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Mathematics 2012

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The following books were written specifically for courses. Throughout the catalog you will find other books that are also suitable for class adoption. They are identified by **TEXT**. Professors who wish to consider a book from this catalog for course use may request an examination copy. For more information please visit: *press.princeton.edu/class.html.*

"We are all fortunate that a mathematician with the experience and vision of E. M. Stein, together with his energetic young collaborator R. Shakarchi, has given us this series."
—Steven George Krantz, *Mathematical Reviews*

NEW

Functional Analysis

Introduction to Further Topics in Analysis

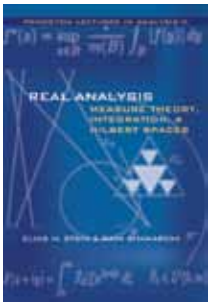
Elias M. Stein & Rami Shakarchi

"This book introduces basic functional analysis, probability theory, and most importantly, aspects of modern analysis that have developed over the last half century. It is the first student-oriented textbook where all of these topics are brought together with lots of interesting exercises and problems. This is a valuable addition to the literature."
—Gerald B. Folland, University of Washington

This is the fourth and final volume in the *Princeton Lectures in Analysis*, a series of textbooks that aim to present, in an integrated manner, the core areas of analysis.

Elias M. Stein is the Albert Baldwin Dod Professor of Mathematics at Princeton University. Rami Shakarchi received his PhD in mathematics from Princeton University.

2011. 448 pages. 27 line illus.
Cl: 978-0-691-11387-6 $85.00 | £59.00



Also by Elias M. Stein & Rami Shakarchi

Fourier Analysis

An Introduction

2003. 320 pages. 40 line illus.
Cl: 978-0-691-11384-5 $85.00 | £59.00

Complex Analysis

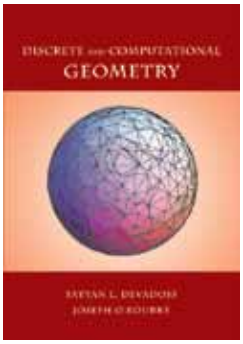
2003. 400 pages. 64 line illus.
Cl: 978-0-691-11385-2 $85.00 | £59.00
Not for sale in South Asia

Real Analysis

Measure Theory, Integration, and Hilbert Spaces

2005. 392 pages. 51 line illus.
Cl: 978-0-691-11386-9 $85.00 | £59.00
Not for sale in South Asia

Cover illustration by Marcella Engel Roberts. Night sky image courtesy of Shutterstock.



NEW

Discrete and Computational Geometry

Satyan L. Devadoss & Joseph O'Rourke

"I thoroughly enjoyed reading this book. It covers an incredibly diverse set of topics, ranging from elementary objects to deep mathematical concepts and important computational problems. Devadoss and O'Rourke have done a remarkable job of showing off the rich interplay between pure mathematics and computing that drives our research community. There really is nothing else like this on the market."
—Jeff Erickson, University of Illinois, Urbana-Champaign

Discrete geometry is a relatively new development in pure mathematics, while computational geometry is an emerging area in applications-driven computer science. Their intermingling has yielded exciting advances in recent years, yet what has been lacking until now is an undergraduate textbook that bridges the gap between the two. *Discrete and Computational Geometry* offers a comprehensive yet accessible introduction to this cutting-edge frontier of mathematics and computer science.

Satyan L. Devadoss is associate professor of mathematics at Williams College. Joseph O'Rourke is the Olin Professor of Computer Science and professor of mathematics at Smith College.

2011. 272 pages. 189 color illus.
Cl: 978-0-691-14553-2 $49.50 | £34.95

NEW

Numerical Analysis

L. Ridgway Scott

"Very few modern books can be compared with the present text as an introduction to the mathematical aspects of numerical analysis. This is a very interesting book that can be used not only as a textbook but also as a reference."
—Doron Levy, University of Maryland

Computational science is fundamentally changing how technological questions are addressed. The design of aircraft, automobiles, and even racing sailboats is now done by computational simulation. The mathematical foundation of this new approach is numerical analysis, which studies algorithms for computing expressions defined with real numbers. Emphasizing the theory behind the computation, this book provides a rigorous and self-contained introduction to numerical analysis and presents the advanced mathematics that underpin industrial software, including complete details that are missing from most textbooks.

L. Ridgway Scott is the Louis Block Professor of Mathematics and Computer Science at the University of Chicago.

2011. 344 pages. 33 line illus. 11 tables.
Cl: 978-0-691-14686-7 $65.00 | £44.95

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"This is an excellent introduction to the exciting world of numerical analysis. Fulfilling the need for a modern textbook on numerical methods, this volume has a wealth of examples that will keep students interested in the material. The mathematics is completely rigorous and I applaud the authors for doing such a marvelous job."
—Michele Benzi, Emory University

"A very scholarly and concise introduction to optimal control theory. Liberzon nicely balances rigor and accessibility, and provides fascinating historical perspectives and thought-provoking exercises. A course based on this book will be a pleasure to take."
—Andrew R. Teel, University of California, Santa Barbara

FORTHCOMING

Numerical Methods

Anne Greenbaum & Timothy P. Chartier

Numerical Methods provides a clear and concise exploration of standard numerical analysis topics, as well as nontraditional ones, including mathematical modeling, Monte Carlo methods, Markov chains, and fractals. Filled with appealing examples that will motivate students, the textbook considers modern application areas, such as information retrieval and animation, and classical topics from physics and engineering. Exercises use MATLAB and promote understanding of computational results.

- Clear and concise exposition of standard numerical analysis topics
- Covers modern applications, including information retrieval and animation, and classical applications from physics and engineering
- Provides flexibility so instructors can emphasize mathematical or applied/computational aspects of numerical methods or a combination
- Includes recent results on polynomial interpolation at Chebyshev points and use of the MATLAB package Chebfun
- Short discussions of the history of numerical methods interspersed throughout
- Supplementary materials available online

Anne Greenbaum is professor of applied mathematics at the University of Washington. Timothy P. Chartier is associate professor of mathematics at Davidson College.

April 2012. 464 pages. 78 halftones. 145 line illus.
CI: 978-0-691-15122-9 $95.00 | £65.00

FORTHCOMING

Calculus of Variations and Optimal Control Theory

A Concise Introduction

Daniel Liberzon

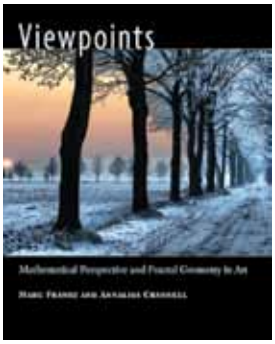
This textbook offers a concise yet rigorous introduction to calculus of variations and optimal control theory, and is a self-contained resource for graduate students in engineering, applied mathematics, and related subjects. Designed specifically for a one-semester course, the book begins with calculus of variations, preparing the ground for optimal control. It then gives a complete proof of the maximum principle and covers key topics such as the Hamilton-Jacobi-Bellman theory of dynamic programming and linear-quadratic optimal control.

Calculus of Variations and Optimal Control Theory also traces the historical development of the subject and features numerous exercises, notes and references at the end of each chapter, and suggestions for further study.

- Offers a concise yet rigorous introduction
- Requires limited background in control theory or advanced mathematics
- Provides a complete proof of the maximum principle
- Uses consistent notation in the exposition of classical and modern topics
- Traces the historical development of the subject
- Solutions manual (available only to teachers)

Daniel Liberzon is associate professor of electrical and computer engineering at the University of Illinois, Urbana-Champaign.

