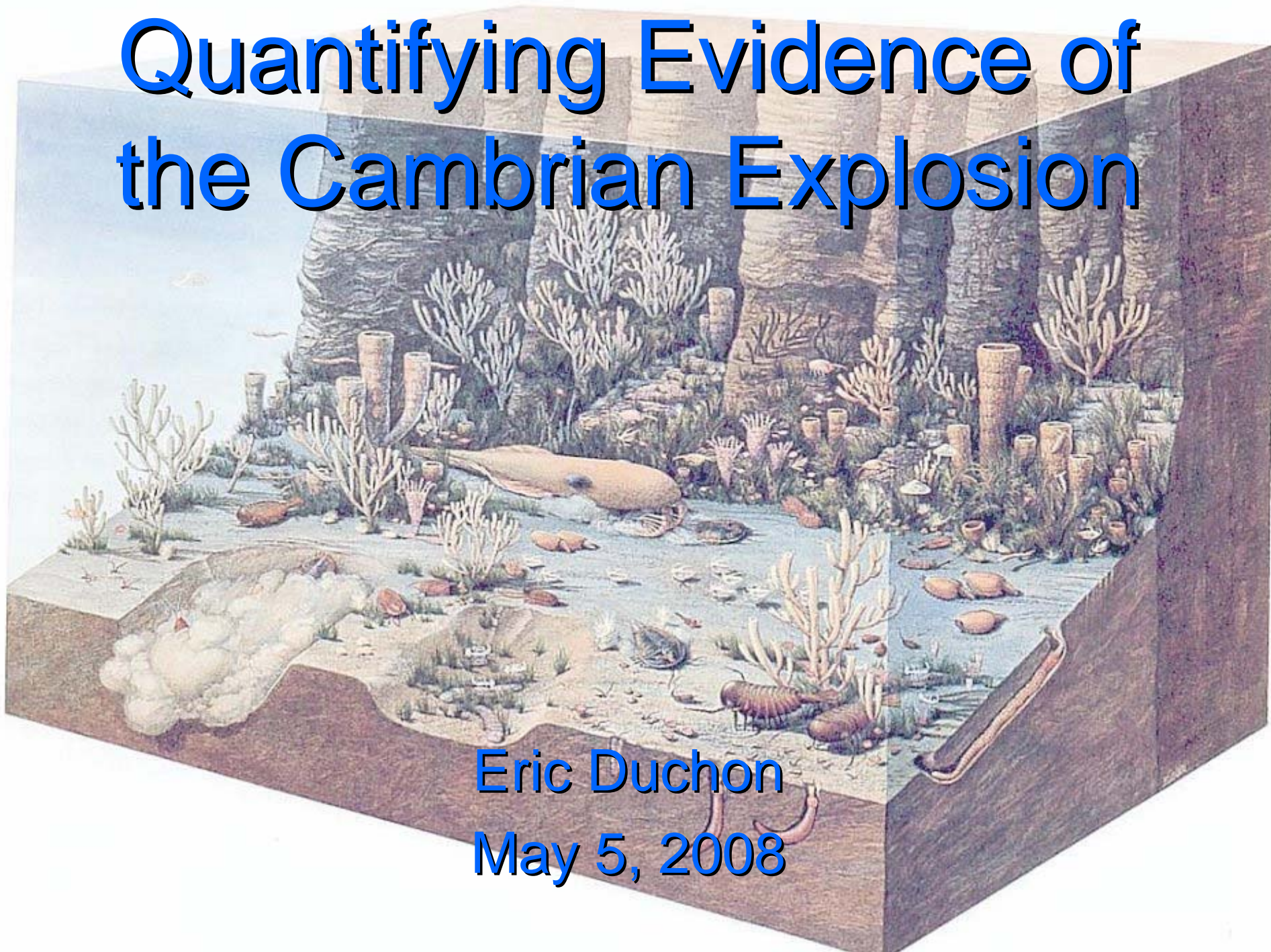


# Quantifying Evidence of the Cambrian Explosion

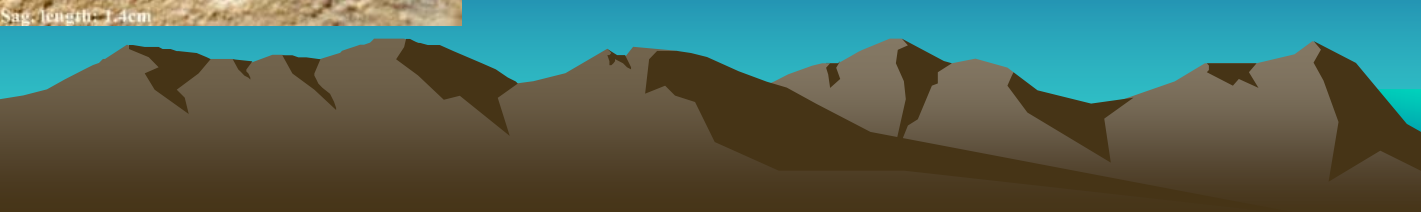
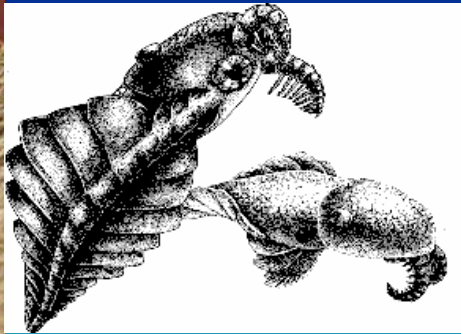


Eric Duchon

