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Faculty Summit 2010

Visualizing all of History with ChronoZoom

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“All the world’s a stage.”

Historians usually see The Earth as a stage on which human History is enacted.

"All the world's a stage."

Historians usually see
The Earth as a stage
on which human
History is enacted.

But Earth has
its own history!

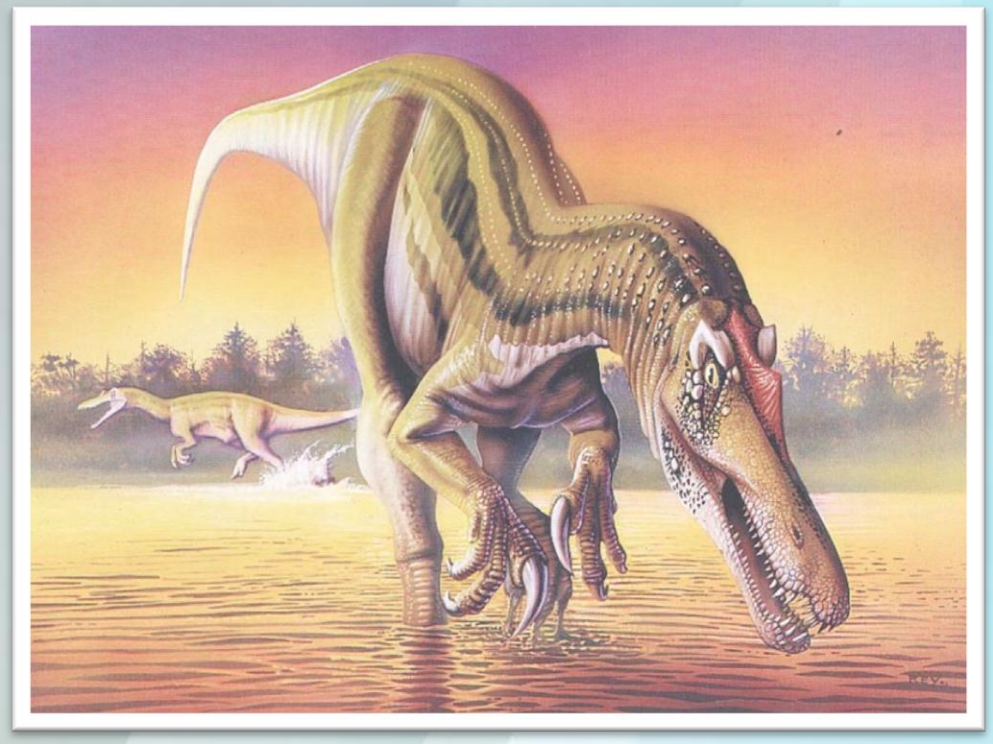
The Time-Scale Problem

Earth history goes back almost exactly
10^6 times as far as Human History

Human History: 5,000 years
Earth history: 5,000 million years

Earth History
Case Study

Dinosaur Extinction

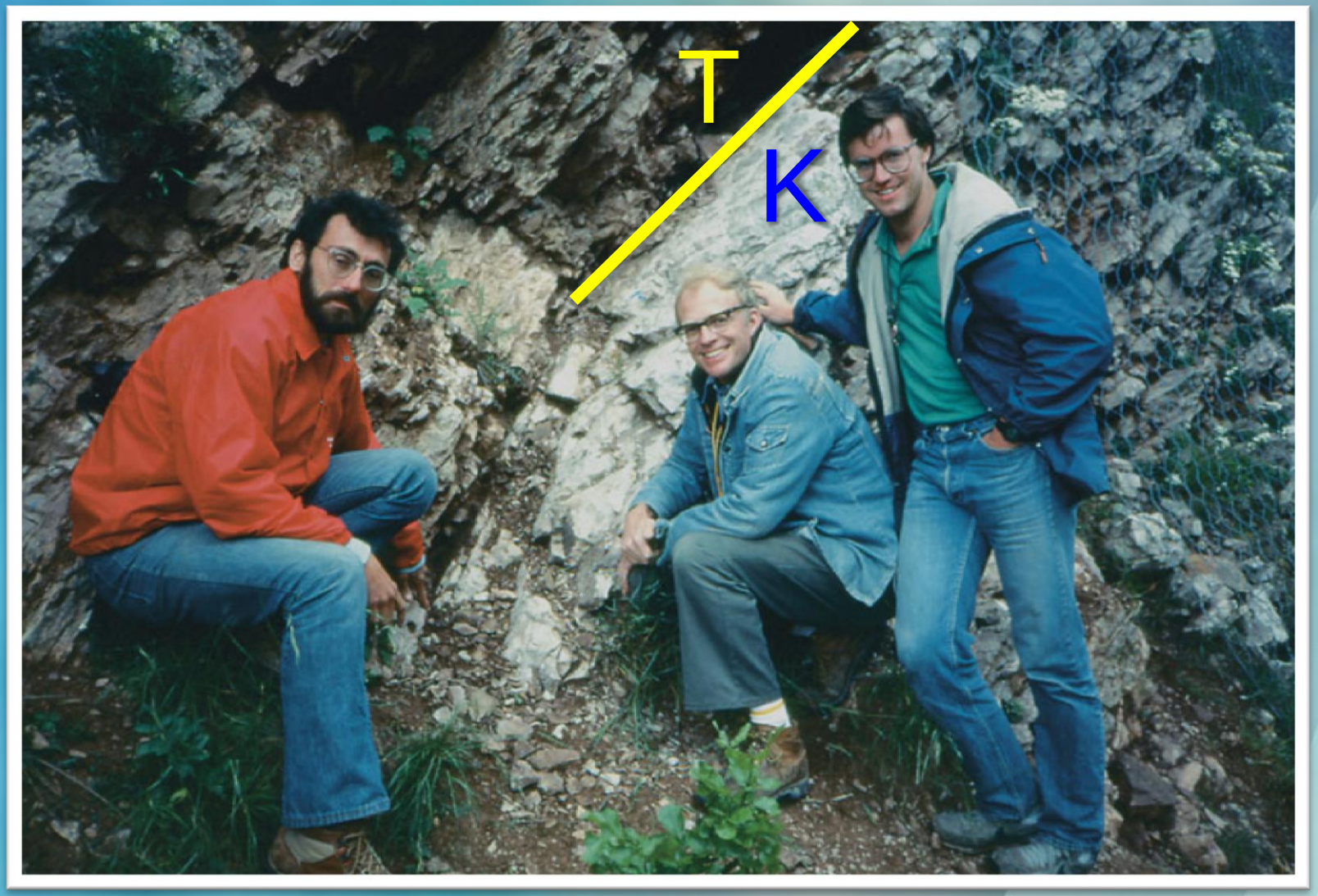


Gubbio, a medieval town in Umbria

Gubbio, a medieval town in Umbria

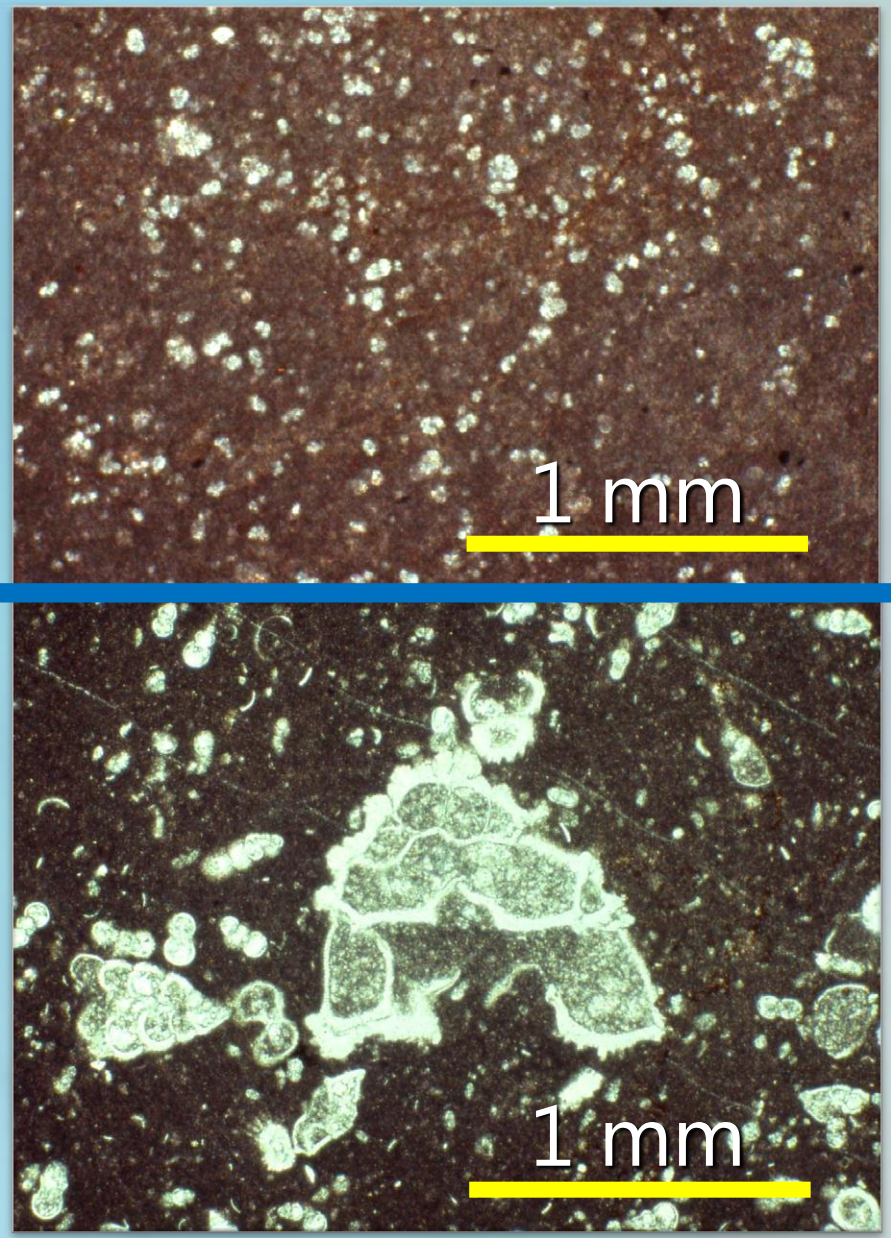
The Bottaccione Gorge near Gubbio

The Cretaceous-Tertiary (KT) boundary in the Bottaccione Gorge



The Cretaceous-Tertiary (KT) boundary
(Same age as the dinosaur extinction)

Near extinction of single-celled forams



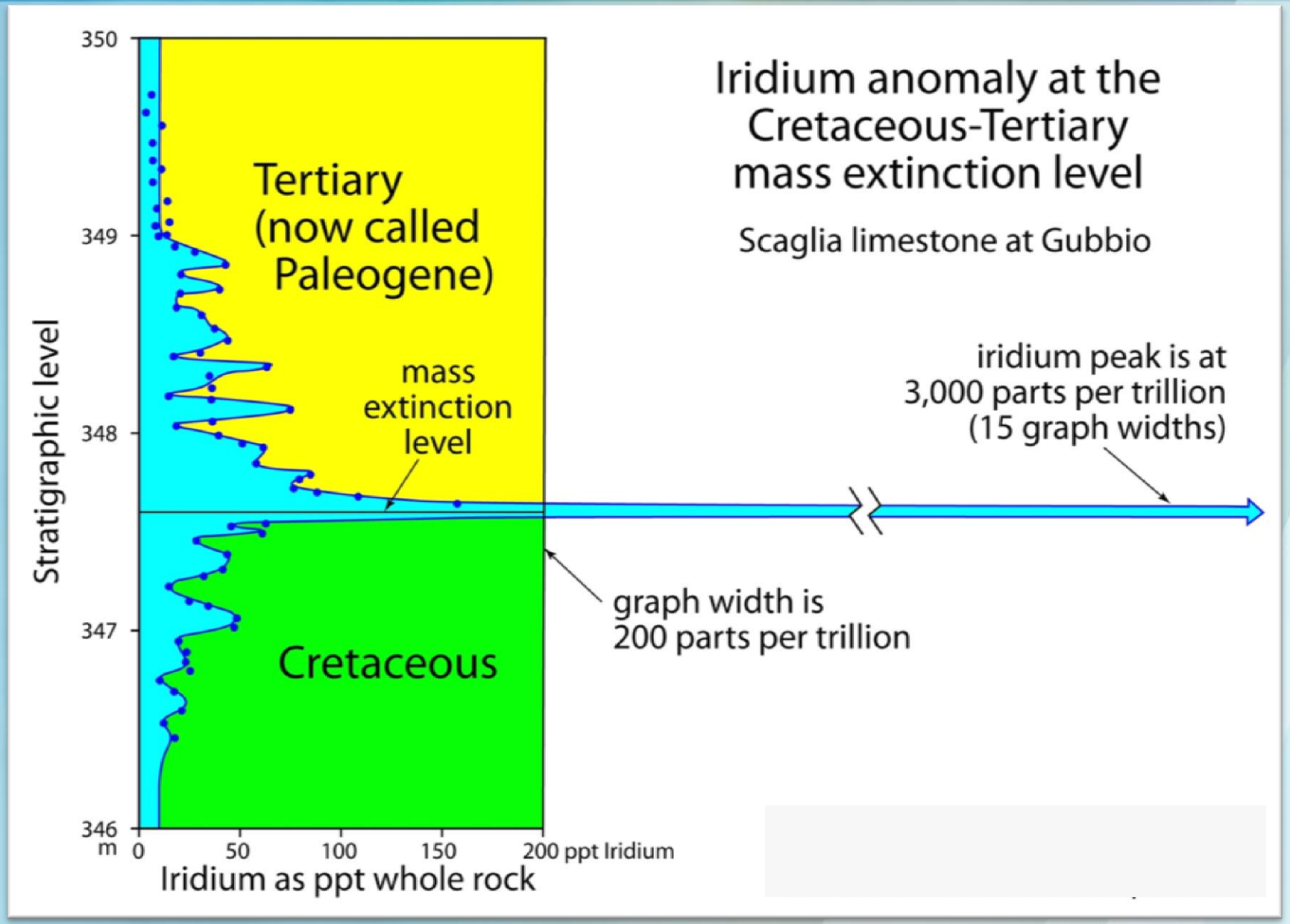
Only 3 species of small forams survive

base Tertiary (T)

top Cretaceous (K)

