

MAPS/CARMA: Celebrating Our Outreach in the Mathematical Sciences

17th August 2012, Nelson Room in the Shortland Building

Jonathan Borwein

FRSC FAAAS FAA

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Director CARMA (Computer Assisted Research Mathematics and Applications)
Laureate Professor University of Newcastle, NSW



Communicating with, to and for the Public and Media

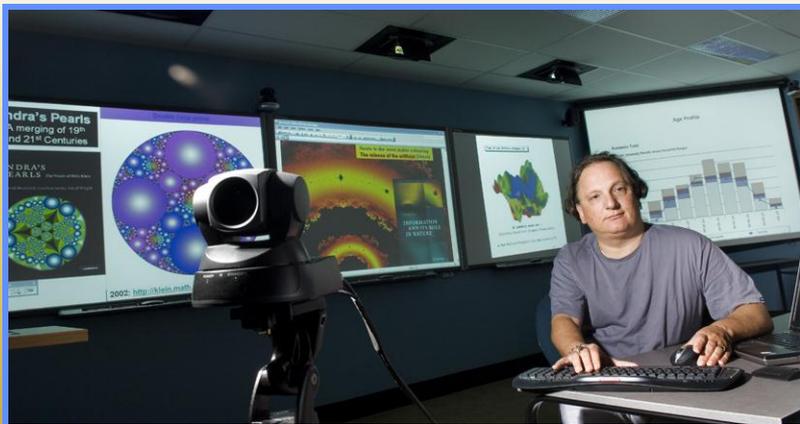
The most prominent requisite to a lecturer, though perhaps not really the most important, is a good delivery; for though to all true philosophers science and nature will have charms innumerable in every dress, yet I am sorry to say that the generality of mankind cannot accompany us one short hour unless the path is strewn with flowers.

...

A truly popular lecture cannot teach, and a lecture that truly teaches cannot be popular.

Michael Faraday (1791-1867)





OUTLINE

Jonathan M. Borwein
Newcastle

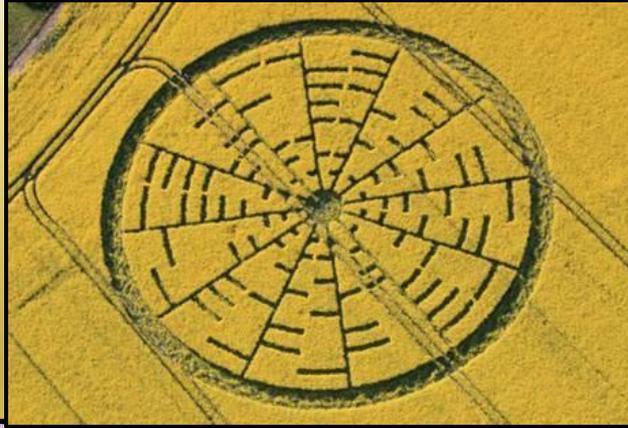


Goals: Pedagogy, Promotion, Policy, Pleasure

- ◆ Which Public, Which Media?
- ◆ Public Lectures and Presentations
- ◆ Interviews (live or background)
- ◆ Print and Blogging (what topics succeed?)
- ◆ Expository Writing (for us or others)
- ◆ A Web Presence is Important

