

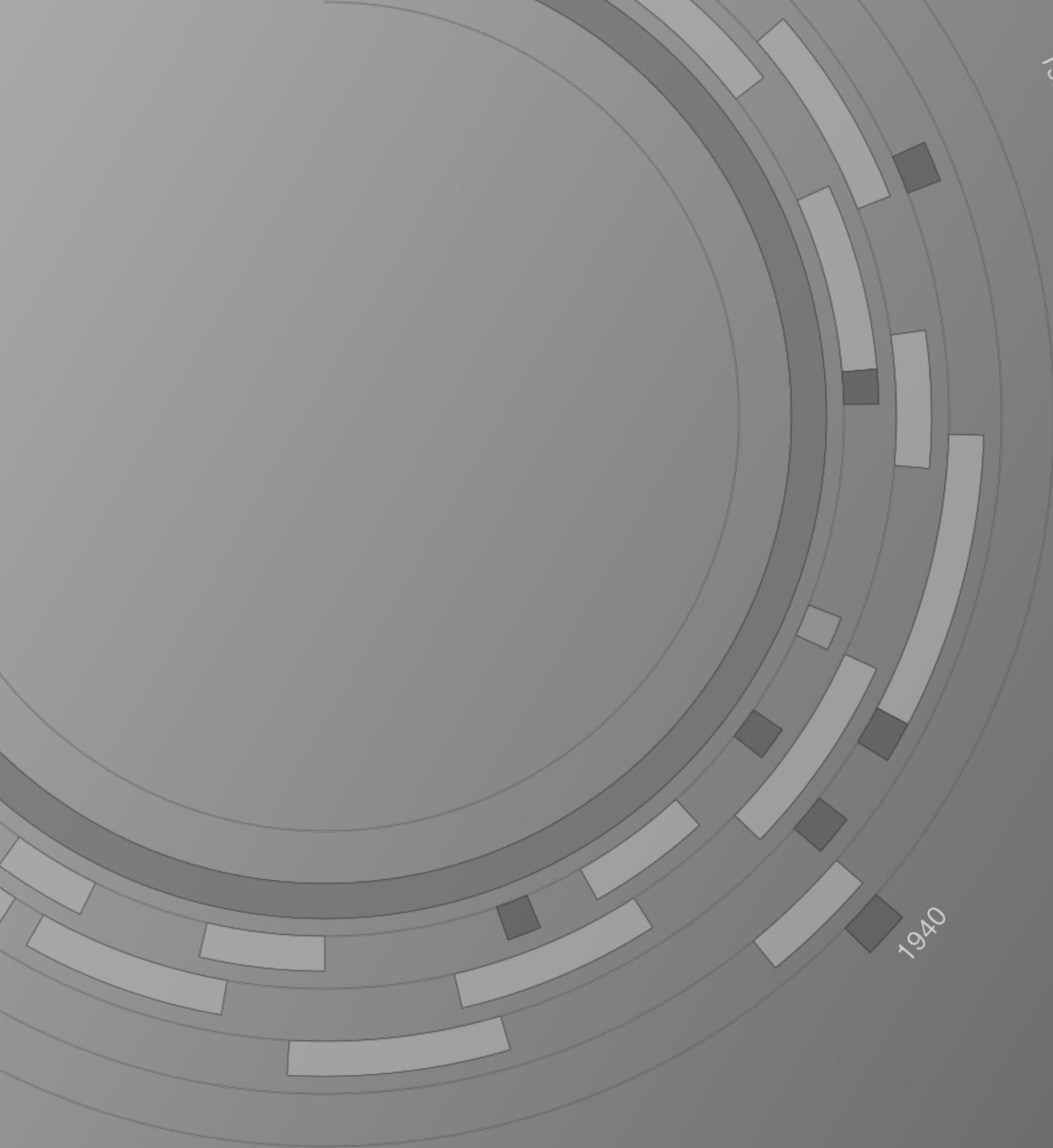
Apr 28 2017 @ Northeastern University



TIMELINES REVISITED:

Considerations for Expressive Storytelling

Matthew Brehmer
Microsoft Research
@mattbrehmer



1920

1930

1940

1950

1960

REPRESENTING **TIME** IN SPACE

YESTERDAY ?

THE BIG BANG ?

THE 2050s ?

DINNER TIME ?

WHERE IS

NOW ?

THE TRIASSIC PERIOD ?

YOUR 8th BIRTHDAY ?

THE 1980s ?

THE 15th CENTURY ?

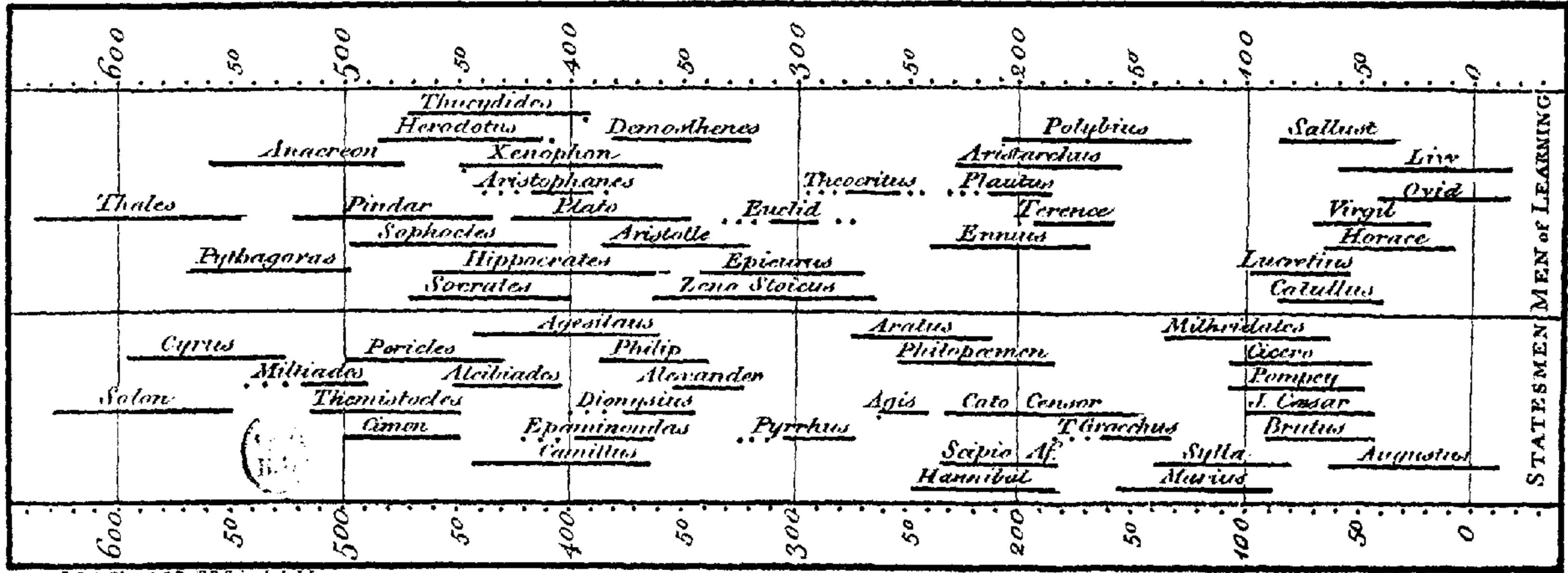


(just a few) VISUAL REPRESENTATIONS OF **TIME**

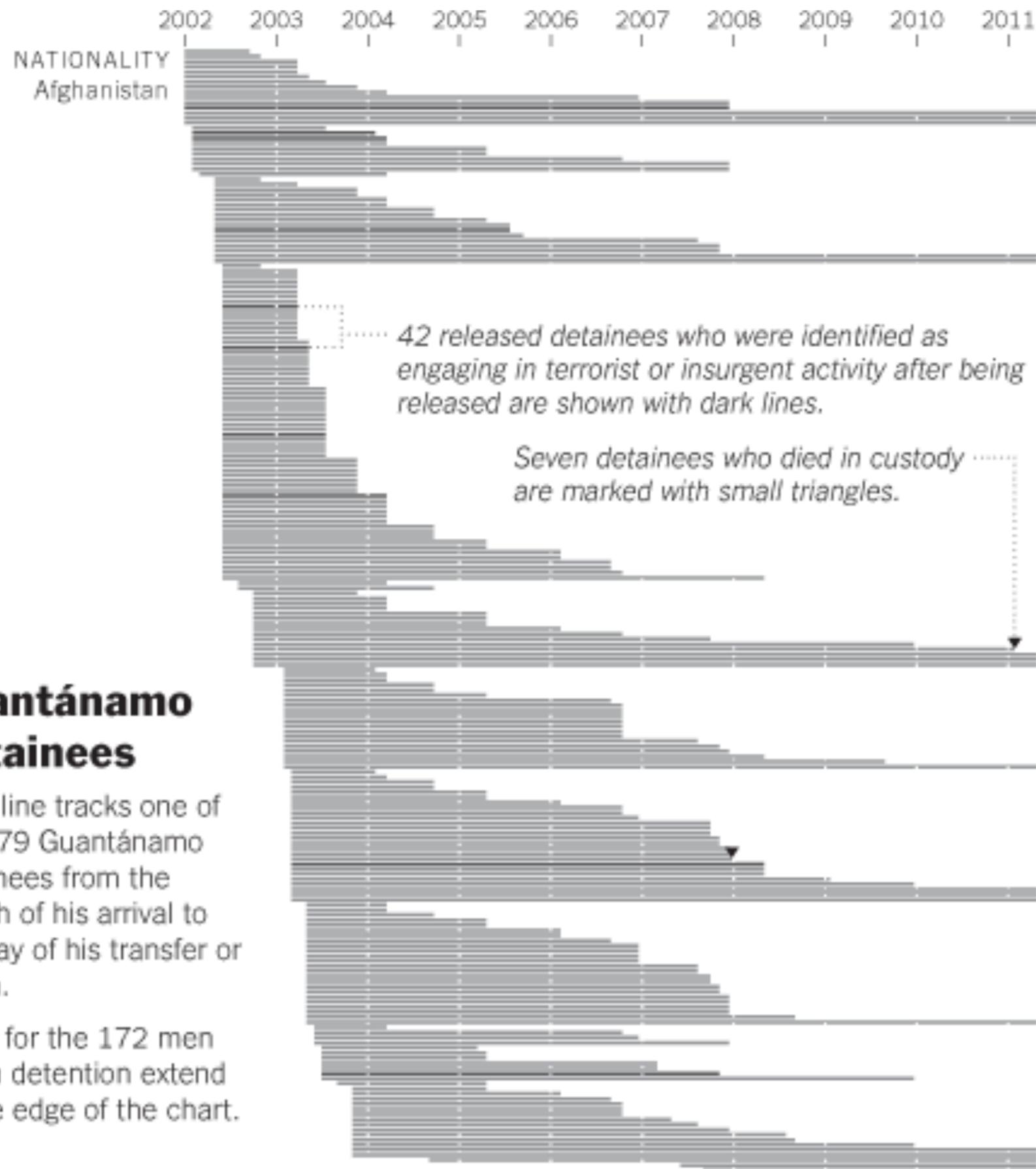




A Specimen of a Chart of Biography.



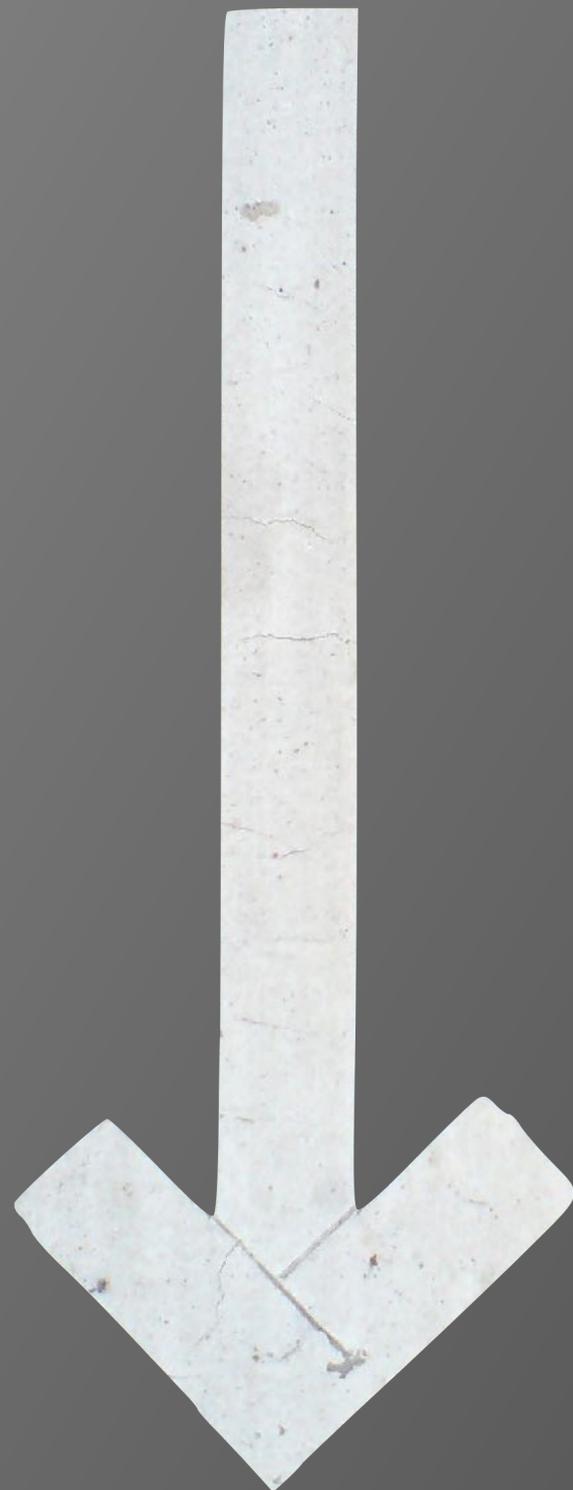
J. Priestley L.L.D. F.R.S. inv. et del.



Guantánamo Detainees

Each line tracks one of the 779 Guantánamo detainees from the month of his arrival to the day of his transfer or death.

Lines for the 172 men still in detention extend to the edge of the chart.







