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Reviews

Paul j. Campbell (Editor)

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REVIEWS

PAUL J. CAMPBELL, *Editor*
Beloit College

Assistant Editor: Eric S. Rosenthal, West Orange, NJ. Articles and books are selected for this section to call attention to interesting mathematical exposition that occurs outside the mainstream of mathematics literature. Readers are invited to suggest items for review to the editors.

Stern, H.S., In favor of a quantitative boycott of the Bowl Championship Series, *Journal of Quantitative Analysis in Sports* 2 (1) (2006), `www.bepress.com/jqas/vol2/iss1/4/` .

Another football season is under way. The Bowl Championship Series (BCS) is supposed to match the top two college teams in a championship game at the end of the season; it uses polls of coaches combined with computer rankings designed by selected individuals. Stern rejects the computer rankings as having no clear-cut objective (beyond merely "validating" the polls) and being deliberately crippled (they are not allowed to use game scores or locations). He advocates that quantitative analysts have nothing to do with the BCS.

Diaconis, Persi, Susan Holmes, and Richard Montgomery, Dynamical bias in the coin toss, `www-stat.stanford.edu/~susan/papers/headswithJ.pdf` .

This paper proves that "vigorously flipped coins are biased to come up the same way they started," with the bias parametrized by the angle between the normal to the coin and the angular momentum vector. The source of the bias is unavoidable wobbling (precession) of the coin. The authors also offer data (for U.S. half-dollars—seen one lately?) that the bias is about $.008 \pm .001$. OK, but earlier they claim that their data show "a bias of at least .01," and they confusingly conclude that "For tossed coins, the classical assumptions of independence with probability 1/2 are pretty solid."

Ash, Avner, and Robert Gross, *Fearless Symmetry: Exposing the Hidden Patterns of Numbers*, Princeton University Press, 2006; xxix + 272 pp, $24.95. ISBN 0–691–12492–2.

The subtitle is pure fluff, but few books are as ambitious as this one, and even fewer realize their ambitions as well. Recent years have seen an explosion of popularizations of mathematics, such as *Symmetry and the Monster* reviewed below. Where there is still a lack, due partly to the more limited audience, is in explanations of topics in advanced mathematics, *featuring the research motivation and exploring connections and context*, for those with enough background to bear with some notation, equations, and abstraction. This book's authors attempt to explain "cutting-edge mathematics" mainly to an audience that has studied calculus (that subject is not used, just the "mathematical maturity" supposed to be attained thereby). A claim to address readers "who have only studied some algebra" is misguided, except to open the door for bright high school students. The mathematics starts with groups and permutations in modern algebra and number theory, progresses through Galois theory and elliptic curves, investigates reciprocity laws, and culminates in an explanation of the proof of Fermat's Last Theorem. Those likely to benefit the most are mathematics majors and mathematicians (it would be great for a senior seminar); I could learn a lot by studying it carefully instead of just of just sampling it for this review. A useful feature (which more books should adopt) is a "Road Map" paragraph at the start of each chapter, which summarizes the purpose of the chapter and sets it in perspective.

Ronan, Mark, *Symmetry and the Monster: One of the Greatest Quests of Mathematics*, Oxford University Press, 2006; viii + 255 pp, \$27. ISBN 0–19–280722–6.

This book traces the classification of simple groups from Lagrange to Richard Borcherds winning the Fields Medal in 1998 for work on the "Monstrous" Lie algebra with its tantalizing connections to number theory, crystals, and string theory. The classification is presented as a search for the "atoms" of symmetry. The author is a mathematician who worked at the edges of the classification theorem; knew all of the principals in it; and cites exact dates, places, and incidents. The work reads briskly and holds interest; apart from the quadratic formula, there is only one equation, near the end, that involves variables.

Packel, Edward, *The Mathematics of Games and Gambling*, 2nd ed., MAA, 2006; xi + 175 pp, \$44 (member: \$35). ISBN 10: 0–88385–646–8; ISBN 13: 978–0–88385–646–8.

With gambling by students a growing phenomenon, and the likelihood increasing that my town will become host to an Indian casino, popular demand may lead me to teach a course from this fine book. It has been updated to reflect newly popular games (e.g., video poker, Texas Holdem) and expanded gambling opportunities (sports betting on the Internet). Five of the seven chapters—on probability (roulette), dice games (backgammon, craps, chuck-a-luck), permutations/combinations (poker, bridge, Keno), binomial distribution (blackjack), and game theory (bluffing)—have an even dozen exercises each, with answers or hints to about one-third of them. The only background needed is high school algebra.

Fasano, Antonio, and Robert Natalini, Lost beauties of the Acropolis: What mathematics can say, *SIAM News* 39 (6) (July/August 2006) 1, 8. 7.

Air pollution vs. marble monuments: "Mathematics can produce not only elegant theories, but also very concrete answers," such as "cleaning" the marble too often is bad, and halving the damage would require reducing the sulfur dioxide in the air by a factor of four.

Peterson, Ivars, Chaotic chomp: The mathematics of crystal growth sheds light on a tantalizing game, *Science News* 170 (4) (22 July 2006) 58–60.

Classic games remain sources of inspiration for new mathematics. Chomp, reinvented in the 1970s by David Gale, is the latest example. Two players take turns removing a cookie from an initially rectangular layout; all cookies above and to the right of it are removed, too. The loser is the player removes the last cookie. There is a winning strategy for the first player (convince yourself by contradiction and exchanging roles of the players); but for nonsquare layouts with more than two columns, what cookie to take first is largely unknown. A new physics-based approach shows that the location of "winning" cookies and corresponding "losing" cookies can vary greatly with small changes in the size of the layout. Yet there are (broken) patterns, which resemble crystal growth processes and fractals. Among the latest results by Adam S. Landsberg (Claremont Colleges) and Eric J. Friedman (Cornell University), who apply re-normalization techniques from physics, is that each $3 \times n$ rectangle has a unique winning cookie.

Messer, Robert, and Philip Straffin, *Topology Now!*, MAA, 2006; xi + 240 pp, \$49.95 (member: \$39.95). ISBN 0–88385–744–8.

The exclamation point in the title emphasizes the authors' view that undergraduate "students should see the exciting geometric ideas of topology now (!) rather than later." Most mathematics majors do not take topology, and most topology courses are mainly point-set topology, so the authors have a point—indeed, for most students, there isn't any "later." This textbook emphasizes continuity, convergence, and connectedness, with applications to knots, manifolds, fixed-point theorems, and algebraic topology. It concludes with a chapter summarizing what most other topology texts focus on: metric spaces, topological spaces, and compactness. Recommended prerequisites are linear algebra, vector calculus, and one additional course in proof mathematics; no analysis or advanced calculus is presupposed. [Disclosure: Author Phil Straffin is a close colleague of mine at Beloit.]