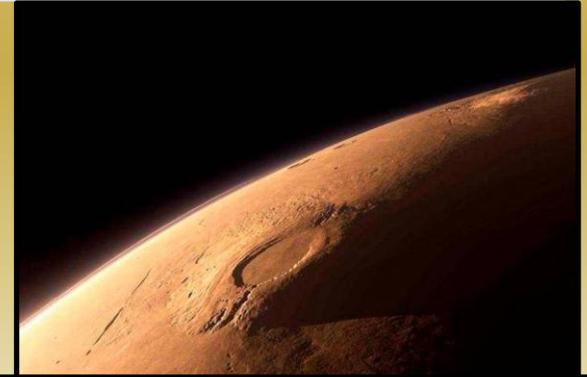
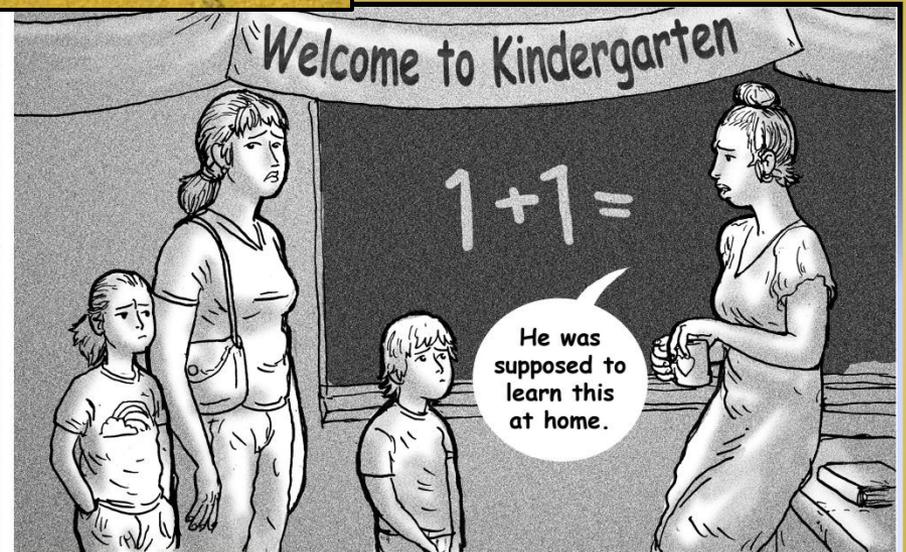
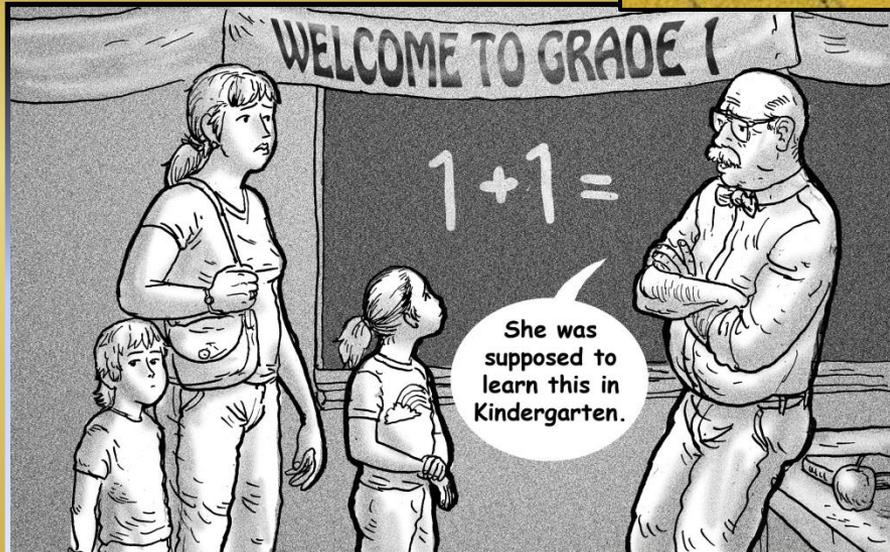
The object of mathematical rigor is to sanction and legitimize the conquests of intuition, and there was never any other object for it. – Jacques Hadamard (1865-1963)

Crop Circles, Curriculum and Curiosity



purports to show

$$e^{i\pi} = -1$$



Three Things to Remember

All professions look bad in the movies ... why should scientists expect to be treated differently?

Michael Crichton addressing 1999 AAAS Meetings, as quoted in *Science* Feb. 19, 1999, p. 1111.

✓ We are not unique

Newspapers cover conflict!

National Post Education Editor to CMS Forum on High school Education, Montreal 2002

✓ Answering “Why do you never cover good news stories?”

Harry Potter is dangerous.

Parisian, Ivar Ekeland speaking at 2002 CMS Forum

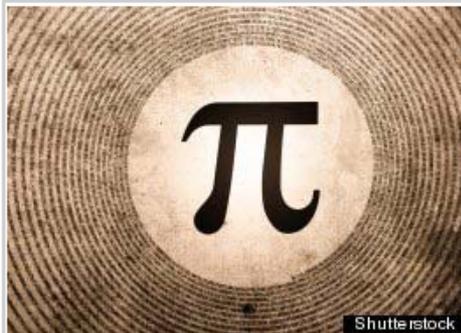
✓ Led to fire storm and 15 editorials in Canada/US in days

✓ Anything you say may be used against you

Pi Never Disappoints

U.S. Population Reaches 314,159,265, Or Pi Times 100 Million: Census

The Huffington Post | By Bonnie Kavoussi
Posted: 08/14/2012 4:03 pm Updated: 08/14/2012 5:55 pm



Pi.

Shutterstock

The U.S. population has reached a nerdy and delightful milestone.

Shortly after 2:29 p.m. on Tuesday, August 14, 2012, the U.S. population was exactly 314,159,265, or Pi (π) times 100 million, the [U.S. Census Bureau reports](#).

Pi (π) is a unique number in multiple ways. For one, it is the ratio of a circle's circumference to its diameter. It is also an irrational number, meaning it goes on forever without ever repeating itself. Are you remembering how much you loved geometry class? You can check out Pi to one million places [here](#).



Above: Aug 14th 2012 *Huffington Post*.