February 2012. 256 pages. 63 line illus.
CI: 978-0-691-15187-8 $75.00 | £52.00



NEW

Viewpoints

Mathematical Perspective and Fractal Geometry in Art

Marc Frantz & Annalisa Crannell

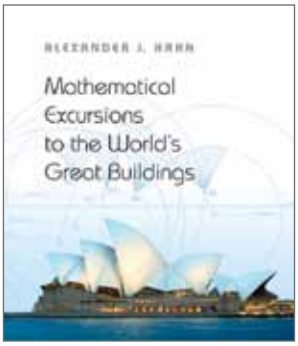
"This entire book is a thing of beauty: the mathematics, the visual art, the writing, the exercises, and the organization. The authors' passion and excitement for their subject matter is apparent on every page. I am in awe."
—Robert Bosch, Oberlin College

An undergraduate textbook devoted exclusively to relationships between mathematics and art, *Viewpoints* is ideally suited for math-for-liberal-arts courses and mathematics courses for fine arts majors. The textbook contains a wide variety of classroom-tested activities and problems, a series of essays by contemporary artists written especially for the book, and a plethora of pedagogical and learning opportunities for instructors and students.

Accessible to students of all levels, *Viewpoints* encourages experimentation and collaboration, and captures the essence of artistic and mathematical creation and discovery.

Marc Frantz teaches mathematics at Indiana University, Bloomington where he is a research associate. Annalisa Crannell is professor of mathematics at Franklin & Marshall College.

2011. 264 pages. 16 color illus. 80 halftones. 170 line illus.
Cl: 978-0-691-12592-3 $45.00 | £30.95



FORTHCOMING

Mathematical Excursions to the World's Great Buildings

Alexander J. Hahn

"Readers who enjoy connecting mathematics to real-world applications will find this book intriguing, as will anyone who wants to learn more about the forces and mathematics behind the construction of the world's great buildings."
—Michael Huber, author of *Mythematics*

From the pyramids and the Parthenon to the Sydney Opera House and the Bilbao Guggenheim, this book takes readers on an eye-opening tour of the mathematics behind some of the world's most spectacular buildings. Beautifully illustrated, the book explores the milestones in elementary mathematics that enliven the understanding of these buildings and combines this with an in-depth look at their aesthetics, history, and structure. Whether using trigonometry and vectors to explain why Gothic arches are structurally superior to Roman arches, or showing how simple ruler and compass constructions can produce sophisticated architectural details, Alexander Hahn describes the points at which elementary mathematics and architecture intersect.

Alexander J. Hahn is professor of mathematics at the University of Notre Dame.

June 2012. 352 pages. 16 color illus. 111 halftones. 233 line illus. 2 tables.
Cl: 978-0-691-14520-4 $49.50 | £34.95

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Read newsworthy and lively commentary on our new blog at *press.princeton.edu/blog*

NEW

Agent-Based and Individual-Based Modeling

A Practical Introduction

Steven F. Railsback & Volker Grimm

"Railsback and Grimm have written a superb introduction to agent-based models. They combine hands-on programming exercises, introductions to some of the core concepts in complex systems, and instruction in model design and analysis. The result is an excellent book that's ideal for both undergraduates and academics."
—Scott E. Page, author of *Diversity and Complexity*

Agent-based modeling is a new technique for understanding how the dynamics of biological, social, and other complex systems arise from the characteristics and behaviors of the agents making up these systems. This innovative textbook gives students and scientists the skills to design, implement, and analyze agent-based models.

Steven F. Railsback is adjunct professor of mathematics at Humboldt State University and a consulting environmental scientist. Volker Grimm is senior scientist in the Department of Ecological Modeling at the Helmholtz Centre for Environmental Research–UFZ in Leipzig and professor at the University of Potsdam.

2011. 352 pages. 62 line illus. 9 tables.
Pa: 978-0-691-13674-5 $55.00 | £37.95
Cl: 978-0-691-13673-8 $99.50 | £69.95

FORTHCOMING

Introduction to Mathematical Sociology

Phillip Bonacich & Philip Lu

"This book provides a concise and up-to-date introduction to mathematical sociology and social network analysis. It presents a solid platform for engaging undergraduates in mathematical approaches to sociological inquiry, and includes Mathematica modules with which students can explore the properties and implications of a variety of formal models. I plan on using it in my courses on social networks."
—Noah E. Friedkin, coauthor of *Social Influence Network Theory: A Sociological Examination of Small Group Dynamics*

Mathematical models and computer simulations of complex social systems have become everyday tools in sociology. Yet until now, students had no up-to-date textbook from which to learn these techniques. *Introduction to Mathematical Sociology* fills this gap, providing undergraduates with a comprehensive, self-contained primer on the mathematical tools and applications that sociologists use to understand social behavior.

Phillip Bonacich and Philip Lu cover all the essential mathematics, including linear algebra, graph theory, set theory, game theory, and probability. They show how to apply these mathematical tools to demography; patterns of power, influence, and friendship in social networks; Markov chains; the evolution and stability of cooperation in human groups; chaotic and complex systems—and more.

Phillip Bonacich is professor emeritus of sociology at the University of California, Los Angeles. Philip Lu is a PhD candidate in sociology at UCLA.

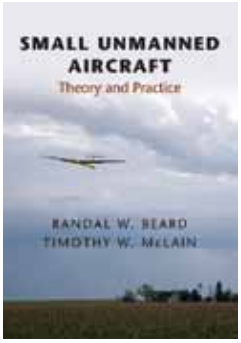
April 2012. 216 pages. 83 line illus. 30 tables.
Cl: 978-0-691-14549-5 $45.00 | £30.95

FORTHCOMING

Small Unmanned Aircraft

Theory and Practice

Randal W. Beard & Timothy W. McLain



"Written with confidence and authority by leading researchers in the field, this effectively organized book provides an excellent reference for all those interested in this subject."
—Emilio Frazzoli, Massachusetts Institute of Technology

Randal W. Beard is a professor in the Department of Electrical and Computer Engineering at Brigham Young University. Timothy W. McLain is a professor in the Department of Mechanical Engineering at Brigham Young University.

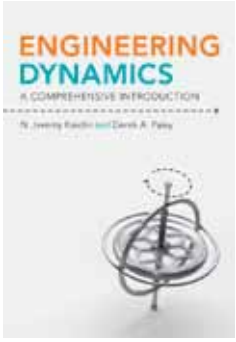
March 2012. 320 pages. 126 line illus. 8 tables.
Cl: 978-0-691-14921-9 $99.50 | £69.95

NEW

Engineering Dynamics

A Comprehensive Introduction

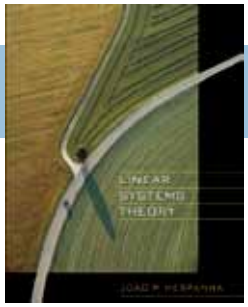
N. Jeremy Kasdin & Derek A. Paley



"This landmark text stands apart in the field, and will be welcomed by students and instructors alike."
—Dennis S. Bernstein, University of Michigan

N. Jeremy Kasdin is professor of mechanical and aerospace engineering and lead investigator for the Terrestrial Planet Finder project at Princeton University. Derek A. Paley is assistant professor of aerospace engineering and director of the Collective Dynamics and Control Laboratory at the University of Maryland.

