University of British Columbia
Department of Computer Science

Tamara Munzner

**Interactive Visualization of
Evolutionary Trees and Gene Sequences**

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UBC CS Discovery Forum

Computer Graphics

- create or manipulate images with computer
  - movies, games, photorealistic simulation

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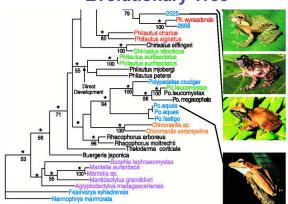 - but wait, there's more!

Visualization

- using interactive computer graphics to help people understand information better

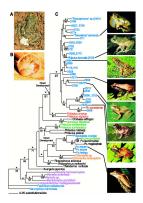 - biological data:
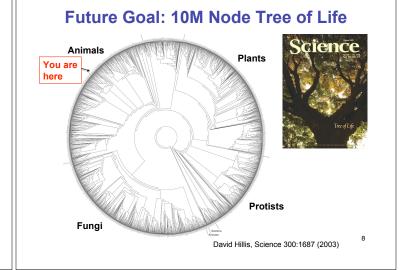   evolutionary trees and gene sequences

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Evolutionary Tree

M Meegaskumbura et al., Science 298:379 (2002)

Common Dataset Size Today

M Meegaskumbura et al., Science 298:379 (2002)

Future Goal: 10M Node Tree of Life

Animals

Plants

Protists

Fungi

Bacteria
Archaea

David Hillis, Science 300:1687 (2003)

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Future Goal: 10M Node Tree of Life

You are here

Animals

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Paper Comparison: Multiple Trees
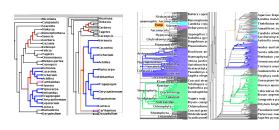
focus

context

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TreeJuxtaposer

- side by side comparison of evolutionary trees
  - both focus and context with stretchable surface
- demo - downloadable from http://olduvai.sf.net/tj

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Reconstructing Trees from Genes

- know leaves, infer interior nodes
  - similarity: parallel evolution or common ancestor?

Equidae — horses, zebras, asses

Tapiridae — tapirs

Rhinocerotidae — rhinos

[research.amnh.org/programs/genomelab]

Horse   Rhinocerus   Tapir

[gwis2.circ.gwu.edu/~atkins]

- old: morphology
  - observable similarities

- new: molecular
  - DNA sequences - nucleotides
  - protein sequences - amino acids

horse: ...CCTGAACCG...

tapir: ...ACTCTACCG...

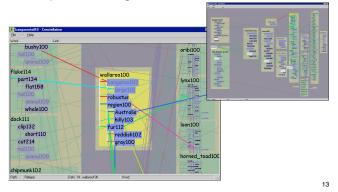rhino: ...GCTCTACCG...

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SequenceJuxtaposer

- comparison of aligned gene sequences
  - focus and context with stretchable surface
- demo - downloadable from http://olduvai.sf.net/sj

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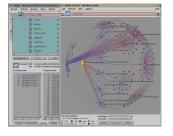## CS: Collaboration with Many Fields

- computational linguistics

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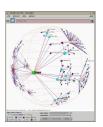## CS: Collaboration with Many Fields

- mathematics: topology and geometry

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CS: Collaboration with Many Fields

- software for web site designers
  - now also useful for biologists!
  - downloadable from graphics.stanford.edu/~munzner/h3

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More Information

- http://www.cs.ubc.ca/~tmm

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