See also

<https://theconversation.edu.au/bad-numbers-make-for-killer-headlines-and-dodgy-news-7894>

Right: a **Mazda 3.1415925** ... spotted on the road in the Bay area recently.

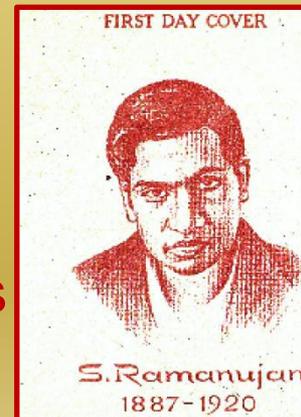
Science Journalists

Good ones are remarkable people

- ✓ Scientific American, American Scientist (Brian Hayes), Science News (Ivars Petersen), New Scientist, AMS (Barry Cipra, Allyn Jackson), ABC (ex. Paul Willis), CBC, BBC, NYT (ex. James Gleick), Globe and Mail, LA Times, etc.
- ✓ Very quick studies under tight deadlines, covering many fields; often with strong science background
- ✓ They are your friends; get used to being edited

Not all are so well qualified

- ✓ The reporter responsible for the quote below fell asleep during my brother's lecture
- ✓ He woke up during the next talk on **savant calculators** and did not notice the speaker had changed



Srinivasa Ramanujan (1887-1920) was an Indian idiot savant. – Peter Borwein (speaking at the AAAS in 1987 – as quoted in Chicago and syndicated widely)

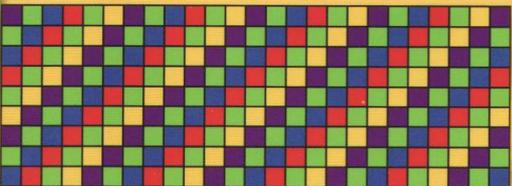
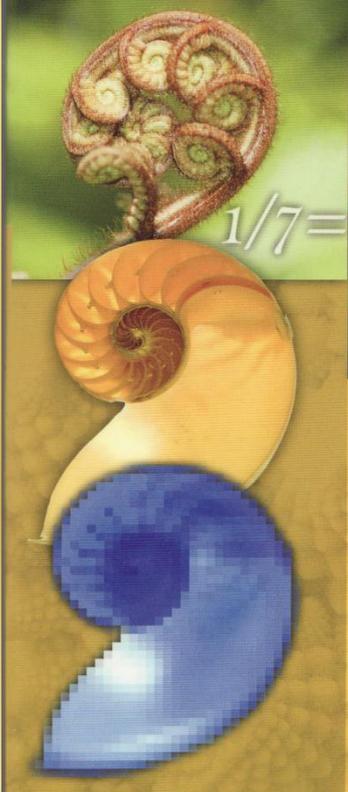
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Mathematics and Beauty

Aesthetic Approaches to Teaching Children

Nathalie Sinclair
Foreword by William Higginson



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"This is an exceptionally important book. . . . It could be the starting point for many cognitive, social, and educational benefits."

—From the Foreword by **William Higginson**,
Queen's University, Canada

"In a time of much sterile math teaching and grimly utilitarian school reform, this elegant and beautiful book brings to life a whole new vision. . . . Nathalie Sinclair makes a brilliant case for rethinking math instruction so that an aesthetically rich learning environment becomes the path to meaning, intellectual journeys, and—dare we say the word?—pleasure."

—**Joseph Featherstone**,
Michigan State University

In this innovative book, Nathalie Sinclair makes a compelling case for the inclusion of the aesthetic in the teaching and learning of mathematics. Using a provocative set of philosophical, psychological, mathematical, technological, and educational insights, she illuminates how the materials and approaches we use in the mathematics classroom can be enriched for the benefit of all learners. While ranging in scope from the young learner to the professional mathematician, there is a particular focus on middle school, where negative feelings toward mathematics frequently begin. Offering specific recommendations to help teachers evoke and nurture their students' aesthetic abilities, this book:

- Features powerful episodes from the classroom that show students in the act of developing a sense of mathematical aesthetics.
- Analyzes how aesthetic sensibilities to qualities such as connectedness, fruitfulness, apparent simplicity, visual appeal, and surprise are fundamental to mathematical inquiry.
- Includes examples of mathematical inquiry in computer-based learning environments, revealing some of the roles they play in supporting students' aesthetic inclinations.

Nathalie Sinclair is an assistant professor in the Department of Mathematics at Michigan State University.