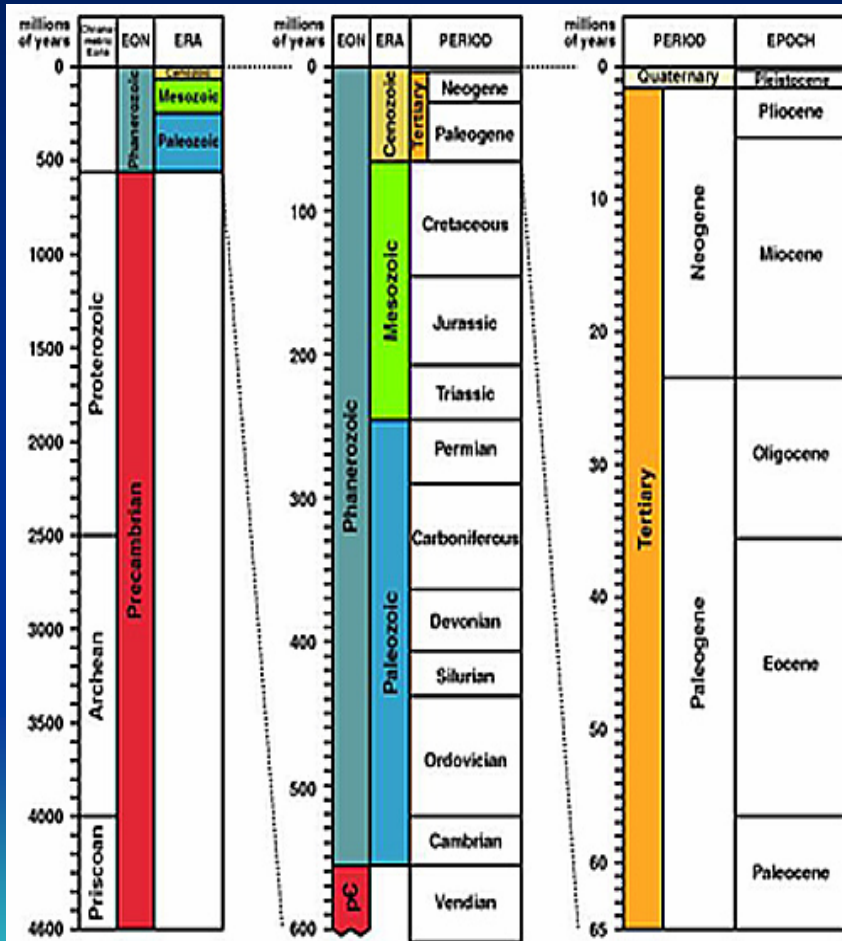
May 5, 2008

# Crazy Creatures

- Proliferation of metazoans
  - Many animal taxa first seen in Cambrian fossils
- Live in a shallow sea
  - Globally distributed population?