Many species of forams, including large ones

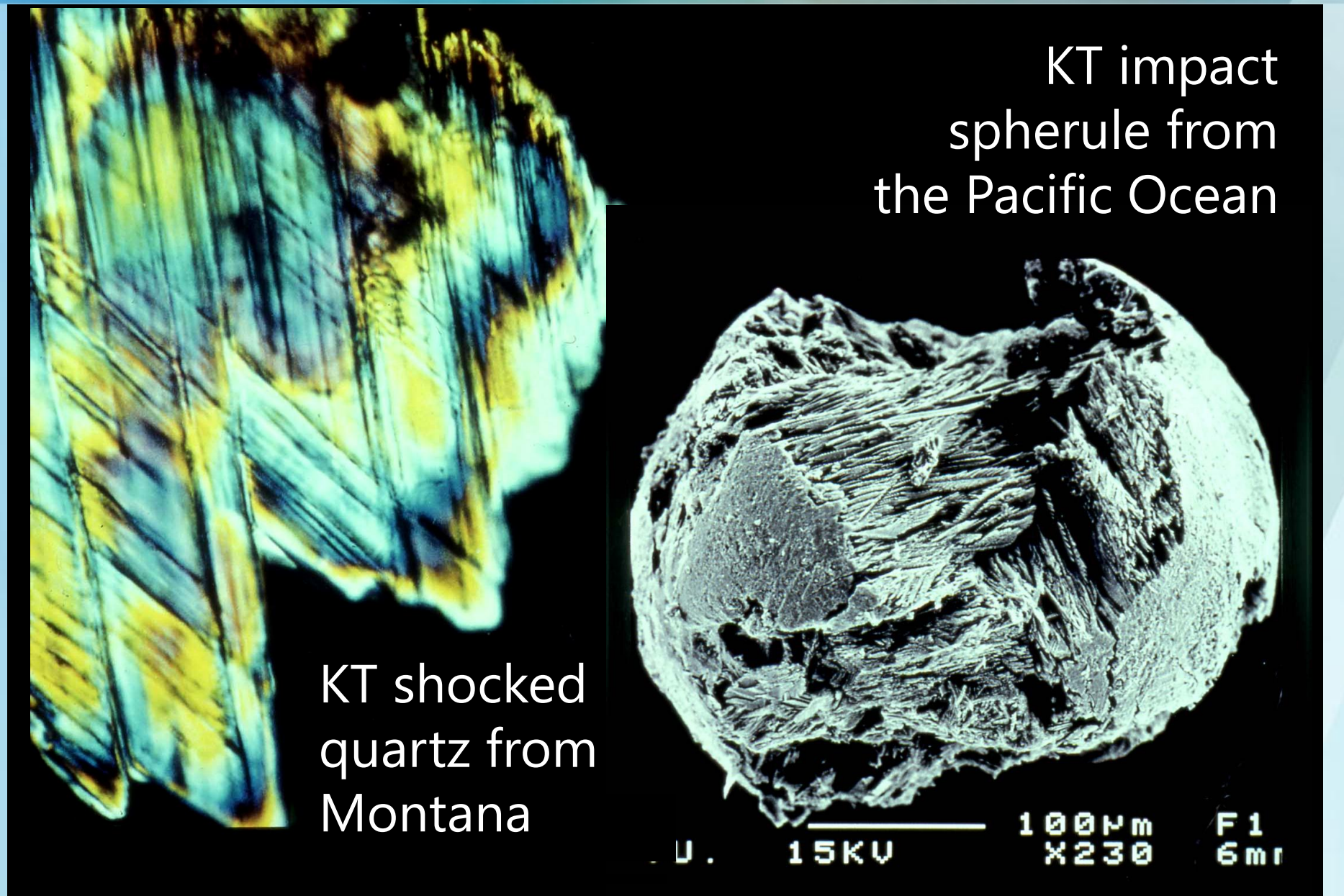
Iridium: evidence for an impact-extinction link



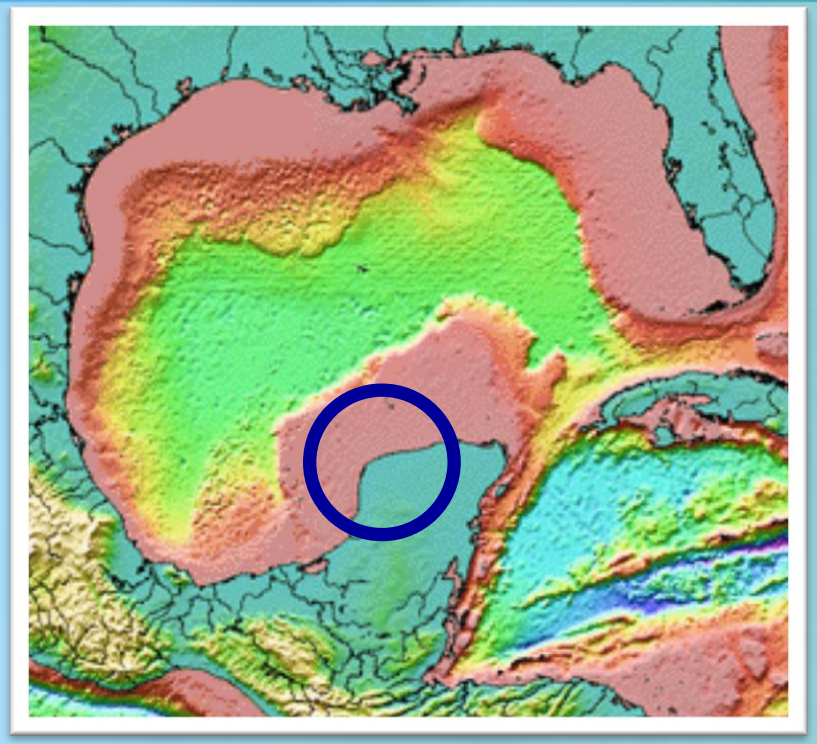
The Berkeley Theory — Impact at the KT boundary

Donald E. Davis

Evidence for the KT impact

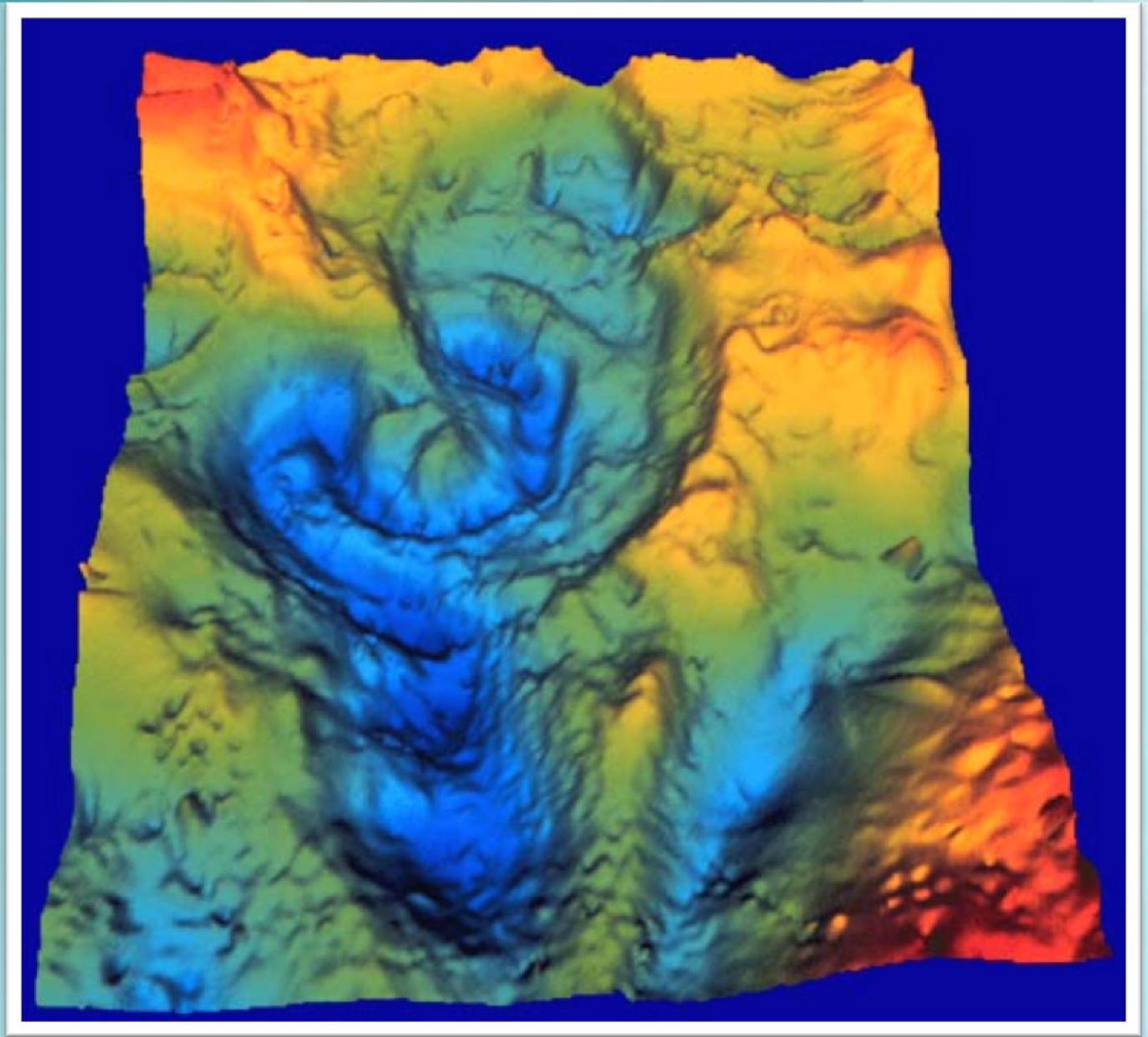


The buried crater at Chicxulub (Yucatán Peninsula)

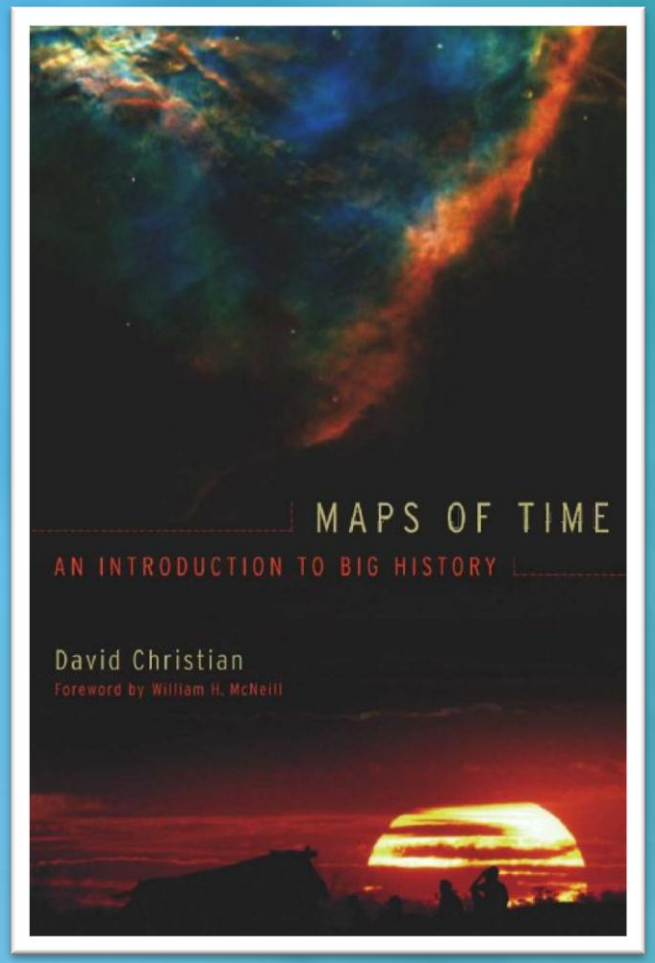


Diameter 170 km
(largest on Earth in
last 1.8 billion years)