2011. 688 pages. 328 line illus. 4 tables.
Cl: 978-0-691-13537-3 $99.50 | £69.95



Steady Aircraft Flight and Performance

N. Harris McClamroch

"This book is right on the mark. McClamroch's theoretical developments are, as usual, very rigorous and detailed."
—Eric Feron, Georgia Institute of Technology

2011. 416 pages. 23 halftones. 70 line illus.
Cl: 978-0-691-14719-2 $80.00 | £55.00

Linear Systems Theory

João P. Hespanha

"This is a splendidly written textbook; in fact, the next time I teach linear systems theory, I intend to use it."
—Alan J. Laub, *Elements of Computation Theory*

2009. 280 pages. 42 line illus. 3 tables.
Cl: 978-0-691-14021-6 $75.00 | £52.00

Winner of the 2011 Harold Chestnut Control Engineering Textbook Prize, International Federation of Automatic Control

Feedback Systems

An Introduction for Scientists and Engineers

Karl Johan Åström & Richard M. Murray

"[T]his is a refreshing text which is delightful to read, and which even experts in the area may find a valuable resource for its diverse applications, and exercises."
—Matthias Kawski, *Mathematical Reviews*

2008. 408 pages. 24 halftones. 183 line illus. 5 tables.
Cl: 978-0-691-13576-2 $69.50 | £48.95
Not for sale in South Asia

Stability and Stabilization

An Introduction

William J. Terrell

2009. 480 pages. 14 line illus.
Cl: 978-0-691-13444-4 $78.50 | £55.00

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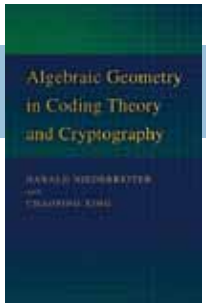

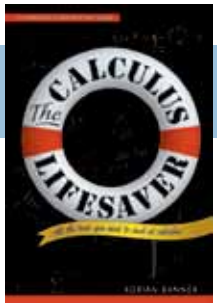

Introduction to Differential Equations with Dynamical Systems
Stephen L. Campbell & Richard Haberman

"This concise and up-to-date textbook addresses the challenges that undergraduate mathematics, engineering and science students experience during a first course on differential equations."
—*L'Enseignement Mathematique*

2008. 448 pages. 150 line illus.
Cl: 978-0-691-12474-2 $99.50 | £69.95
Not for sale in South Asia

Probability, Markov Chains, Queues, and Simulation
The Mathematical Basis of Performance Modeling
William J. Stewart

"The book represents a valuable text for courses in statistics and stochastic processes, so it is strongly recommended."
—Hassan S. Bakouch, *Journal of Applied Statistics*

2009. 776 pages. 175 line illus.
Cl: 978-0-691-14062-9 $95.00 | £65.00

Algebraic Geometry in Coding Theory and Cryptography
Harald Niederreiter & Chaoping Xing

"Coding theory has a rapidly growing corpus of knowledge, and now appears explicitly in several classifications in the MSC. [This] book … is certainly an important addition to the literature in this area and a serious candidate for becoming one of the standard textbooks in related courses."
—Cicero Carvalho, *Mathematical Reviews*

2009. 272 pages.
Cl: 978-0-691-10288-7 $49.95 | £34.95

The Calculus Lifesaver
All the Tools You Need to Excel at Calculus
Adrian Banner

"Banner's style is informal, engaging and distinctly non-intimidating, and he takes pains to not skip any steps in discussing a problem. Because of its unique approach, *The Calculus Lifesaver* is a welcome addition to the arsenal of calculus teaching aids."
—*MAA Online*

A Princeton Lifesaver Study Guide

2007. 752 pages. 350 line illus.
Pa: 978-0-691-13088-0 $29.95 | £19.95

Honors Calculus
Charles R. MacCluer

"MacCluer's book … is calculus 'done right.'… This is a book that will allow the instructor to build a fascinating course in a variety of different ways. Teaching from this book should be a joy for all."
—Steven G. Krantz, *UMAP Journal*

2006. 184 pages. 38 line illus.
Cl: 978-0-691-12533-6 $60.00 | £41.95

Second Edition
Quantum Field Theory in a Nutshell
A. Zee

"A beautiful exposition of the way modern field theorists think about quantum field theory, packed with insights and physical intuition. Zee's book should be required reading for every serious student of the subject."
—Nima Arkani-Hamed, Institute for Advanced Study

In a Nutshell

2010. 608 pages. 95 line illus.
Cl: 978-0-691-14034-6 $80.00 | £55.00

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This new series includes classic puzzle books that have been published by Princeton University Press. They include paradoxes, perplexities, and mathematical conundrums for the serious head scratcher.

FORTHCOMING PAPERBACK

Slicing Pizzas, Racing Turtles, and Further Adventures in Applied Mathematics

Robert B. Banks

"[This book] teaches us to delight in the unexpected challenges to our numerical imagination."
—*Booklist*

Robert B. Banks (1922–2002) was professor of engineering at Northwestern University and dean of engineering at the University of Illinois at Chicago.

July 2012. 304 pages.
Pa: 978-0-691-15499-2 $18.95 | £12.95

FORTHCOMING PAPERBACK

Across the Board

The Mathematics of Chessboard Problems

John J. Watkins

"Watkins offers an excellent invitation to serious mathematics."
—*Choice*

John J. Watkins is professor emeritus of mathematics at Colorado College.

July 2012. 272 pages. 204 line illus.
Pa: 978-0-691-15498-5 $18.95 | £12.95

FORTHCOMING PAPERBACK
With a new preface by the author

Chases and Escapes

The Mathematics of Pursuit and Evasion

Paul J. Nahin

"[A] fascinating history of the mathematics of pursuit."
—Justin Mullins, *New Scientist*

Paul J. Nahin is a professor emeritus of electrical engineering at the University of New Hampshire.

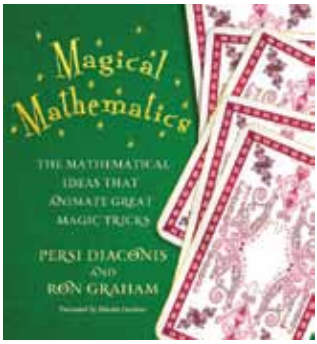
July 2012. 272 pages. 5 halftones. 67 line illus.
Pa: 978-0-691-15501-2 $18.95 | £12.95

Also by Paul J. Nahin
FORTHCOMING PAPERBACK

Duelling Idiots and Other Probability Puzzlers

"These puzzles invite the reader to think intuitively, mathematically, and creatively."
—*Mathematics Teacher*

July 2012. 280 pages.
Pa: 978-0-691-15500-5 $18.95 | £12.95



NEW

With a foreword by Martin Gardner

Magical Mathematics

The Mathematical Ideas That Animate Great Magic Tricks

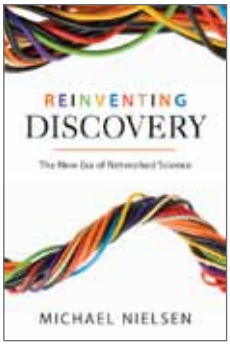
Persi Diaconis & Ron Graham

"Finally a book that celebrates the math involved in magic. This is quite simply the most brilliant book ever written on this mind-blowing, highly secretive field."
—David Blaine, illusionist

Magical Mathematics reveals the secrets of amazing, fun-to-perform card tricks—and the profound mathematical ideas behind them—that will astound even the most accomplished magician. Persi Diaconis and Ron Graham provide easy, step-by-step instructions for each trick, explaining how to set up the effect and offering tips on what to say and do while performing it. Each card trick introduces a new mathematical idea, and varying the tricks in turn takes readers to the very threshold of today's mathematical knowledge.