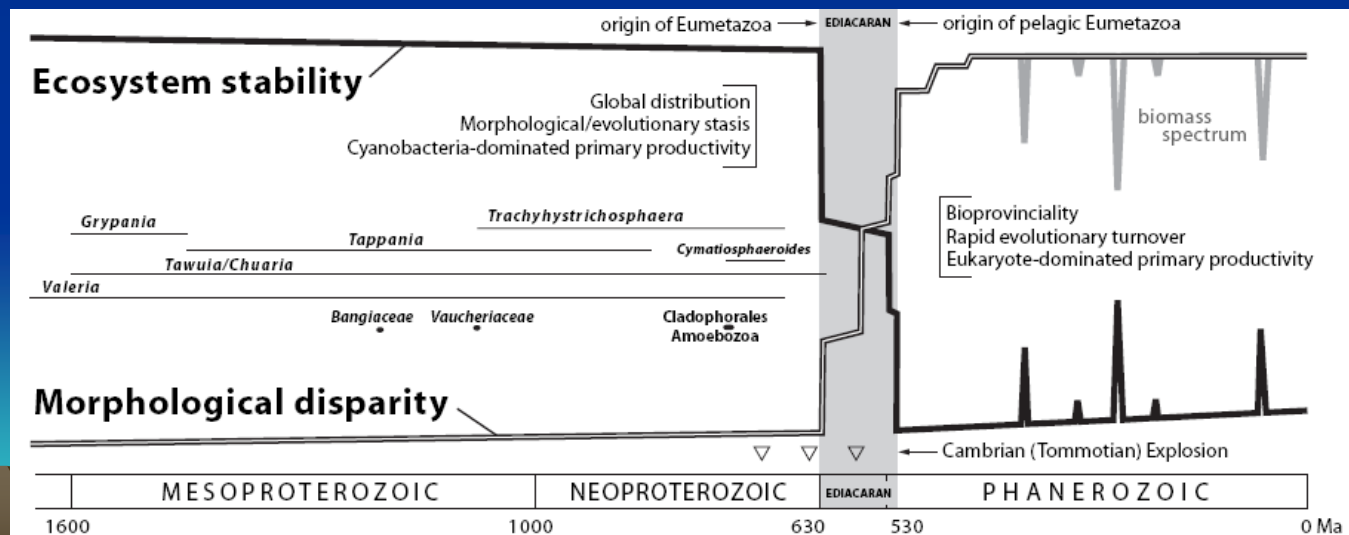
# Enormous Timescales



- Long period of high stability, low evolutionary rates
- How is this multitude of forms generated?
  - Environmental perturbations of glaciers, phosphorus, molybdenum & oxygen?
- Similar to radiation of mammals in the Tertiary?

# A Macro-Evo/Eco Perspective

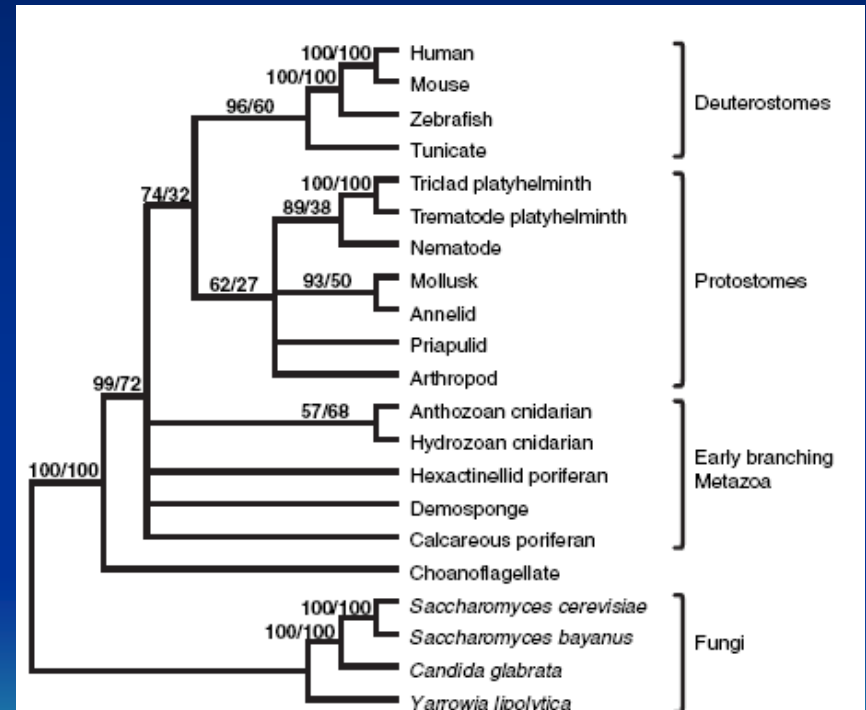
- Little speciation or evolution in Precambrian
  - Stasis from simple 2 trophic level ecosystem?
    - Stable with respect to perturbations via simple system and global distribution?
- Ediacaran – Eumetazoa and a dynamic food web
  - Drives evolution at a faster rate through more dynamic interactions
- Cambrian – Geographic niches and species specialization encourage fast evolution via ecosystem interactions