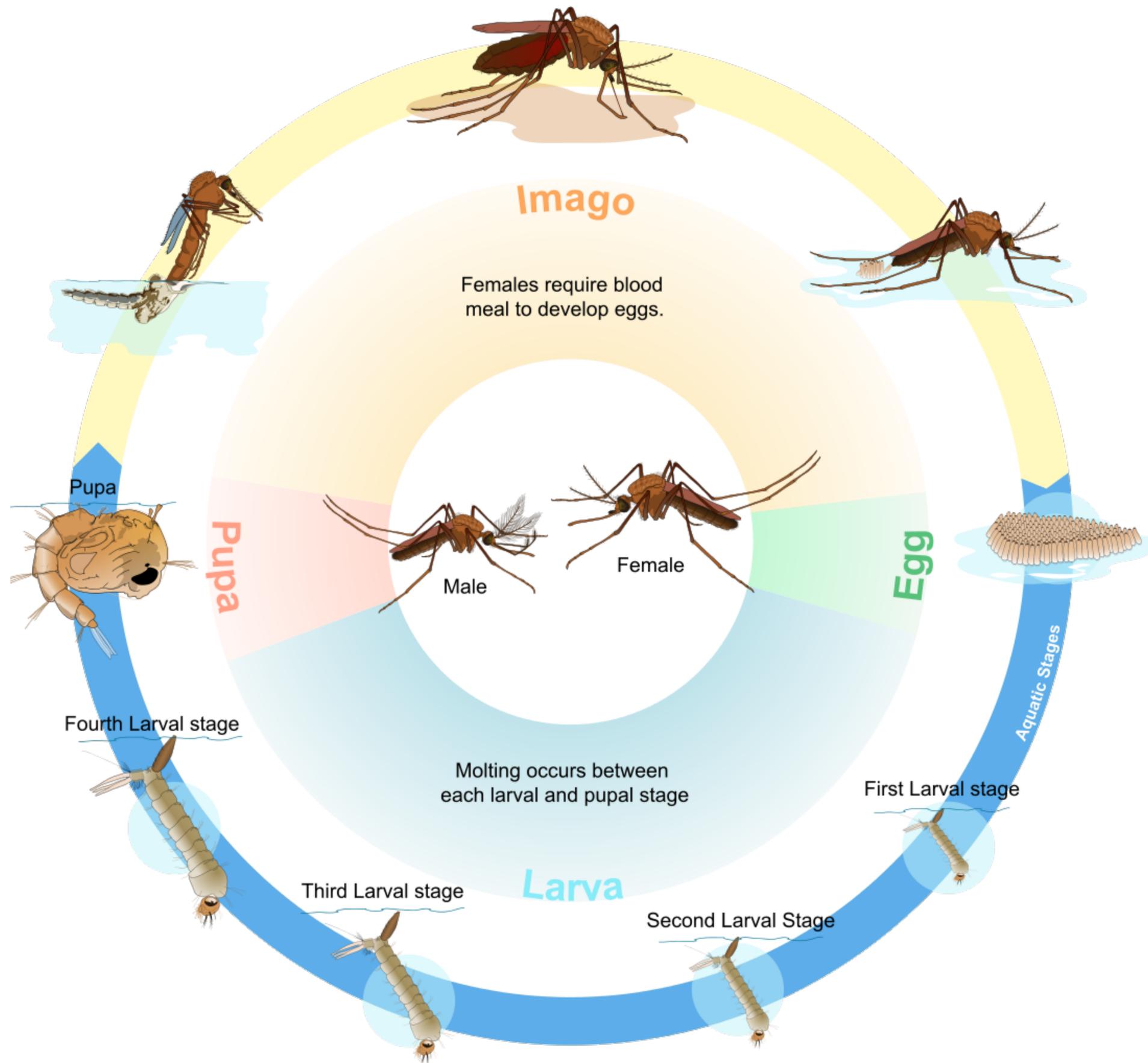
1078 - 1120
The White Tower Built

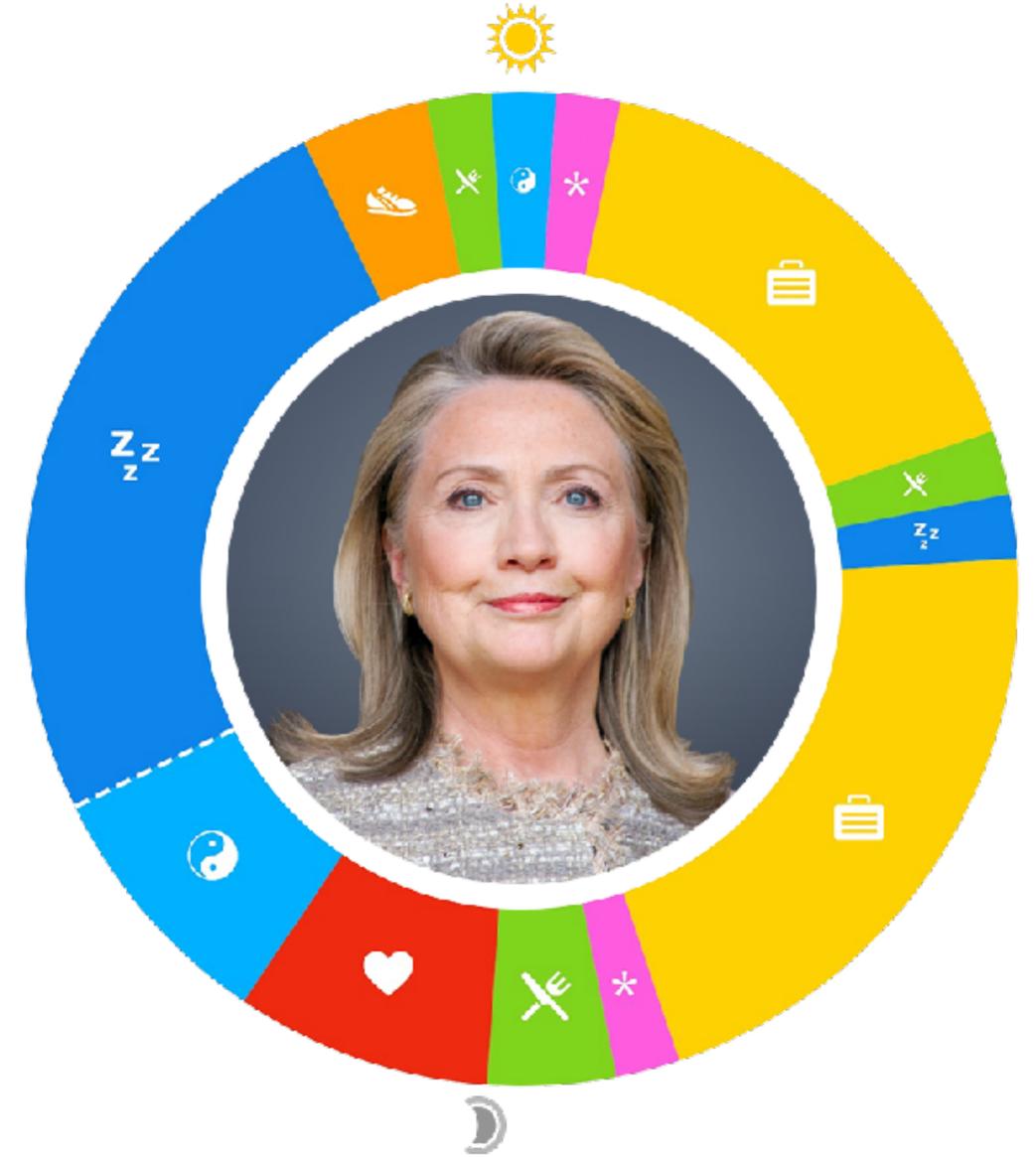


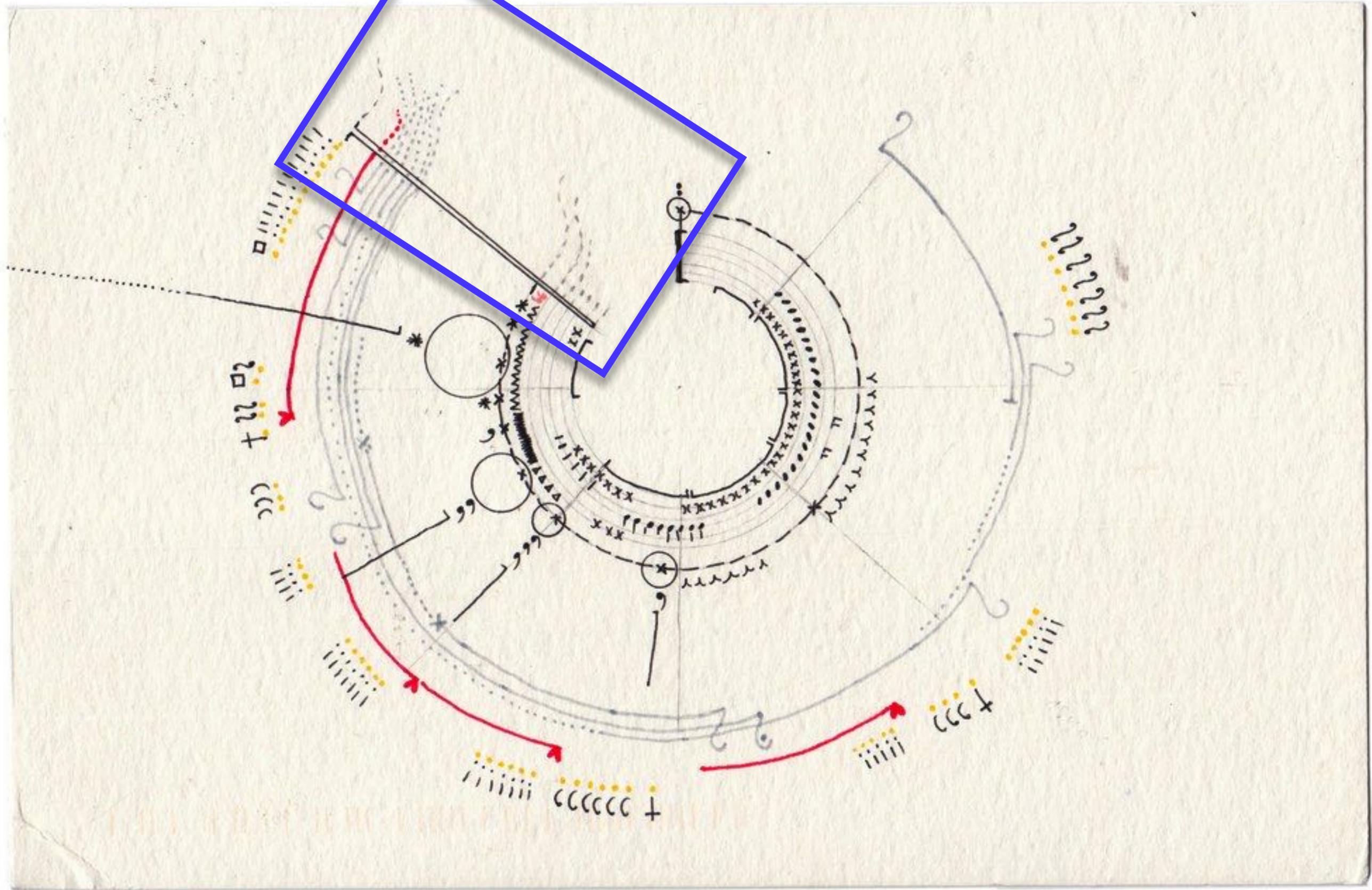
1066 - 1087
William I

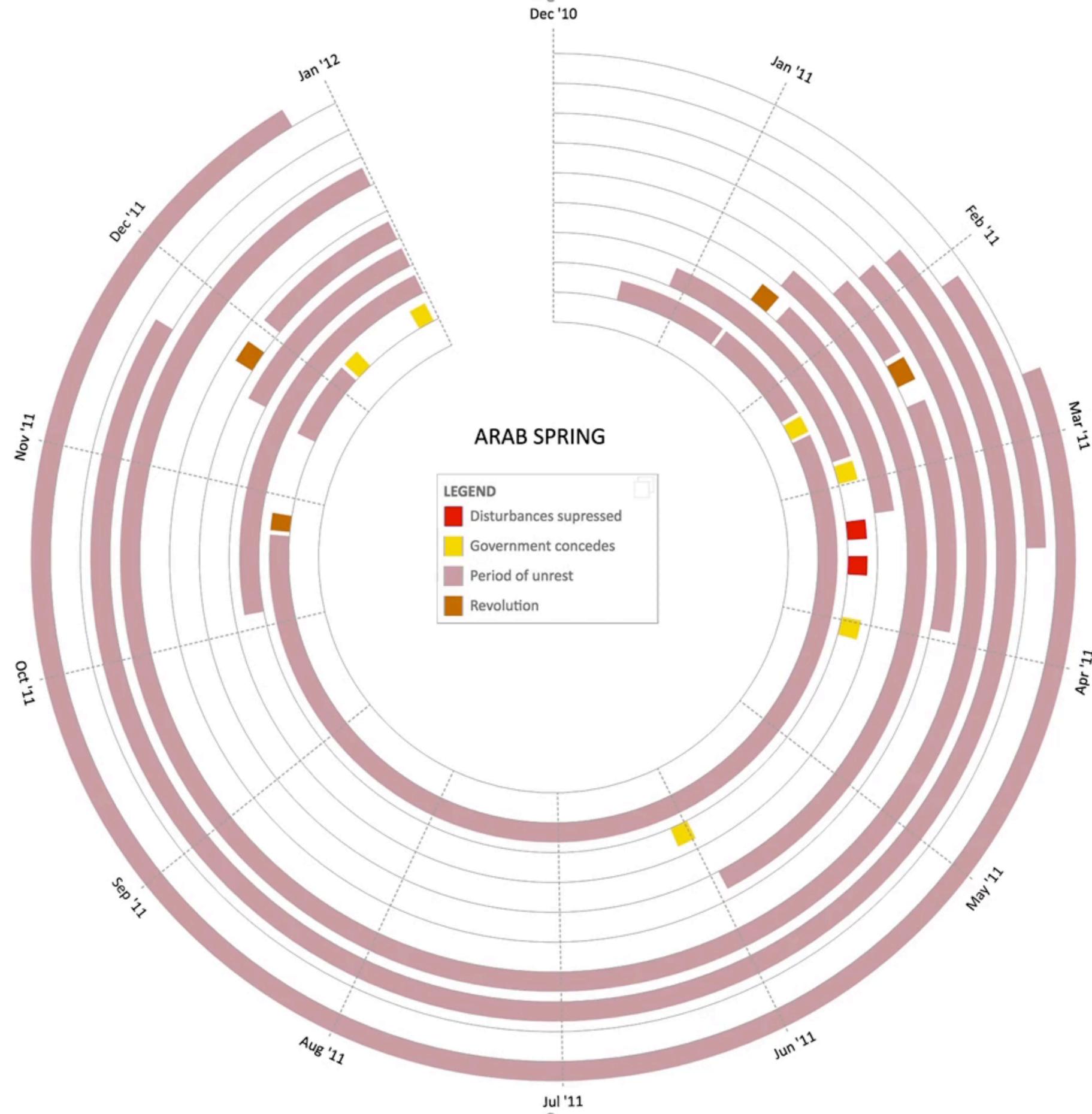
1066
The Tower Founded



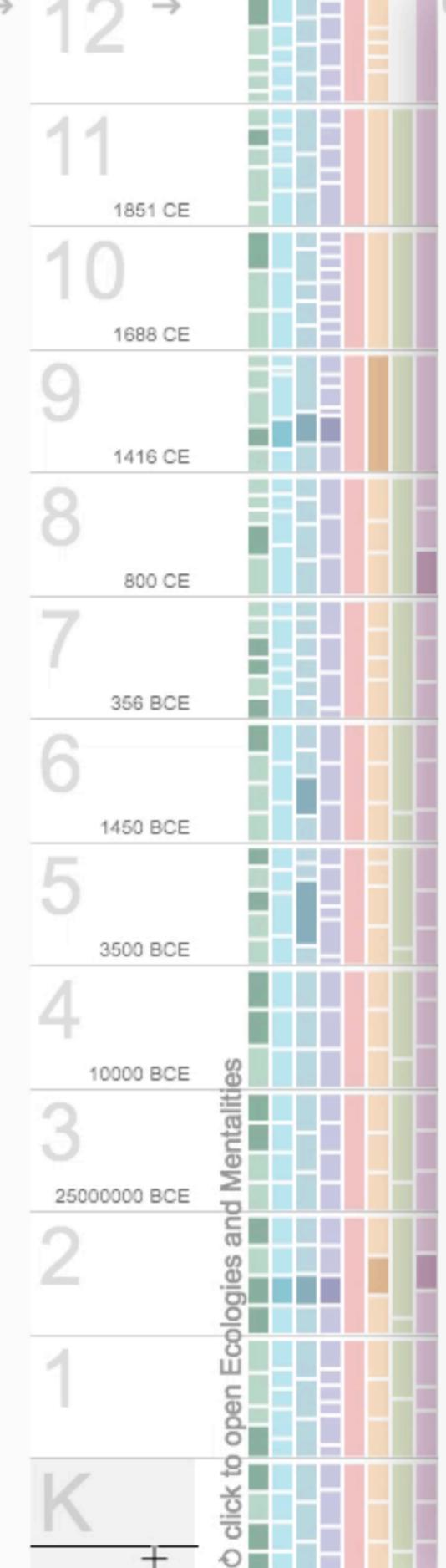
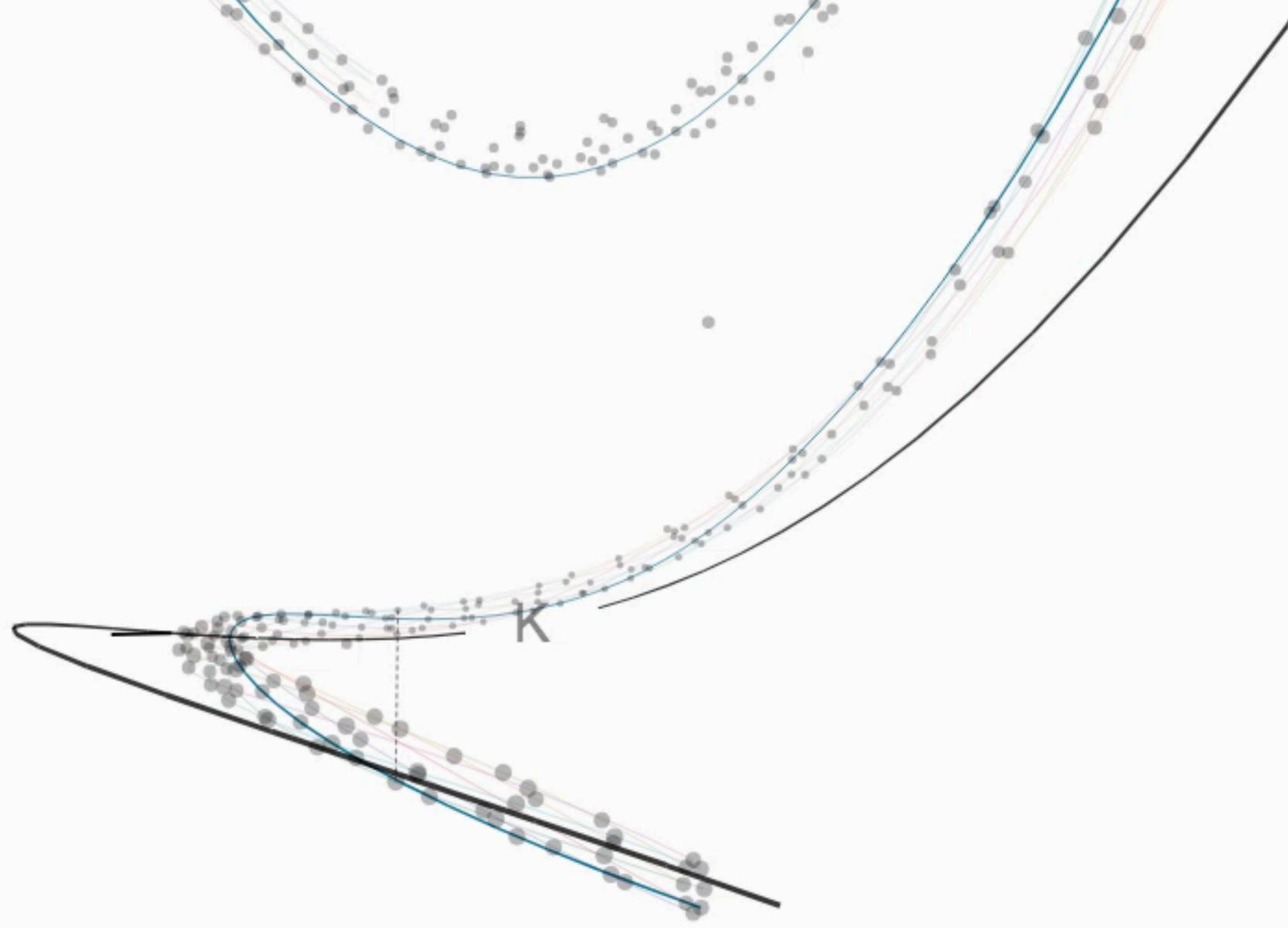