Persi Diaconis is professor of mathematics and statistics at Stanford University and a professional magician. Ron Graham is professor of mathematics and computer science at the University of California, San Diego, and a professional juggler.

2011. 264 pages. 133 color illus. 14 halftones. 56 line illus. 10 tables.
Cl: 978-0-691-15164-9 $29.95 | £19.95



NEW

Reinventing Discovery

The New Era of Networked Science

Michael Nielsen

"Science has always been a contact sport; the interaction of many minds is the engine of the discipline. Michael Nielsen has given us an unparalleled account of how new tools for collaboration are transforming scientific practice. *Reinventing Discovery* doesn't just help us understand how the sciences are changing, it shows us how we can participate in the change."
—Clay Shirky, author of *Here Comes Everybody* and *Cognitive Surplus*

In *Reinventing Discovery*, Michael Nielsen argues that we are living at the dawn of the most dramatic change in science in more than 300 years. This change is being driven by powerful new cognitive tools, enabled by the internet, which are greatly accelerating scientific discovery. There are many books about how the internet is changing business or the workplace or government. But this is the first book about something much more fundamental: how the internet is transforming the nature of our collective intelligence and how we understand the world.

This is a book for anyone who wants to understand how the online world is revolutionizing scientific discovery today—and why the revolution is just beginning.

Michael Nielsen is one of the pioneers of quantum computing. He is an essayist, speaker, and advocate of open science.

2011. 272 pages. 6 halftones. 8 line illus.
Cl: 978-0-691-14890-8 $24.95 | £16.95

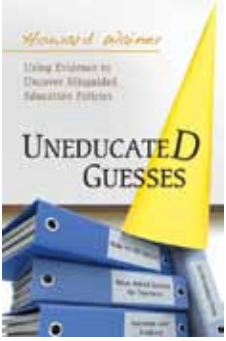
Read newsworthy and lively commentary on our new blog at *press.princeton.edu/blog*

NEW

Uneducated Guesses

Using Evidence to Uncover Misguided Education Policies

Howard Wainer



"*Uneducated Guesses* is an insider's look at using test scores to make high stakes decisions in education. In this rigorous, refreshing rebuttal of conventional thinking, Wainer argues that in the world of education policy, we all would be better served by examining the evidence that demonstrates that our ideas will improve the systems we're trying to transform."
—Dennis Van Roekel, National Education Association

No one concerned about seeing our children achieve their full potential can afford to ignore this book. With forceful storytelling, wry insight, and a wealth of real-world examples, *Uneducated Guesses* exposes today's educational policies to the light of empirical evidence, and offers solutions for fairer and more viable future policies.

Howard Wainer is distinguished research scientist at the National Board of Medical Examiners and adjunct professor of statistics at the Wharton School of the University of Pennsylvania.

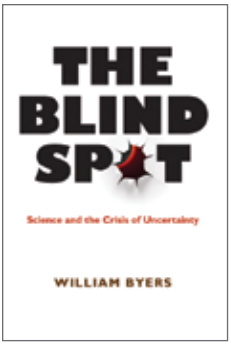
2011. 200 pages. 23 line illus. 17 tables.
Cl: 978-0-691-14928-8 $24.95 | £16.95

NEW

The Blind Spot

Science and the Crisis of Uncertainty

William Byers



"Is the idea that anything can be determined with absolute certainty an illusion?… Byers incorporates many brilliant thinkers and seminal scientific breakthroughs into his discussion, offering the cogent, invigorating argument that only by embracing uncertainty can we truly progress."
—*Kirkus Reviews*

William Byers is professor emeritus of mathematics and statistics at Concordia University in Montreal.

2011. 224 pages. 2 halftones. 3 line illus.
Cl: 978-0-691-14684-3 $24.95 | £16.95

Also by Howard Wainer

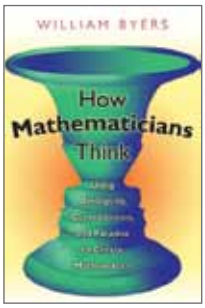
NEW PAPERBACK

Picturing the Uncertain World

How to Understand, Communicate, and Control Uncertainty through Graphical Display

"This is a very well-written book with subtle analyses and a refreshing approach to the field of statistics."
—Wibke Weber, *Information Design Journal*

2011. 280 pages. 11 color illus. 14 halftones. 81 line illus. 12 tables.
Pa: 978-0-691-15267-7 $19.95 | £13.95
Cl: 978-0-691-13759-9 $29.95 | £19.95



Also by William Byers

Winner of the 2007 Best Sci-Tech Book in Mathematics, *Library Journal*

One of *Choice*'s Outstanding Academic Titles for 2007

How Mathematicians Think

Using Ambiguity, Contradiction, and Paradox to Create Mathematics

2010. 424 pages. 6 halftones. 48 line illus.
Pa: 978-0-691-14599-0 $24.95 | £16.95
Cl: 978-0-691-12738-5 $45.00 | £30.95

NEW

With a foreword by Philip J. Davis

Fascinating Mathematical People

Interviews and Memoirs

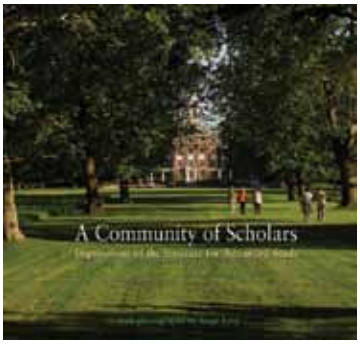
Edited by Donald J. Albers & Gerald L. Alexanderson

"*Fascinating Mathematical People* is a wonderfully varied collection. We meet brilliantly successful teachers, authors, a dentist, and two Fields Medal–winning Scandinavians. Some came from academic or intellectual families, another from a blazing-hot glass factory in Pennsylvania, and still another from an ancient and storied English aristocratic background. All of them had surprising side paths and detours on their way to mathematical success."
—Reuben Hersh, coauthor of *Loving and Hating Mathematics*

Fascinating Mathematical People is a collection of informal interviews and memoirs of sixteen prominent members of the mathematical community of the twentieth century, many still active. The candid portraits collected here demonstrate that while these men and women vary widely in terms of their backgrounds, life stories, and worldviews, they all share a deep and abiding sense of wonder about mathematics.

Donald J. Albers is senior acquisitions editor at the Mathematical Association of America. Gerald L. Alexanderson is the Michael and Elizabeth Valeriote Professor of Science at Santa Clara University.

2011. 352 pages. 189 halftones.
Cl: 978-0-691-14829-8 $35.00 | £24.95



NEW

A Community of Scholars

Impressions of the Institute for Advanced Study

This beautifully illustrated anthology celebrates eighty years of history and intellectual inquiry at the Institute for Advanced Study, one of the world's leading centers for theoretical research. Featuring essays by current and former members and faculty along with photographs by Serge J-F. Levy, the book captures the spirit of curiosity, freedom, and comradeship that is a hallmark of this unique community of scholars.

Founded in 1930 in Princeton, New Jersey, the institute encourages and supports fundamental research in the sciences and humanities—the original, often speculative thinking that can transform how we understand our world. Albert Einstein was among the first in a long line of brilliant thinkers to be affiliated with the institute. They include Kurt Gödel, George Kennan, J. Robert Oppenheimer, Erwin Panofsky, Homer A. Thompson, John von Neumann, and Hermann Weyl. This volume offers an intimate portrait in words and images of a storied institution that might best be described as a true academic village. The personal reflections collected here—written by leading figures from across the disciplines—bring this exceptional academic institution and its history vibrantly to life.