ALSO OF INTEREST—

Improving Access to Mathematics: Diversity and Equity in the Classroom
Na'ilah Suad Nasir and Paul Cobb, Editors
2007/Paper and cloth

Photo of fern by John Spavin
Photo of nautilus by Peter Werner
Background photo of cabbage by Piero Marsiaj



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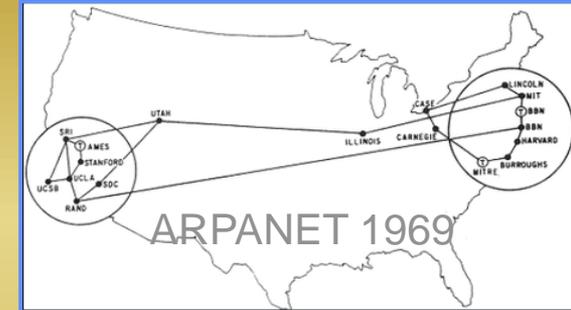


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Which Public?

Schools (and everything else)

- ✓ Know the level and the physical environment
 - ✓ Bring a clock. Is there a blackboard? Can it be seen?
 - ✓ How big is the screen? Ask if you can't look. **Green** is bad
- ✓ Never run over. No one is *that* interested

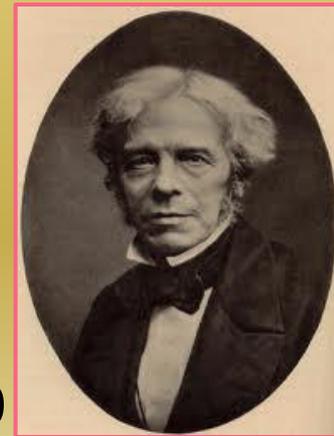


Other Sciences and Disciplines

- ✓ Domains of expertise decay quadratically
- ✓ ACRONYMS and technical terms: “*Yiddish speaks itself.*”
- ✓ Learn to “lie” for everyone’s benefit

The Public

- ✓ **Great and Unwashed**: have something for everyone
- ✓ **Elite**: Vancouver Academy or Shine Dome
- ✓ **World Science Festival**: 600 paying guests age 7-70



A centre of excellence is a place where second rate people do first rate work. – Michael Faraday

Mysteries of the Mathematical Universe

New School

Manhattan 5/6/11



Borwein, de Sautoy,
Devlin and Singh



WSF Opening Video

Public Lectures and Presentations

Public Lectures

- ✓ Many are listening in second language – esp. in Universities
- ✓ So view overheads like sidebars in *Science* or *SciAmer*
- ✓ Limit formulas (others may **hum them**) and ‘**cognitive stress**’.
- ✓ Don’t read your slides
- ✓ Time yourself in advance: have multiple natural endpoints

Panel Discussions

- ✓ Know your brief and ‘try’ to keep to it
- ✓ Moderator (WSF) or opponent (*Huff Post* Aug 5th) may not

Web Presence

- ✓ Crucial for **you** and for the Uni
 - ✓ “*I never knew you were so high up in CECM!*”
- ✓ For recruitment at all levels
- ✓ My **Maths Portal**: Links and Tools (my own and others)



Interviews

For Daily or Weekly Press

- ✓ Ask to help “**fact check**” not to “approve” the article
 - ✓ Never say “**off the record**” what you can’t live with on the record
- ✓ You never have real control; my recent **KAU-Saudi** comment to *Australian* was quoted:
 - ✓ *“It is a pretty cynical attempt to hijack the ratings. It may work” in **mathematics to do real good...***

For Live Media

- ✓ Know what they want to discuss
- ✓ Practice in advance: role play
- ✓ Make sure you make your main points



3. Publish the same result several times. 4. You are more likely to be remembered by your expository work. – Gian-Carlo Rota [1932-1999], “**Ten lessons** I wish I had been taught” (1996)

