

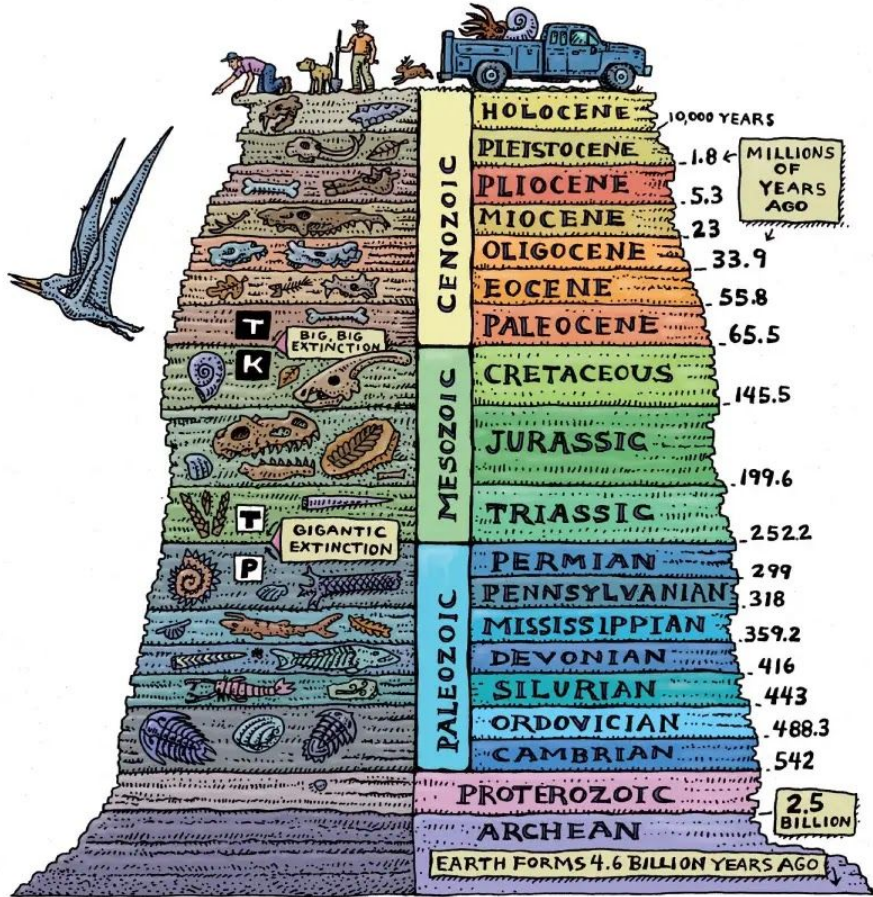
# Semantic Mapping of the Geologic Timescale: A temporal reference

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A presentation by Susan Edelstein

TaxonWorks  
October 25th, 2023

# Geologic Timescale



Relative age dating based on the law of superposition.



# INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

www.stratigraphy.org

International Commission on Stratigraphy

v 2023/06



Evolution / Era Erekenim / Era System / Period	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)
Phanerozoic	Quaternary	Holocene	UL	0.0117
		Upper Pleistocene	UL	0.129
		Middle Pleistocene	UL	0.774
		Lower Pleistocene	UL	1.80
	Pliocene	Gelasian	UL	2.58
		Piacenzian	UL	3.600
		Zanclean	UL	5.333
		Messinian	UL	7.246
		Tortonian	UL	11.63
	Miocene	Serravallian	M	13.82
		Langhian	M	15.98
		Burdigalian	M	20.44
	Oligocene	Aquitanian	LIE	23.03
		Chattian	LIE	27.82
	Eocene	Rupelian	LIE	33.9
		Priabonian	LIE	37.71
		Bartonian	LIE	41.2
		Lutetian	LIE	47.8
	Paleocene	Ypresian	LIE	56.0
		Thanetian	LIE	59.2
Selandian		LIE	61.6	
Cretaceous	Danian	LIE	66.0	
	Maastrichtian	LIE	72.1 ± 0.2	
	Campanian	LIE	83.6 ± 0.2	
	Santonian	LIE	86.3 ± 0.5	
	Coniacian	LIE	89.8 ± 0.3	
	Turonian	LIE	93.9	
	Cenomanian	LIE	100.5	
	Albian	LIE	~ 113.0	
	Aptian	LIE	~ 121.4	
	Barremian	LIE	125.77	
Lower	Hauterivian	LIE	~ 139.8	
	Valanginian	LIE	~ 132.6	
	Berriasian	LIE	~ 145.0	