Imaged by gravity



The Concept of Big History



David Christian
Macquarie University
Sydney

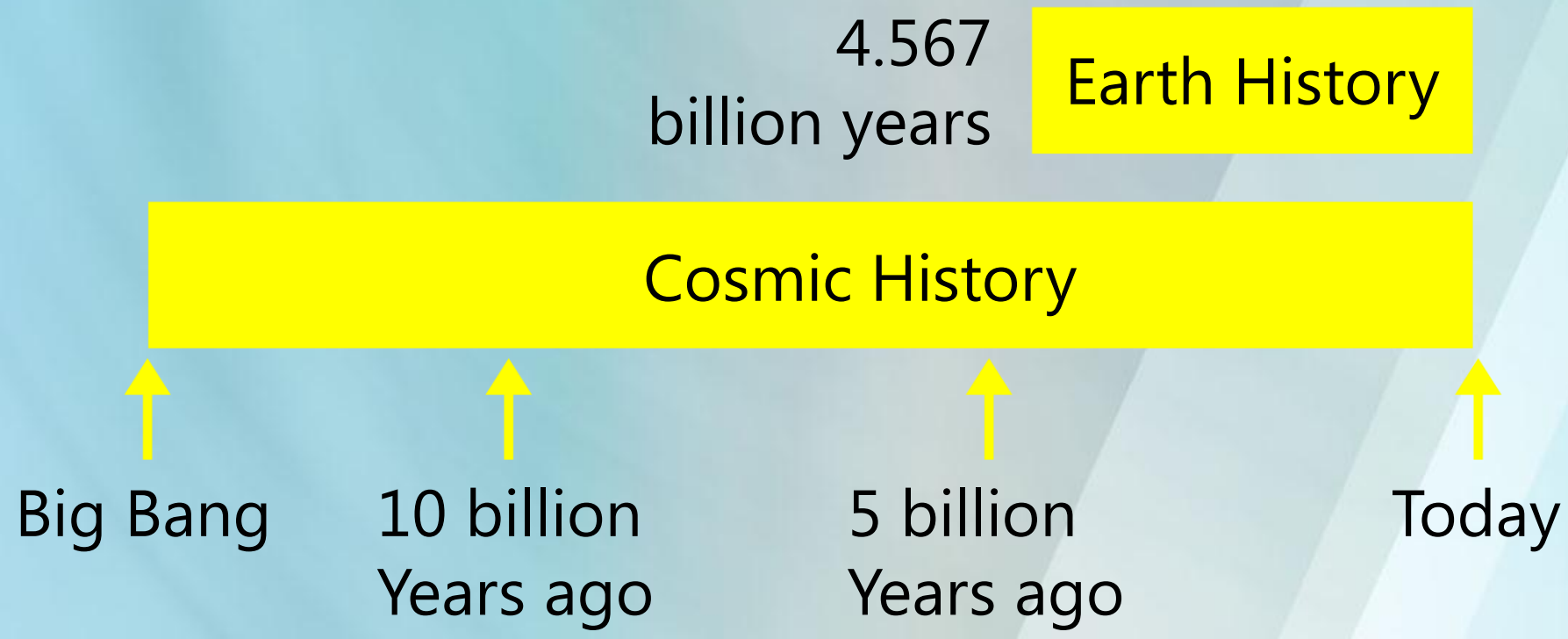
Maps of Time, 2004,
University of California Press

Berkeley Big History course

Earth and Planetary Science 51
Big History: Cosmos, Earth, Life, Humanity

The Time-Scale Problem in Big History

The Time-Scale Problem in Big History



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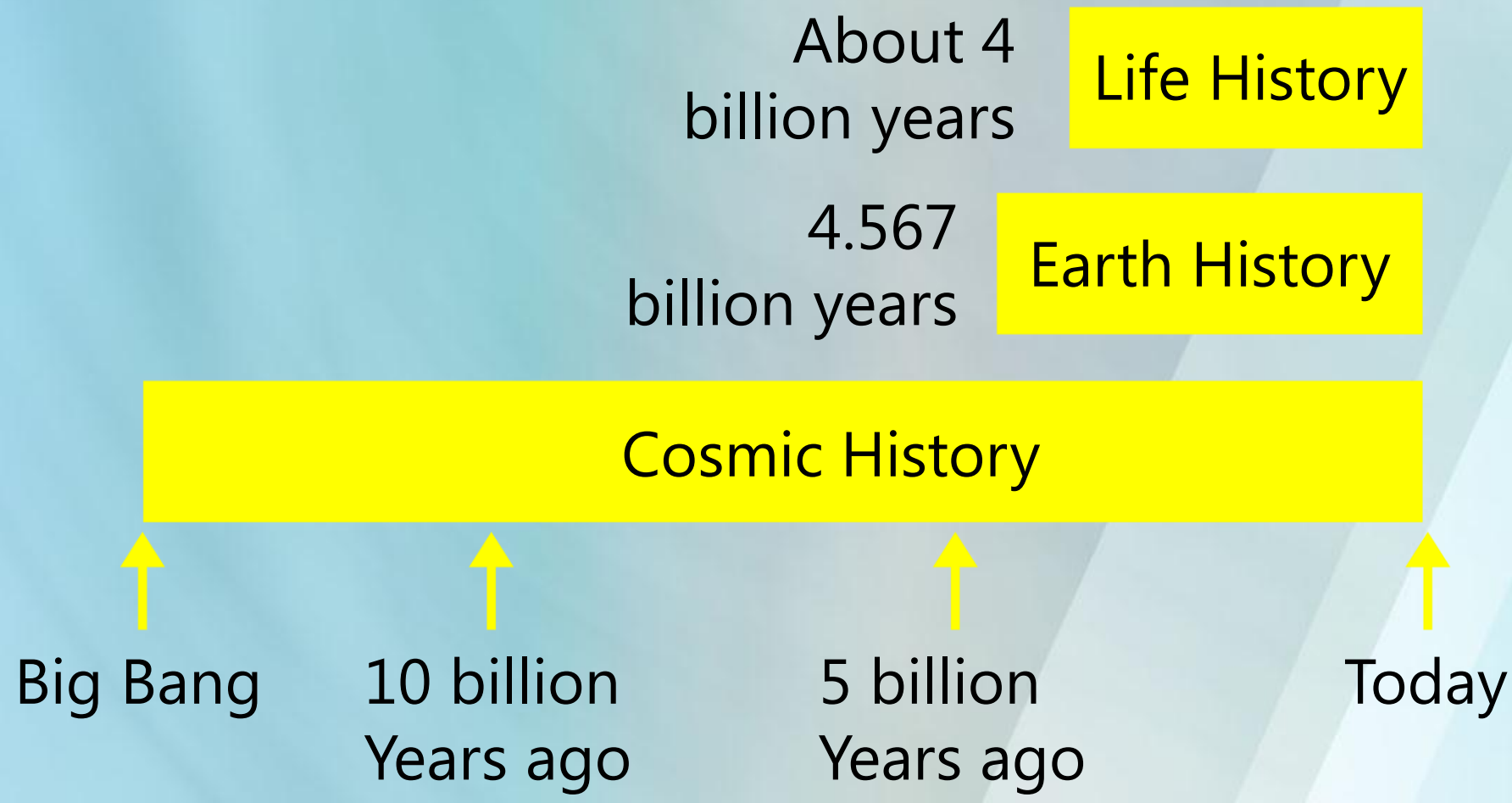