Jon Borwein's Blogs and Other Non-Technical Online Writing

Where to Look

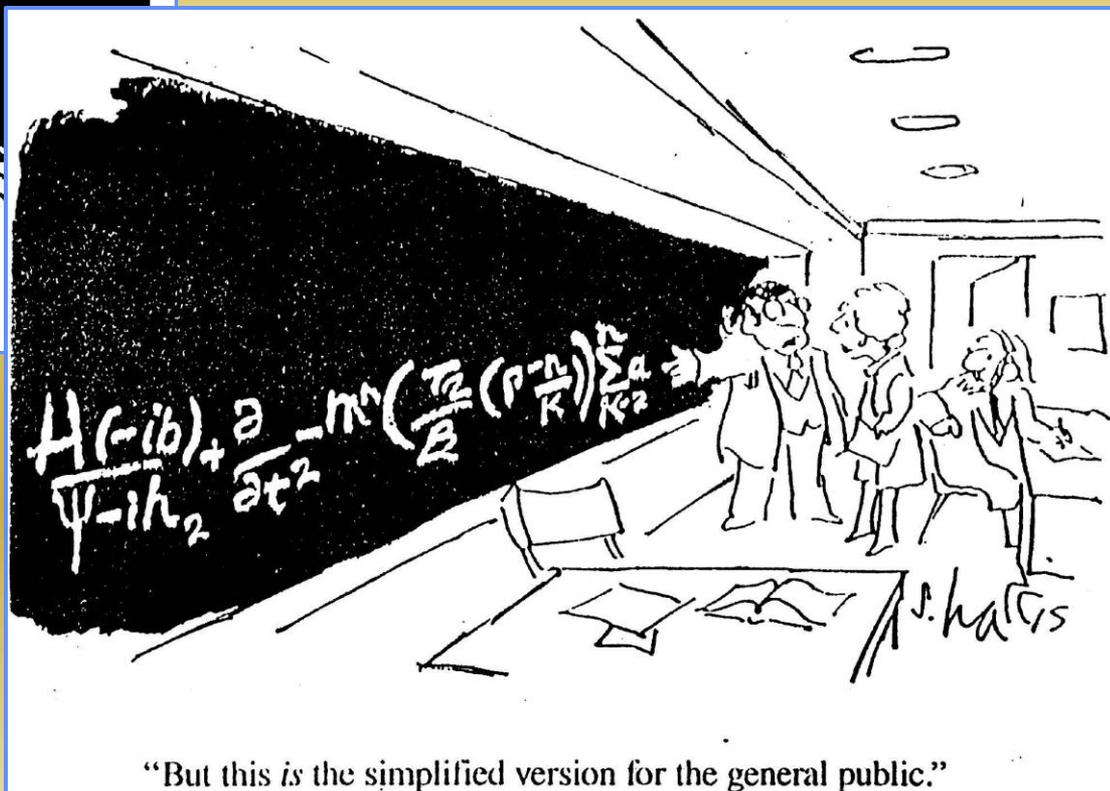
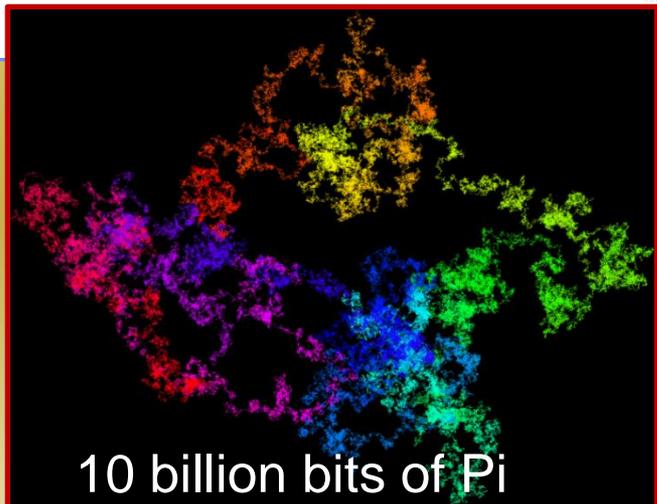
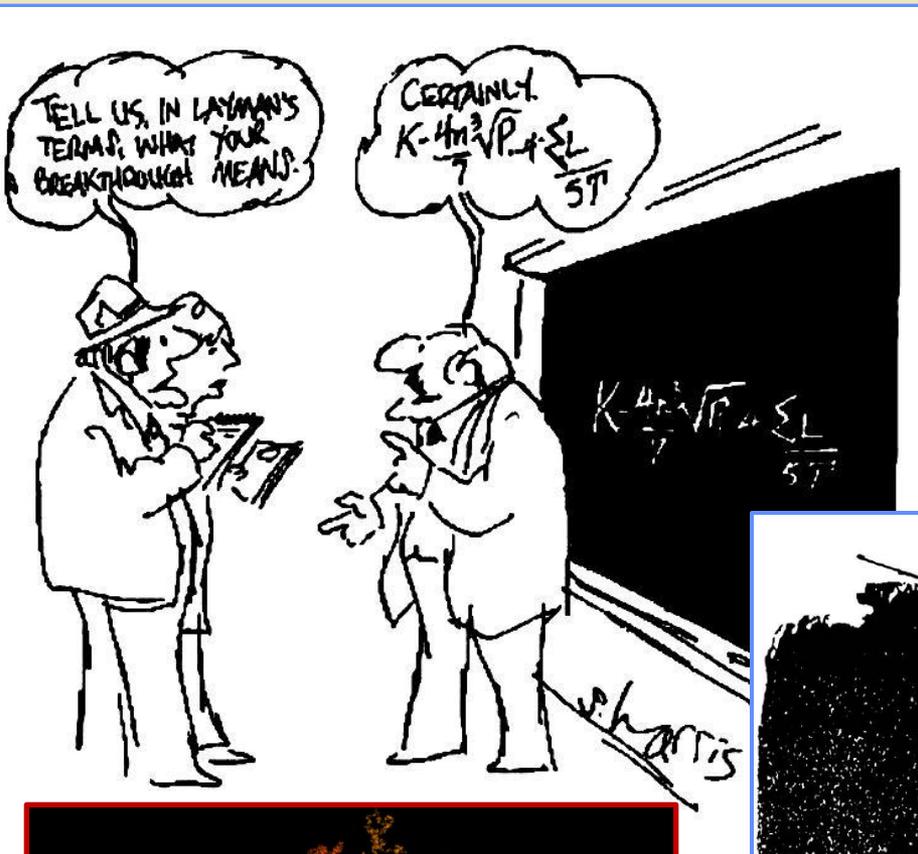
1. Blogs in the [Huffington Post](#)
March 15, 2012. [Pi Day in America](#) (Huffington Post)
March 2011. Piday article for [ABC Science on line](#)
2. My online articles in [The Conversation](#) (since March 2011)
3. Two mathematicians contemplate the cosmos at [Math Drudge](#) (since June 2009)