Evolution / Era Erekenim / Era System / Period	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)
Mesozoic	Jurassic	Upper	Tithonian	149.2 ± 0.7
		Kimmeridgian	154.8 ± 0.8	
		Oxfordian	161.5 ± 1.0	
	Middle	Callovian	165.3 ± 1.1	
		Bathonian	168.2 ± 1.2	
		Aalenian	170.9 ± 0.8	
	Lower	Toarcian	174.7 ± 0.8	
		Pliensbachian	184.2 ± 0.3	
	Triassic	Upper	Serravallian	192.9 ± 0.3
			Sinemurian	199.5 ± 0.3
Hettangian			201.4 ± 0.2	
Middle		Rhaetian	~ 208.5	
		Norian	~ 227	
Lower		Carian	~ 237	
		Ladinian	~ 242	
Permian		Anisian	247.2	
		Induan	251.2	
		Changhsingian	251.902 ± 0.024	
Carboniferous	Wuchiapingian	254.14 ± 0.07		
	Lopingian	258.51 ± 0.21		
	Capitanian	264.28 ± 0.16		
	Wordian	266.9 ± 0.4		
Paleozoic	Permian	Roadian	273.01 ± 0.14	
		Kungurian	283.5 ± 0.6	
		Artinskian	290.1 ± 0.26	
	Carboniferous	Sakmarian	293.52 ± 0.17	
		Asselian	298.9 ± 0.15	
	Pennsylvanian	Gzhelian	303.7 ± 0.1	
		Kasimovian	307.0 ± 0.1	
	Mississippian	Moscovian	315.2 ± 0.2	
		Bashkirian	323.2 ± 0.4	
	Lower	Serpukhovian	330.9 ± 0.2	
Visean		346.7 ± 0.4		
Tournaisian	358.9 ± 0.4			

Evolution / Era Erekenim / Era System / Period	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)
Phanerozoic	Devonian	Upper	Famennian	372.2 ± 1.6
		Frasnian	382.7 ± 1.6	
		Givetian	387.7 ± 0.8	
	Middle	Eifelian	393.3 ± 1.2	
		Emsian	407.6 ± 2.6	
	Lower	Pragian	410.8 ± 2.8	
		Lochkovian	419.2 ± 3.2	
	Silurian	Pridoli	423.0 ± 2.3	
		Ludlow	425.6 ± 0.9	
		Wenlock	427.4 ± 0.5	
Ordovician	Homerian	430.5 ± 0.7		
	Sheinwoodian	433.4 ± 0.8		
Paleozoic	Upper	Telychian	438.5 ± 1.1	
		Aeronian	440.8 ± 1.2	
	Rhuddanian	443.8 ± 1.5		
Middle	Hirnantian	445.2 ± 1.4		
	Katian	453.0 ± 0.7		
Lower	Sandbian	458.4 ± 0.9		
	Darriwilian	467.3 ± 1.1		
Cambrian	Dapingian	470.0 ± 1.4		
	Floian	477.7 ± 1.4		
	Tremadocian	485.4 ± 1.9		
Furongian	Stage 10	~ 489.5		
	Jiangshanian	~ 494		
	Paibian	~ 497		
Miaolingian	Guzhangian	~ 500.5		
	Drumian	~ 504.5		
Series 2	Wuliuan	~ 509		
	Stage 4	~ 514		
Terreneuvian	Stage 3	~ 521		
	Stage 2	~ 529		
Fortunian	538.8 ± 0.2			

