Lonely Planet's top 10 cities

Travel experts Lonely Planet have named the top 10 cities for 2011 in their annual travel bible, Best in Travel 2011. The top-listed cities win points for their local cultures, value for money, and overall va-va-voom. So which cities make the cut? Find out here, from 10 to 1...

What do you think of the list?
Tell us here!

Related links: Lonely Planet destination videos
A weekend in Newcastle

Images: ThinkStock/Getaway
Proposed NeCTAR VLs

Six VL nodes in:

- Applied Statistics
- Dynamical Systems
- Geometry & Applications
- Modelling Tissue Growth
- Mathematical Optimization
- Symmetry

based on AMSI AGRooms and
Effective Teaching, Effective Learning in the Quantitative Disciplines

Teaching with Collaboration Tools at the Tertiary Level?
Actually: Teaching and Researching with Collaboration Tools and Technology.

I shall describe highlights of my two decades of experience with Advanced Collaborative Environments (ACEs) in Canada and Australia, running shared seminars, conferences, resources and courses over the internet.

Presence at a distance
- What works
- What doesn’t?
- Why?

Jonathan Borwein FRSC, FAA, FAAAS
CARMA, University of Newcastle
Computer Assisted Research Mathematics and its Applications

Revised 28/09/11

CARMA’s 3D Logo
Research, Teaching & Outreach

- Are each helped by the others - and by collaborative technology - but content comes first.
Teaching is Hard

Especially teaching easy things
You can’t take liberties

Technology can help
But only so much
Unis can’t afford much

"Just a darn minute! — Yesterday you said that X equals two!"
Technology Includes

Tom Lehrer’s
That’s Mathematics


All Artefacts:
- Cartoons
- Pictures
- Films
- Music
- Animations
- Simulations
- Spreadsheets
- Packages
- Applets
- **Haptics**
- Virtual Reality
- **Blogs** (Math Drudge)
- JSTOR, Amazon, iTunes...

Technology Includes

Random walks on the first million digits of Pi (top) and e (bottom)
That’s Mathematics

Tune - "That’s Entertainment"

This was most likely written for the July Fermat Fest held in San Francisco.

Counting sheep
When
Being
Who
Being
Who
That
When
Bouquet
Who
From
When
How
That

Dear Jonathan Borwein:

As sole copyright owner of the song THAT'S MATHEMATICS, I grant you permission to use it on the CD mentioned in your letter of July 7th, in the manner described therein.

I dare say I should charge a fee for this use, but since I assume the song is already out there on the web in mp3 form without my permission (as many of them are), I can’t justify penalizing you for being honest. In other words, there will be no charge.

I own all the rights, by the way, so you don’t have to clear it with Rhino. If there is to be any printed material accompanying the CD, the credit should read: © 1995 Tom Lehrer. Used by permission.

Good luck with your project.

Sincerely yours,

Tom Lehrer
SFU VR 2002: **Caveman Geometry**

Very cool for the one person with control and very expensive
Current and expected advances in mathematical computation and scientific visualization make it now possible to do (teach, learn) mathematics in many varied and flexible ways.

We'll continue to explore and flag the opportunities to integrate computational, graphic and other tools into our teaching - for philosophic, pedagogic and aesthetic reasons.

- [http://www.experimentalmath.info](http://www.experimentalmath.info)
- 2008
- 2009
- 2010
“Seminars” on Hormones

- **1991-93** Internet based experience (pre WWW)
  - [www.cecm.sfu.ca](http://www.cecm.sfu.ca)
- **1994-2001** PL in Canadian NCE TeleLearning
  - Multimodal Modal Mathematics (many early Applets)
- **1994-6**: Organic Mathematics Project (OMP)
- **AMS Notices article** (in Press)
- **2001-03** [www.irmacs.sfu.ca](http://www.irmacs.sfu.ca)
  - Nationally funded math-science collaboration centre
- **2002** SFU CoLab: my 1st [ACE](http://www.sfu.ca/ACE) (session at ICIAM03)
- **2006** Talk on ACE-Collaboration to [SSHRC](http://www.sshrc-vsc.gc.ca)
- **2003-2011** WestGrid ACE Research Project
The AG in Action in CoLab
A heavy warning used to be given [by lecturers] that pictures are not rigorous; this has never had its bluff called and has permanently frightened its victims into playing for safety. Some pictures, of course, are not rigorous, but I should say most are (and I use them whenever possible myself). J. E. Littlewood, 1885-1977

From Littlewood's Miscellany (p. 35 in 1953 edition). Said long before the current graphic, visualization and geometric tools were available.
Briefly, a visual theorem is the graphical or visual output from a computer program - usually one of a family of such outputs - which the eye organizes into a coherent, identifiable whole and which is able to inspire mathematical questions of a traditional nature or which contributes in some way to our understanding or enrichment of some mathematical or real world situation.