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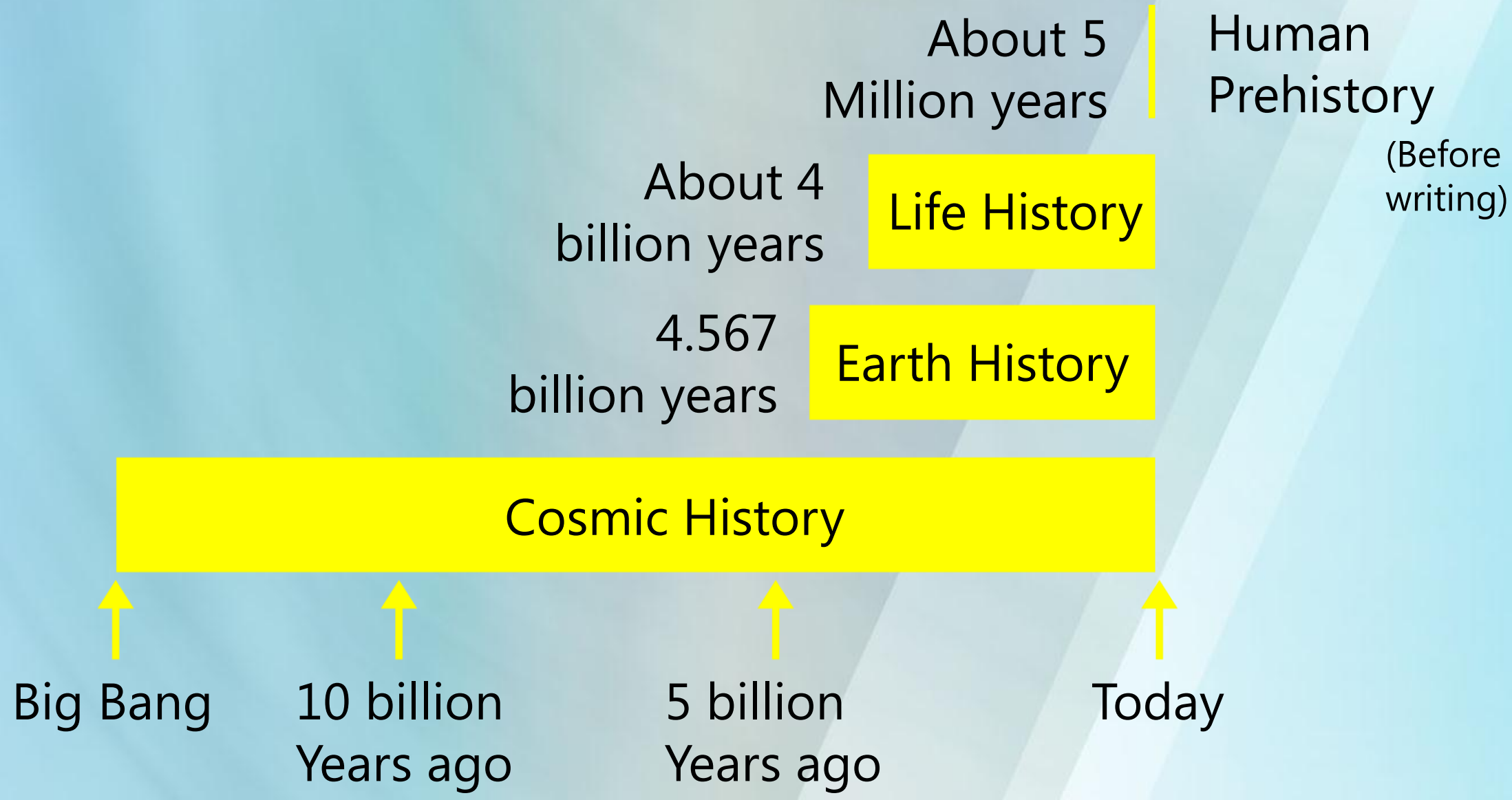
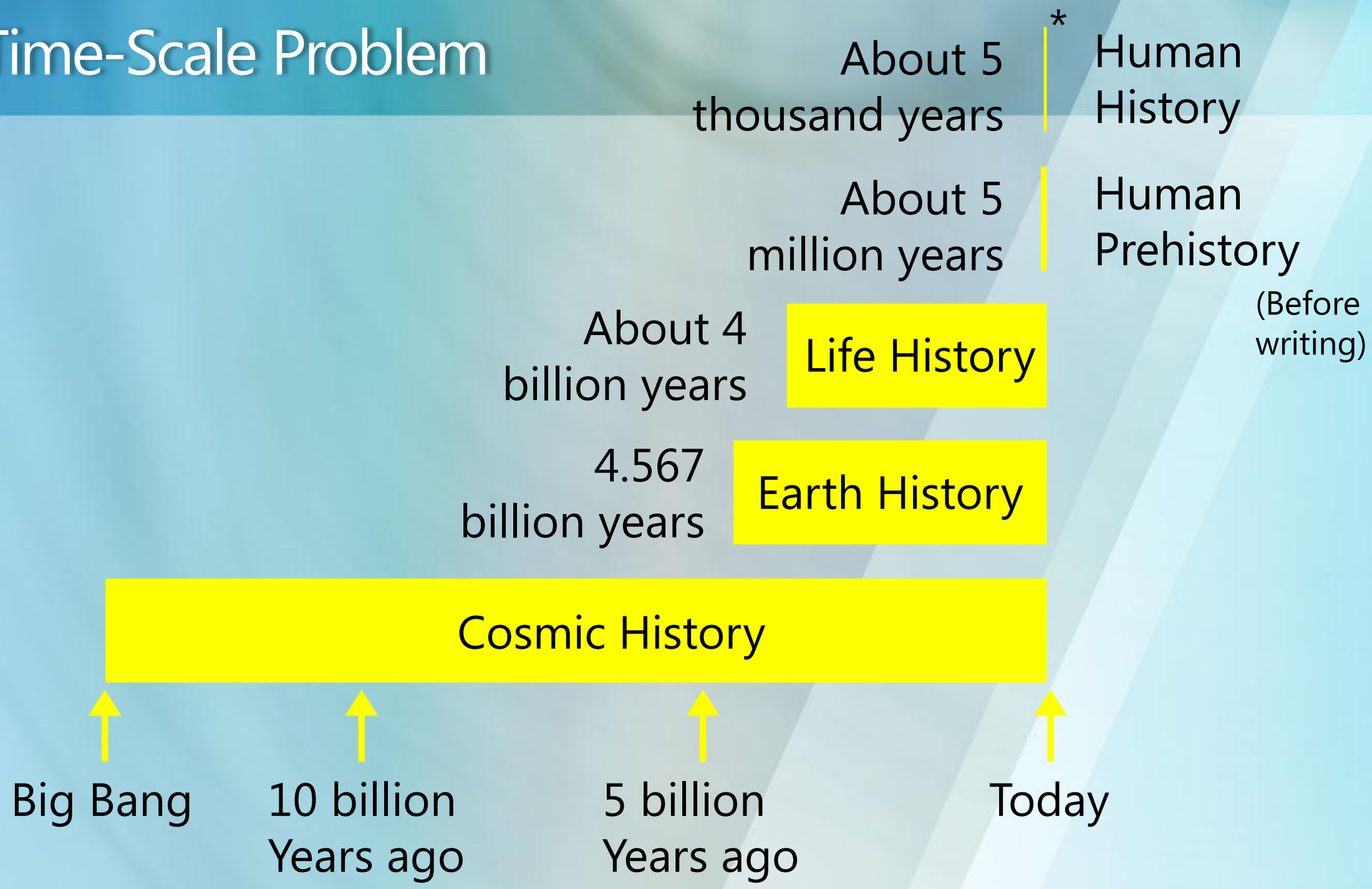
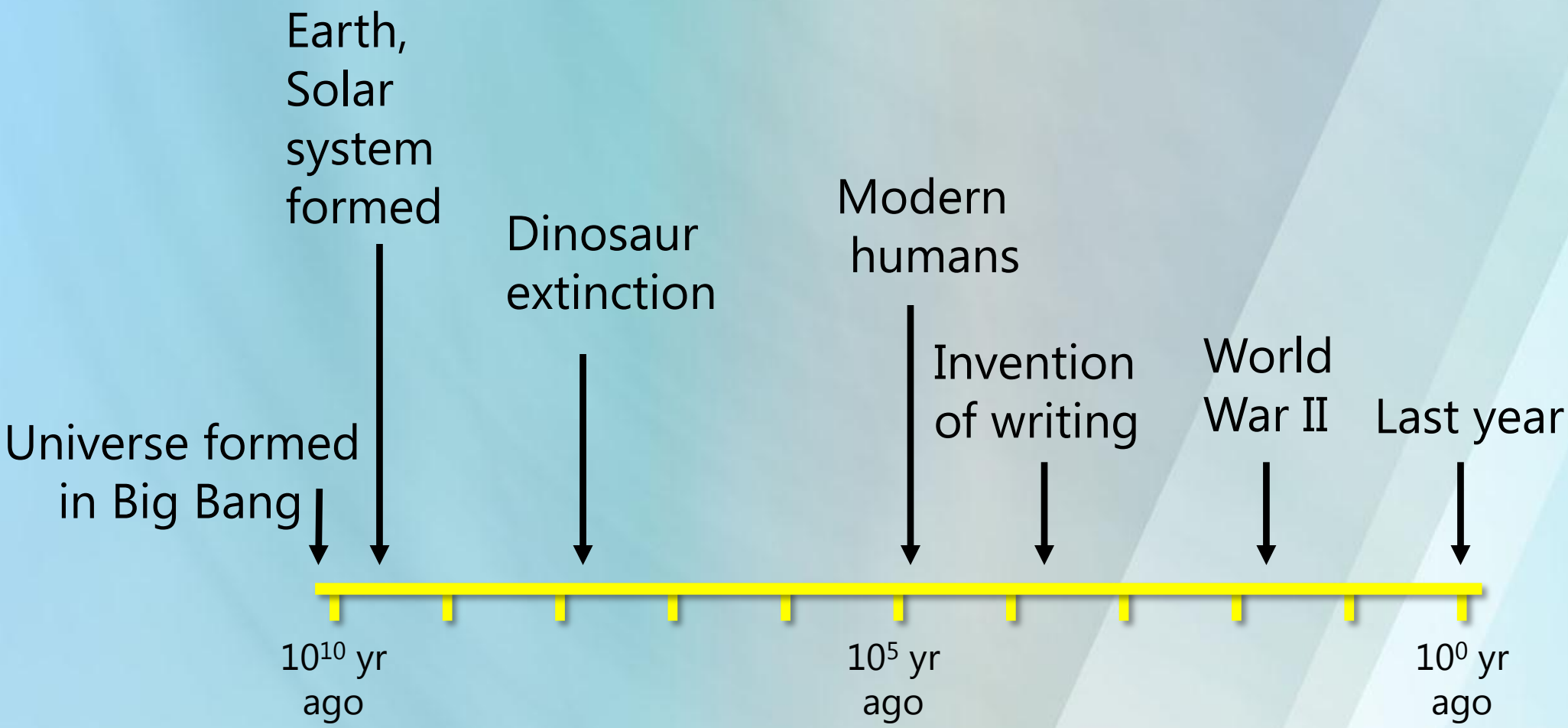