4. My mathematics, science and society quotation collection or [qlog](#) (since 1995)
5. [Talking to Telstra](#) (August 2010)
6. [The Prophet in Clayton Park](#) (Sept 2007)
7. [The Book of Lawrence](#)

8. Follow my nephew Zachary Nevin's July 2012 [ride across Canada](#) to raise awareness of MS.
The story was aired nationally in Canada by [CTV News](#)
There is a [Facebook page](#) and a [Twitter Feed](#)

<http://carma.newcastle.edu.au/jon/blogs.html>

Know the Audience and use Pictures



And Other Expository Writing

✓ For Ourselves and for Others

Take Risks. The Demand is There

- Talk to me if you want to try out a topic
- For Blogs, MAA Monthly, Intelligencer, ...
 - ✓ Have story to tell and defensible opinions
 - ✓ Use simple declarative sentences
 - ✓ And short paragraphs!
 - ✓ Titles are important. Some are failures:
 - ✓ **Danger of death: are we programmed to miscalculate risk?**



THE AMERICAN MATHEMATICAL MONTHLY		MAA
VOLUME 118, NO. 1	AUGUST-SEPTEMBER 2010	
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An Official Publication of the Mathematical Association of America

The Benefits are Great and it is FUN

Lots of readers and feedback: (1-2% comment or tweet or ...)

- ✓ AMM has 100,000 readers (**hand-overs**)
- ✓ **Conversation**: 17 articles, 46,062 readers, 265 comments
- ✓ My **online lectures** get 100-fold as many readers as in-person
- ✓ **2012 PiDay** in **HuffPost**: 18,218 f likes, 1625 f shares, 119 tweets, ...

THE COMPUTER AS CRUCIBLE
AN INTRODUCTION TO EXPERIMENTAL MATHEMATICS

JONATHAN BORWEIN • KEITH DEVLIN

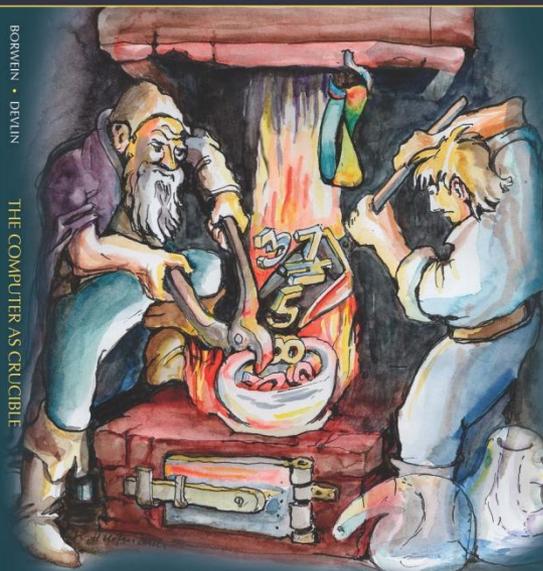


For a long time, pencil and paper were considered the only tools needed by a mathematician (some might add the waste basket). As in many other areas, computers play an increasingly important role in mathematics and have vastly expanded and legitimized the role of experimentation in mathematics. How can a mathematician use a computer as a tool? What about as more than just a tool, but as a collaborator?

Keith Devlin and Jonathan Borwein, two well-known mathematicians with expertise in different mathematical specialties but with a common interest in experimentation in mathematics, have joined forces to create this introduction to experimental mathematics. They cover a variety of topics and examples to give the reader a good sense of the current state of play in the rapidly growing new field of experimental mathematics. The writing is clear and the explanations are enhanced by relevant historical facts and stories of mathematicians and their encounters with the field over time.