Evolution / Era Erekenim / Era System / Period	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)
Proterozoic	Neo-proterozoic	Ediacaran	~ 635	
		Cryogenian	~ 720	
	Meso-proterozoic	Tonian	1000	
		Stenian	1200	
		Ectasian	1400	
	Paleo-proterozoic	Calymnian	1600	
		Statherian	1800	
	Archean	Orosirian	2050	
		Rhyacian	2300	
		Siderian	2500	
Neo-archean	~ 2800			
	Meso-archean	~ 3200		
Paleo-archean	~ 3600			
	Eo-archean	~ 4000		
Hadean	4567			

Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Italic fonts indicate informal units and placeholders for unnamed units. Versioned charts and detailed information on ratified GSSPs are available at the website <http://www.stratigraphy.org>. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaran; only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (~) is provided.

Ratified Subseries/Subepochs are abbreviated as UL (Upper/Late), M (Middle) and LIE (Lower/Early). Numerical ages for all systems except Quaternary, upper Paleogene, Cretaceous, Jurassic, Triassic, Permian, Cambrian and Precambrian are taken from 'A Geologic Time Scale 2012 by Gradstein et al. (2012), those for the Quaternary, upper Paleogene, Cretaceous, Jurassic, Triassic, Permian, Cambrian and Precambrian were provided by the relevant ICS subcommissions.

Colouring follows the Commission for the Geological Map of the World ([www.cgmw.org](http://www.cgmw.org))



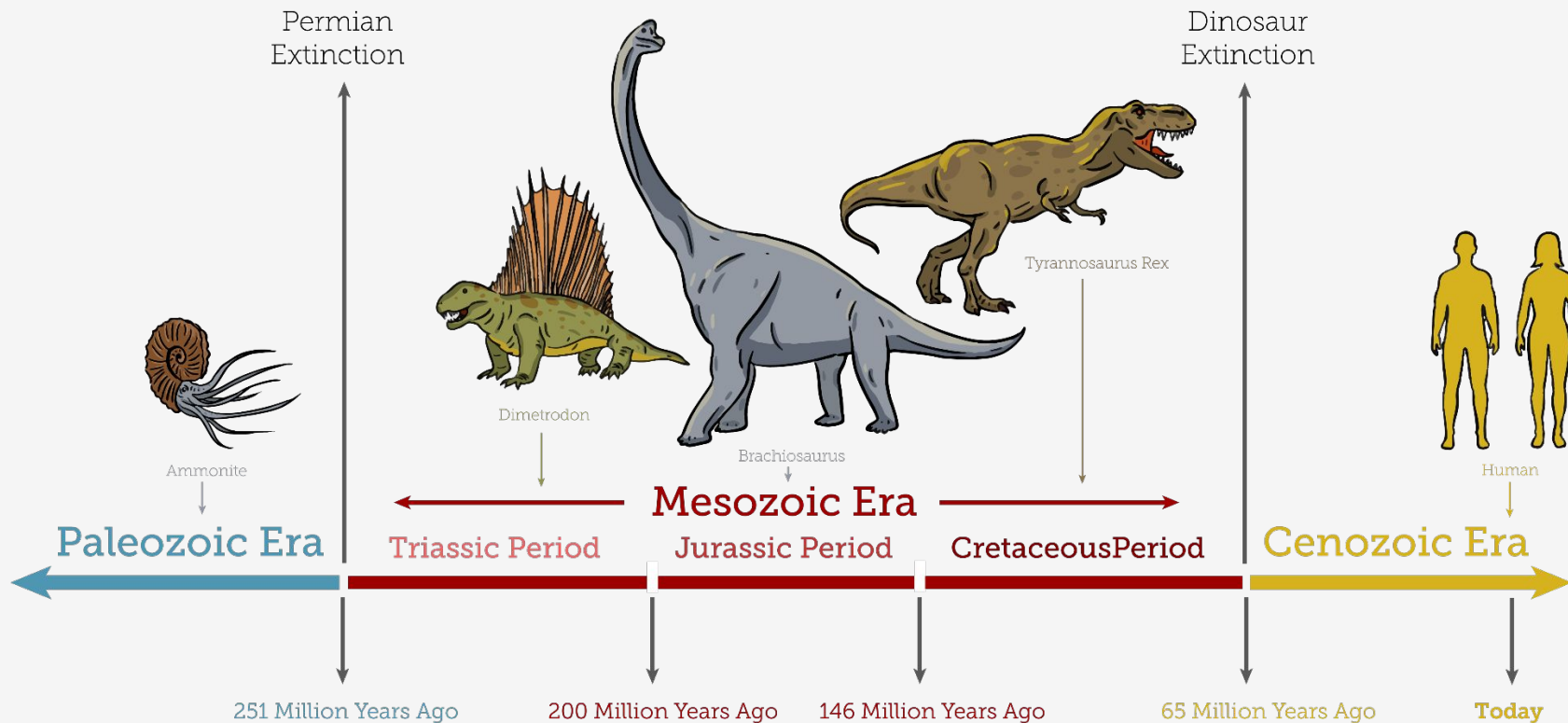
Chart drafted by K.M. Cohen, D.A.T. Harper, P.L. Gibbard, N. Car (c) International Commission on Stratigraphy, June 2023