The Time-Scale Problem



Log Scale time interval distortion



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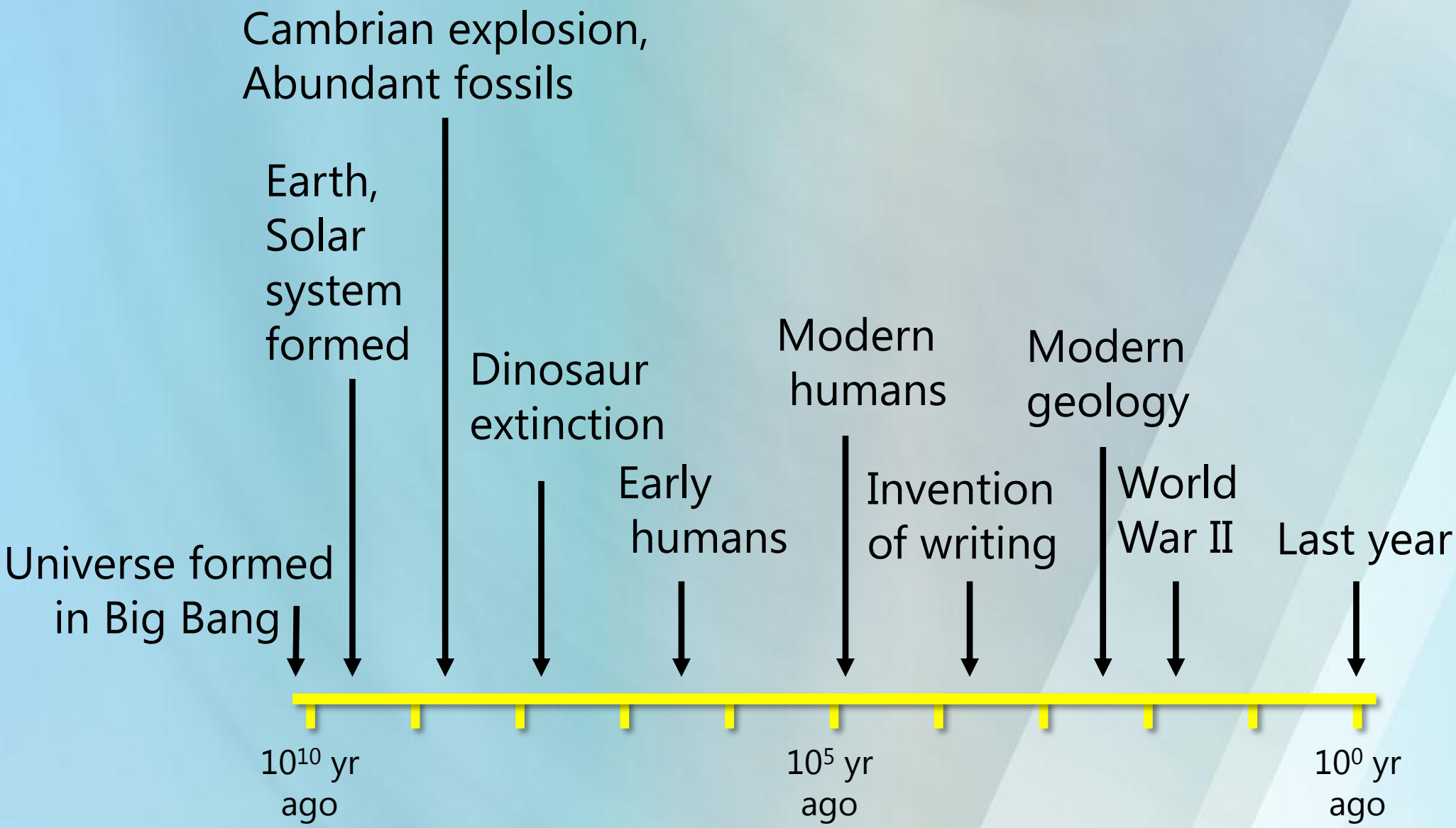
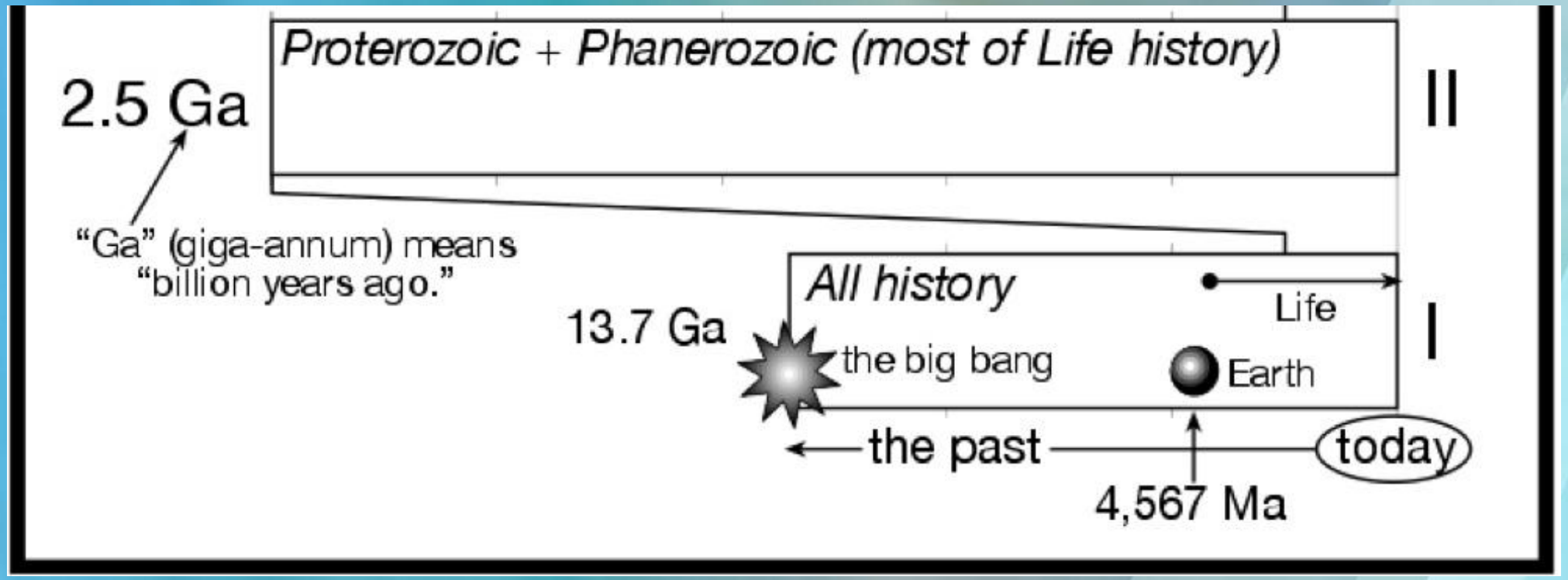
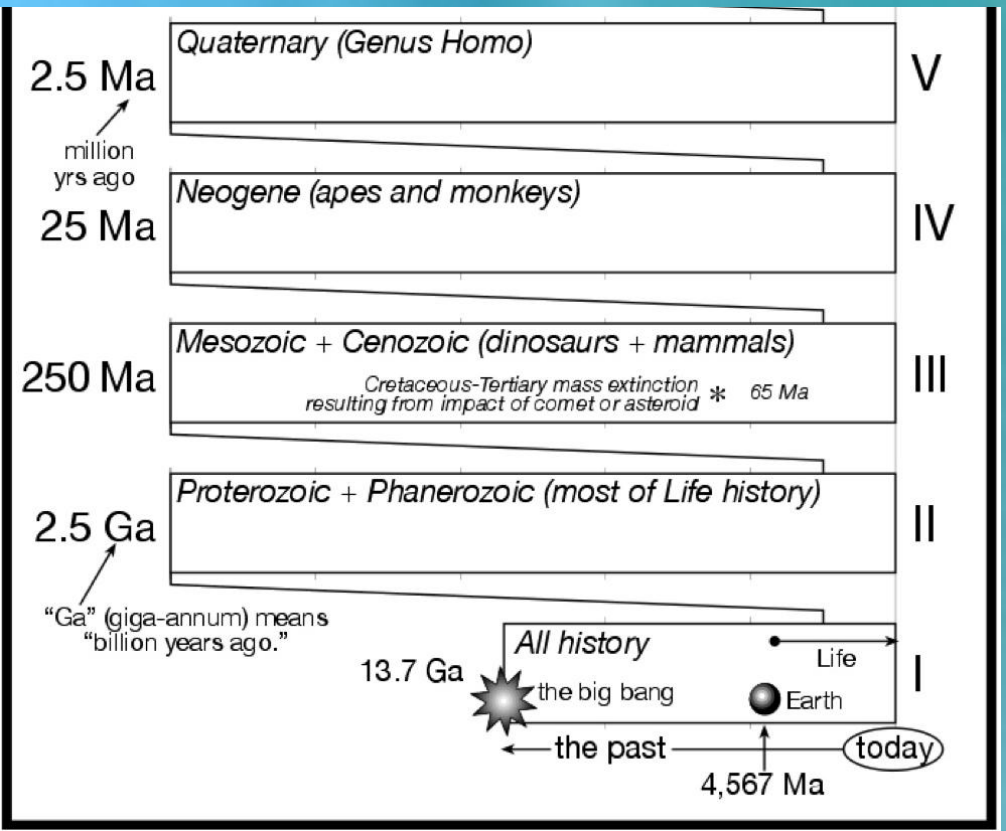
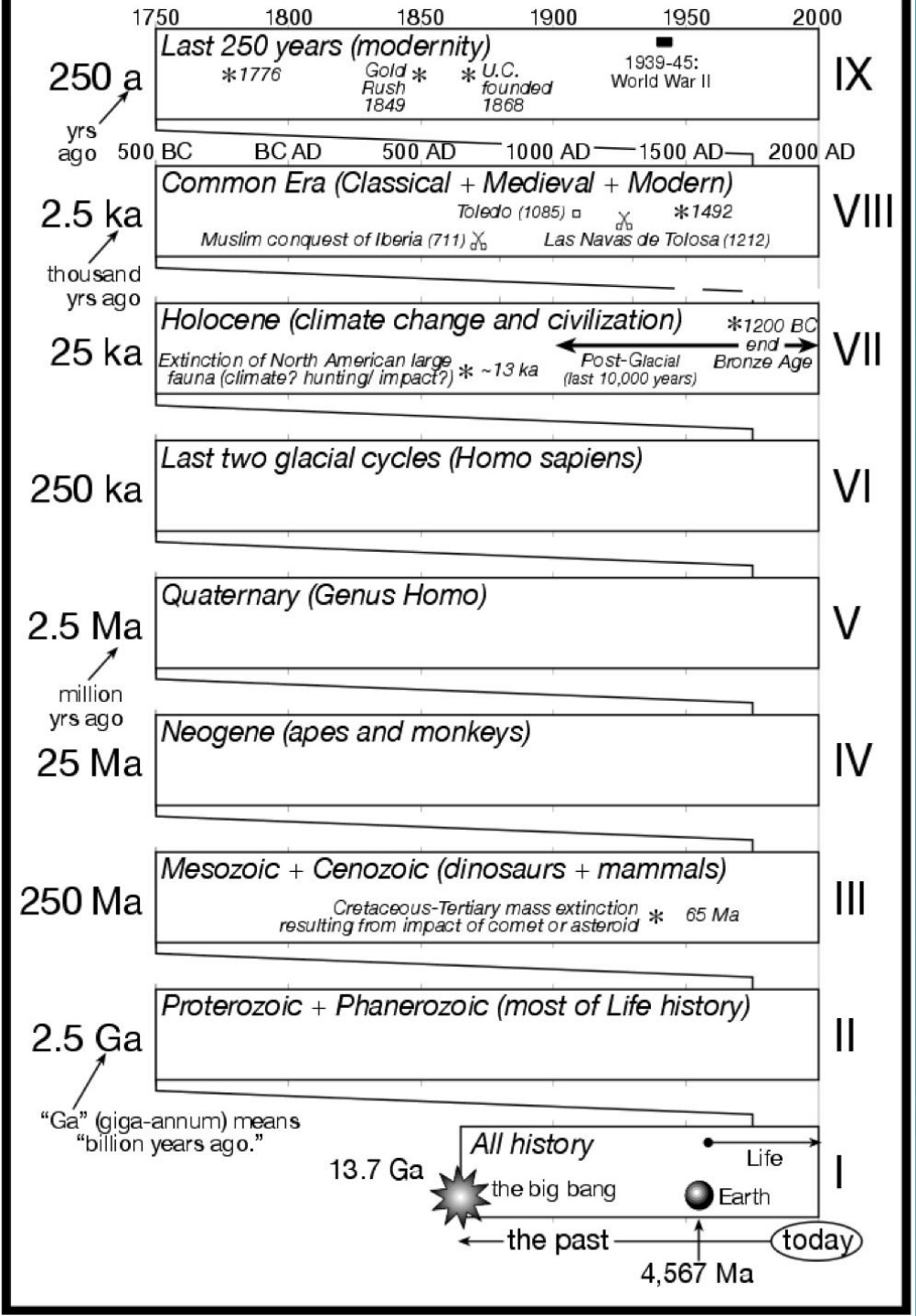




Each scale expands the last 10% of the previous scale.


2.5 Ma
million yrs ago
Quaternary (Genus Homo)
V
25 Ma
Neogene (apes and monkeys)
IV
250 Ma
Mesozoic + Cenozoic (dinosaurs + mammals)
Cretaceous-Tertiary mass extinction resulting from impact of comet or asteroid
65 Ma
III
2.5 Ga
Proterozoic + Phanerozoic (most of Life history)
II
"Ga" (giga-annum) means "billion years ago."
13.7 Ga
All history
Life
the big bang
Earth
I
the past
today
4,567 Ma


1750
1800
1850
1900
1950
2000
Last 250 years (modernity)
*1776
Gold Rush 1849
*
* U.C. founded 1868
1939-45: World War II
250 a
IX
yrs ago
500 BC
BC AD
500 AD
1000 AD
1500 AD
2000 AD
Common Era (Classical + Medieval + Modern)
Toledo (1085)
*1492
Muslim conquest of Iberia (711)
Las Navas de Tolosa (1212)
2.5 ka
VIII
thousand yrs ago
Holocene (climate change and civilization)
*1200 BC end Bronze Age
Extinction of North American large fauna (climate? hunting/ impact?)
* ~13 ka
Post-Glacial (last 10,000 years)
25 ka
VII
Last two glacial cycles (Homo sapiens)
250 ka
VI
Quaternary (Genus Homo)
2.5 Ma
V
million yrs ago
Neogene (apes and monkeys)
25 Ma
IV
Mesozoic + Cenozoic (dinosaurs + mammals)
Cretaceous-Tertiary mass extinction resulting from impact of comet or asteroid
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ChronoZoom as a Research Tool

Ideas for the future

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Faculty Summit 2010

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Title
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Announcement Title

announcing

The KT extinction: Sudden or Gradual?

Robert Butler, Univ. Arizona

The KT extinction: Sudden or Gradual?

