of Java; why it was designed the way it was, why it works the way it does, why it sometimes doesn't work, why it's better than C++, why it's not. Although it also does a good job of teaching the what and how of the language, *Thinking in Java* is definitely the thinking person's choice in a Java book. **Robert S. Stephenson**

Thanks for writing a great book. The more I read it the better I like it. My students like it, too. **Chuck Iverson**

I just want to commend you for your work on *Thinking in Java*. It is people like you that dignify the future of the Internet and I just want to thank you for your effort. It is very much appreciated. **Patrick Barrell, Network Officer Mamco, QAF Mfg. Inc.**

I really, really appreciate your enthusiasm and your work. I download every revision of your online books and am looking into languages and exploring what I would never have dared (C#, C++, Python, and Ruby, as a side effect). I have at least 15 other Java books (I needed 3 to make both JavaScript and PHP viable!) and subscriptions to Dr. Dobbs, JavaPro, JDJ, JavaWorld, etc., as a result of my pursuit of Java (and Enterprise Java) and certification but I still keep your book in higher esteem. It truly is a thinking man's book. I subscribe to your newsletter and hope to one day sit down and solve some of the problems you extend for the solutions guides for you (I'll buy the guides!) in appreciation. But in the meantime, thanks a lot. **Joshua Long**,  
**www.starbuxman.com**

Most of the Java books out there are fine for a start, and most just have beginning stuff and a lot of the same examples. Yours is by far the best advanced thinking book I've seen. Please publish it soon! ... I also bought *Thinking in C++* just because I was so impressed with *Thinking in Java*.  
**George Laframboise, LightWorx Technology Consulting, Inc.**

I wrote to you earlier about my favorable impressions regarding your *Thinking in C++* (a book that stands prominently on my shelf here at work). And today I've been able to delve into Java with your e-book in my virtual hand, and I must say (in my best Chevy Chase from *Modern Problems*), "I like it!" Very informative and explanatory, without reading like a dry textbook. You cover the most important yet the least covered concepts of Java development: the whys. **Sean Brady**

I develop in both Java and C++, and both of your books have been lifesavers for me. If I am stumped about a particular concept, I know that I can count on your books to a) explain the thought to me clearly and b) have solid examples that pertain to what I am trying to accomplish. I have yet to find another author that I continually whole-heartedly recommend to anyone who is willing to listen. **Josh Asbury, A^3 Software Consulting, Cincinnati, Ohio**

Your examples are clear and easy to understand. You took care of many important details of Java that can't be found easily in the weak Java documentation. And you don't waste the reader's time with the basic facts a programmer already knows. **Kai Engert, Innovative Software, Germany**

I'm a great fan of your *Thinking in C++* and have recommended it to associates. As I go through the electronic version of your Java book, I'm finding that you've retained the same high level of writing. Thank you! **Peter R. Neuwald**

VERY well-written Java book...I think you've done a GREAT job on it. As the leader of a Chicago-area Java special interest group, I've favorably mentioned your book and Web site several times at our recent meetings. I would like to use *Thinking in Java* as the basis for a part of each monthly SIG meeting, in which we review and discuss each chapter in succession. **Mark Ertes**

By the way, printed TIJ2 in Russian is still selling great, and remains bestseller. Learning Java became synonym of reading TIJ2, isn't that nice? **Ivan Porty, translator and publisher of *Thinking in Java 2<sup>nd</sup> Edition* in Russian**

I really appreciate your work and your book is good. I recommend it here to our users and Ph.D. students. **Hugues Leroy // Iriisa-Inria Rennes France, Head of Scientific Computing and Industrial Tranfert**

OK, I've only read about 40 pages of *Thinking in Java*, but I've already found it to be the most clearly written and presented programming book I've come across...and I'm a writer, myself, so I am probably a little critical. I have *Thinking in C++* on order and can't wait to crack it—I'm fairly new to programming and am hitting learning curves head-on everywhere. So this is just a quick note to say thanks for your excellent work. I had begun to burn a little low on enthusiasm from slogging through the mucky, murky prose of most computer books—even ones that came with glowing recommendations. I feel a whole lot better now. **Glenn Becker, Educational Theatre Association**

Thank you for making your wonderful book available. I have found it immensely useful in finally understanding what I experienced as confusing in Java and C++. Reading your book has been very satisfying. **Felix Bizaoui, Twin Oaks Industries, Louisa, Va.**