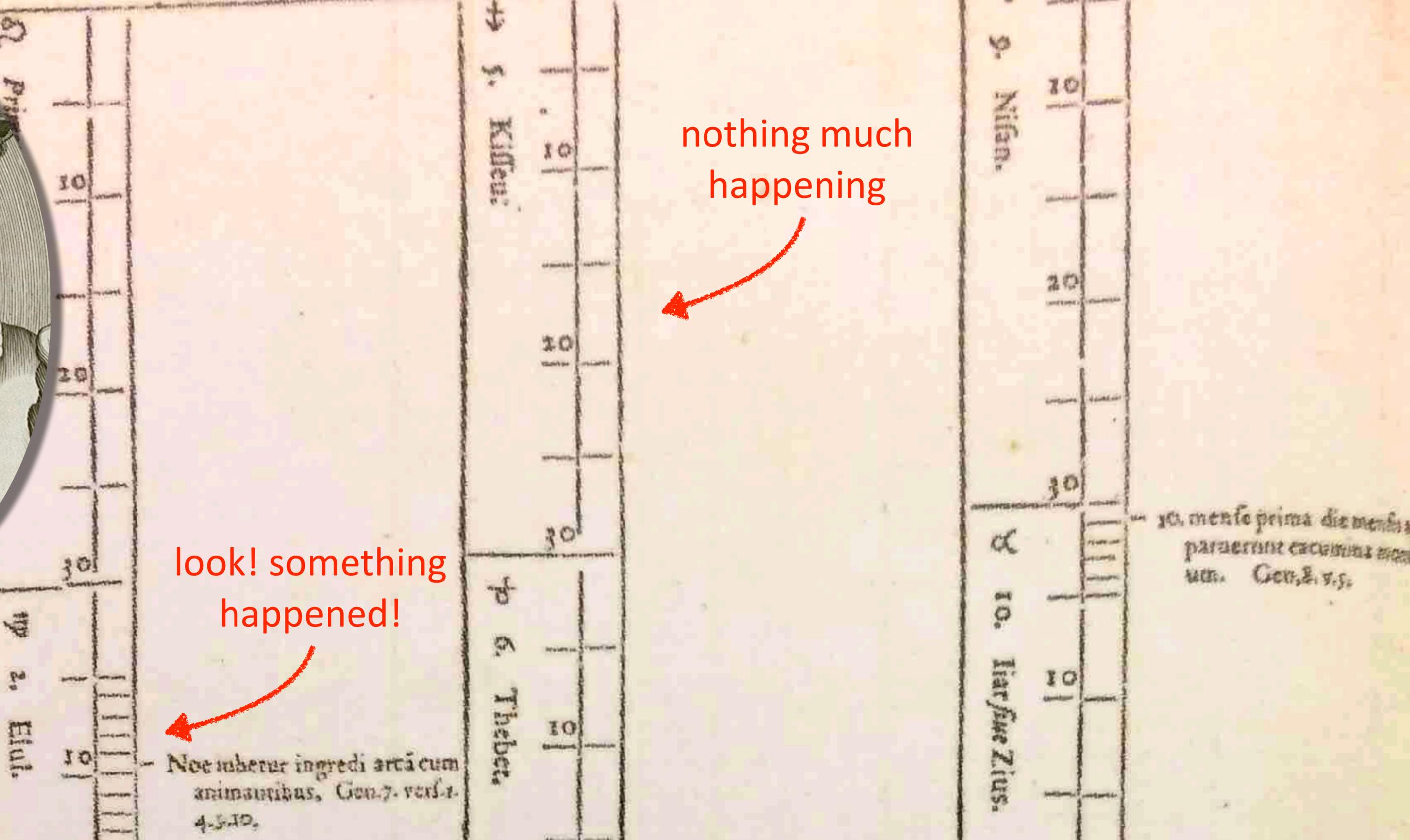




La Zorca



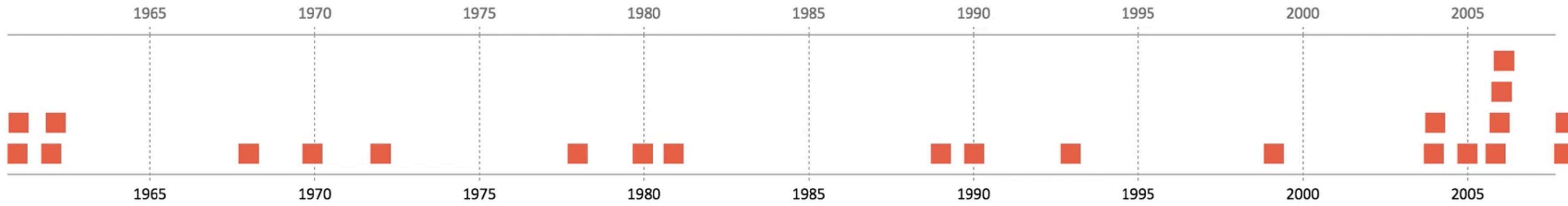
Aeuum primum.

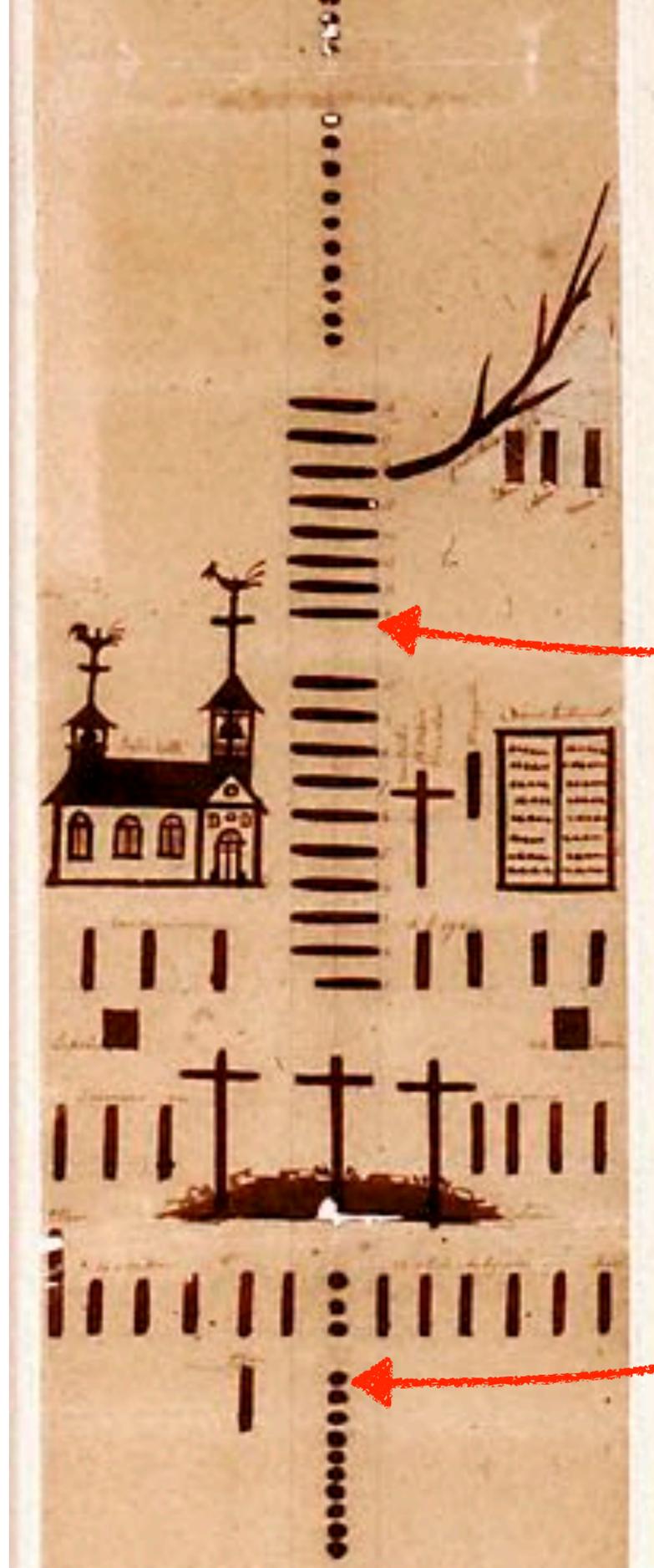


nothing much happening

look! something happened!

Time Elapsed Between C5 Hurricanes (1960 – 2010) 5 Hurricanes: 1960 - 2010





each line = 1 century

each dot = 1 year

Blanchett's
Catholic Ladder
(1838)