Robert Butler, Univ. Arizona

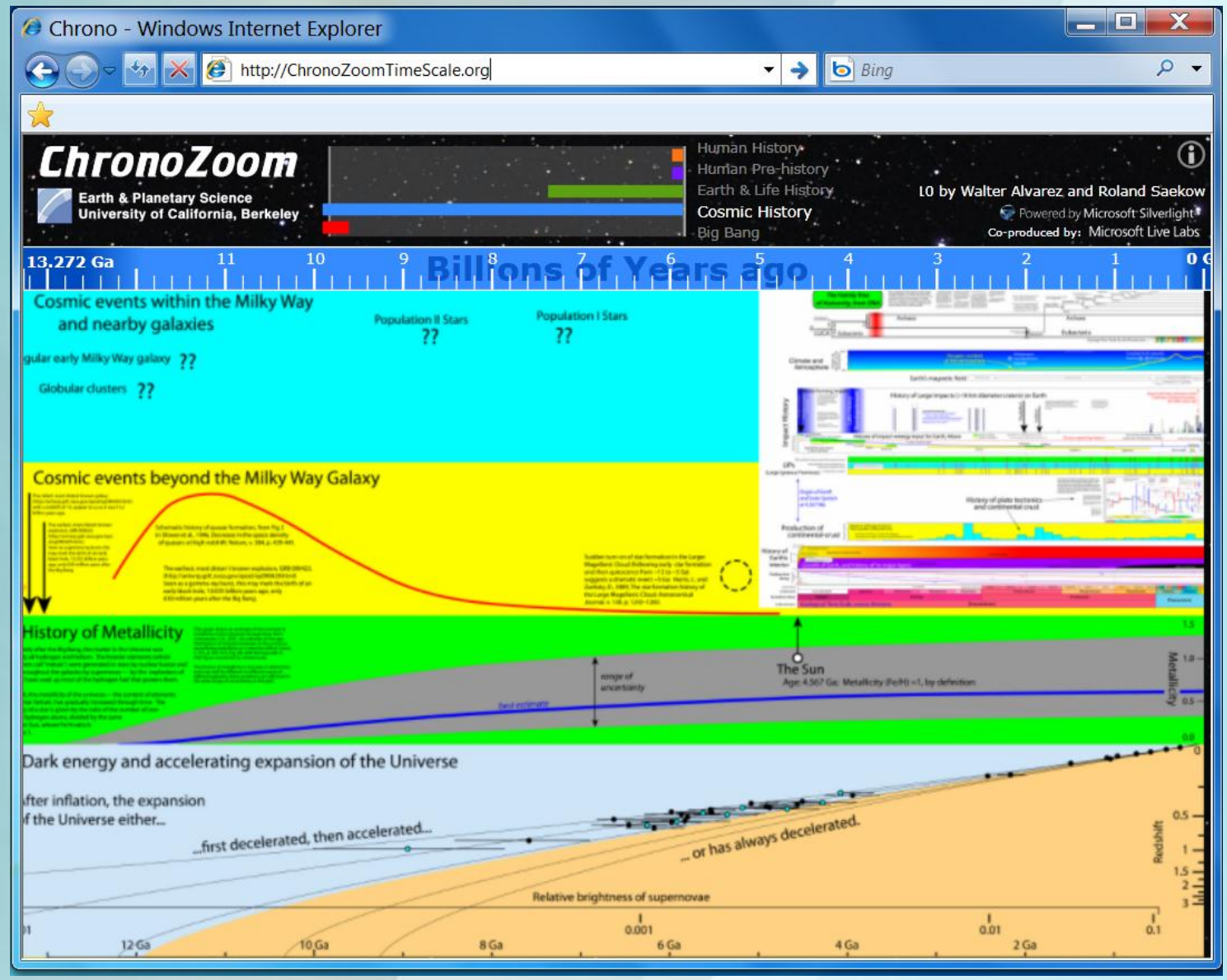
ChronoZoom First Generation

ChronoZoomTimeScale.org

Time Navigator

Portal to online resources

Compare information



Earth History
Case Study #2

Saharan
Climate Change

Touareg Festival at Ghat, 1969

The Sahara, verdant 8,000 years ago, is now a desert

Stone-age art shows animals who lived in the now-hyperarid desert

Libyan Sahara

Algerian Sahara

Bedrock grooved by glaciers

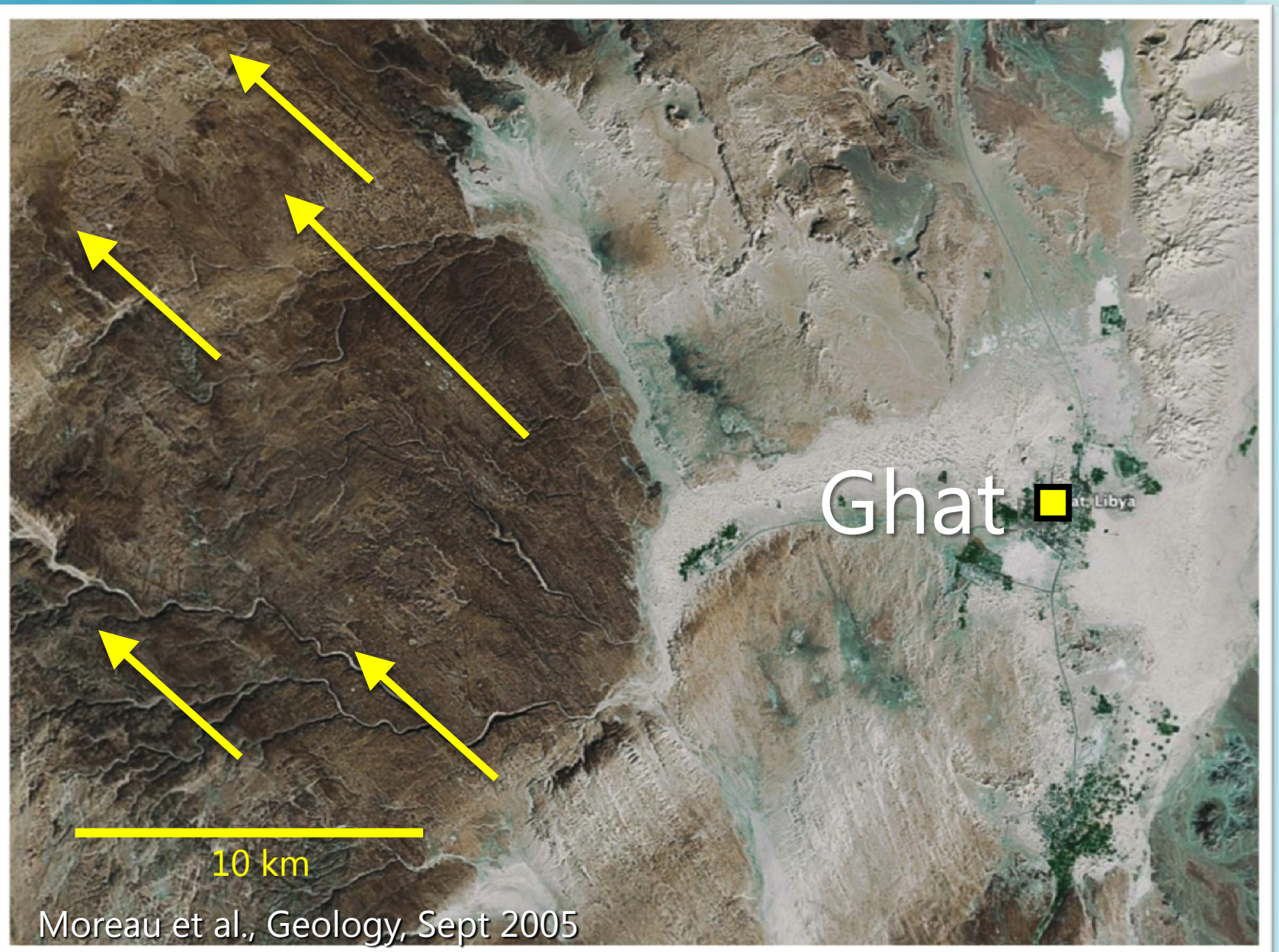
Algerian Sahara

Bedrock grooved by glaciers in the Ordovician, about 450 million years ago

An Ordovician fossil ice stream in Libya 450 million years old

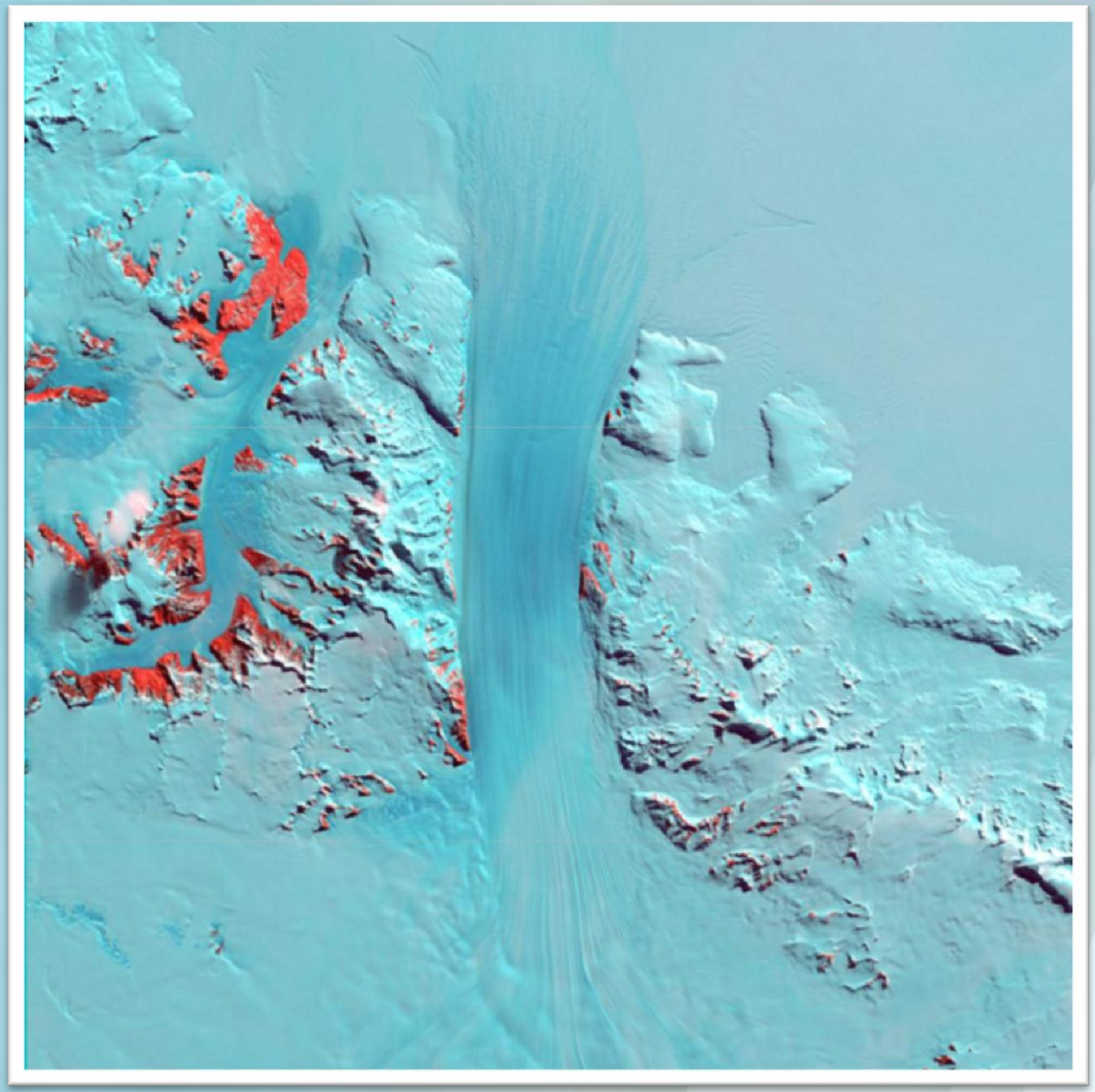
Mega-scale glacial lineations

due to a fast-flowing ice stream



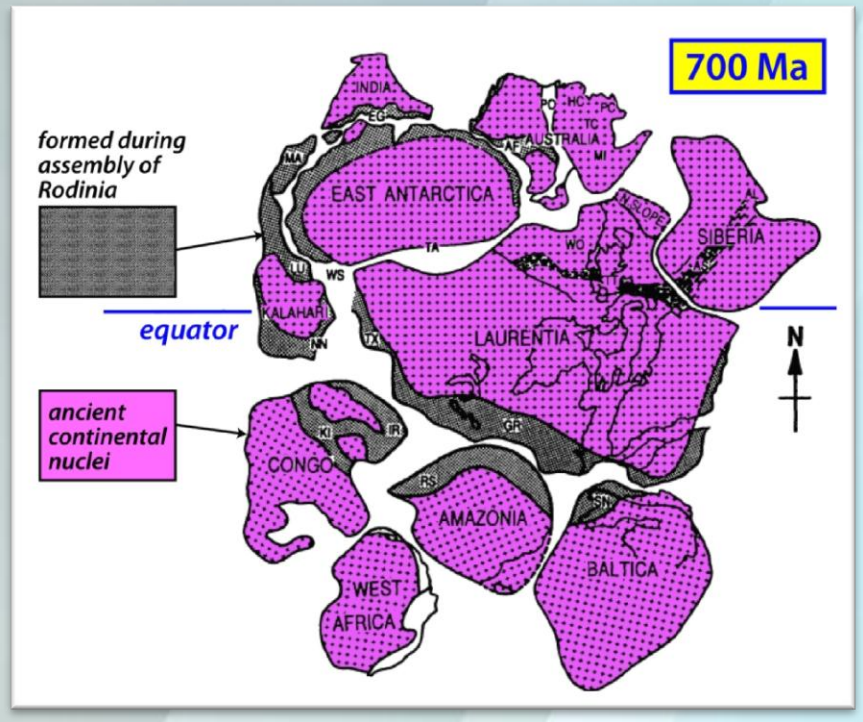
A modern ice stream in Antarctica: Byrd Glacier