I must congratulate you on an excellent book. I decided to have a look at *Thinking in Java* based on my experience with *Thinking in C++*, and I was not disappointed. **Jaco van der Merwe, Software Specialist, DataFusion Systems Ltd, Stellenbosch, South Africa**

This has to be one of the best Java books I've seen. **E.F. Pritchard, Senior Software Engineer, Cambridge Animation Systems Ltd., United Kingdom**

Your book makes all the other Java books I've read or flipped through seem doubly useless and insulting. **Brett Porter, Senior Programmer, Art & Logic**

I have been reading your book for a week or two and compared to the books I have read earlier on Java, your book seems to have given me a great start. I have recommended this book to a lot of my friends and they have rated it excellent. Please accept my congratulations for coming out with an excellent book. **Rama Krishna Bhupathi, Software Engineer, TCSI Corporation, San Jose**

Just wanted to say what a "brilliant" piece of work your book is. I've been using it as a major reference for in-house Java work. I find that the table of contents is just right for quickly locating the section that is required. It's also nice to see a book that is not just a rehash of the API nor treats the programmer like a dummy. **Grant Sayer, Java Components Group Leader, Ceedata Systems Pty Ltd, Australia**

Wow! A readable, in-depth Java book. There are a lot of poor (and admittedly a couple of good) Java books out there, but from what I've seen yours is definitely one of the best. **John Root, Web Developer, Department of Social Security, London**

I've *just* started *Thinking in Java*. I expect it to be very good because I really liked *Thinking in C++* (which I read as an experienced C++ programmer, trying to stay ahead of the curve) ... You are a wonderful author. **Kevin K. Lewis, Technologist, ObjectSpace, Inc.**

I think it's a great book. I learned all I know about Java from this book. Thank you for making it available for free over the Internet. If you wouldn't have I'd know nothing about Java at all. But the best thing is that your book isn't a commercial brochure for Java. It also shows the bad sides of Java. YOU have done a great job here. **Frederik Fix, Belgium**

I have been hooked to your books all the time. A couple of years ago, when I wanted to start with C++, it was *C++ Inside & Out* which took me around the fascinating world of C++. It helped me in getting better opportunities in life. Now, in pursuit of more knowledge and when I wanted to learn Java, I

bumped into *Thinking in Java*—no doubts in my mind as to whether I need some other book. Just fantastic. It is more like rediscovering myself as I get along with the book. It is just a month since I started with Java, and heartfelt thanks to you, I am understanding it better now. **Anand Kumar S., Software Engineer, Computervision, India**

Your book stands out as an excellent general introduction. **Peter Robinson, University of Cambridge Computer Laboratory**

It's by far the best material I have come across to help me learn Java and I just want you to know how lucky I feel to have found it. THANKS! **Chuck Peterson, Product Leader, Internet Product Line, IVIS International**

The book is great. It's the third book on Java I've started and I'm about two-thirds of the way through it now. I plan to finish this one. I found out about it because it is used in some internal classes at Lucent Technologies and a friend told me the book was on the Net. Good work. **Jerry Nowlin, MTS, Lucent Technologies**

Of the six or so Java books I've accumulated to date, your *Thinking in Java* is by far the best and clearest. **Michael Van Waas, Ph.D., President, TMR Associates**

I just want to say thanks for *Thinking in Java*. What a wonderful book you've made here! Not to mention downloadable for free! As a student I find your books invaluable (I have a copy of C++ *Inside Out*, another great book about C++), because they not only teach me the how-to, but also the whys, which are of course very important in building a strong foundation in languages such as C++ or Java. I have quite a lot of friends here who love programming just as I do, and I've told them about your books. They think it's great! Thanks again! By the way, I'm Indonesian and I live in Java. **Ray Frederick Djajadinata, Student at Trisakti University, Jakarta**

The mere fact that you have made this work free over the Net puts me into shock. I thought I'd let you know how much I appreciate and respect what you're doing. **Shane LeBouthillier, Computer Engineering student, University of Alberta, Canada**

I have to tell you how much I look forward to reading your monthly column. As a newbie to the world of object oriented programming, I appreciate the time and thoughtfulness that you give to even the most elementary topic. I

have downloaded your book, but you can bet that I will purchase the hard copy when it is published. Thanks for all of your help. **Dan Cashmer, B. C. Ziegler & Co.**