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013, updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

URL: <http://www.stratigraphy.org/ICSchart/ChronostratChart2023-06.pdf>

Cohen et al., 2023

# Geologic Timescale



# GBIF Published Verbatim Values

> 1,000,000 Data Points

6,743 → 178

Verbatim Values

Controlled Values

Published Datasets

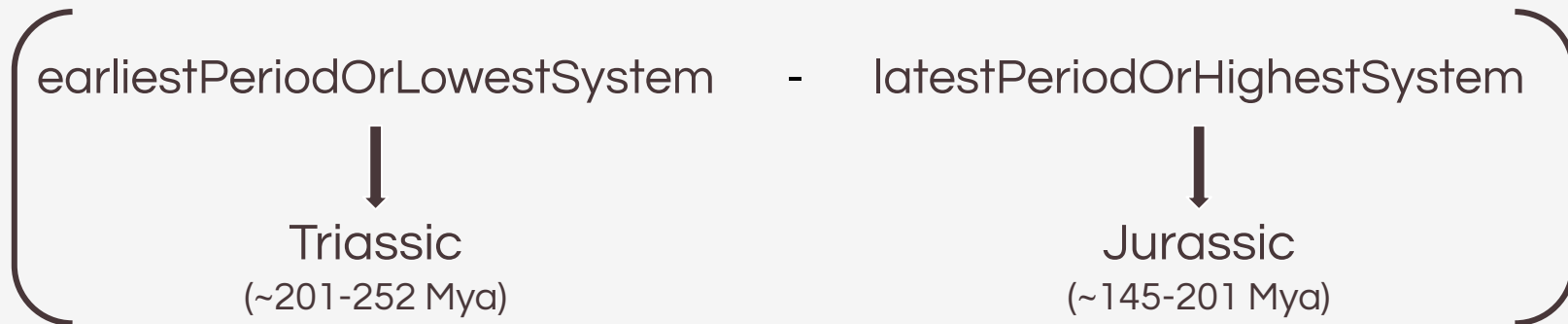
ICS Timescale

# Geologic Timescale Terms

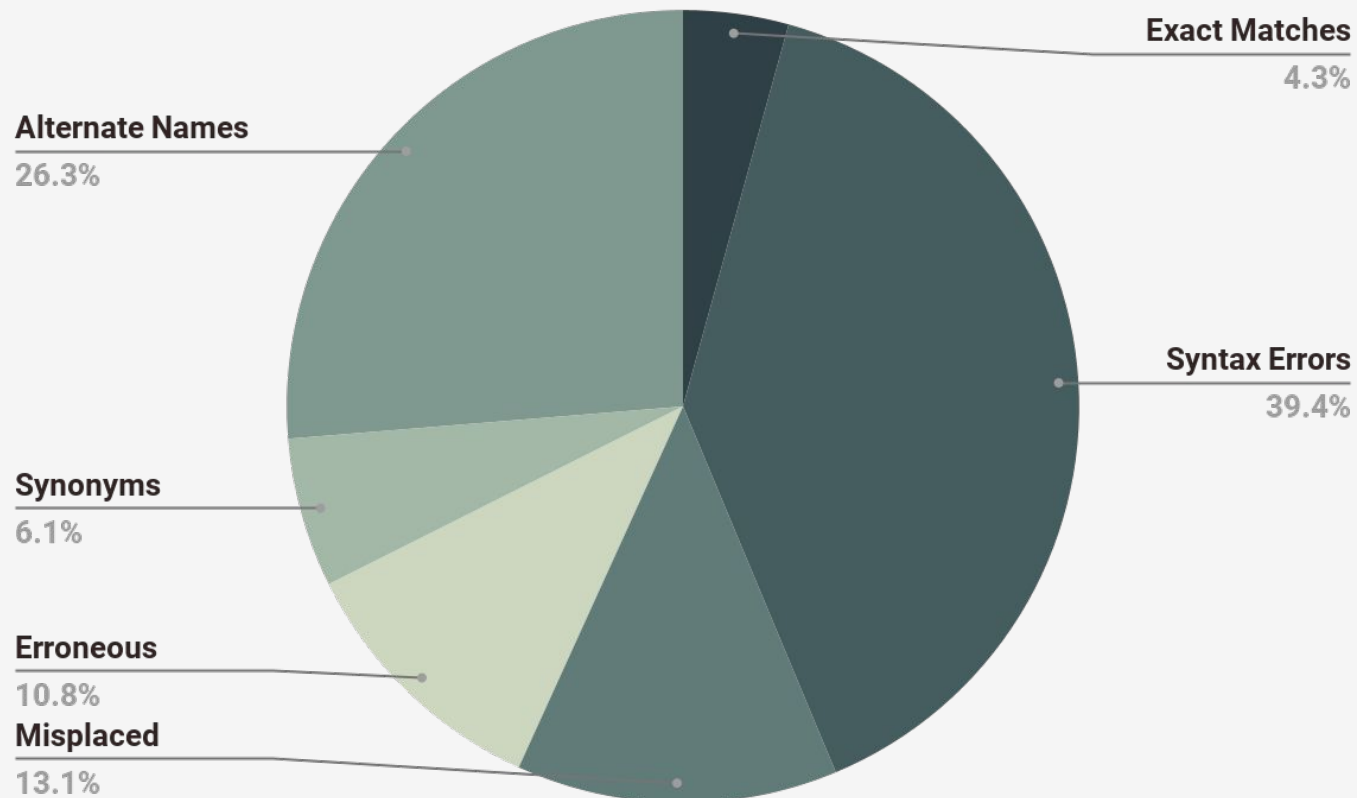
Standardized Vocabulary

GeologicalContext Class: <https://dwc.tdwg.org/terms/#geologicalcontext>

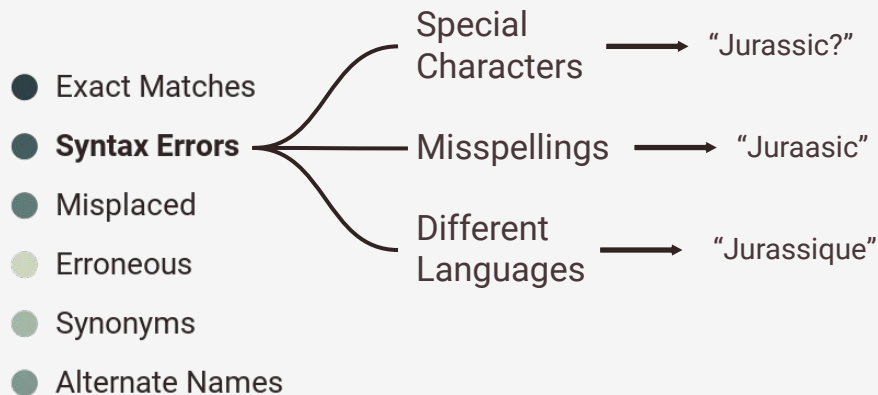
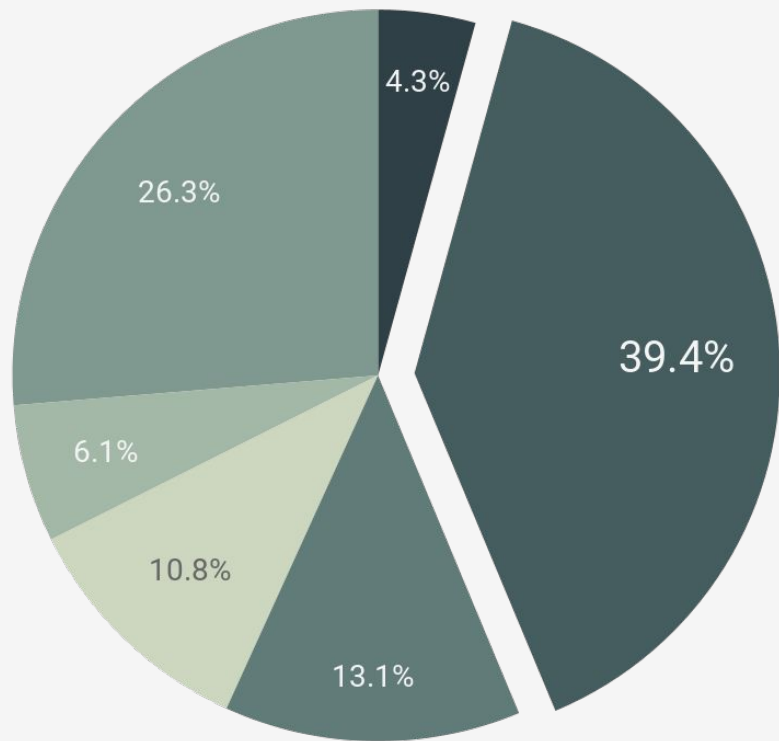
Lower and upper bound of each rank in the Geologic Time Scale