20 km wide

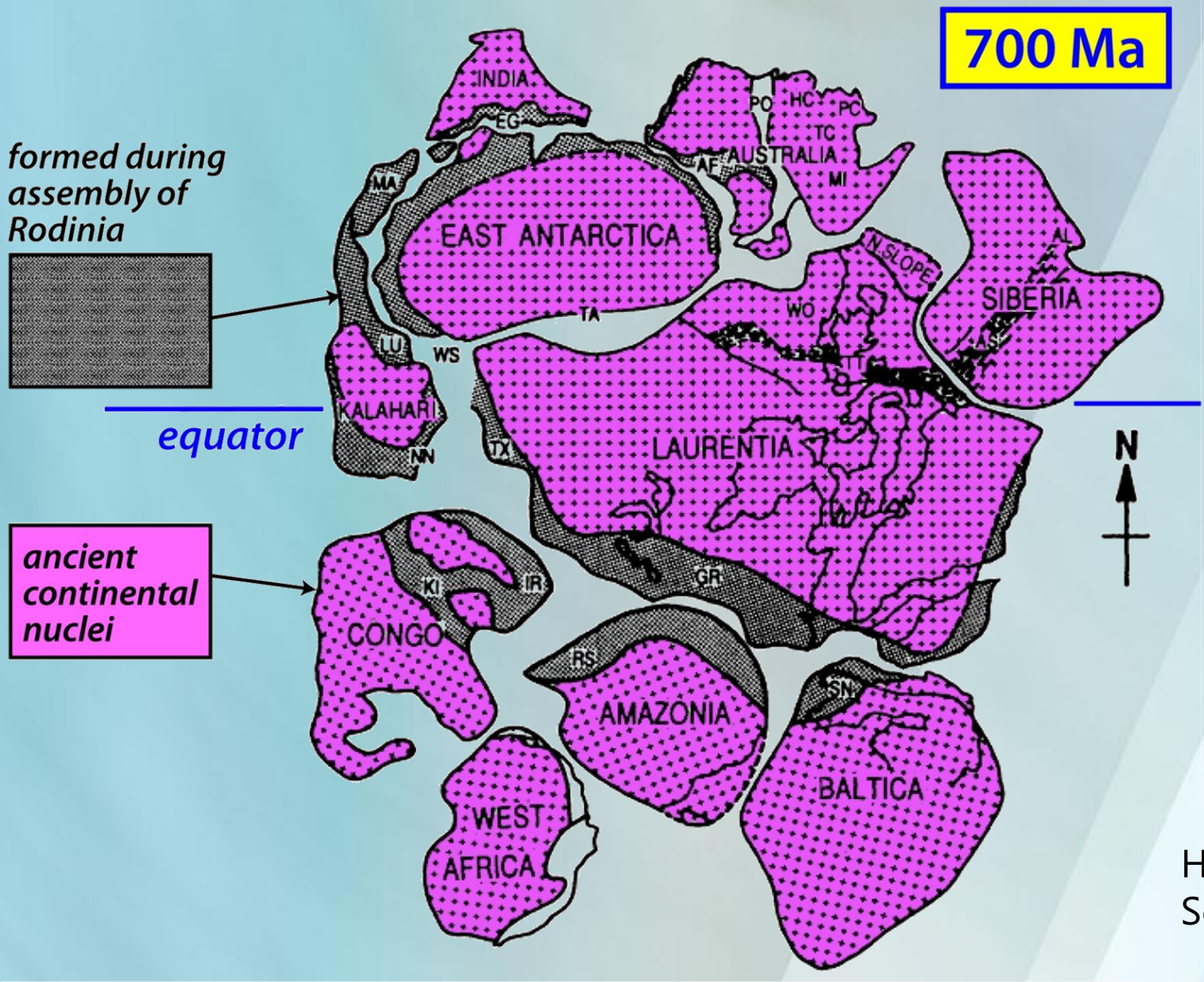


Earth History
Case Study #3

Super-continent Cycle

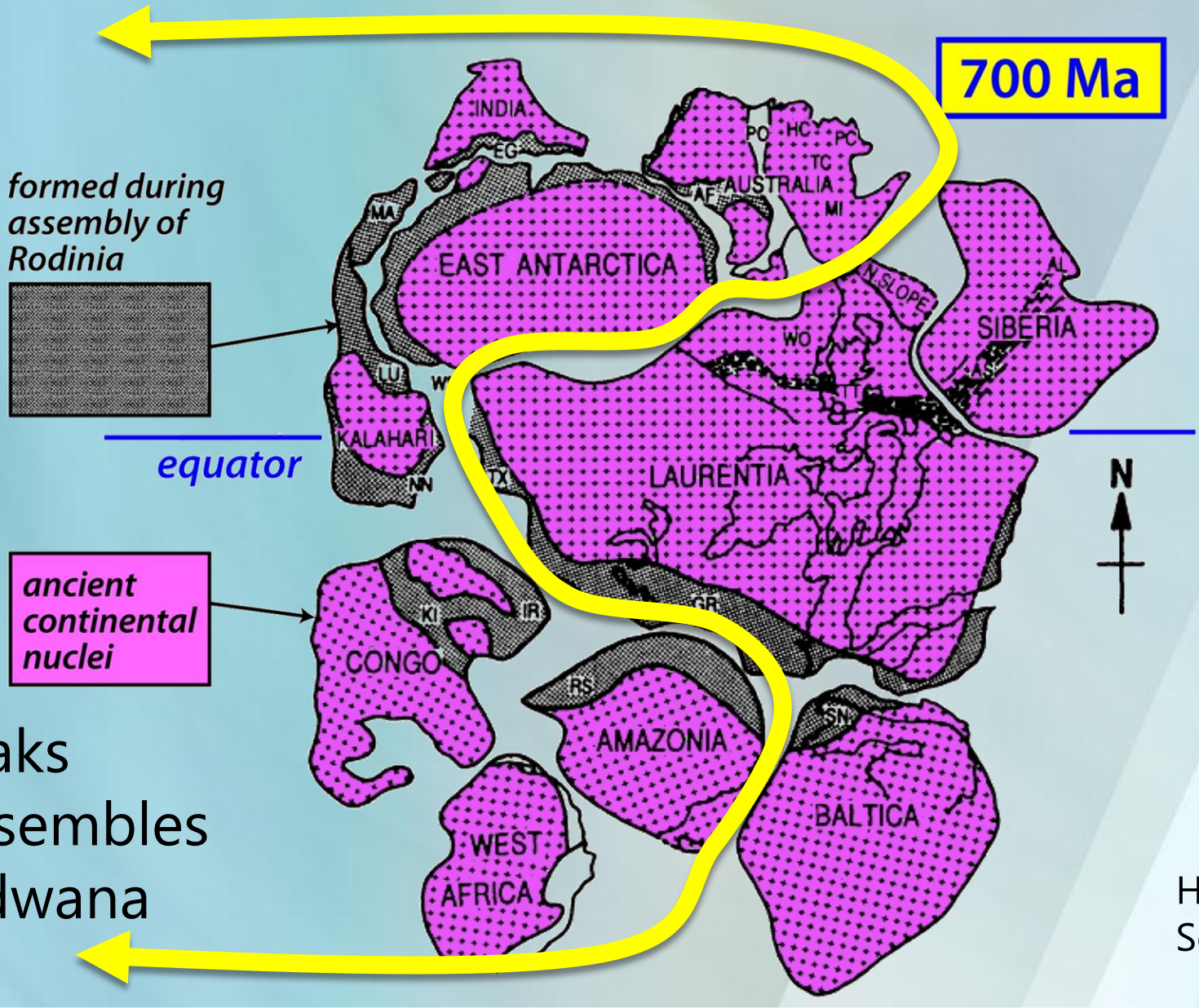


The Rodinia Supercontinent, 700 million years ago



Hoffman, 1991, Science

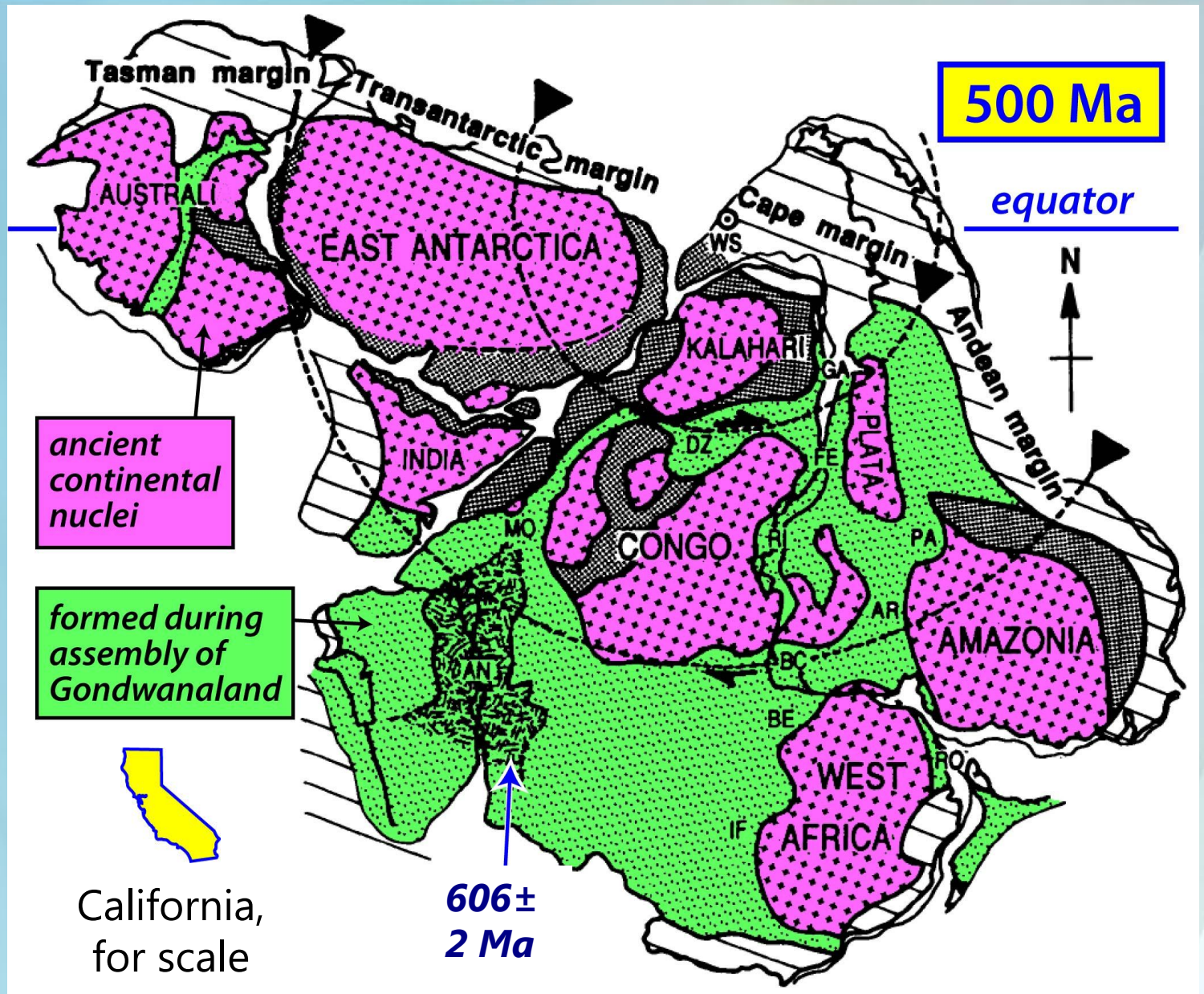
The Rodinia Supercontinent, 700 million years ago



