A MATHEMATICAL WELCOME to CoLab

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Canada Research Chair & Director

Canada Research Chairs
Chaires de recherche du Canada
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★ Conceptualizing – mathematical modelling and real-time distributed visualization/decision making
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- **Conceptualizing** – mathematical modelling and real-time distributed visualization/decision making
- **Computing** – parallelization and gridification
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- Conceptualizing – mathematical modelling and real-time distributed visualization/decision making
- Computing – parallelization and gridification
- Communicating and Collaborating – ACEs (Advanced Collaborative Environments) and Caves

Tom Lehrer locally, with permission
PROMISES & PITFALLS

- I shall briefly identify both ... ups and downs
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  - starting with Canadian Grid Computing (www.westgrid.ca)
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Free cycles for All! And 'help'. So do join **c3.ca**
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  ⋆ ⋅ ⋅ and a link to CoLab photo plus some prototypical demos
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• What will a large linear (nonlinear) system be in three years?
THE BEOWULF SAGA

The digital future must recapture the past (digitally)
THE BEOWULF SAGA

The digital future must recapture the past (digitally)

- And it helps to understand the present!
SFU’s new **Top500** ‘hot’ **192cpu Beowulf** cluster was home built for under **$250K US**
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• Which vendors will still be around in three years?
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CHALLENGING PARADIGMS

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  - Shared, distributed emersive reality engines (*NewMIC*, *CoLab*), bandwidth and *VizServers* (*VAN*)
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- How to access these at reasonable (human and dollar) costs?
THREE DIMENSIONAL SPATIAL KNOTS

In the NewMIC ‘Cave’
AN ESSENTIALLY STRICTLY CONVEX FUNCTION WITH NONCONVEX SUBGRADIENT DOMAIN AND WHICH IS NOT STRICTLY CONVEX

\[ \text{max}((x-2)^2 + y^2 - 1, -(x^4 y)^{1/4}) \]
AND PALPABLE STRUCTURES

AN ESSENTIALLY STRICTLY CONVEX FUNCTION WITH
NONCONVEX SUBGRADIENT DOMAIN
AND WHICH IS NOT STRICTLY CONVEX

\[ f(x, y) := ((x - 2)^2 + y^2 - 1) \lor -\frac{4}{\sqrt{xy}} \]
AND PALPABLE STRUCTURES

$\begin{align*}
\text{f}(x, y) & := ( (x - 2)^2 + y^2 - 1 ) \lor -\sqrt[4]{xy} 
\end{align*}$

- When appropriately educated, seeing is believing
QUALITY OF RECONSTRUCTIONS
QUALITY OF RECONSTRUCTIONS

Ideal Sinogram Information
QUALITY OF RECONSTRUCTIONS

Ideal Sinogram Information and Realistic Noise
QUALITY OF RECONSTRUCTIONS

Ideal Sinogram Information and Realistic Noise when Combined
QUALITY OF RECONSTRUCTIONS

- Space and Speed allow for Quality to come to the fore

Ideal Sinogram Information and Realistic Noise when Combined
CINDERELLA’S DYNAMIC PROOFS

♠ Mathematics is changing
CINDERELLA’S DYNAMIC PROOFS

♠ Mathematics is changing – becoming more democratic and accessible
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A proof that $\sqrt{2}$ is irrational
CINDERELLA’S DYNAMIC PROOFS

♠ Mathematics is changing – becoming more democratic and accessible

A proof that $\sqrt{2}$ is irrational

- Inter-disciplinarity is much more possible (e.g., pseudo spectra)
♠ My personal corporate interests clash with my open-source principles
A DISCLAIMER

♦ My personal corporate interests clash with my open-source principles — www.mathresources.ca
A DISCLAIMER

♠ My personal corporate interests clash with my **open-source principles** — [www.mathresources.ca](http://www.mathresources.ca)

Maple **embedded** in a 9000 word dictionary. Our logo is the Gauss’ family seal
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THOMAS JEFFERSON

“If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of everyone, and the receiver cannot dispossess himself of it.
“If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of everyone, and the receiver cannot dispossess himself of it.

Its peculiar character, too, is that no one possesses the less, because every other possesses the whole of it. He who receives an idea from me, receives instruction himself without lessening mine; as he who lites his taper at mine, receives light without darkening me.²

² See my Quotations page
CHAOS IN ROOTS
THAT’S IT, EXCEPT IF …
THAT’S IT, EXCEPT IF …

- Quantum computing goes macro!\(^3\)

\(^3\) The 2001 factorization of 15 using \(10^{20}\) molecules at IBM
REPTILIAN PARALLELISM

Two heads are not always better than one!
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- Thank you to all who have helped build CoLab.