The contributors to this anthology are Sir Michael Atiyah, Chantal David, Freeman Dyson, Jane F. Fulcher, Peter Goddard, Barbara Kowalzig, Wolf Lepenies, Paul Moravec, Joan Wallach Scott, and David H. Weinberg.

2011. 128 pages. 89 halftones.
Cl: 978-0-691-15136-6 $24.95 | £16.95

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NEW

In Pursuit of the Traveling Salesman

Mathematics at the Limits of Computation

William J. Cook

"A gripping insider's account of one of the great mathematical problems. This book shows how deep mathematical insights can arise from apparently simple questions, and how the results can be applied to that most human of objectives: to achieve a desired outcome in the best possible way. *In Pursuit of the Traveling Salesman* deserves to become an instant classic."
—Ian Stewart, author of *Professor Stewart's Hoard of Mathematical Treasures*

What is the shortest possible route for a traveling salesman seeking to visit each city on a list exactly once and return to his city of origin? It sounds simple enough, yet the traveling salesman problem is one of the most intensely studied puzzles in applied mathematics—and it has defied solution to this day. In this book, William Cook takes readers on a mathematical excursion, picking up the salesman's trail in the 1800s when Irish mathematician W. R. Hamilton first defined the problem, and venturing to the furthest limits of today's state-of-the-art attempts to solve it.

William J. Cook is the Chandler Family Chair and Professor in Industrial and Systems Engineering at Georgia Institute of Technology.

2012. 248 pages. 113 color illus. 19 halftones. 19 line illus. 2 tables.
CI: 978-0-691-15270-7 $27.95 | £19.95

NEW

With a foreword by Chris Bishop

Nine Algorithms That Changed the Future

The Ingenious Ideas That Drive Today's Computers

John MacCormick

"This is a delightful exploration, in layman's terms, of nine beautiful algorithms that are essential to today's computers. Using clever analogies, MacCormick gives readers a greater knowledge of both the technology they use every day and the intellectual underpinnings of computing. He combines a mathematician's appreciation of powerful ideas and an educator's skill at explaining them in an engaging way."
—Sharon Perl, Google

"MacCormick picks nine algorithms for his version of 'genius awards,' and they are good ones. The reader comes away with a new sense of what genius in computer science looks like. And MacCormick leaves room for a future genius, perhaps inspired by this book, to someday make it a top ten list."
—William H. Press, coauthor of *Numerical Recipes*

These nine revolutionary algorithms have changed our world: this book unlocks their secrets, and lays bare the incredible ideas that our computers use every day.

John MacCormick is a leading researcher and teacher of computer science. He is currently a professor of computer science at Dickinson College.

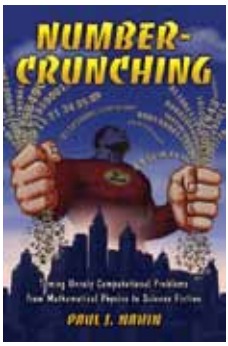
2011. 232 pages. 5 halftones. 98 line illus. 1 table.
CI: 978-0-691-14714-7 $27.95 | £19.95

NEW

Number-Crunching

Taming Unruly Computational Problems from Mathematical Physics to Science Fiction

Paul J. Nahin



"While there is a plethora of computational physics books, only this one brings the sheer joy and fascination of the subject to the general reader. The problems in *Number-Crunching* are nicely selected, the prose is clear and humorous, and the solutions range from the interesting to the gloriously counterintuitive. With the ubiquity of powerful personal computers and the easy availability of scientific software, this is a very timely book."
—Lawrence Weinstein, coauthor of *Guesstimation*

Paul J. Nahin is the author of many best-selling popular math books, including *Mrs. Perkins's Electric Quilt*, *Digital Dice*, *Chases and Escapes* (see page 7), *When Least Is Best*, and *An Imaginary Tale* (all Princeton). He is professor emeritus of electrical engineering at the University of New Hampshire.

2011. 408 pages. 4 halftones. 98 line illus. 6 tables.
Cl: 978-0-691-14425-2 $29.95 | £19.95

Also by Paul J. Nahin
NEW PAPERBACK
With a new preface by the author

Dr. Euler's Fabulous Formula

Cures Many Mathematical Ills

"Nahin includes gems from all over mathematics, ranging from engineering applications to beautiful pure-mathematical identities."
—Timothy Gowers, *Nature*

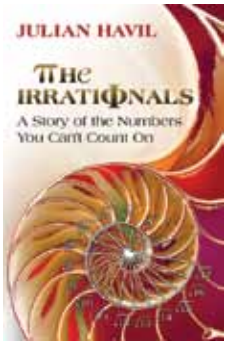
2011. 416 pages. 2 halftones. 77 line illus.
Pa: 978-0-691-15037-6 $19.95 | £13.95
Cl: 978-0-691-11822-2 $29.95 | £19.95

FORTHCOMING

The Irrationals

A Story of the Numbers You Can't Count On

Julian Havil



The ancient Greeks discovered them, but it wasn't until the nineteenth century that irrational numbers were properly understood and rigorously defined, and even today not all their mysteries have been revealed. In *The Irrationals*, the first popular and comprehensive book on the subject, Julian Havil tells the story of irrational numbers and the mathematicians who have tackled their challenges, from antiquity to the twenty-first century. Along the way, he explains why irrational numbers are surprisingly difficult to define—and why so many questions still surround them.

Julian Havil is the author of *Gamma: Exploring Euler's Constant* and *Nonplussed!: Mathematical Proof of Implausible Ideas* (all Princeton). He is a retired former master at Winchester College, England.

July 2012. 280 pages. 100 line illus.
Cl: 978-0-691-14342-2 $29.95 | £19.95

Also by Julian Havil
NEW PAPERBACK

Impossible?

Surprising Solutions to Counterintuitive Conundrums

"Julian Havil's *Impossible?* is a superb discussion of problems easily understood by a high schooler, yet with solutions so counterintuitive as to seem impossible.... There are surprises on almost every page."
—Martin Gardner

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Pa: 978-0-691-15002-4 $18.95 | £12.95
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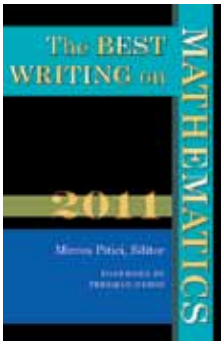
NEW

With a foreword by Freeman Dyson

The Best Writing on Mathematics 2011

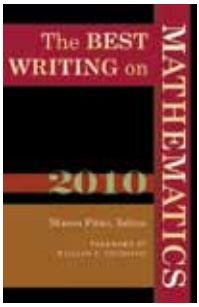
Edited by Mircea Pitici



This anthology brings together the year's finest mathematics writing from around the world. Featuring promising new voices alongside some of the foremost names in the field, *The Best Writing on Mathematics 2011* makes available to a wide audience many articles not easily found anywhere else—and you don't need to be a mathematician to enjoy them. These writings offer surprising insights into the nature, meaning, and practice of mathematics today. They delve into the history, philosophy, teaching, and everyday occurrences of math, and take readers behind the scenes of today's hottest mathematical debates.

Mircea Pitici is a PhD candidate in mathematics education at Cornell University. He teaches mathematics courses and writing seminars at Cornell and Ithaca College.