BORWEIN • DEVLIN

THE COMPUTER AS CRUCIBLE



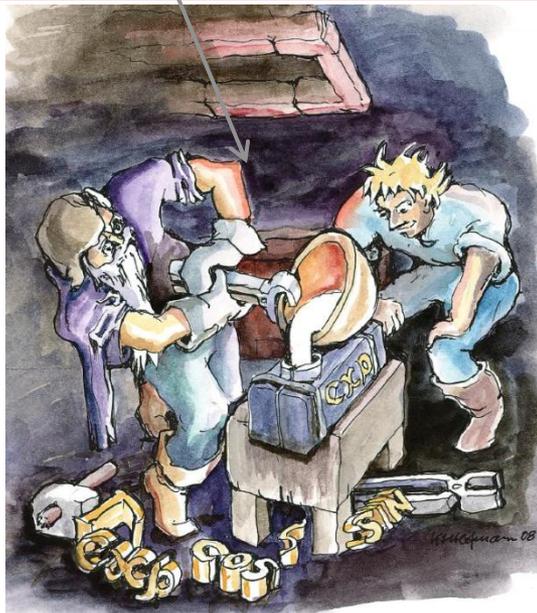
THE COMPUTER AS CRUCIBLE

AN INTRODUCTION TO EXPERIMENTAL MATHEMATICS

JONATHAN BORWEIN • KEITH DEVLIN



A K Peters, Ltd.



Jonathan Borwein

Keith Devlin

with illustrations by Karl H. Hofmann

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AK Peters 2008 Japan & Germany 2010

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数学を生み出す 魔法のるつぼ

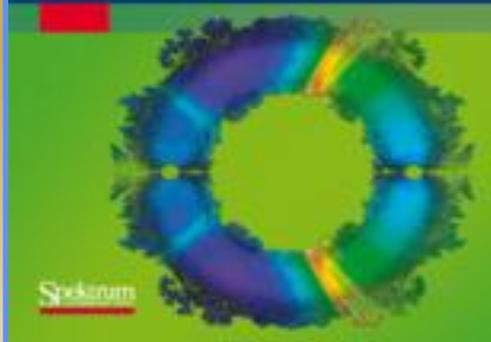
実験数学への招待



Jonathan Borwein
Keith Devlin
著
宏 訳

Experimentelle Mathematik

Eine beispieldorientierte Einführung



“Cookbook” Mathematics

- ✓ State-of-the-art machine translation
- ✓ math magic melting pot
- ✓ full head mathematicians
- ✓ No wonder Sergei Brin wants more



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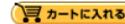
- Hacks
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- Desktop Reference
- The Missing Manual
- Make

Math magic melting pot produces - - Introduction to Experimental Mathematics



Jonathan Borwein, Keith Devlin Author, translated by Hiroshi place I know
 December 2009 issue
 Page 164
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 ISBN978-4-87311-436-1
 Original book: [The Computer As Crucible](#)

Purchase the book from O'Reilly:



[Content](#) | [Table of contents](#) | [First printing errata](#)

[Math to solve crimes in the mathematical genetic] [[reading bestselling author, represented by mathematics, and Keith Devlin, mathematician and researcher Jonathan Borwein spirited experimental experimental mathematics explain what kind Masu. Mathematics and Classical prove the theorem by rotating a full head mathematicians, unlike the mathematical experiment we calculated using a tool the computer predicted using other computer algebra systems based on massive amounts of data up, and will examine, literally means "experimental" He is what we find in mathematics. This book introduces the mathematics test of instrumental combinations.

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Even best selling authors do not control foreign editions or covers – Stephen J. Gould (1941-2002)

Final Diffuse Musings

Changing Cognitive Styles

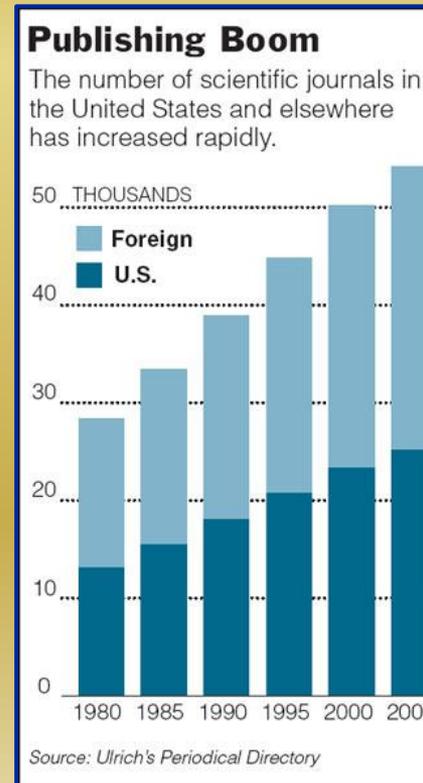
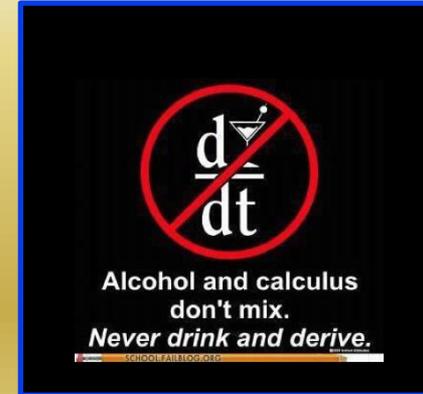
- ✓ Stroop effect
- ✓ “Strategic reading”
- ✓ Wolfram Alpha