Just want to congratulate you on a job well done. First I stumbled upon the PDF version of *Thinking in Java*. Even before I finished reading it, I ran to the store and found *Thinking in C++*. Now, I have been in the computer business for over eight years, as a consultant, software engineer, teacher/trainer, and recently as self-employed, so I'd like to think that I have seen enough (not "have seen it all," mind you, but enough). However, these books cause my girlfriend to call me a "geek." Not that I have anything against the concept—it is just that I thought this phase was well beyond me. But I find myself truly enjoying both books, like no other computer book I have touched or bought so far. Excellent writing style, very nice introduction of every new topic, and lots of wisdom in the books. Well done. **Simon Goland, simonsez@smartt.com, Simon Says Consulting, Inc.**

I must say that your *Thinking in Java* is great! That is exactly the kind of documentation I was looking for. Especially the sections about good and poor software design using Java. **Dirk Duehr, Lexikon Verlag, Bertelsmann AG, Germany**

Thank you for writing two great books (*Thinking in C++*, *Thinking in Java*). You have helped me immensely in my progression to object oriented programming. **Donald Lawson, DCL Enterprises**

Thank you for taking the time to write a really helpful book on Java. If teaching makes you understand something, by now you must be pretty pleased with yourself. **Dominic Turner, GEAC Support**

It's the best Java book I have ever read—and I read some. **Jean-Yves MENGANT, Chief Software Architect NAT-SYSTEM, Paris, France**

*Thinking in Java* gives the best coverage and explanation. Very easy to read, and I mean the code fragments as well. **Ron Chan, Ph.D., Expert Choice, Inc., Pittsburgh, Pa.**

Your book is great. I have read lots of programming books and your book still adds insights to programming in my mind. **Ningjian Wang, Information System Engineer, The Vanguard Group**

*Thinking in Java* is an excellent and readable book. I recommend it to all my students. **Dr. Paul Gorman, Department of Computer Science, University of Otago, Dunedin, New Zealand**

With your book, I have now understood what object oriented programming means. ... I believe that Java is much more straightforward and often even easier than Perl. **Torsten Römer, Orange Denmark**

You make it possible for the proverbial free lunch to exist, not just a soup kitchen type of lunch but a gourmet delight for those who appreciate good software and books about it. **Jose Suriol, Scylax Corporation**

Thanks for the opportunity of watching this book grow into a masterpiece! IT IS THE BEST book on the subject that I've read or browsed. **Jeff Lapchinsky, Programmer, Net Results Technologies**

Your book is concise, accessible and a joy to read. **Keith Ritchie, Java Research & Development Team, KL Group Inc.**

It truly is the best book I've read on Java! **Daniel Eng**

The best book I have seen on Java! **Rich Hoffarth, Senior Architect, West Group**

Thank you for a wonderful book. I'm having a lot of fun going through the chapters. **Fred Trimble, Actium Corporation**

You have mastered the art of slowly and successfully making us grasp the details. You make learning VERY easy and satisfying. Thank you for a truly wonderful tutorial. **Rajesh Rau, Software Consultant**

*Thinking in Java* rocks the free world! **Miko O'Sullivan, President, Idocs Inc.**

## About *Thinking in C++*:

**Winner of the 1995 Software Development Magazine Jolt Award  
for Best Book of the Year**

“This book is a tremendous achievement. You owe it to yourself to have a copy on your shelf. The chapter on iostreams is the most comprehensive and understandable treatment of that subject I’ve seen to date.”

**Al Stevens**  
**Contributing Editor, *Doctor Dobbs Journal***

“Eckel’s book is the only one to so clearly explain how to rethink program construction for object orientation. That the book is also an excellent tutorial on the ins and outs of C++ is an added bonus.”

**Andrew Binstock**  
**Editor, *Unix Review***

“Bruce continues to amaze me with his insight into C++, and *Thinking in C++* is his best collection of ideas yet. If you want clear answers to difficult questions about C++, buy this outstanding book.”

**Gary Entsminger**  
**Author, *The Tao of Objects***

“*Thinking in C++* patiently and methodically explores the issues of when and how to use inlines, references, operator overloading, inheritance, and dynamic objects, as well as advanced topics such as the proper use of templates, exceptions and multiple inheritance. The entire effort is woven in a fabric that includes Eckel’s own philosophy of object and program design. A must for every C++ developer’s bookshelf, *Thinking in C++* is the one C++ book you must have if you’re doing serious development with C++.”

**Richard Hale Shaw**  
**Contributing Editor, *PC Magazine***



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