2011. 416 pages. 59 halftones. 4 line illus. 7 tables.
Pa: 978-0-691-15315-5 $19.95 | £13.95



Also edited by Mircea Pitici

With a foreword by William P. Thurston

The Best Writing on Mathematics 2010

"A delight to read. This is a fine volume with lots of terrific articles that are as enticing as they are varied. The sum total is simply great."
—Barry Mazur, Harvard University

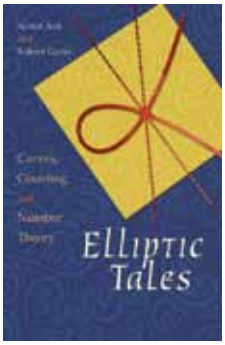
2011. 440 pages. 28 halftones.
Pa: 978-0-691-14841-0 $19.95 | £13.95

FORTHCOMING

Elliptic Tales

Curves, Counting, and Number Theory

Avner Ash & Robert Gross



"Assuming only what every mathematically inclined freshman should know, this book leads the reader to an understanding of one of the most important conjectures in current number theory—whose proof is one of the Clay Mathematics Institute's million-dollar prize problems. The book is carefully and clearly written, and can be recommended without hesitation."
—Peter Swinnerton-Dyer, University of Cambridge

Elliptic Tales describes the latest developments in number theory by looking at one of the most exciting unsolved problems in contemporary mathematics—the Birch and Swinnerton-Dyer Conjecture.

Avner Ash is professor of mathematics at Boston College. Robert Gross is associate professor of mathematics at Boston College.

April 2012. 312 pages. 52 line illus. 16 tables.
Cl: 978-0-691-15119-9 $29.95 | £19.95

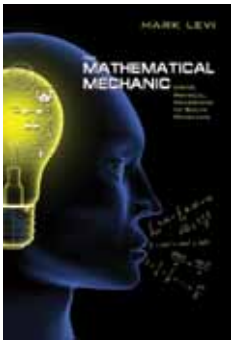
Also by Avner Ash & Robert Gross

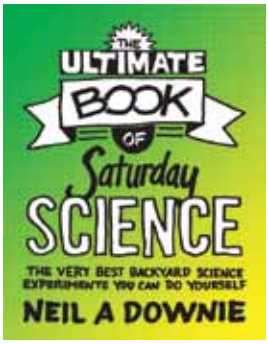
With a new preface by the authors

Fearless Symmetry

Exposing the Hidden Patterns of Numbers

2008. 312 pages. 1 halftone. 2 line illus.
Pa: 978-0-691-13871-8 $24.95 | £16.95





FORTHCOMING

Why Cats Land on Their Feet

And 76 Other Physical Paradoxes and Puzzles

Mark Levi

"*Why Cats Land on Their Feet* offers a trove of interesting and varied physical phenomena. Each one is clearly explained and easily understood, but many require an insightful observation for their resolution.… A most enjoyable read."
—Julian Havil, author of *Impossible?: Surprising Solutions to Counterintuitive Conundrums*

Ever wonder why cats land on their feet? Or what holds a spinning top upright? Or whether it is possible to feel the Earth's rotation in an airplane? *Why Cats Land on Their Feet* is a compendium of paradoxes and puzzles that readers can solve using their own physical intuition. And the surprising answers to virtually all of these astonishing paradoxes can be arrived at with no formal knowledge of physics.

Mark Levi is professor of mathematics at Pennsylvania State University.

June 2012. 240 pages. 90 line illus.
Pa: 978-0-691-14854-0 $19.95 | £13.95

FORTHCOMING

The Ultimate Book of Saturday Science

The Very Best Backyard Science Experiments You Can Do Yourself

Neil A. Downie

"This is the most extensive collection of project ideas at this level that I know of. Downie gives better 'how to' explanations and takes the ideas further than most other books of this kind. *The Ultimate Book of Saturday Science* is a true omnibus."
—David Willey, University of Pittsburgh at Johnstown

The Ultimate Book of Saturday Science is Neil Downie's biggest and most astounding compendium yet of science experiments you can do in your own kitchen or backyard using common household items. It may be the only book that encourages hands-on science learning through the use of high-velocity, air-driven carrots.

Neil A. Downie is a lead scientist with Air Products and Chemicals, Inc., and visiting professor of multidisciplinary engineering at the University of Surrey.

June 2012. 488 pages. 50 halftones. 150 line illus.
Pa: 978-0-691-14966-0 $29.95 | £19.95

Also by Mark Levi

FORTHCOMING PAPERBACK

One of *Choice*'s Outstanding Academic Titles for 2009
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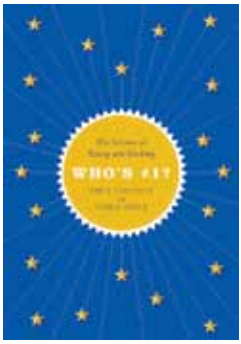
The Mathematical Mechanic

Using Physical Reasoning to Solve Problems

"*The Mathematical Mechanic* is an excellent display of creative, interdisciplinary problem-solving strategies. The author has explained complex concepts with simplicity, yet the mathematics is accurate."
—*Mathematics Teacher*

July 2012. 200 pages. 56 halftones. 66 line illus. 1 table.
Pa: 978-0-691-15456-5 $14.95 | £10.95
Cl: 978-0-691-14020-9 $19.95 | £13.95



FORTHCOMING

Who's #1?

The Science of Rating and Ranking

Amy N. Langville & Carl D. Meyer

"This highly accessible book gives readers a comprehensive account of the different mathematical ranking techniques across many different disciplines, and will appeal to everyone from researchers to sports statistics junkies."
—Sep Kamvar, author of *Numerical Algorithms for Personalized Search in Self-organizing Information Networks*

A website's ranking on Google can spell the difference between success and failure for a new business. NCAA football ratings determine which schools get to play for the big money in post-season bowl games. Product ratings influence everything from the clothes we wear to the movies we select on Netflix. Ratings and rankings are everywhere, but how exactly do they work? *Who's #1?* offers an engaging and accessible account of how scientific rating and ranking methods are created and applied to a variety of uses.

Amy N. Langville is associate professor of mathematics at the College of Charleston. Carl D. Meyer is professor of mathematics at North Carolina State University. They are the authors of *Google's PageRank and Beyond: The Science of Search Engine Rankings* (see page 19).

March 2012. 256 pages. 25 halftones. 47 line illus. 60 tables.
Cl: 978-0-691-15422-0 $29.95 | £19.95

FORTHCOMING

The Universe in Zero Words

The Story of Mathematics as Told through Equations

Dana Mackenzie

"Demanding very little prior mathematical knowledge, this is one of the best popular histories of mathematics in recent years. Dana Mackenzie's prose is lively and easy to read, and his mix of historical background and personal biographies of the main characters is engaging."
—Eli Maor, author of *The Pythagorean Theorem: A 4,000-Year History* and e*: The Story of a Number*

The Universe in Zero Words tells the history of twenty-four great and beautiful equations that have shaped mathematics, science, and society—from the elementary (1+1=2) to the sophisticated (the Black-Scholes formula for financial derivatives), and from the famous ($E=mc^2$) to the arcane (Hamilton's quaternion equations). Mackenzie, who has been called a "popular-science ace" by *Booklist* magazine, lucidly explains what each equation means, who discovered it (and how), and how it has affected our lives.

Dana Mackenzie is a frequent contributor to *Science*, *Discover*, and *New Scientist*. He was a mathematics professor for thirteen years before becoming a full-time writer.