16.23 petaflop Sequoia at LLL

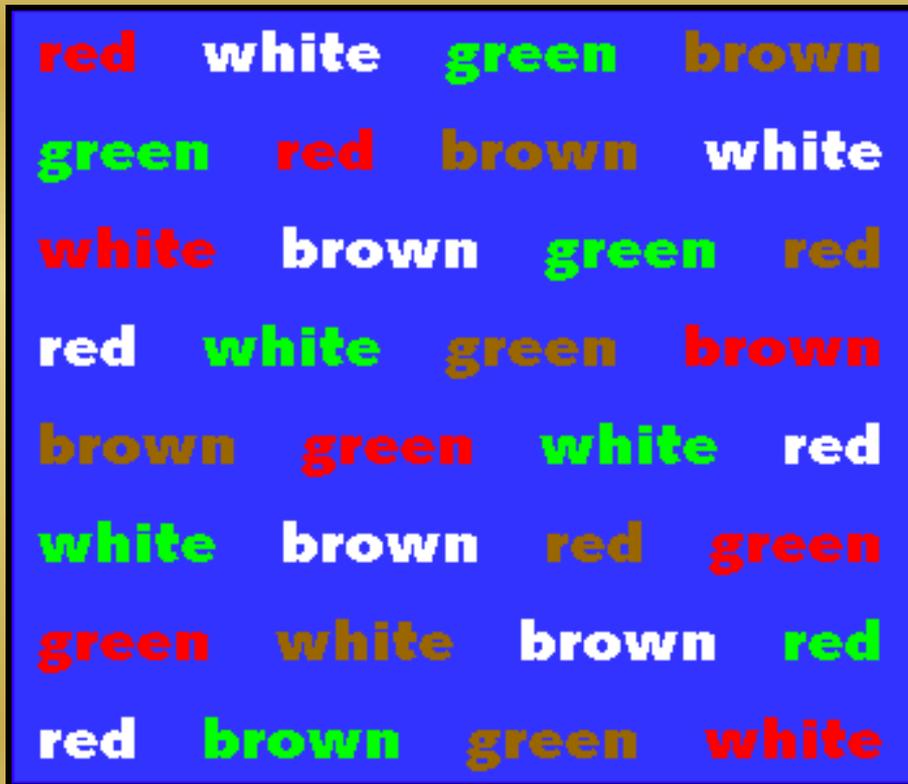
Moore's Law is Still in Effect

- ✓ The media will look very different in ten years
- ✓ Human beings will not



Changing User Experience and Expectations

What is attention? (**Stroop** test, 1935)



1. Say the **color** represented by the **word**
2. Say the **color** represented by the **font** color

(young) multi-taskers perform #2 easily and are (too) good at suppressing information?

Hypnotism works: *Sleight of mind*

http://www.snre.umich.edu/eplab/demos/st0/stroop_program/stroopgraphicnonshockwave.gif

Acknowledgements: Cliff Nass, CHIME lab, Stanford ([interference](#) and [twitter?](#))

Other Cognitive Shifts

Harwell 1951-1973

- ✓ They were right, pre iPad !



Science Online August 13, 2009

Strategic Reading, Ontologies, and the Future of Scientific Publishing

Allen H. Renear* and Carole L. Palmer

The revolution in scientific publishing that has been promised since the 1980s is about to take place. Scientists have always read strategically, working with many articles simultaneously to search, filter, scan, link, annotate, and analyze fragments of content. An observed recent increase in strategic reading in the online environment will soon be further intensified by two current trends: (i) the widespread use of digital indexing, retrieval, and navigation resources and (ii) the emergence within many scientific disciplines of interoperable ontologies. Accelerated and enhanced by reading tools that take advantage of ontologies, reading practices will become even more rapid and indirect, transforming the ways in which scientists engage the literature and shaping the evolution of scientific publishing.

- ✓ Potentially hostile to mathematical research & teaching patterns

Moore's law This picture is worth 100,000 ENIACs

Eckert & Mauchly (1946)



The number of **ENIACS** needed to store the 20Mb TIF file the Smithsonian sold me

THANK YOU