Reference:
*Cartographies
of Time* (2010)
Rosenberg &
Grafton



May 2005
平成 17 年

Monday
1

Tuesday
2

Wednesday
3

Thursday
4

Friday
5

Saturday
6

8

9

10

11

12

13

14

15

16

17

18

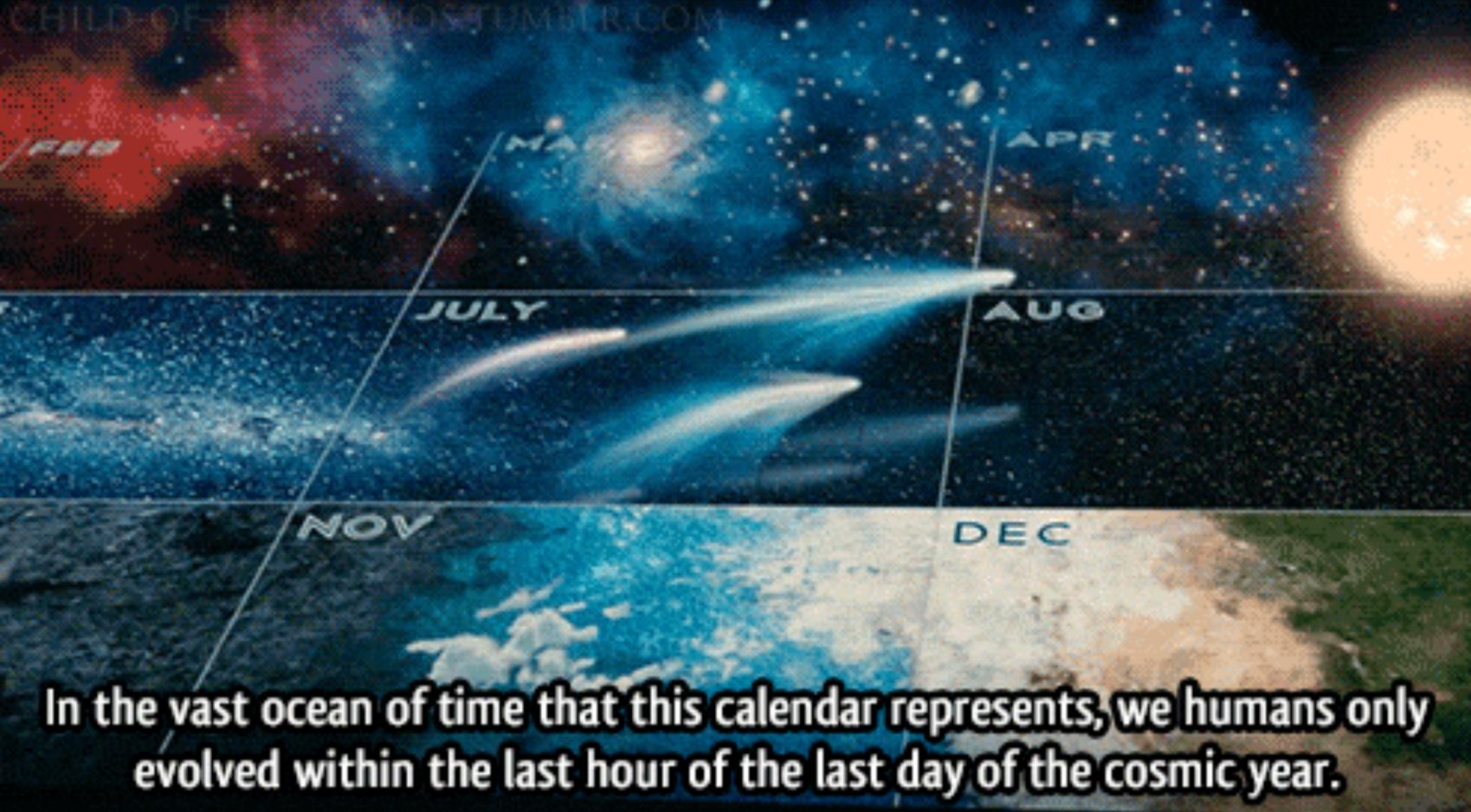
19

22

23

24

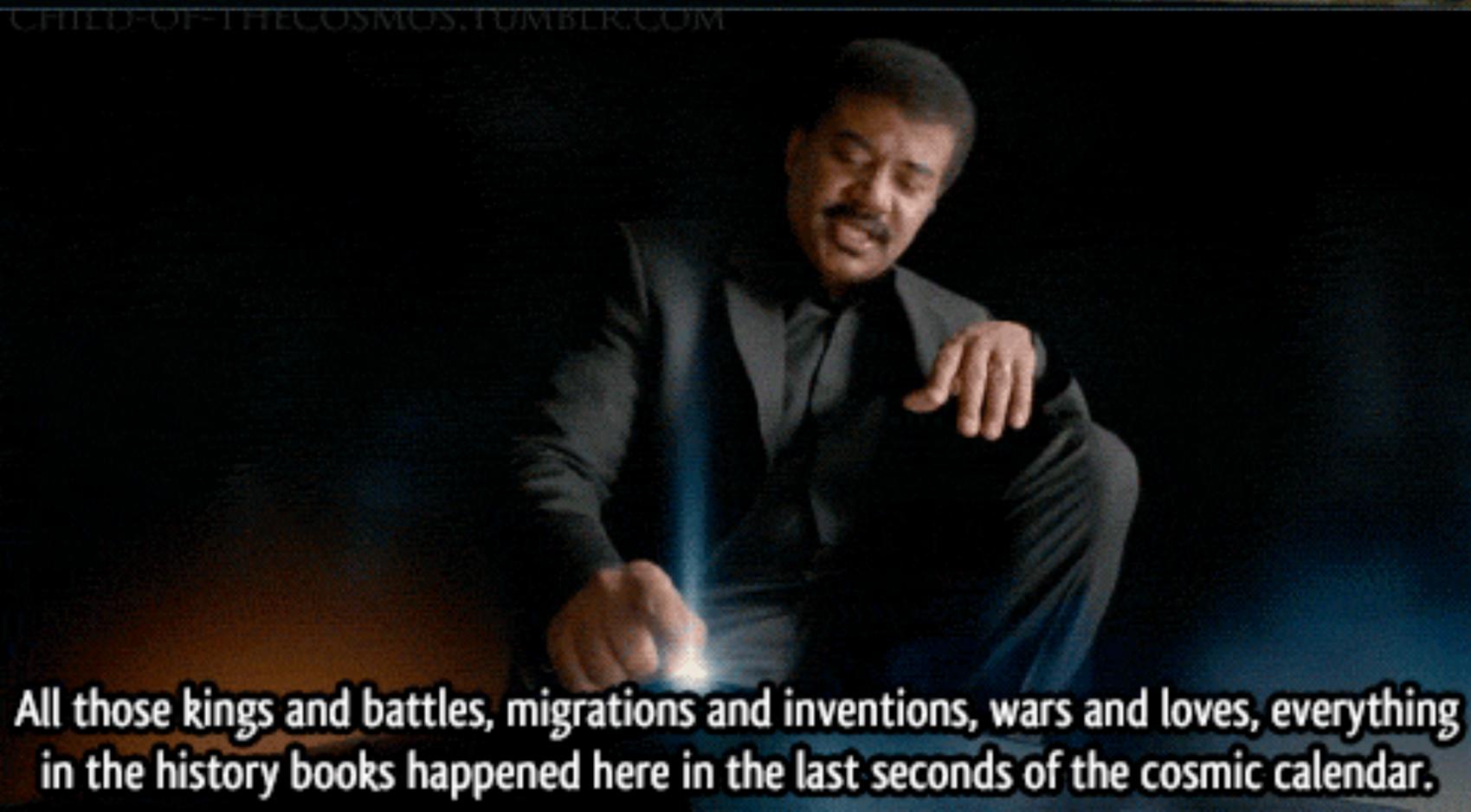
5
12 13
19 20 21
26 27 28



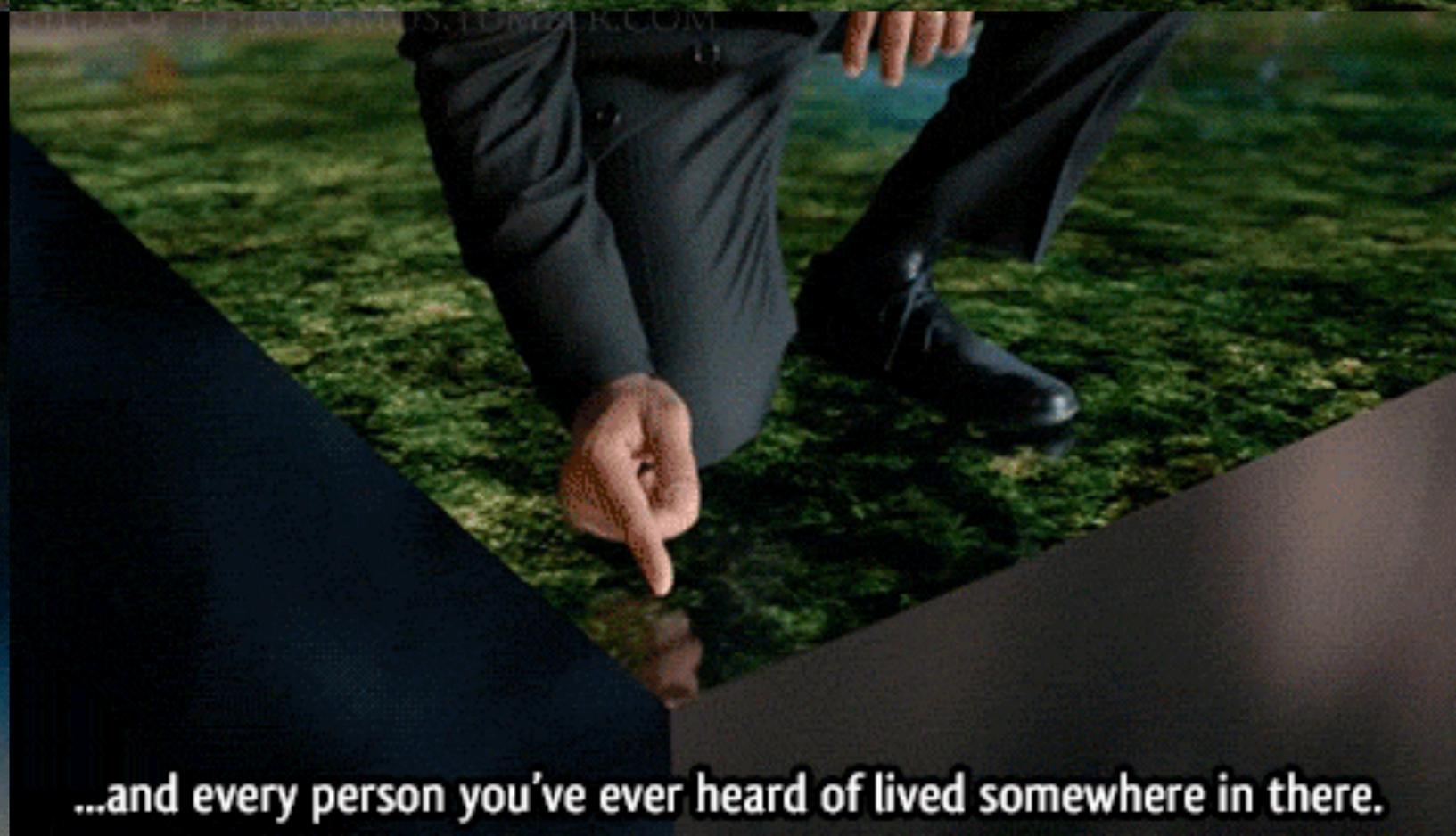
In the vast ocean of time that this calendar represents, we humans only evolved within the last hour of the last day of the cosmic year.



11:59 and 46 seconds: All of recorded history occupies only the last 14 seconds...

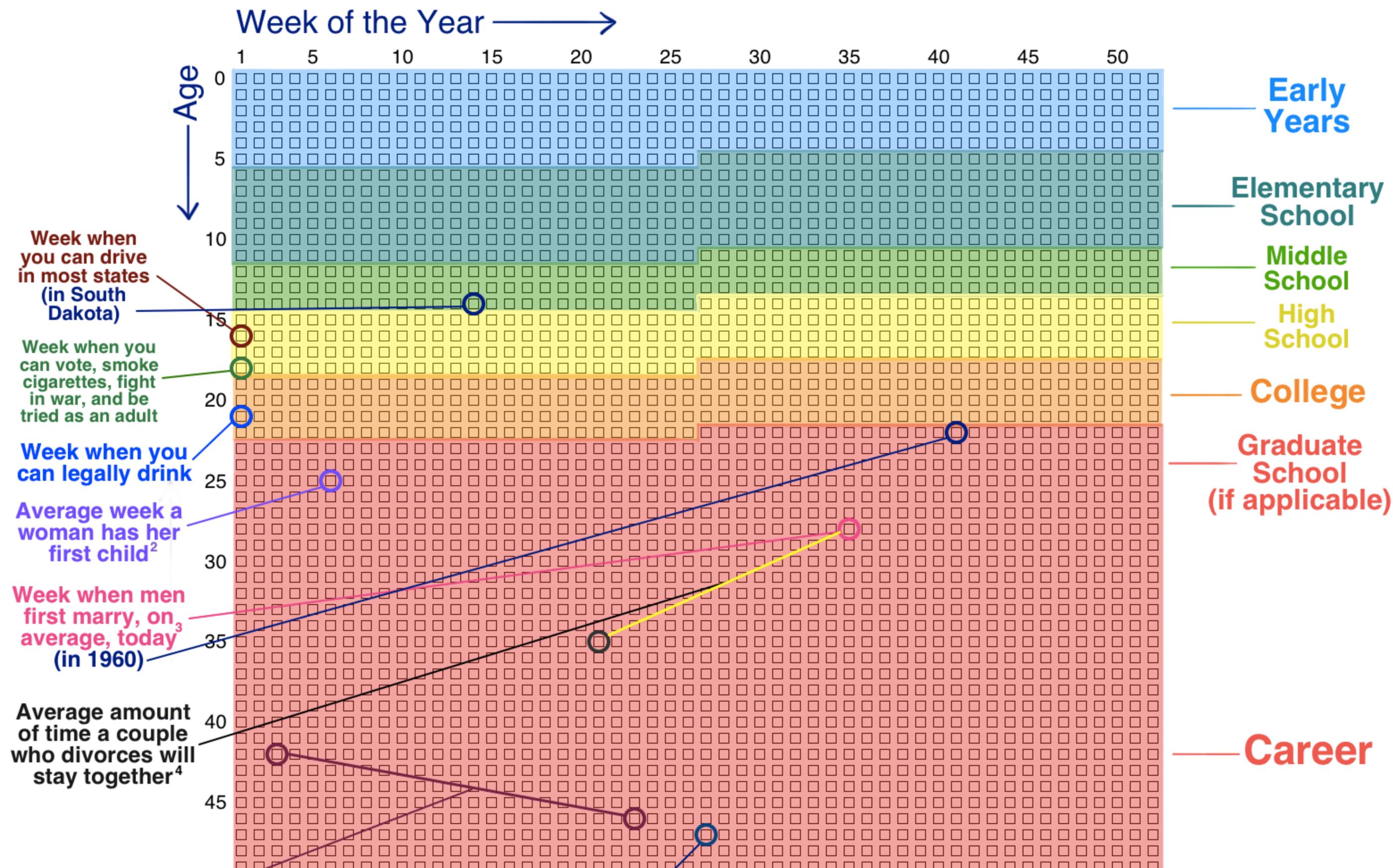


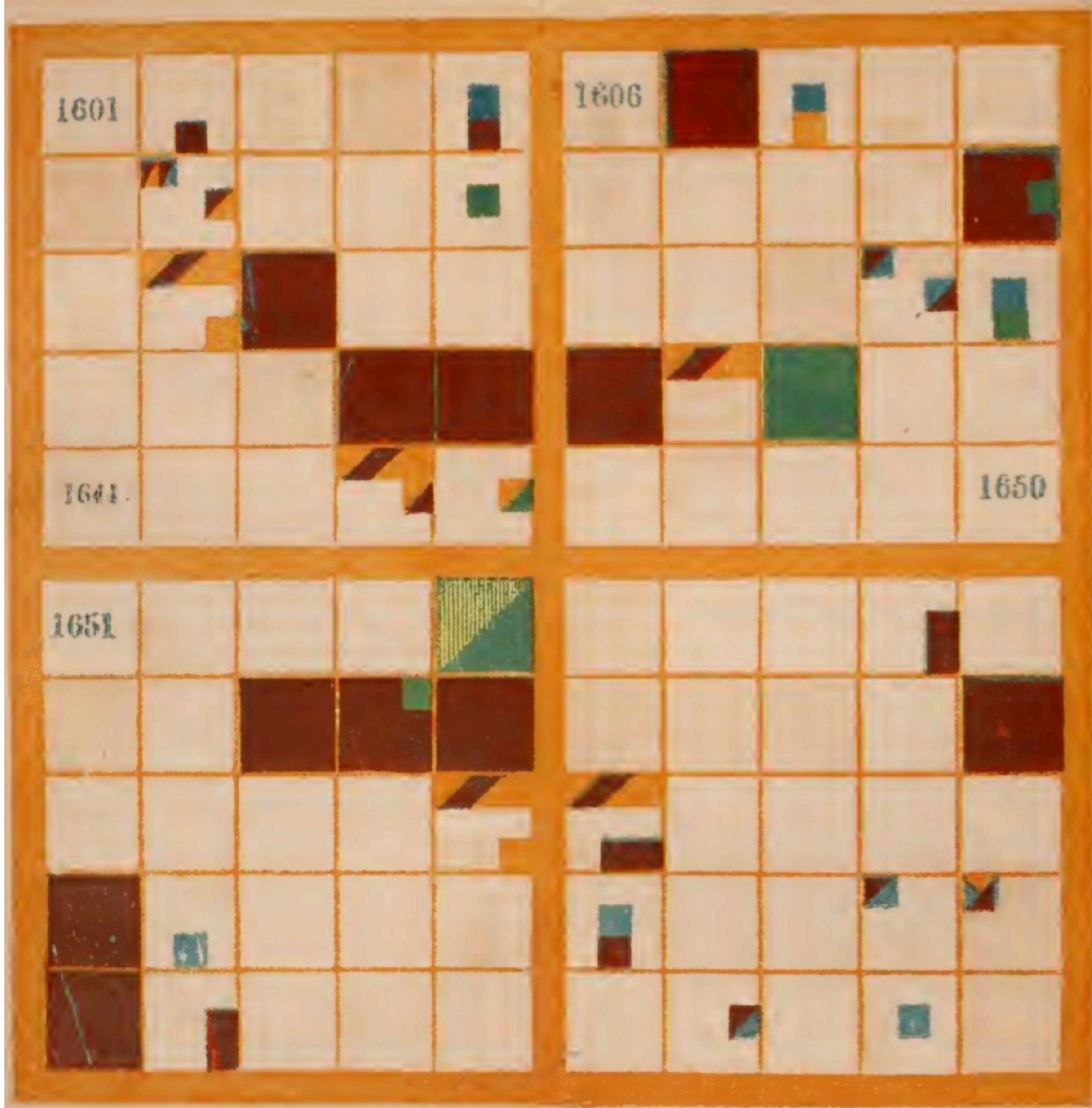
All those kings and battles, migrations and inventions, wars and loves, everything in the history books happened here in the last seconds of the cosmic calendar.



...and every person you've ever heard of lived somewhere in there.

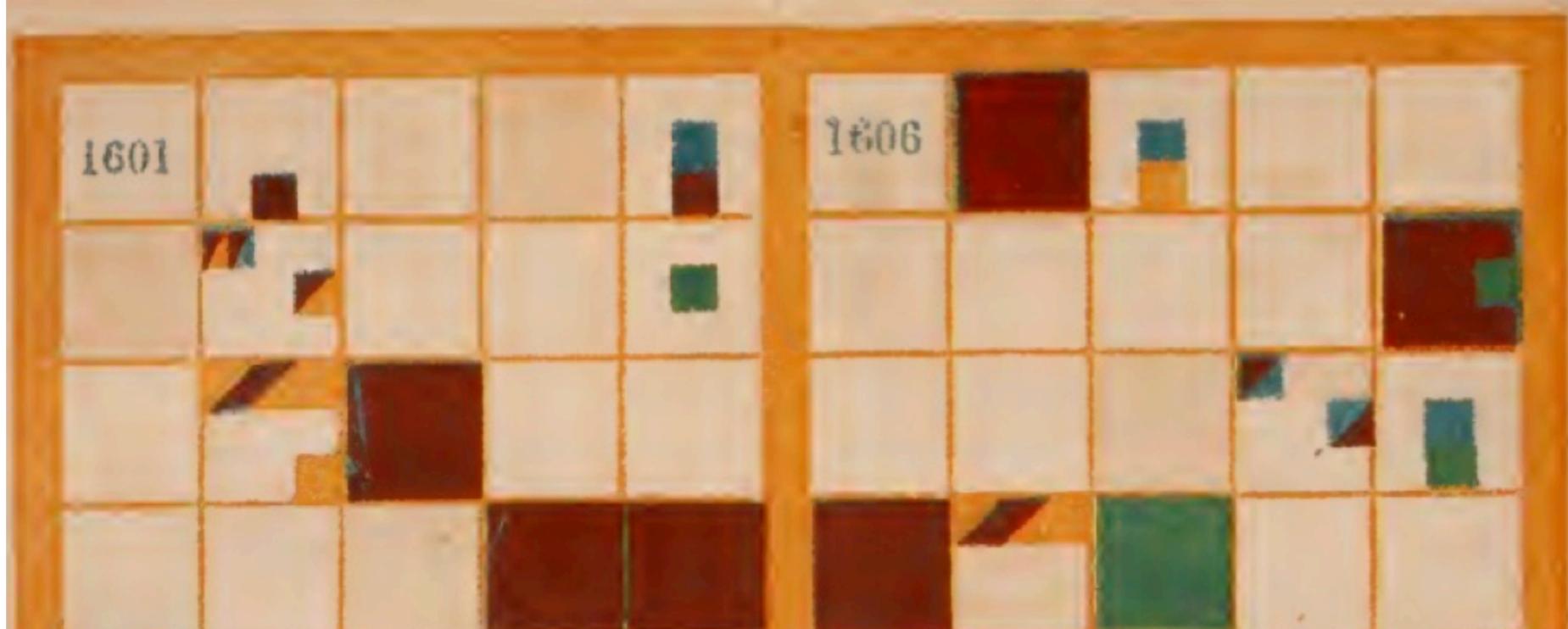






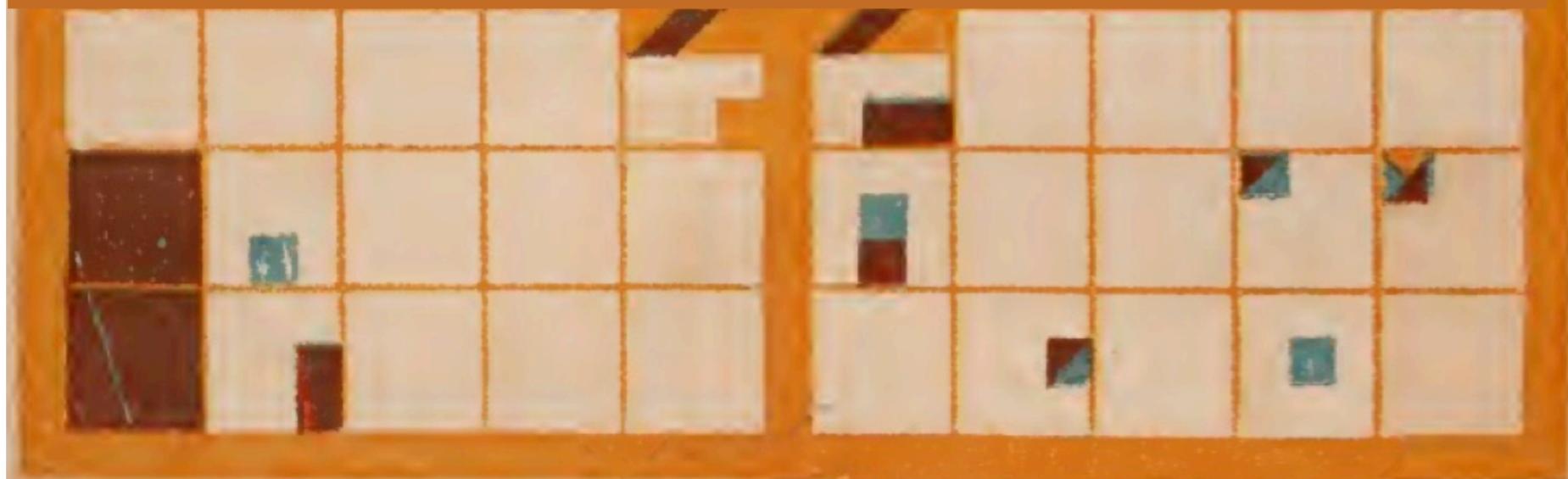
Peabody's
*Polish American
 System of Chronology*
 (mid 19th century)