June 2012. 224 pages. 26 color illus. 17 halftones. 12 line illus.
Cl: 978-0-691-15282-0 $27.95 | £19.95
Not for sale in Australia

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FORTHCOMING

X and the City

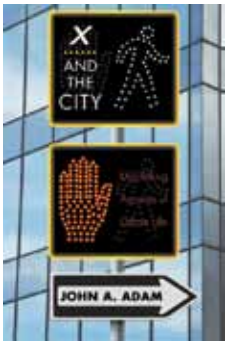
Modeling Aspects of Urban Life

John A. Adam

"Why did the chicken cross the road? Because the Jaywalker Equation said it had enough time between cars. How does the Ambler Gambler Graph tell if you can blast through a yellow traffic light before it turns red? And why are taxicabs slower than Euclid? These and many other mathematical conundrums are answered in John Adam's admirable new collection."
—Neil A. Downie, author of *Vacuum Bazookas, Electric Rainbow Jelly, and 27 Other Saturday Science Project*

John A. Adam is professor of mathematics at Old Dominion University.

June 2012. 304 pages. 2 halftones. 104 line illus. 8 tables.
Cl: 978-0-691-15464-0 $27.95 | £19.95



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FORTHCOMING PAPERBACK

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One of *Choice*'s Outstanding Academic Titles for 2009

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David S. Richeson

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David S. Richeson is associate professor of mathematics at Dickinson College.

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NEW PAPERBACK

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A 4,000-Year History

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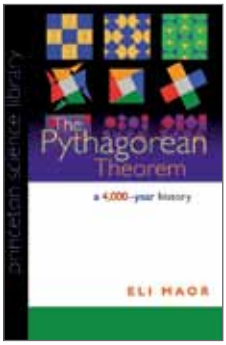
Eli Maor teaches the history of mathematics at Loyola University in Chicago and at the Graham School of General Education at the University of Chicago.

Princeton Science Library

2010. 288 pages. 9 color illus. 141 line illus. 2 tables.
Pa: 978-0-691-14823-6 $17.95 | £12.50
Cl: 978-0-691-12526-8 $24.95 | £16.95



Also by Eli Maor

e

The Story of a Number

Princeton Science Library

2009. 248 pages. 6 halftones. 74 line illus.
Pa: 978-0-691-14134-3 $15.95 | £10.95
Not for sale in South Asia

NEW

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A Novel of Deception, Power, and Internet Intrigue

Shumeet Baluja

"Clever and prophetic. *The Silicon Jungle* will be required reading from Silicon Valley to Washington, DC."
—Marc Rotenberg, Electronic Privacy Information Center

Shumeet Baluja is a senior staff research scientist at Google.

2011. 352 pages.
Cl: 978-0-691-14754-3 $27.95 | £19.95

NEW PAPERBACK

Pythagoras' Revenge

A Mathematical Mystery

Arturo Sangalli

"For a total escape, this novel is perfect."
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Arturo Sangalli is a freelance science journalist and writer.

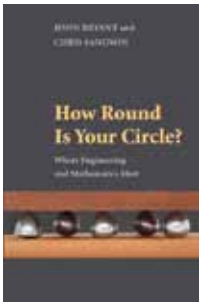
2011. 208 pages. 10 line illus. 1 map.
Pa: 978-0-691-15019-2
$14.95 | £10.95
Cl: 978-0-691-04955-7
$24.95 | £16.95

NEW PAPERBACK

How Round Is Your Circle?

Where Engineering and Mathematics Meet

John Bryant & Chris Sangwin



"Part magic show, part history lesson, and all about geometry, *How Round Is Your Circle?* is an eloquent testimonial to the authors' passion for numbers."
—*Civil Engineering*

John Bryant, now retired, was lecturer in engineering at the University of Exeter. Chris Sangwin is lecturer in mathematics at the University of Birmingham.

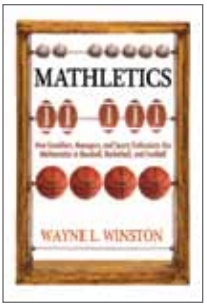
2011. 344 pages. 30 color illus. 60 halftones. 180 line illus.
Pa: 978-0-691-14992-9 $19.95 | £13.95

FORTHCOMING PAPERBACK
With a new epilogue by the author

Mathletics

How Gamblers, Managers, and Sports Enthusiasts Use Mathematics in Baseball, Basketball, and Football

Wayne L. Winston



"*Mathletics* is like a seat at courtside."
—Mark Cuban, owner of the Dallas Mavericks

Wayne L. Winston is the John and Esther Reese Professor of Decision Sciences at Indiana University's Kelley School of Business.

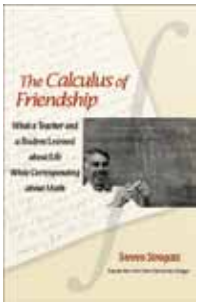
April 2012. 392 pages. 114 line illus. 49 tables.
Pa: 978-0-691-15458-9 $19.95 | £13.95
Cl: 978-0-691-13913-5 $29.95 | £19.95

NEW PAPERBACK

The Calculus of Friendship

What a Teacher and a Student Learned about Life While Corresponding about Math

Steven Strogatz



"An intimate view of mentorship."
—*Nature*

Steven Strogatz is the Jacob Gould Schurman Professor of Applied Mathematics at Cornell University.

2011. 184 pages. 9 halftones. 46 line illus.
Pa: 978-0-691-15038-3 $14.95 | £10.95
Cl: 978-0-691-13493-2 $19.95 | £13.95

FORTHCOMING

Circles Disturbed

The Interplay of Mathematics and Narrative

Edited by Apostolos Doxiadis & Barry Mazur

"This collection is a pioneering effort to trace the hidden connections between mathematics and narrative. It succeeds magnificently, and represents a very significant contribution that will appeal to the professional mathematician as well as the general educated reader. The articles are written by top authorities in their fields."
—Doron Zeilberger, Rutgers University

Apostolos Doxiadis is a writer. Barry Mazur is the Gerhard Gade University Professor in the Department of Mathematics at Harvard University.

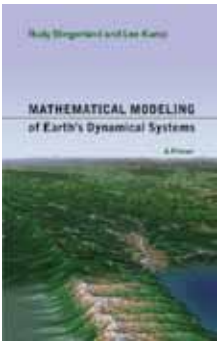
April 2012. 552 pages. 91 line illus.
Cl: 978-0-691-14904-2 $49.50 | £34.95

NEW

Mathematical Modeling of Earth's Dynamical Systems

A Primer

Rudy Slingerland & Lee Kump



"Written by two of the leading researchers in the field, *Mathematical Modeling of Earth's Dynamical Systems* is a must-read for all geoscientists, and not just students. This excellent primer offers bite-size gems of insight into the world of quantitative geosciences applications, covers both mathematical and modeling concepts, and offers practical exercises to build expertise. Course notes and methodologies will be improving across our academies."
—James P. M. Syvitski, Community Surface Dynamics Modeling System

Rudy Slingerland and Lee Kump are professors of geosciences at Pennsylvania State University.

2011. 248 pages. 3 halftones. 72 line illus. 9 tables. 1 map.
Pa: 978-0-691-14514-3 $45.00 | £30.95
Cl: 978-0-691-14513-6 $99.50 | £69.95

NEW

Validated Numerics

A Short Introduction to Rigorous Computations

Warwick Tucker

"A significant contribution.... *Validated Numerics* will be read by those interested in interval arithmetic, numerical analysis, and ways to make computer simulations more robust and less susceptible to errors. It is well written and well organized."
—A. J. Meir, Auburn University

Warwick Tucker is professor of mathematics and principal investigator for the Computer-Aided Proofs in Analysis (CAPA) Group at Uppsala University in Sweden.