# Error Types

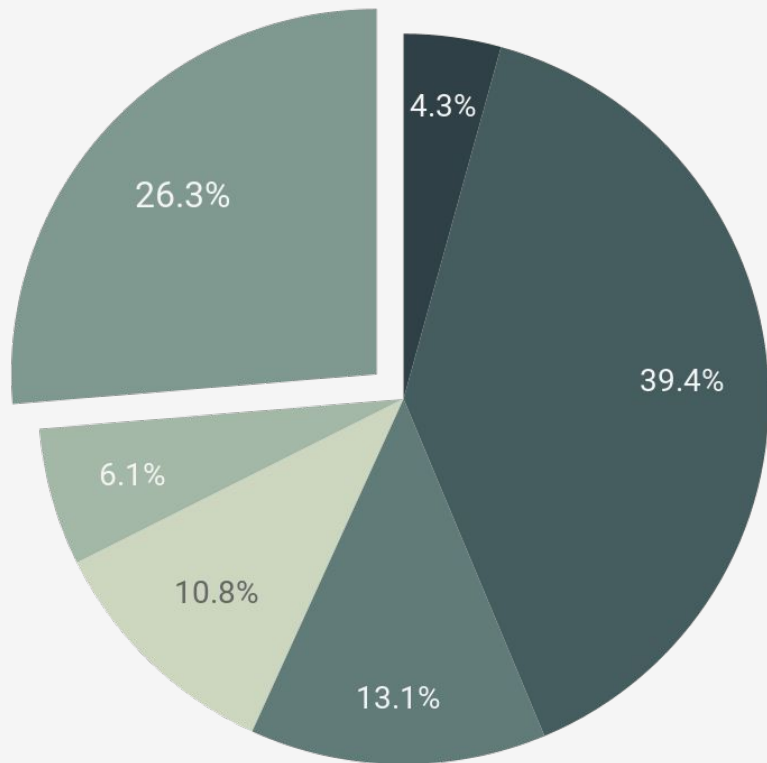


# Syntax Errors





# Alternate Terms



● Exact Matches

● Syntax Errors

● Misplaced

● Erroneous

● Synonyms

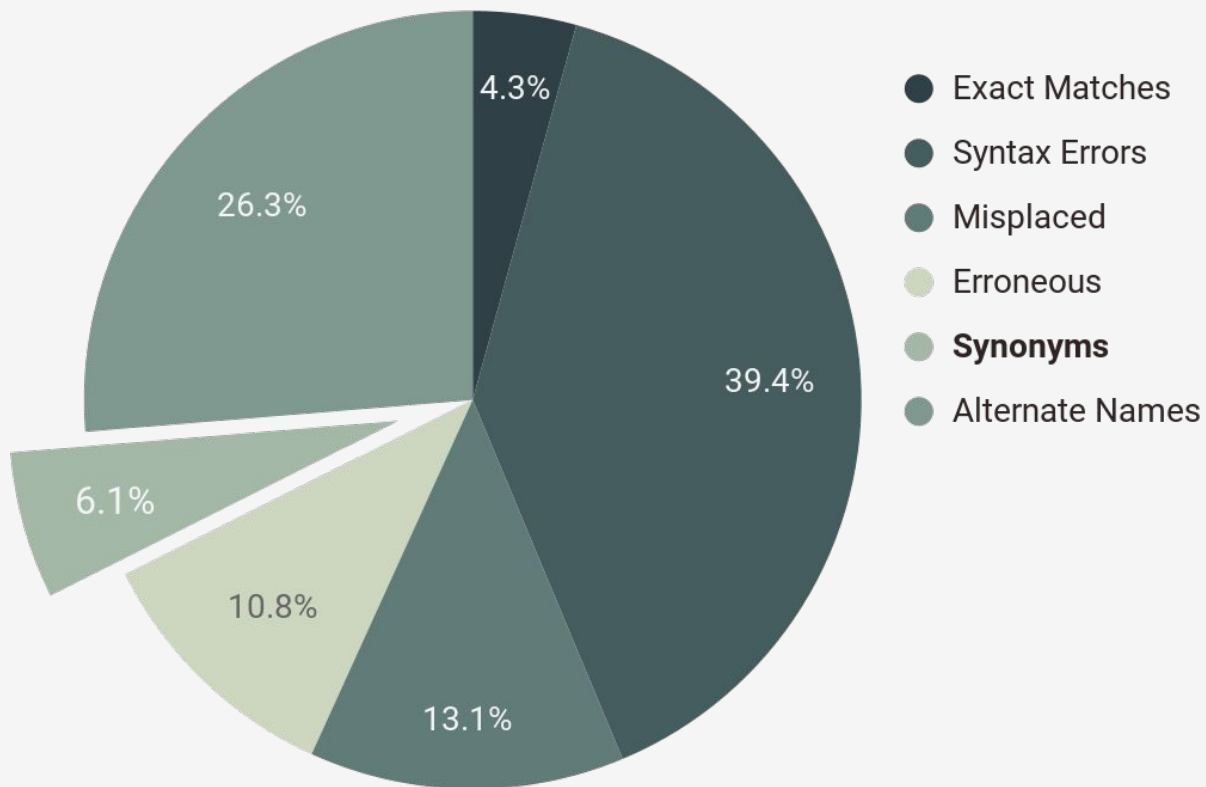
● **Alternate Names**

Regional Terms

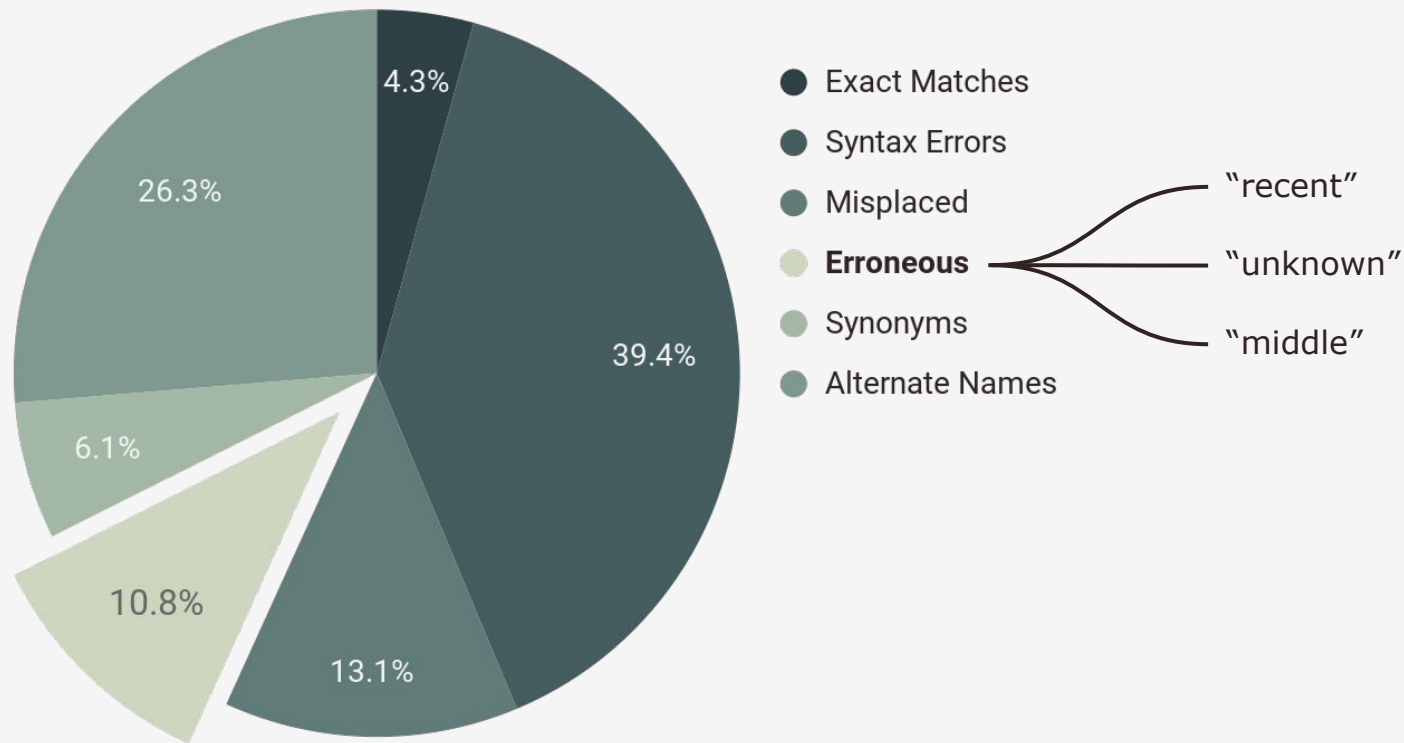
Higher Granularity

Biostratigraphic  
Zones

# Synonyms



# Erroneous Values



# Mapping Rules

## Problem

Misspellings, special characters, or non-standardized contextual annotations

Incomprehensible misspelling that does not correspond to a valid value

## Action

Omit all and map to corresponding valid terms (if the association is clear)

Set to NULL

## Example

"Jurassic" → Jurassic

"Euronian" → NULL

# Terminology Guidelines

- ❖ These general terminology guidelines are...
  - Comprehensive
  - Repeatable
  - Capable of semi-automation
  - Conformable to any dataset

**Thank You  
for  
Your Time!**

If you have any questions, please email me at [shedelst@ncsu.edu](mailto:shedelst@ncsu.edu)