Reference:
*Cartographies
 of Time* (2010)
 Rosenberg &
 Grafton



The Shape of History

Reimagining Elizabeth Palmer Peabody's Historical Visualization Work



HARPER'S MONTHLY MAGAZINE

Vol. cxxx December, 1914. No. DCCLXXV



How to Make
History Dates Stick
By Mark Twain

With Many Illustrations by the Author



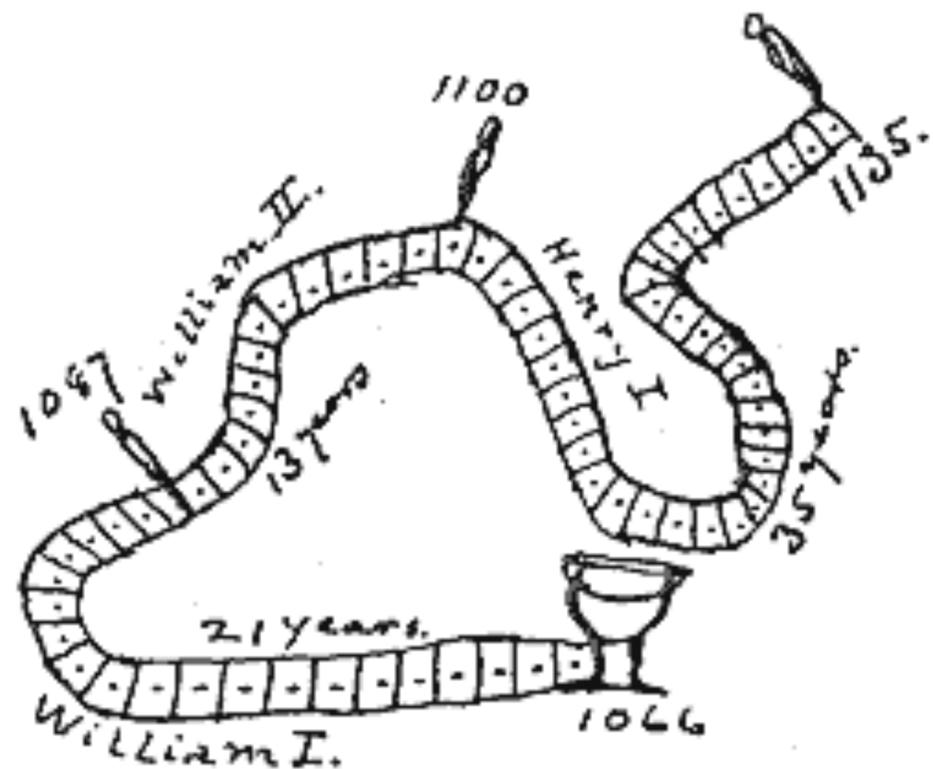


FIG. 2

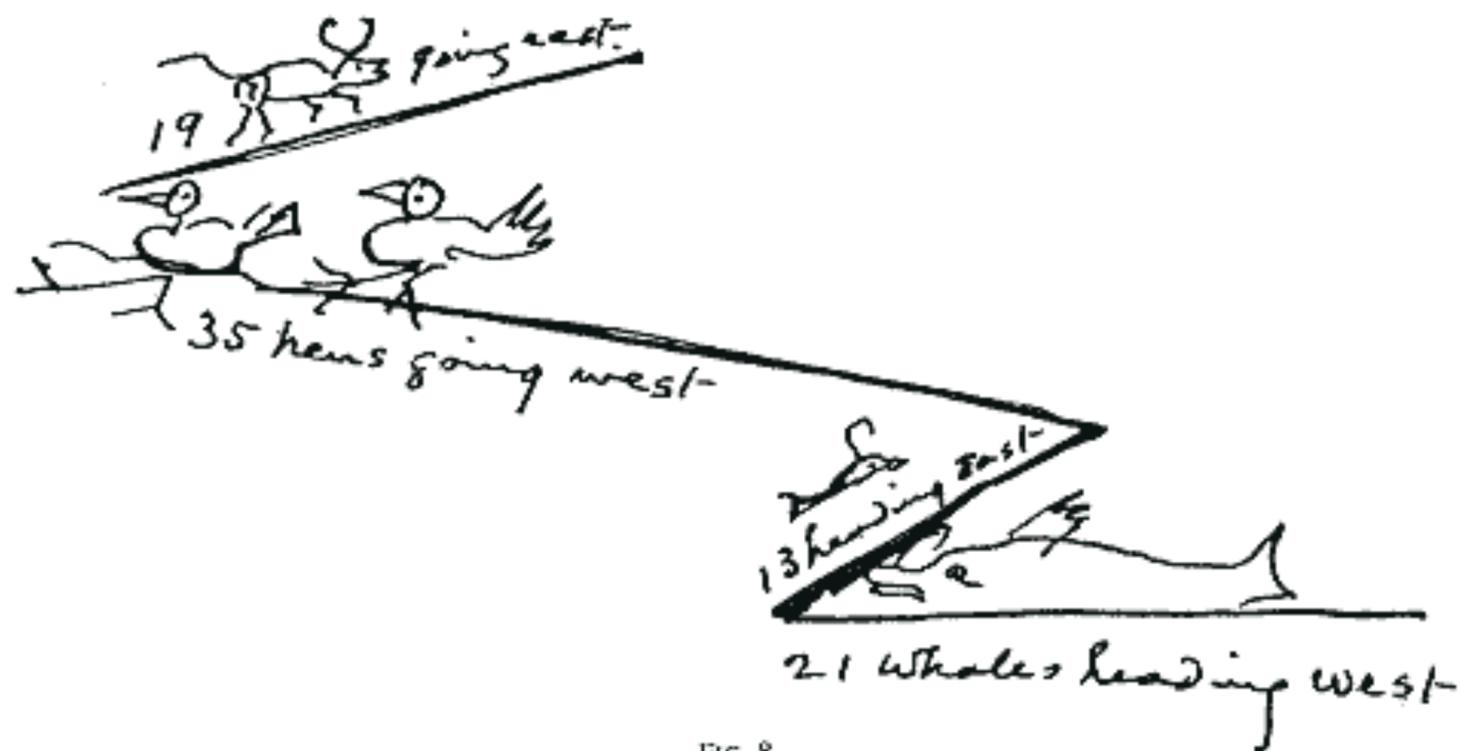
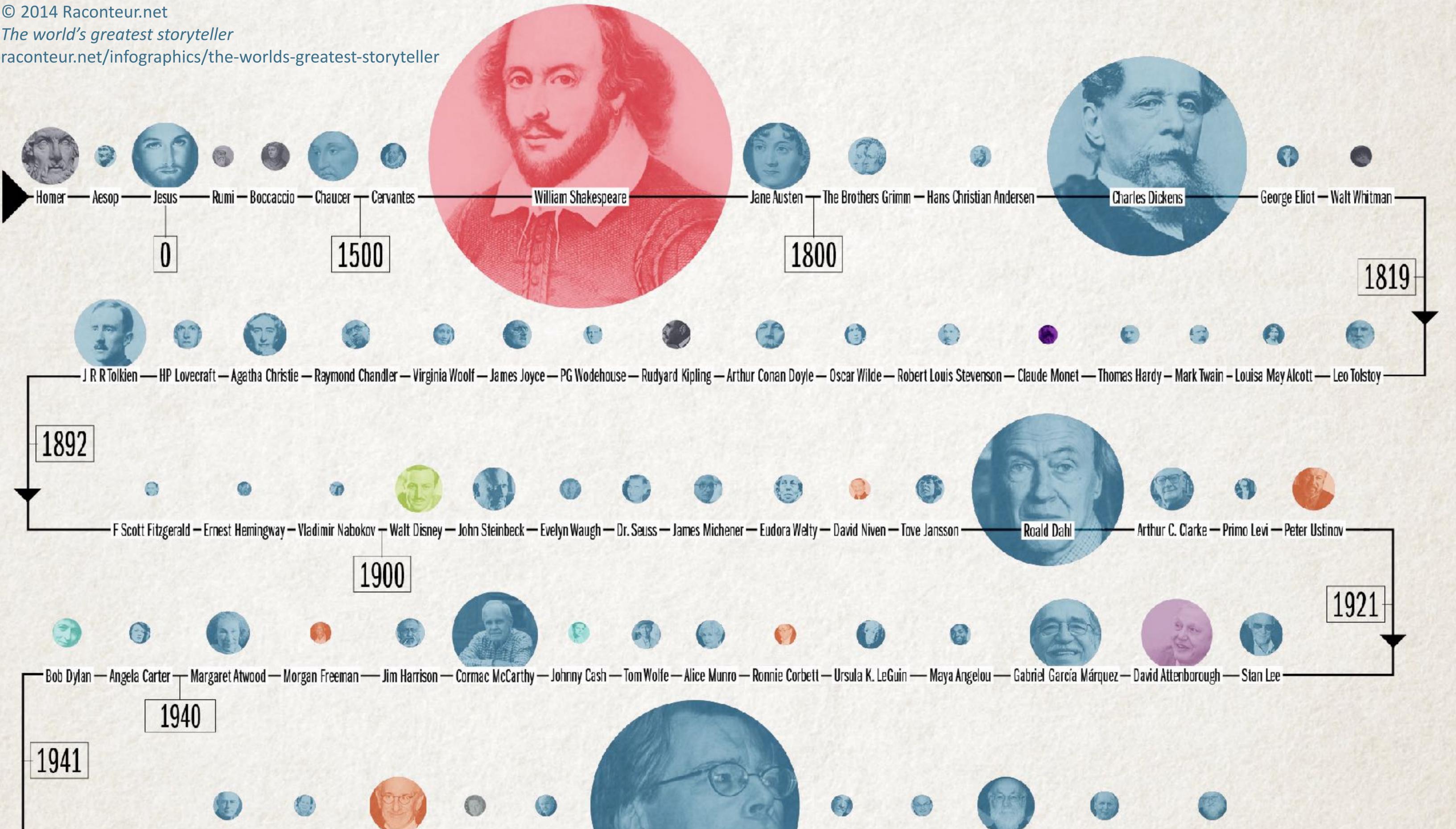
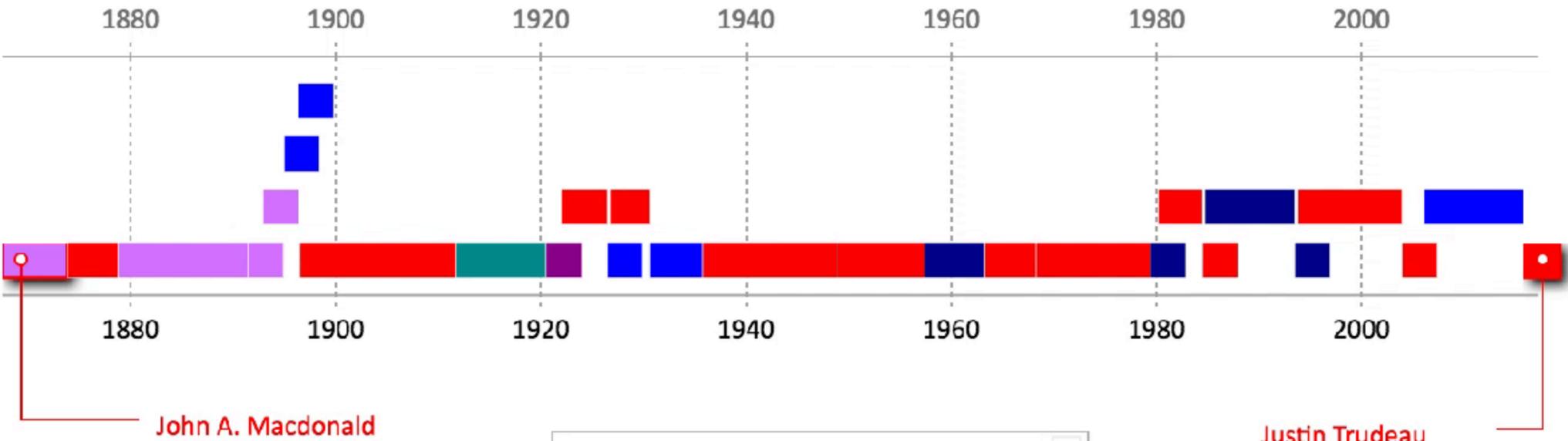


FIG. 8



Prime Ministers of Canada

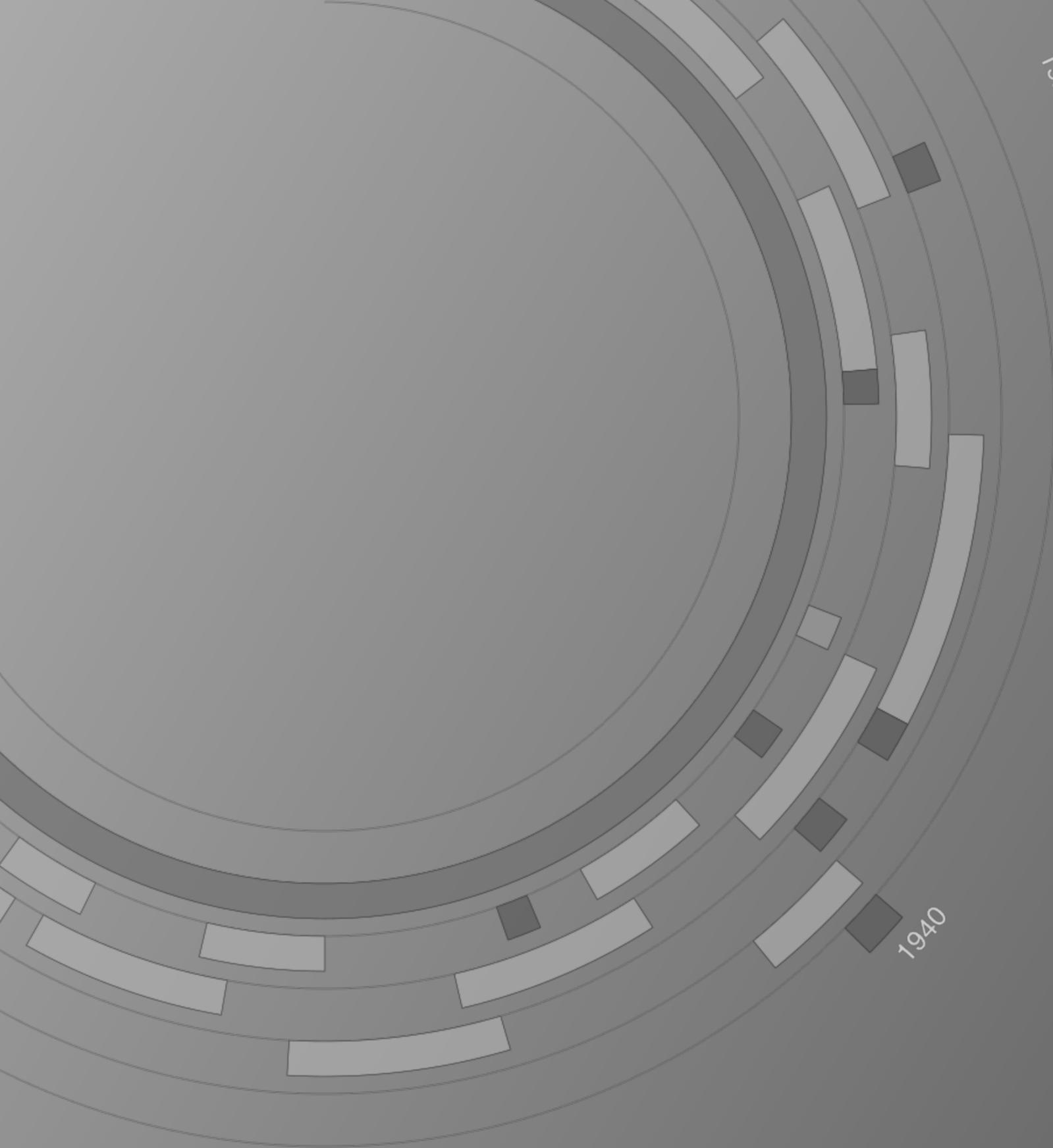


LEGEND

- Conservative
- Conservative and Unionist
- Liberal
- Liberal-Conservative
- National Liberal and Conservative
- Progressive Conservative

(just a few) VISUAL REPRESENTATIONS OF TIME





WHAT IS A **TIMELINE** FOR?