Pictures as Datasets

Striking fractal patterns formed by plotting complex zeros for all polynomials in powers of x with coefficients 1 and -1 to degree 18 (from Organic Maths)

Coloration is by sensitivity of polynomials to slight variation around the values of the zeros. The color scale represents a normalized sensitivity to the range of values; red is insensitive to violet which is strongly sensitive.

- All zeros are pictured (at 3600 dpi)
- Figure 1b is colored by their local density
- Figure 1d shows sensitivity relative to the $x^9$ term
- The white and orange striations are not understood

A wide variety of patterns and features become visible, leading researchers to totally unexpected mathematical results

Roots of Zeros

What you draw is what you see (visible patterns in number theory)
Stable Roots

Roots in the most stable colouring

J. G. Roederer

INFORMATION AND ITS ROLE IN NATURE

Springer
The TIFF on THREE SCALES:
100, 300, 3600 dpi

Pictures are more democratic but they come from formulae
L: PBB in Vancouver BC on H323

C: Me in Newcastle NSW on Skype (both at home)

R: Scott in Halifax NS on Access Grid

Now microseconds matter

Main Audience in IRMACS 100 seat passive 3D room
Dislocated Conferences

» 2001 Many distance Seminar & Conference Presentations: Skype, EVO, Access Grid, H323, ...
» 2009 IRMACS-Fields Number Theory: shared plenaries
» 2011 JonFest 2011 in Vancouver: AG and streamed ...

» 2005 Frequent dislocated Theses defences and Job Interviews (in many fields)

» 2005 The C2C (‘coast to coast’) seminar
» 2008 Book chapter (on what and what not to do)
» 2008 Presentation on C2C experience
» 2011 6 years of Remote Collaboration article

» 2011 TransPacific Workshop regularly with UBC/SFU
Standards, Standards

- Uniformization only works up to a point
- Organizational and technical agility are critical

How standards proliferate:
(See: A/C chargers, character encodings, instant messaging, etc.)

Situation: There are 14 competing standards.

14?! Ridiculous! We need to develop one universal standard that covers everyone's use cases. Yeah!

Soon:

Situation: There are 15 competing standards.
Technological Issues

- Picking the right technology for a given setting
  - Applications layers? Interactivity?
- Multi-site and band-width issues
  - Decide who is the client/server
  - Security issues: tests, interviews
- Sound
  - Echo cancellation/feed back
  - Questions/muting/microphones
- Images
  - Computer and/or cameras
- Avoid unnecessary bells and whistles

Technological adoption decisions are usually made by institutional ignoramuses who never have to, nor could, use the resources (from Blackboard to iPad)
Organizational Issues

» Quality Assurance
  » Practice sessions are key
  » Rules to be followed
    » It should be ‘easy as chalk’ but ...
  » Adequate human technical support

» Production events or one-off experiments?
  » Effort to reward ratio?
  » Advertise, Advertise.
    » Under promise and over deliver
  » Try to store, measure and get feedback

An HCl class ppt analysis of a CoLab Honours class, and more
The following is a list of useful math tools. The distinction between categories is somewhat arbitrary.

Utilities (General)
1. The On-Line Encyclopedia of Integer Sequences
2. ISC2.0: The Inverse Symbolic Calculator
3. 3D Function Grapher
4. Julia and Mandelbrot Set Explorer
5. The KnotPlot Site
6. The Cinderella Geometry Site

Utilities (Special)
7. BBP Digit Database
8. Integer Relations Interface: PSLQ and LLL
9. EZ Face: Evaluation of Euler Sums and Multiple Zeta Values
10. GraPHedron: Automated and Computer Assisted Conjectures in Graph Theory
11. ProofWeb a system for teaching logic and for using proof assistants through the web
12. Embree-Trefethen-Wright Pseudospectra and Eigenproblems
13. Symbolic and Numeric Convex Analysis Tools

Reference
14. NIST Digital Library of Mathematical Functions
15. Experimental Mathematics Website
16. Numbers, Constants, and Computation
17. Numbers: the Competition
18. The Prime Pages
19. MathResource Online Dictionary

Content
20. Math in the Media (from the AMS)
21. Wolfram Mathworld
22. Planet Math
23. Wikipedia: Mathematics
24. Euclid in Java
25. Finch's Mathematical Constants

Math Courses 2011
26. Multi-Zeta Values Honours Course 2010 (Borwein and Zudilin)
   Given over the AMSI Access Grid Network
Workshop

29 - 30 September, 2011
University of Wollongong, NSW

Presenters
- Leigh Wood, Macquarie University
- Caz Sandison, University of Wollongong
- Walter Bloom, Murdoch University
- Jonathan Borwein, University of Newcastle
- Christine Brown, University of Wollongong
- Paul Denny, University of Auckland
- David Easdown, The University of Sydney
- Mark Nelson, University of Wollongong
- Katherine Seaton, LaTrobe University
- Shane Wilson, ING Direct Australia

Thank You