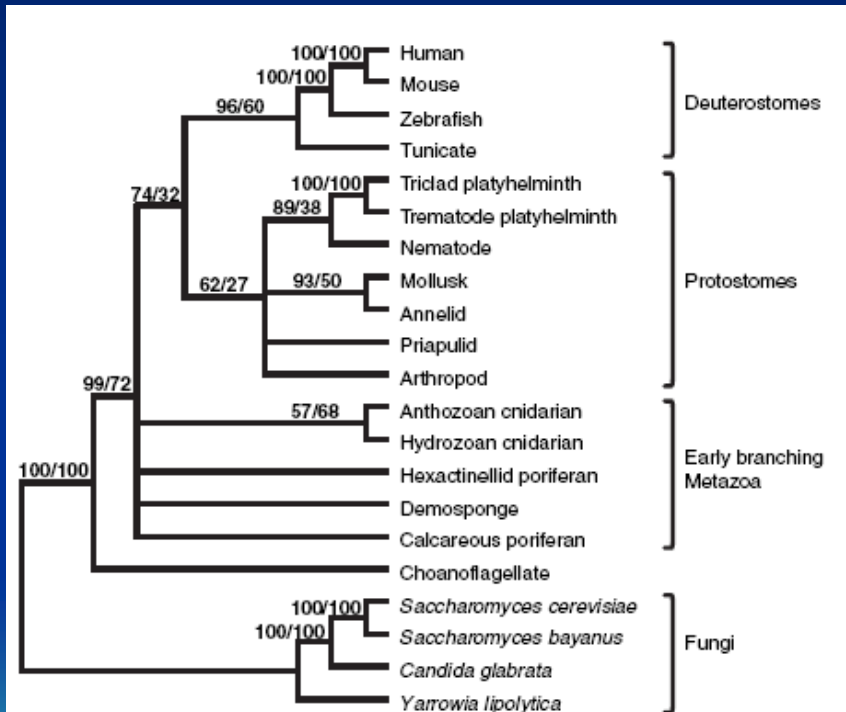


# Molecular Clocks

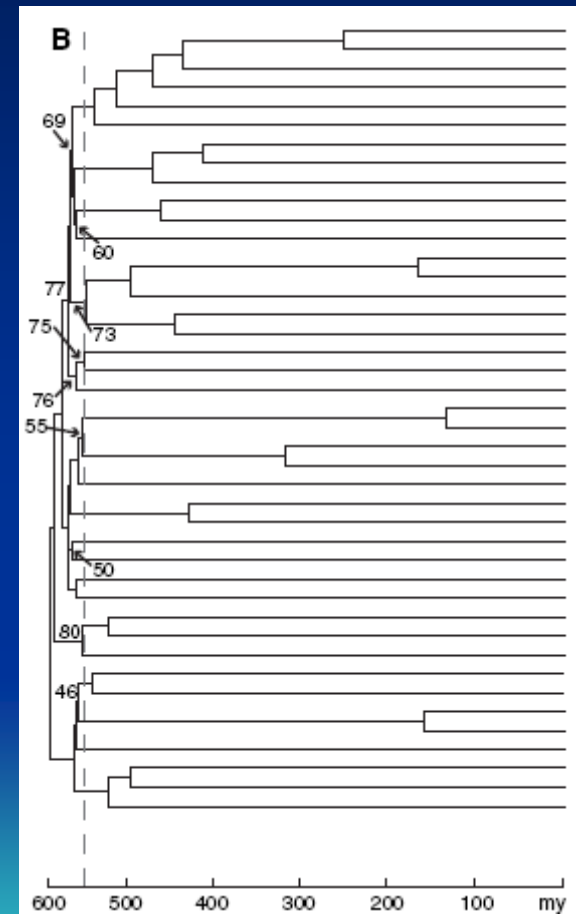
- Comparative studies with few genetic markers date animal clading from 1 to 10 bya
- New study uses fifty genetic groups
  - Many clade relationships still unresolvable
- A resolution limit for this technique exists?
  - Works great for uniformly evolved fungi
  - Equally poorly for time-modeled mammals



# Cambrian Explosion like Mammalian Speciation?



Cambrian Phylogeny with 4 out of 14 nodes well-resolved



Time-evolved model of Mammalian clades

# Conclusions

- Is there a fundamental shift in evolutionary rates and mechanisms from the Precambrian to Cambrian Eras?
- Long branches after a clade limit the resolution of molecular clock techniques





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