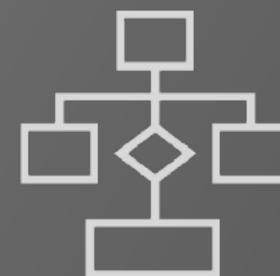
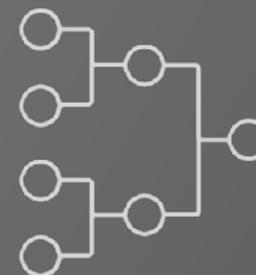
WHAT HAPPENED WHEN?

WHEN & HOW MUCH?

WHERE, WHAT, & WHEN?

WHAT WAS RELATED WHEN?

WHAT IF & WHEN?



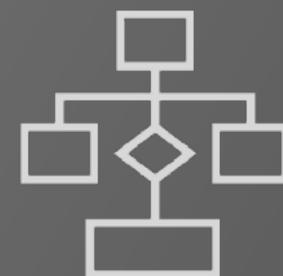
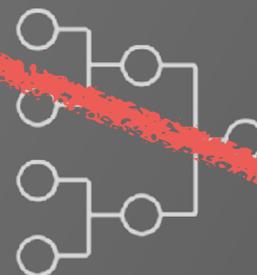
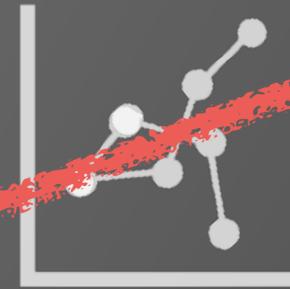
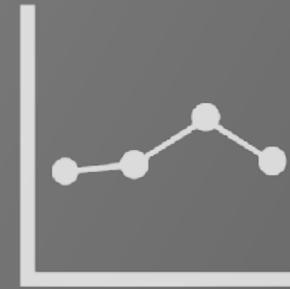
WHAT HAPPENED WHEN?

WHEN & HOW MUCH?

WHERE, WHAT, & WHEN?

WHAT WAS RELATED WHEN?

WHAT IF & WHEN?



WHAT HAPPENED WHEN?



in what sequence?

for how long?

did events A and B co-occur?

when, relative to event C?



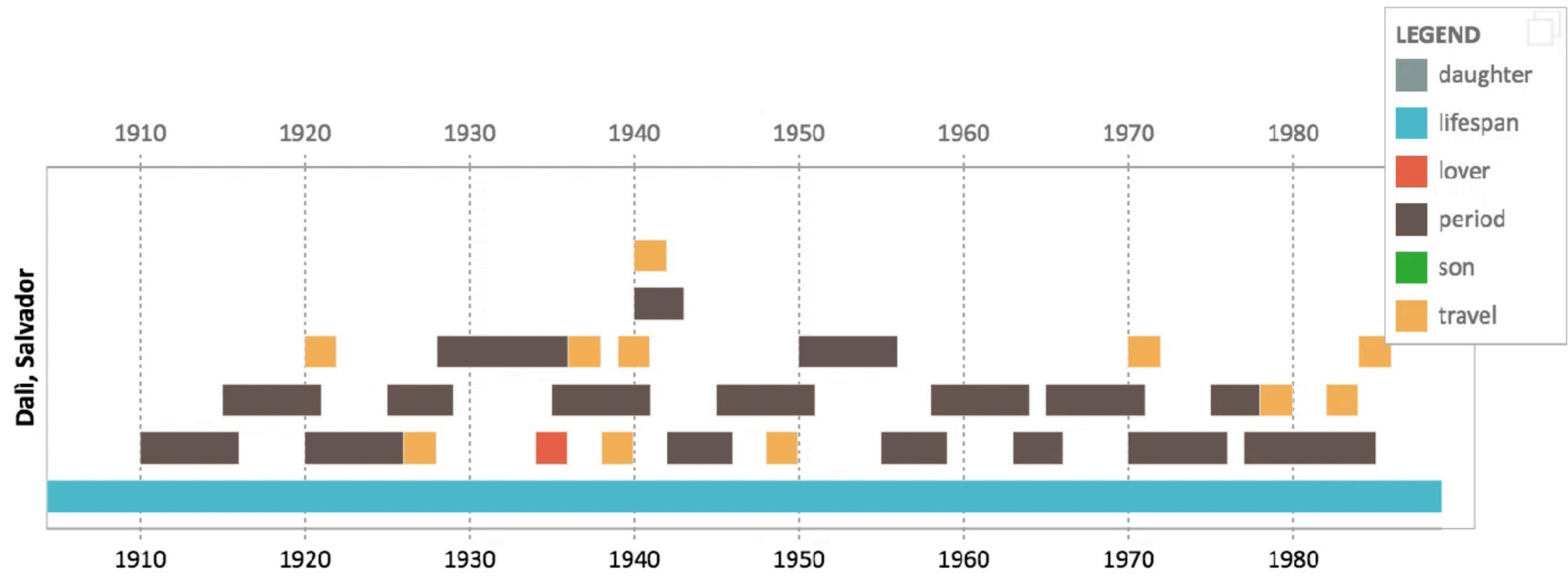
1910

1920

1930

1940

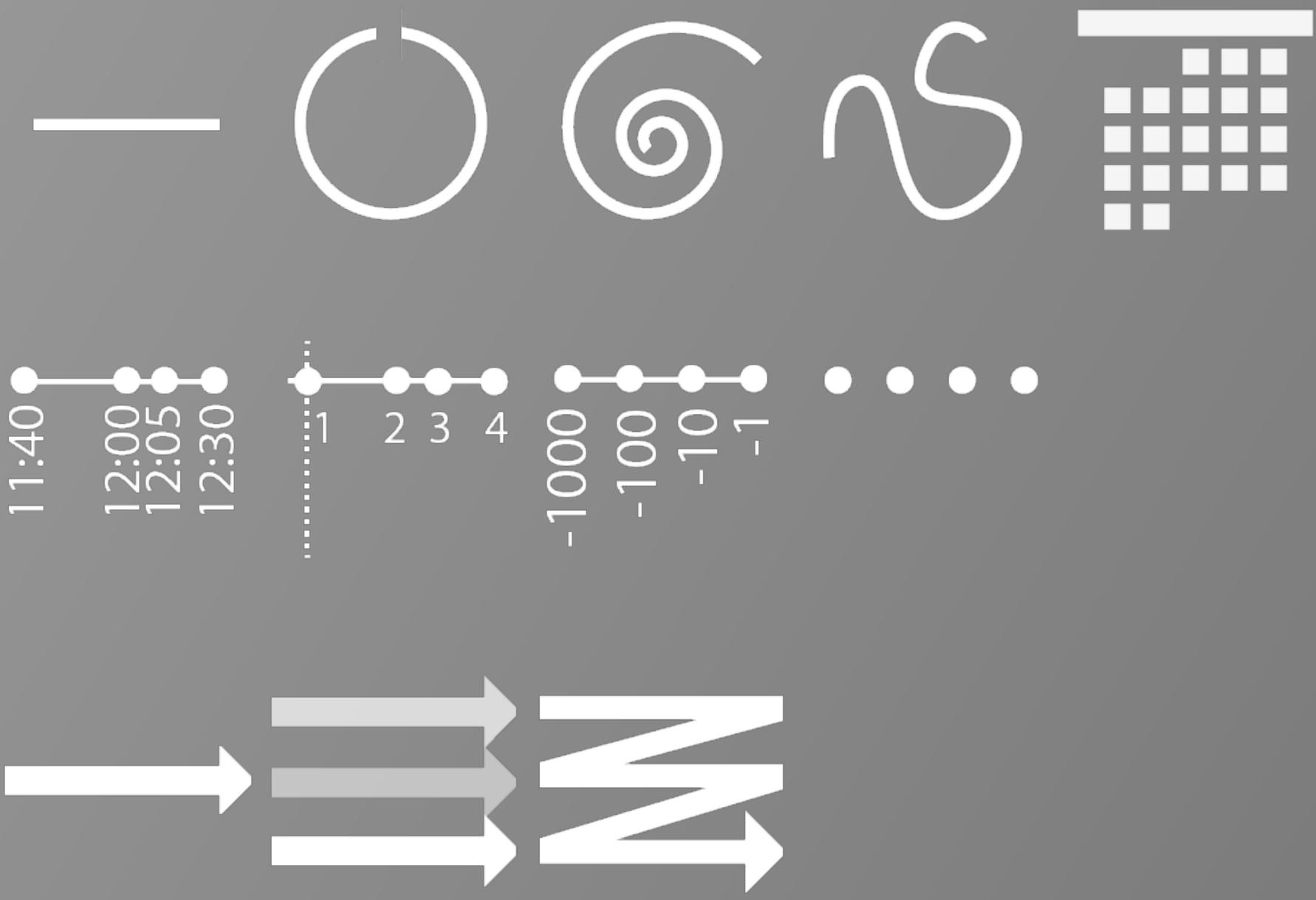
1950



REPRESENTATION

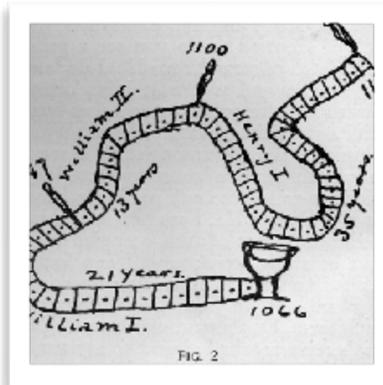
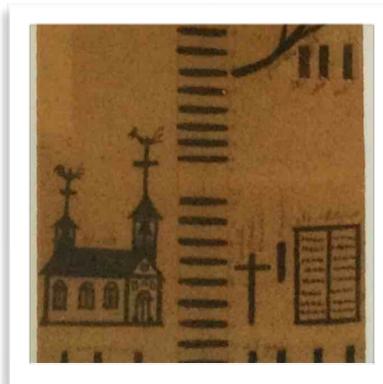
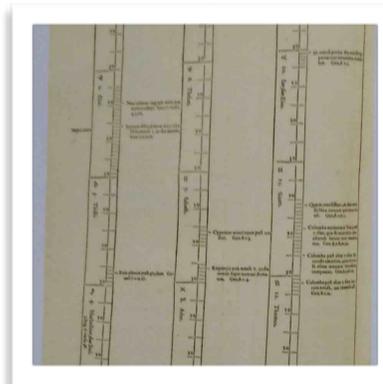
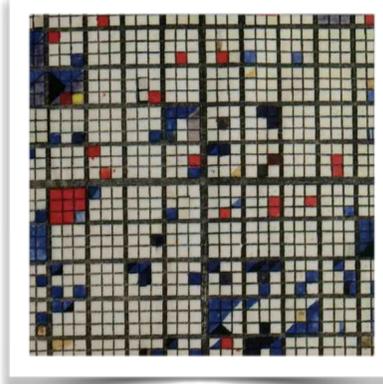
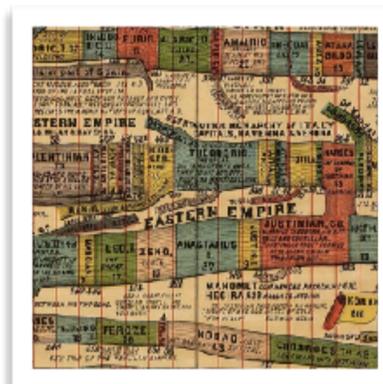
SCALE

LAYOUT

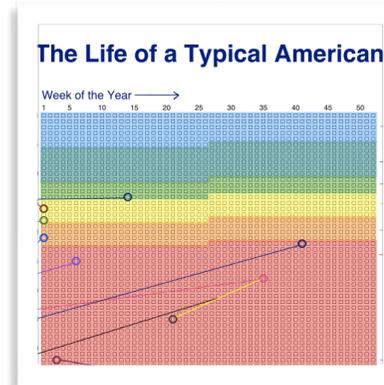
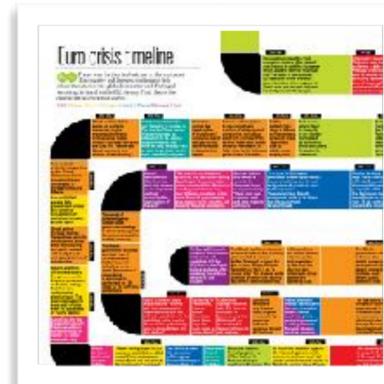


A survey of 263 timelines & timeline-producing tools

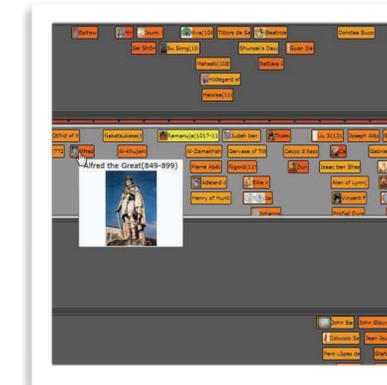
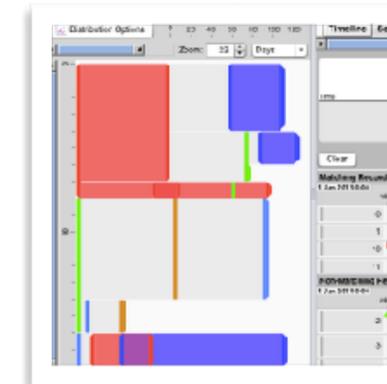
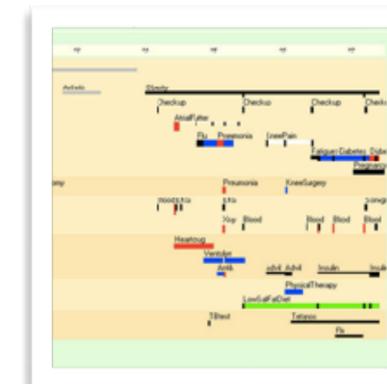
TIMELINES THROUGHOUT HISTORY



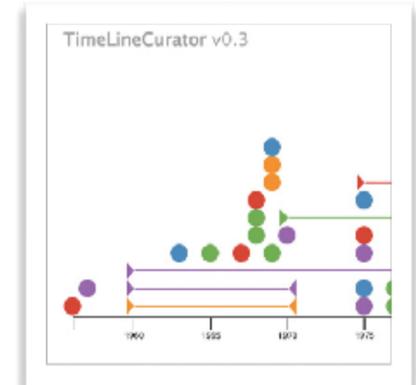
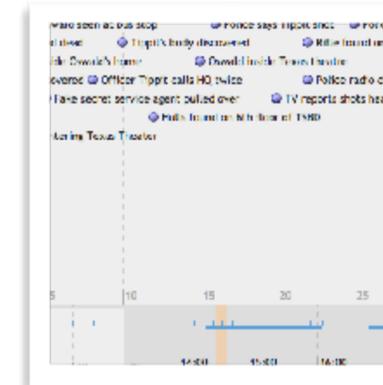
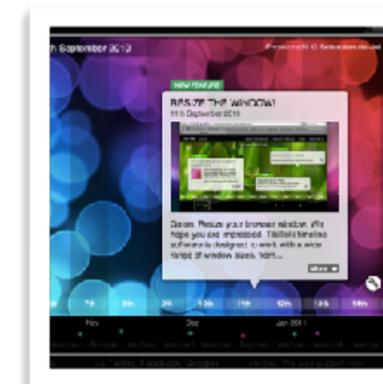
INFOGRAPHICS & BESPOKE TIMELINES