2011. 152 pages. 41 line illus. 18 tables.
Cl: 978-0-691-14781-9 $45.00 | £30.95

FORTHCOMING **TEXT**

Hybrid Dynamical Systems

Modeling, Stability, and Robustness

Rafal Goebel, Ricardo G. Sanfelice & Andrew R. Teel

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Rafal Goebel is an assistant professor in the Department of Mathematics and Statistics at Loyola University, Chicago. Ricardo G. Sanfelice is an assistant professor in the Department of Aerospace and Mechanical Engineering at the University of Arizona. Andrew R. Teel is a professor in the Electrical and Computer Engineering Department at the University of California, Santa Barbara.

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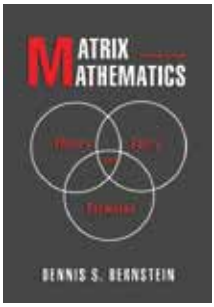

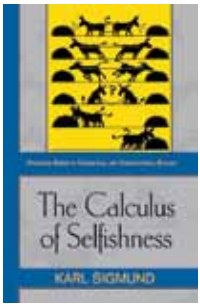

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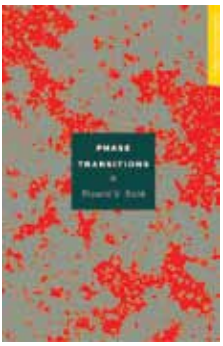

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Ricard V. Solé is ICREA research professor and head of the Complex Systems Lab at Pompeu Fabra University and external professor at the Santa Fe Institute.

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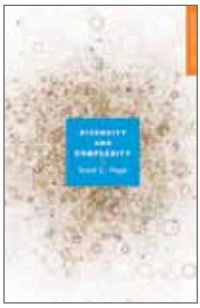

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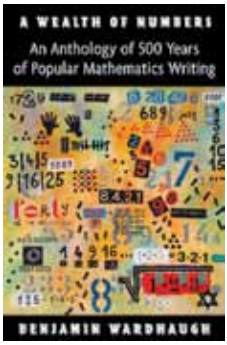

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Benjamin Wardhaugh is a postdoctoral research fellow at All Souls College, University of Oxford, where he studies and teaches the history of mathematics.

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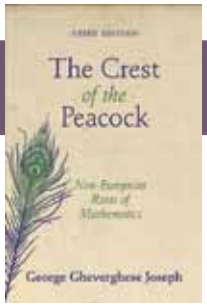

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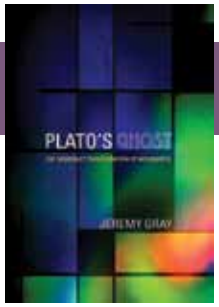

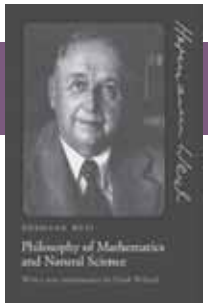

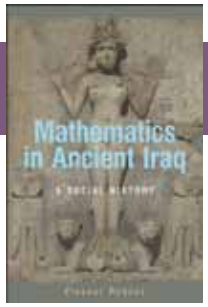

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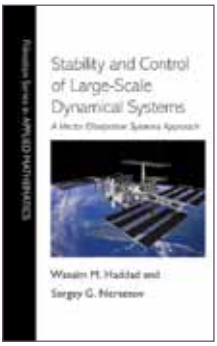

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Wassim M. Haddad is a professor in the School of Aerospace Engineering at Georgia Institute of Technology. Sergey G. Nersesov is an associate professor in the Department of Mechanical Engineering at Villanova University.

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NEW

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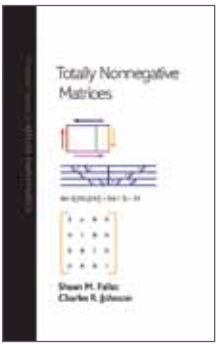

"This book is a valuable new reference on the subject of totally nonnegative matrices and its insights will be much appreciated by a broad community of readers."
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Shaun M. Fallat is professor of mathematics and statistics at the University of Regina. Charles R. Johnson is the Class of 1961 Professor of Mathematics at the College of William & Mary.

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Mihály Bakonyi (1962–2010) was professor of mathematics at Georgia State University. Hugo J. Woerdeman is professor and head of the Department of Mathematics at Drexel University.

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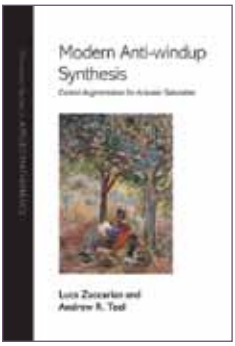

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Luca Zaccarian is associate professor of control engineering at the University of Rome, Tor Vergata. Andrew R. Teel is a professor in the Electrical and Computer Engineering Department at the University of California, Santa Barbara.

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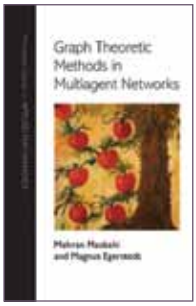

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Charles Fefferman is the Herbert E. Jones, Jr., '43 University Professor of Mathematics at Princeton University. C. Robin Graham is professor of mathematics at the University of Washington.

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Mark Green is professor of mathematics at the University of California, Los Angeles and is Director Emeritus of the Institute for Pure and Applied Mathematics. Phillip A. Griffiths is Professor Emeritus of Mathematics and former director at the Institute for Advanced Study in Princeton. Matt Kerr is assistant professor of mathematics at Washington University in St. Louis.

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Spyros Alexakis is assistant professor of mathematics at the University of Toronto.

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Joram Lindenstrauss is professor emeritus of mathematics at the Hebrew University of Jerusalem. David Preiss is professor of mathematics at the University of Warwick. Jaroslav Tišer is associate professor of mathematics at Czech Technical University in Prague.

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With appendixes by David Masser

This book considers the so-called Unlikely Intersections, a topic that embraces well-known issues, such as Lang's and Manin-Mumford's, concerning torsion points in subvarieties of tori or abelian varieties. More generally, the book considers algebraic subgroups that meet a given subvariety in a set of "unlikely" dimension. The book is an expansion of the Hermann Weyl Lectures delivered by Umberto Zannier at the Institute for Advanced Study in Princeton in May 2010.

Umberto Zannier is professor of mathematics at the Scuola Normale Superiore di Pisa in Pisa, Italy.

April 2012. 160 pages.
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Jean-Michel Bismut is professor of mathematics at the Université Paris-Sud, Orsay.

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Bas Edixhoven is professor of mathematics at the University of Leiden. Jean-Marc Couveignes is professor of mathematics at the University of Toulouse le Mirail.

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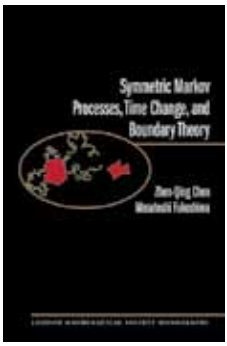

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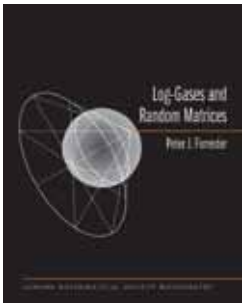

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