This part breaks off, then reassembles to form Gondwana

Hoffman, 1991, Science

The assembly of Gondwanaland

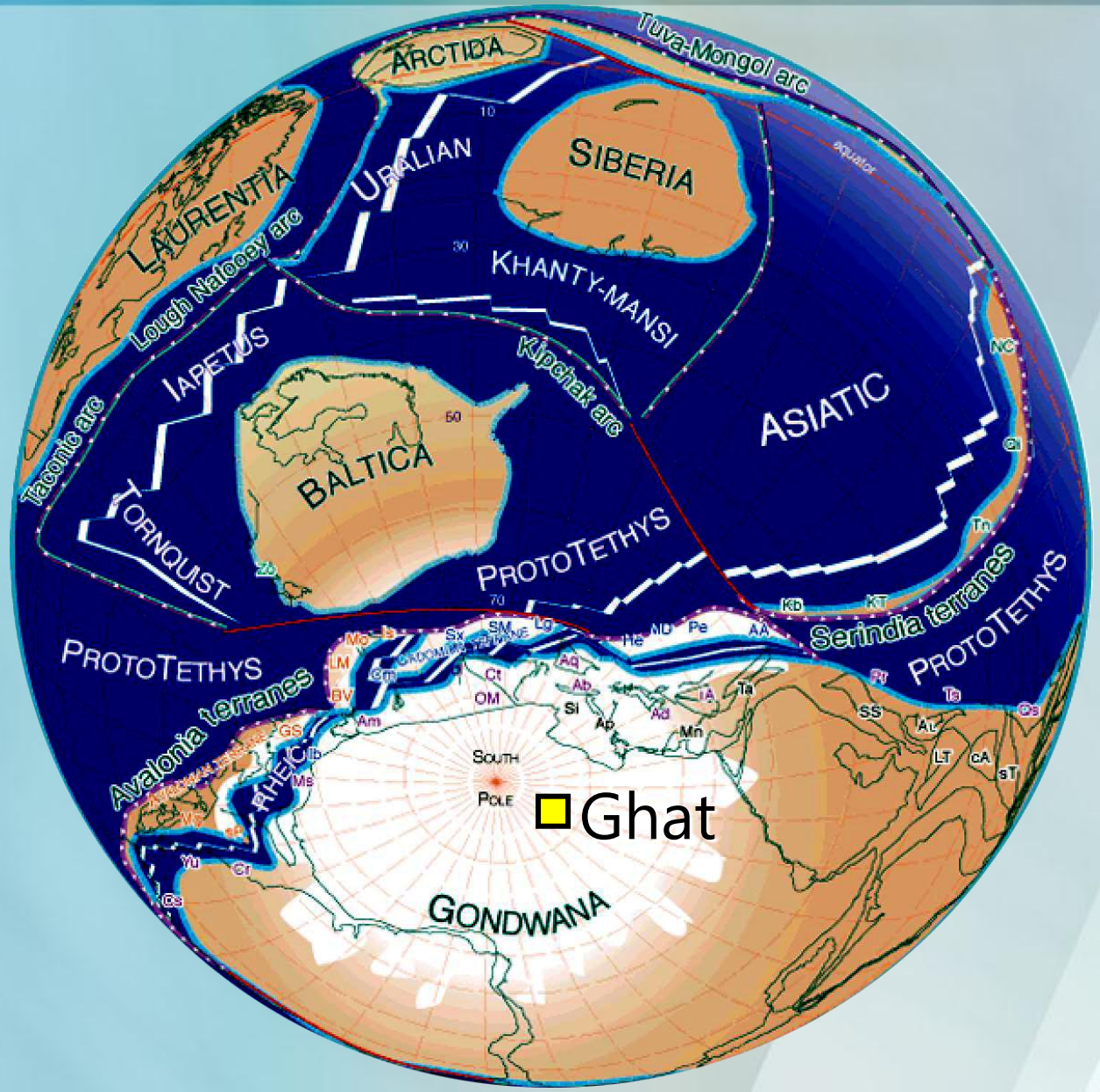


Hoffman, 1991, Science

The assembly of Gondwanaland

Hoffman, 1991, Science

Ordovician glacier in Gondwanaland



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demo

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ChronoZoom /Student

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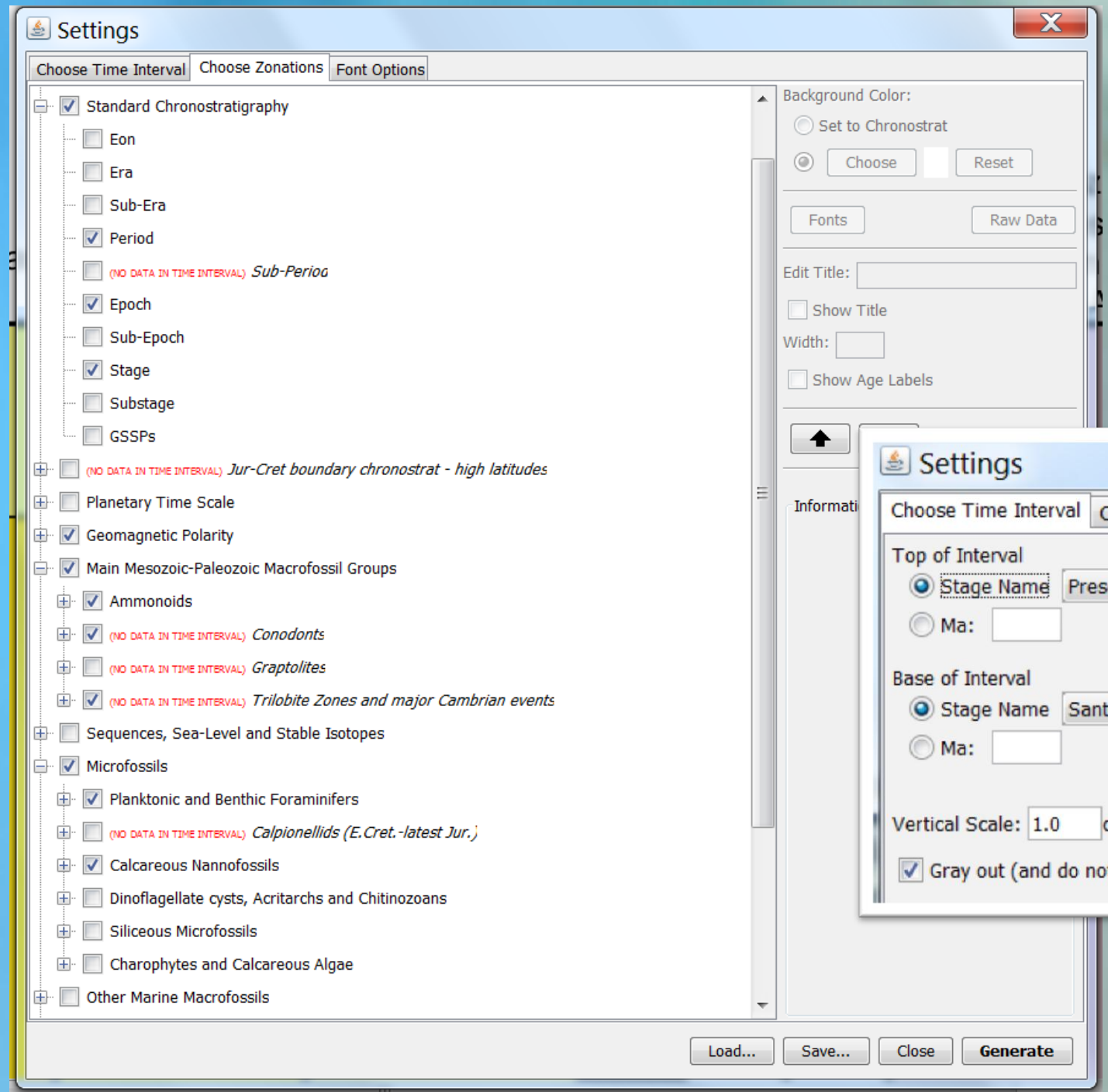
University of California, Berkeley

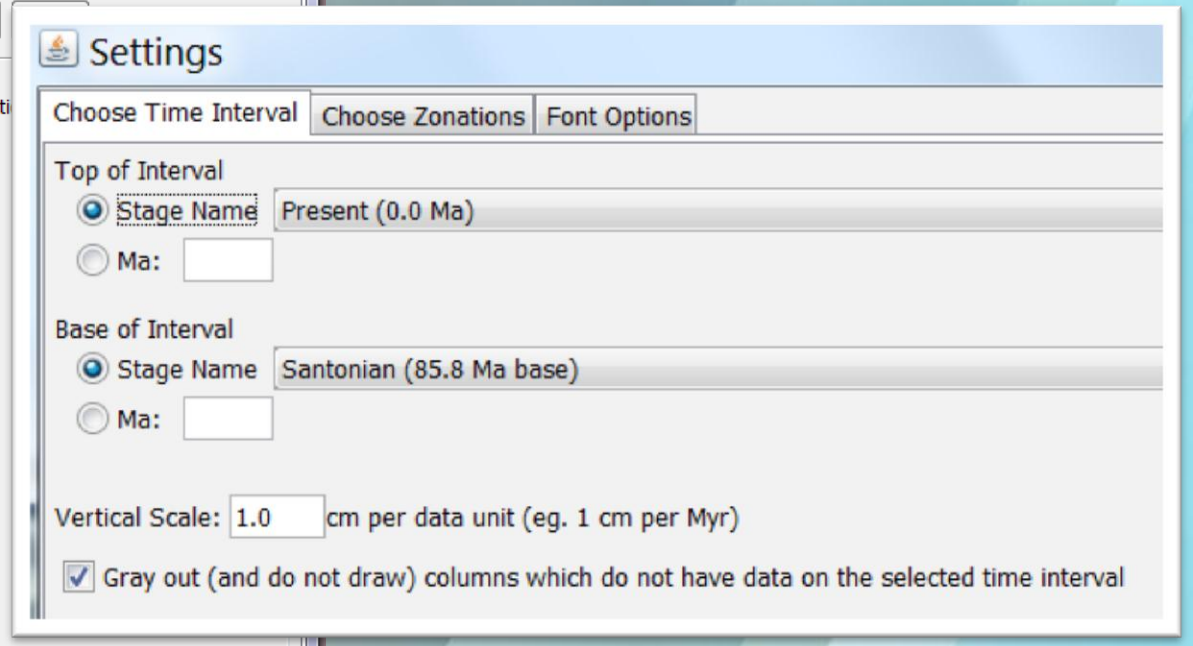
demo



TimeScale Creator

www.TSCreator.com

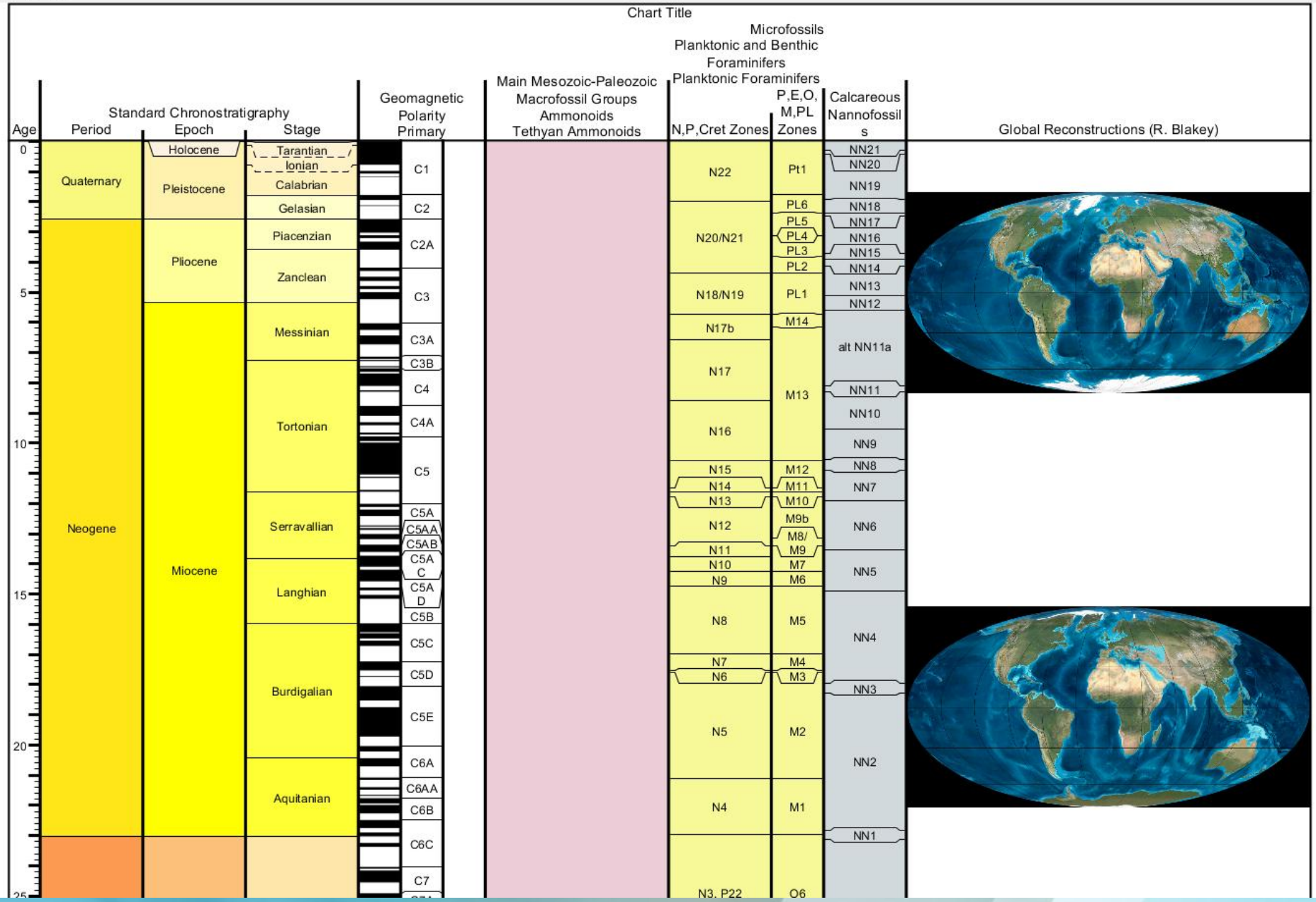
James Ogg
Adam Lugowski



Time Scale Creator

File Image Help

Settings... Generate Chart



Time Scale Creator

File Image Help

Settings... Generate Chart

Chart Title

Microfossils
Planktonic and Benthic

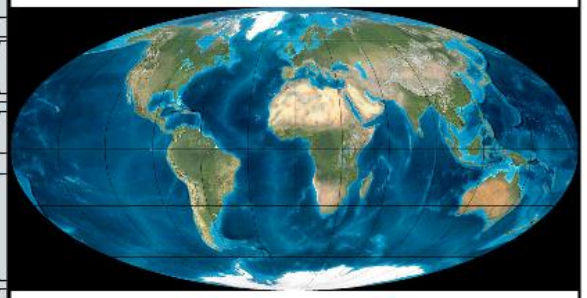
Global Reconstructions (R. Blakey)

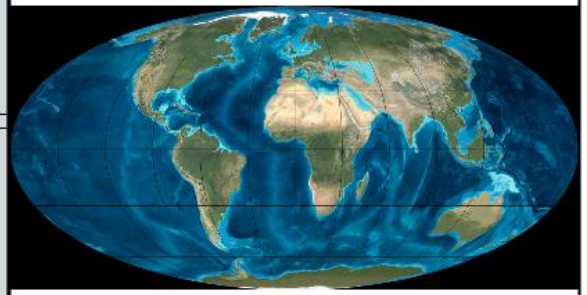
Standard Chronostratigraphy

Age	Period	Epoch	Stage
0	Quaternary	Holocene	Tarantian
			Ionian
		Pleistocene	Calabrian
			Gelasian
		Pliocene	Piacenzian
5			Zanclean
			Messinian
10			Tortonian

Geomagnetic Polarity Primary

C1
C2
C2A
C3
C3A
C3B
C4
C4A





C7

N3, P22

O6

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