VISUALIZATION FOR EXPLORATORY DATA ANALYSIS



INTERACTIVE TIMELINE AUTHORIZING TOOLS



A design space for expressive storytelling with timelines

Representation



Linear



Radial



Grid

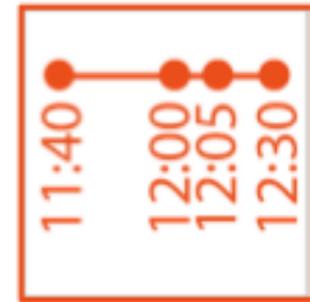


Spiral

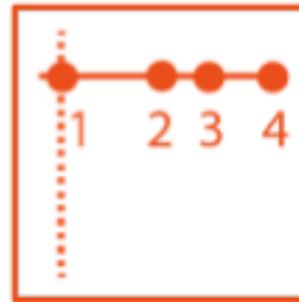


Arbitrary

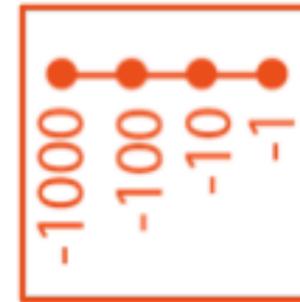
Scale



Chrono-logical



Relative



Logarithmic



Sequential



Sequential +
Interim
Duration

Layout



Unified
(single
timeline)



Faceted
(multiple
timelines)

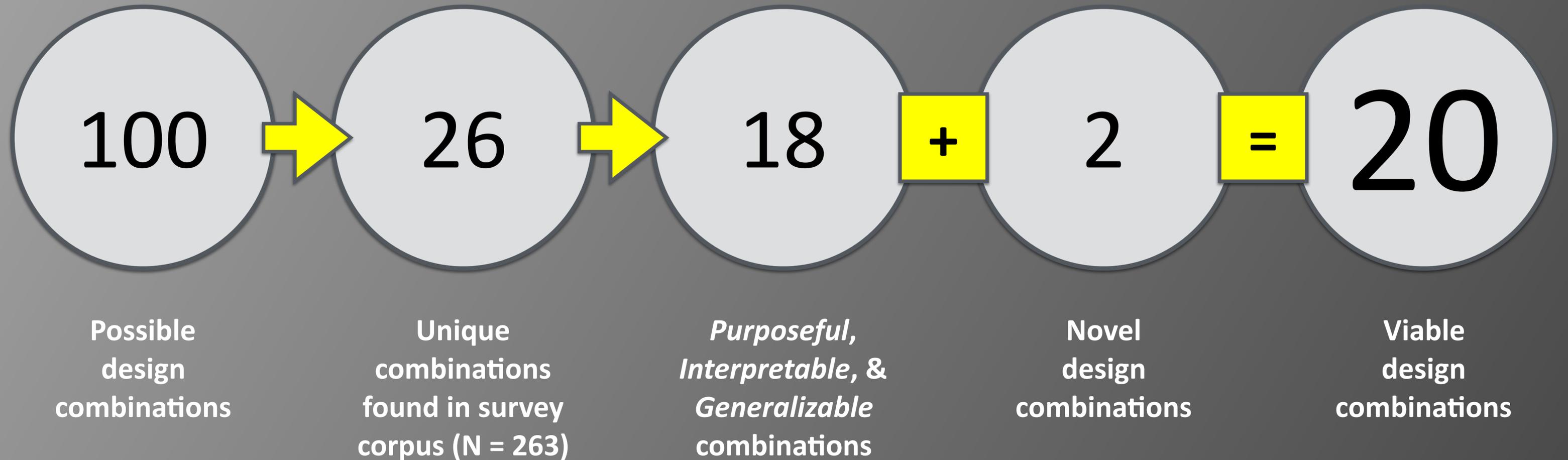


Segmented
timeline

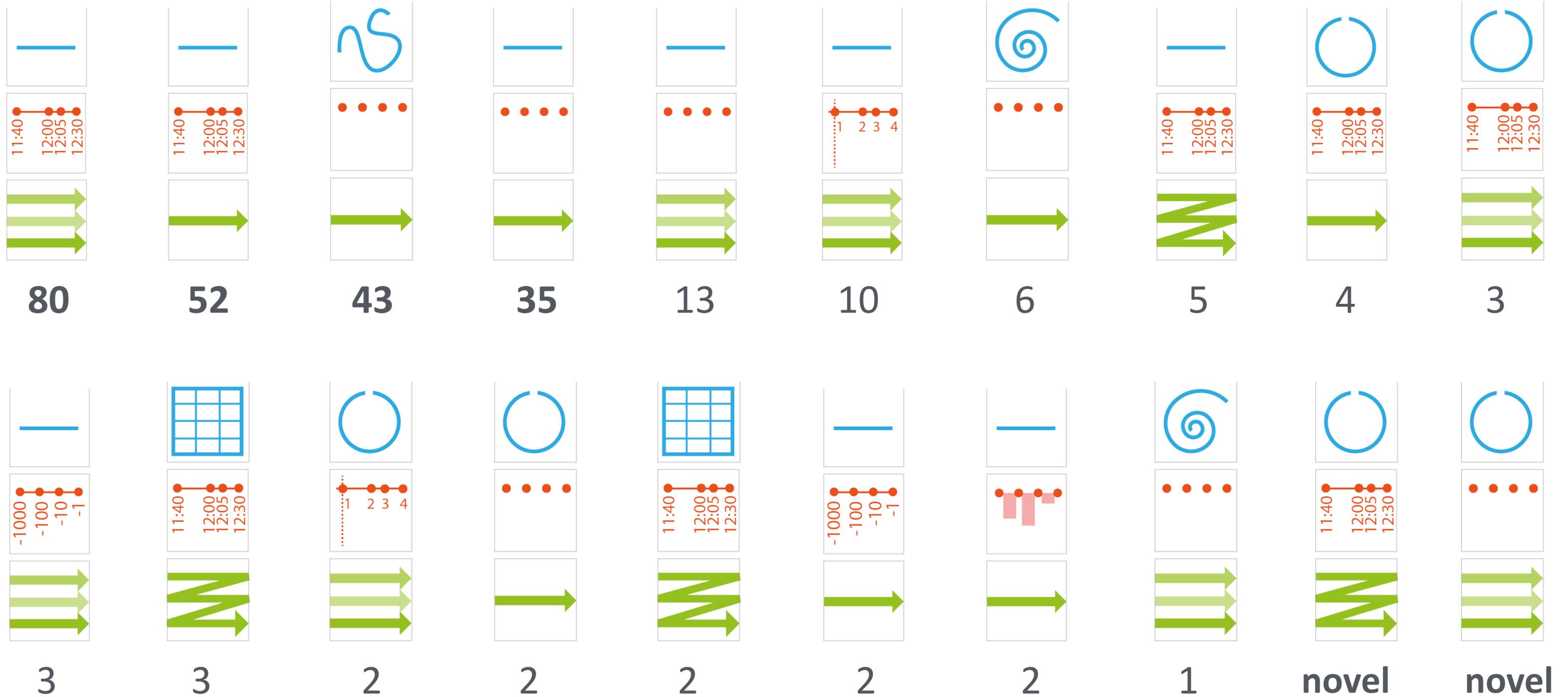


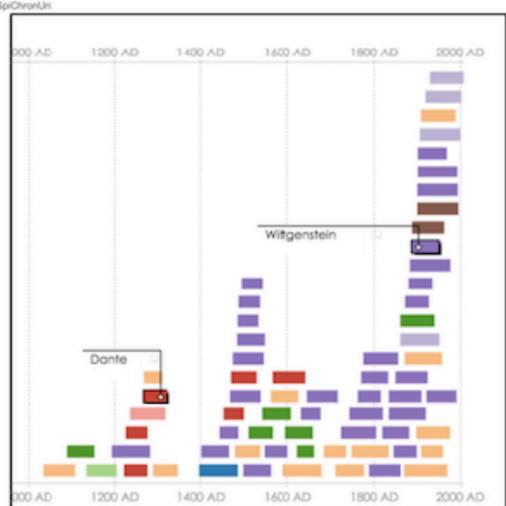
Faceted +
Segmented

Combinations of timeline design choices



20 viable combinations of timeline design choices

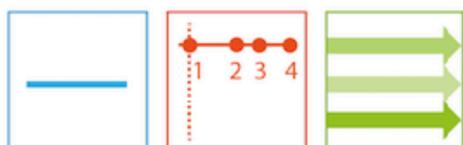
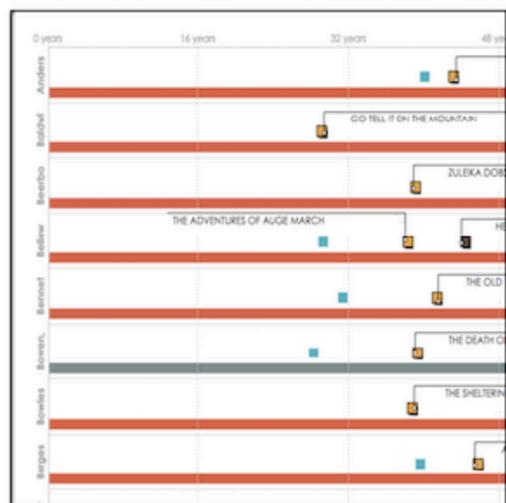




Narrative point: present chronology, duration of events.

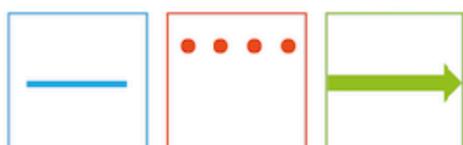
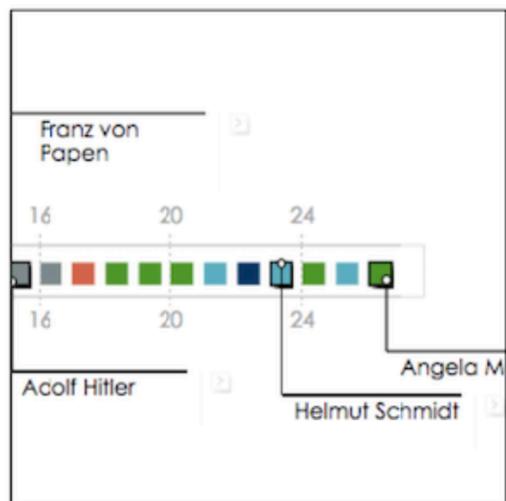
Perceptual task: bar length and position judgment.

Comment: supported by most tools.



Narrative point: compare relative chronology, duration of events between facets; present relative synchronicities.

Perceptual task: bar length and position comparisons.



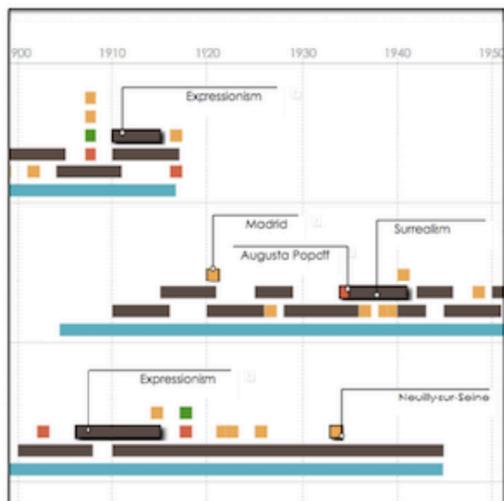
Narrative point: present a sequence of events.

Perceptual task: bar position judgments.

Comment: wide aspect ratio.

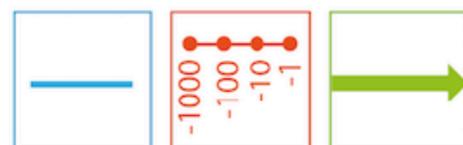
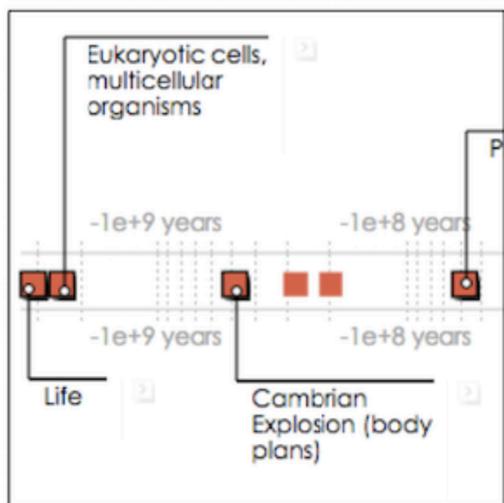


Narrative point: present chronology, duration of events.



Narrative point: compare chronology, duration of events between facets; present synchronicities (coinciding events).

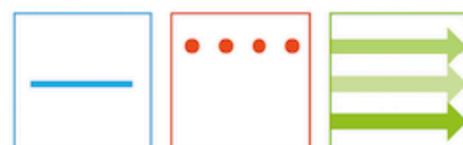
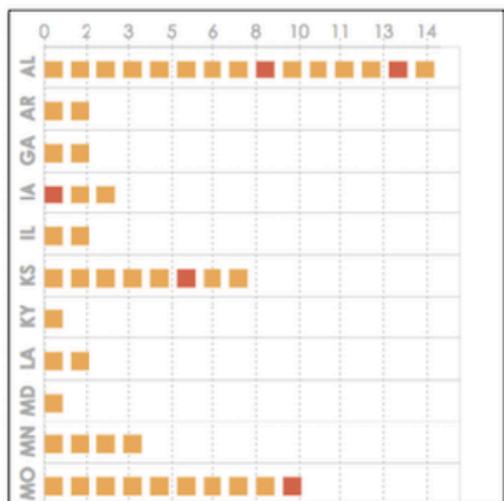
Perceptual task: bar length and position comparisons.



Narrative point: present chronology of a timeline with emphasis on recent events.

Perceptual task: bar position judgment.

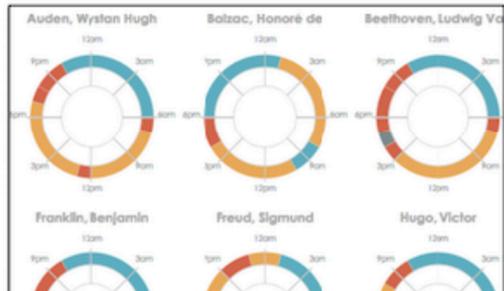
Comment: do not start story with log scale.



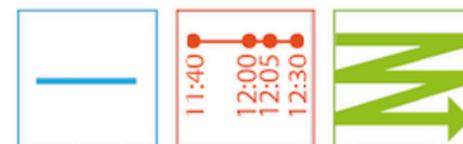
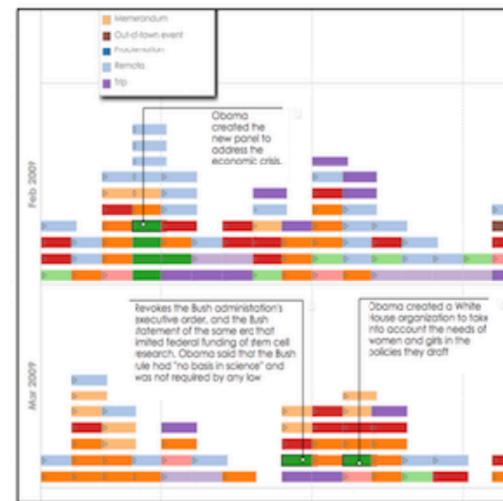
Narrative point: (accurately) compare lengths of sequences between facets.

Perceptual task:

Comment:

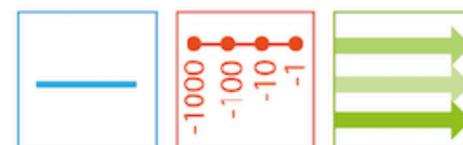
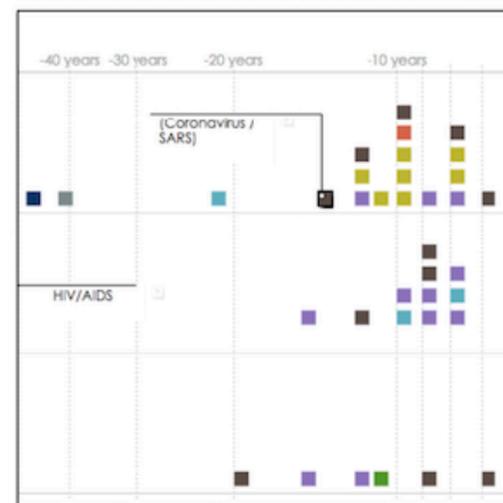


Narrative point: compare chronology, duration of events between facets.



Narrative point: compare chronology, duration, periodicity of events between segments.

