The Best Writing on Mathematics 2010

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http://gonitsora.com/best-writing-mathematics-2010/

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Princeton University Press, 2011.

Mircea Pitici is a mathematics education specialist at Cornel l University. He also teaches writing courses and has edited this anthology as a way of presenting nontechnical expositions of mathematical topics to a general audience. The articles are organized somewhat arbitrarily into six broad categories: “Mathematics Alive”, illustrating the versatility of mathematical writing; “Mathematicians and the Practice of Mathematics”, challenging stereotypes of mathematicians; “Mathematics and Its Applications”, including networks, probability and homology; “Mathematics Education”, ranging from high school to post-graduate level; “History and Philosophy of Mathematics”; and “Mathematics in the Media”.

The sources vary from popular mathematical journals such as *The American Mathematical Monthly* and *The Mathematical Intelligencer*, journals of record like *The Bulletin* and *Notices of the American Mathematical Society*, to blogs and columns from *The New Yorker*, *The Guardian* and *The New York Times*. The articles are presented without critical commentary and on the whole are well chosen and written to appeal to a wide mathematically literate audience. A few, however, especially those on education, are of limited relevance outside of North America.

There are far too many articles to review individually, so I will just comment on ones that I found particularly appealing. In “Mathematics Alive”, there is an amusing but serious discussion by the geometer Branko Grunbaum, called “An enduring error”, concerning the enumeration of the Archimedean Polyhedra: are there 13 or 14? The ambiguity dates right back to Kepler, who in different places claimed both. It persists in research papers and textbooks right up to the present, and Grunbaum gleefully traces its passage. Of course, he also discusses the reason: there are two incompatible definitions of an Archimedean Polyhedron, that is, a convex polyhedron having regular polygons for faces. One definition states that it has isomorphic vertex figures (this is the source of the 14), and the other that its automorphism group acts transitively on the vertex figures (this eliminates one of the 14). Grunbaum carefully describes the two possible rhombicuboctahedra, one of which is transitive on the vertices and the other not.

The section on “Mathematicians and the Practice of Mathematics” contains an essay by Phillip J Davis, published in a popular Swedish mathematical journal, on the mathematical jottings in the notebooks of the Symbolist poet and philosopher Paul Valery (1871–1945). Valery read widely in mathematics and physics, and was acquainted with both E Borel and Hadamard. He was *au fait* with contemporary developments in relativity and quantum physics. While Davis finds nothing mathematically noteworthy in his notes, he points out that Valery was obsessed with clarity of language and saw mathematics as a model for defining concepts precisely and relating them in a coherent way.

This section also contains the curious history, by Alicia Dickenstein, of the lost cover page in the English 1920 translation of Einstein's main article on the *Theory of General Relativity*, published in 1916. This page, which Dickenstein found in the online Einstein archives from the Hebrew University of Jerusalem, contains unstinting praise of the mathematicians who developed the absolute differential calculus on which the theory is based.

There are several novel results in the "Mathematics and Its Applications" section. In "Mathematics and the Internet", Willinger, Anderson and Doyle debunk the popular "scale-free" or power law model of the Internet, pointing out that it is based on easily obtained but unreliable data. Brian Hayes, in "The Higher Arithmetic", shows how to use different number scales to make sense of the very large numbers that pop up in computing, finance and astronomy. In "Knowing When to Stop", Theodore P Hill discusses the mathematical justification of optimal stopping rules in various practical situations.

A controversial article in the "History and Philosophy of Mathematics" section is "Kronecker's algorithmic mathematics" by Harold M Edwards. He demolishes popular legends concerning Kronecker's non-belief in the existence of objects like non-constructible irrational numbers. He points out that Kronecker's algorithms (in the absence of computers) are intended to be theoretically, not practically, computable. Finally, as a strong adherent of Kronecker's version of constructive mathematics, Edwards pours scorn on Brouwer's lawless sequences as well as Hilbert's proof of the existence of integral bases of algebraic number fields. One may feel the desire to argue with Edwards, but there is no doubt that he presents interesting ideas in an intriguing way.

In the "Mathematics and the Media" section, the classical and jazz musician Vijay Iyer, in a column from *The Guardian* newspaper called "Strength in numbers", describes the way in which mathematical ideas have explicitly influenced musicians. For example, he traces harmonic rhythms based on initial segments of the Fibonacci sequence in the music of Karnatak India, West Africa, Bartok and even Michael Jackson's "Billie Jean"!

In summary, I recommend this book to the readers as enjoyable bedside reading.

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