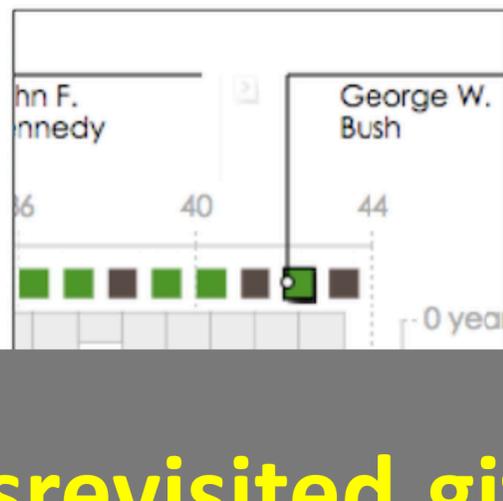
Perceptual task: bar length and position comparisons.



Narrative point: compare chronologies with emphasis on recent events between facets; show synchronicity.

Perceptual task: bar position comparisons.

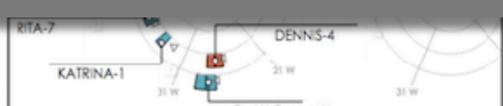
Comment: do not start story with log scale.



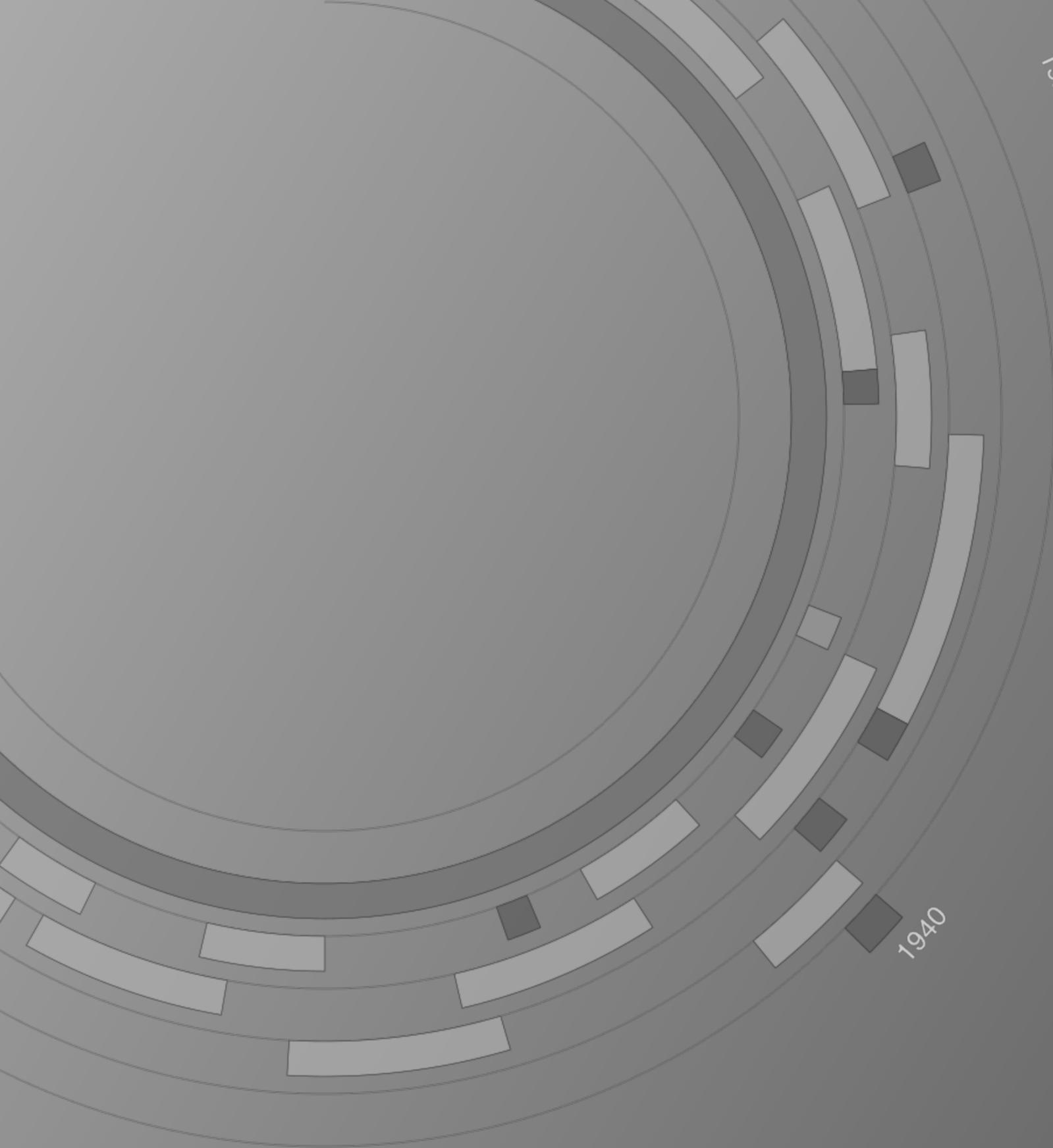
Narrative point: present a sequence of events with distribution of time elapsed between events.

timelinesrevisited.github.io

journal paper + survey + example galleries



Narrative point: compare chronology, duration, periodicity of events.



1920

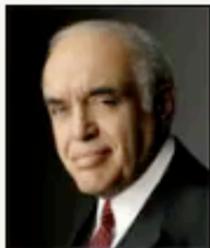
1930

1940

1950

1960

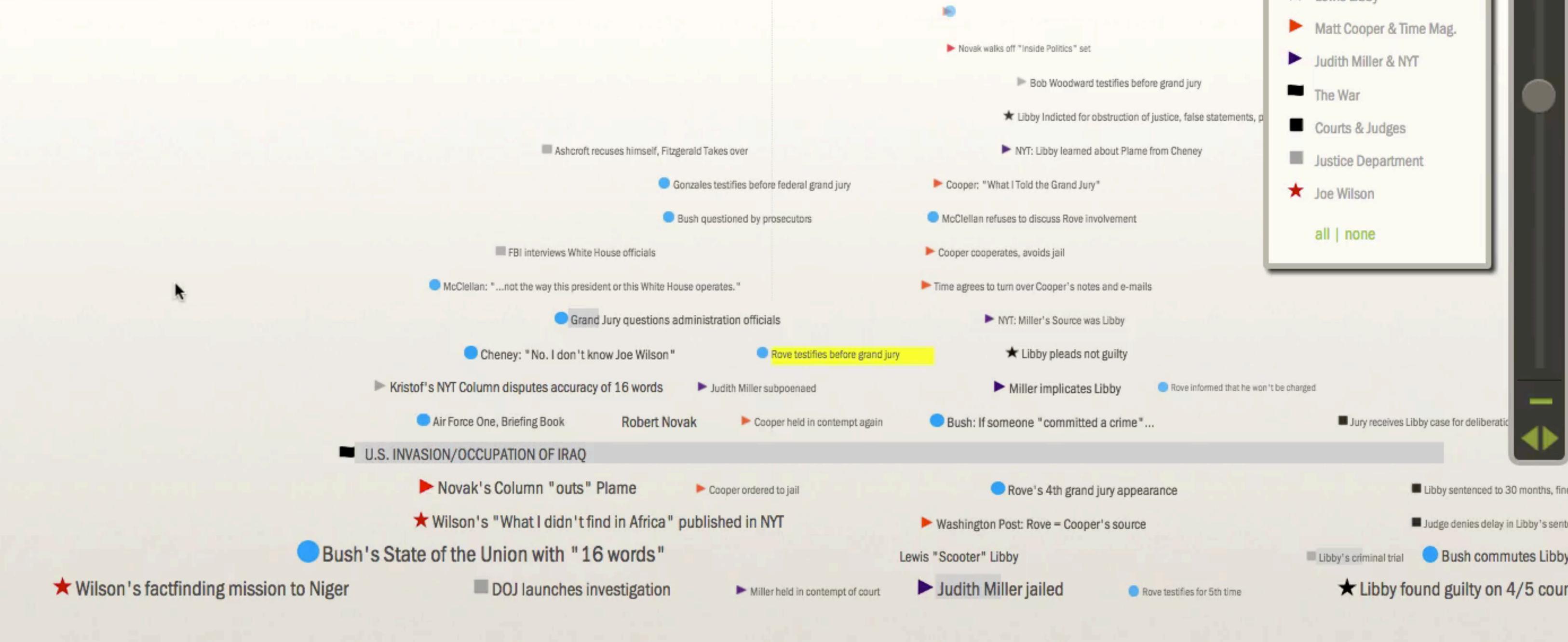
STORYTELLING WITH TIMELINES



Legend:

- White House
- ▶ Novak
- ★ Lewis Libby
- ▶ Matt Cooper & Time Mag.
- ▶ Judith Miller & NYT
- The War
- Courts & Judges
- Justice Department
- ★ Joe Wilson

all | none



2002

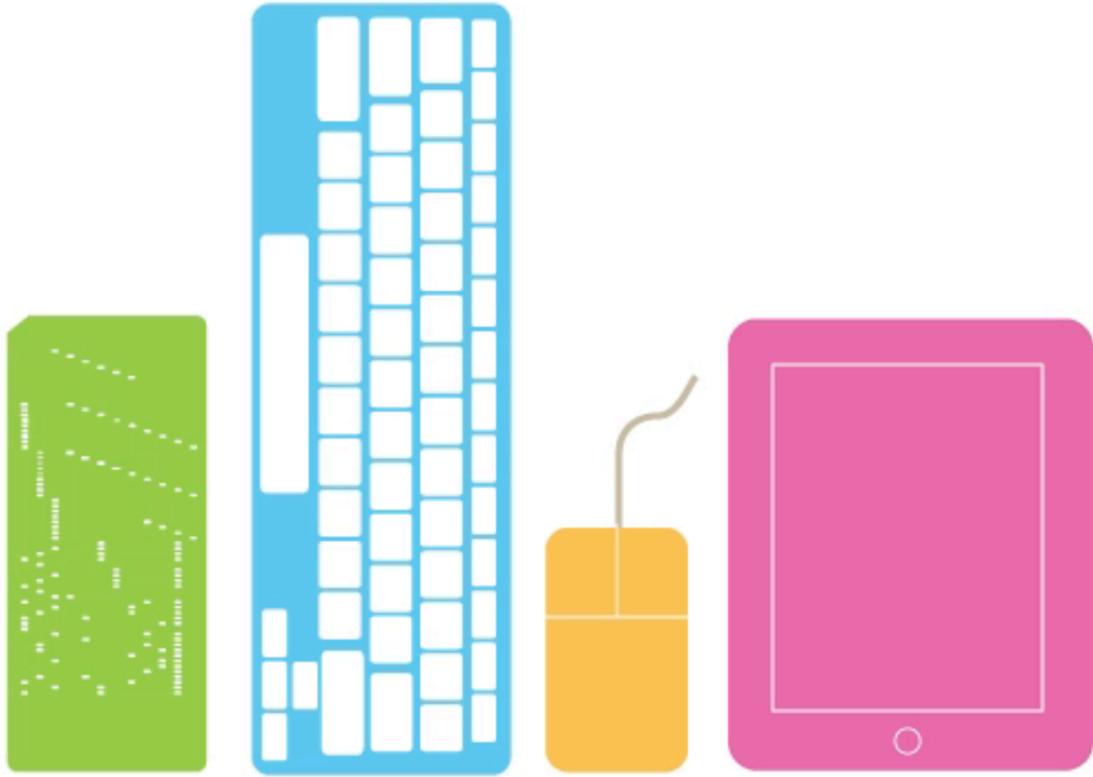
2003

2004

2005

2006

2007



From punch cards to multi touch.

Arjuna Soriano

Revolutionary User Interfaces

The human computer interface helps to define computing at any one time. As computers have become more mainstream the interfaces have become more intimate. This is the journey of computer technology and how it has come to touch all of our lives.



The Antikythera
1600



CHRONOLOGICAL

*Dali was born, **THEN** he started painting, **THEN** moved to Paris, ...*

NON-CHRONOLOGICAL

*Dali lived in Paris during his Surrealist period, ... **MEANWHILE**, Matisse was in Italy, ... , **YEARS EARLIER**, he too lived in Paris, ...*

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

List View Document View Control Panel

Sort list by: Order inside document

+

Start here to add your text

TimeLineCurator

Insert a short description for your timeline here

Track names:

1

2

3

4

5

6

Instructions

About

Tweet

Events: 0, vague expressions: 0

**EXPRESSIVE
STORYTELLING
WITH TIMELINES**

Chronological OR non-chronological

Choice of representations for time

Choice of time scales



TIMELINE STORYTELLER

timelinestoryteller.com

Chronological OR non-chronological

Choice of representations for time

Choice of time scales

Annotate, emphasize, reveal,



Timeline representation: Linear, Radial, Spiral, Curve, Calendar, Grid

Scale: Chronological, Relative, Log, Sequential, Collapsed

Layout: Unified, Faceted, Segmented

TOUR ?

Timeline Storyteller (Alpha)

Load timeline data: DEMO, JSON, CSV,

Load timeline story: DEMO,

An expressive visual storytelling environment for presenting timelines.

A note about privacy: Your data remains on your machine and is not shared with Microsoft unless you export the content you create and provide your email address. If you share your content with Microsoft, we will use it for research and to improve our products and services. We may also include it in a future research publication. By using this service, you agree to Microsoft's Privacy Statement and Terms of Use.



1.5 x speed



Timeline representation: Linear, Radial, Spiral, Curve, Calendar, Grid

Scale: Chronological, Relative, Log, Sequential, Collapsed

Layout: Unified, Faceted, Segmented

TOUR ?

LEGEND

- daughter
- lifespan
- lover
- period
- son
- travel

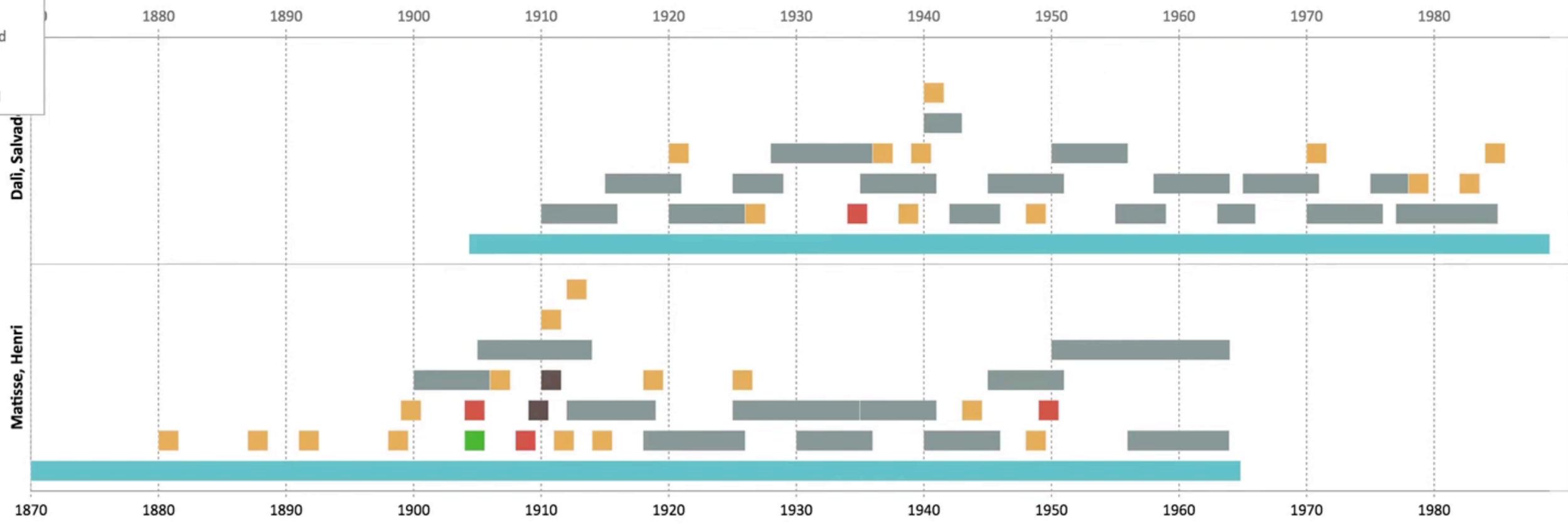
Open

Annotate

CLEAR

Filter

Export



Navigation controls: Stop, Previous, Next, Full Screen, and a thumbnail of the current view.

3 x speed



Timeline representation: Linear, Radial, Spiral, Curve, Calendar, Grid

Scale: Chronological, Relative, Log, Sequential, Collapsed

Layout: Unified, Faceted, Segmented

TOUR ? [envelope icon]

LEGEND

- daughter
- lifespan
- lover
- period
- son
- travel

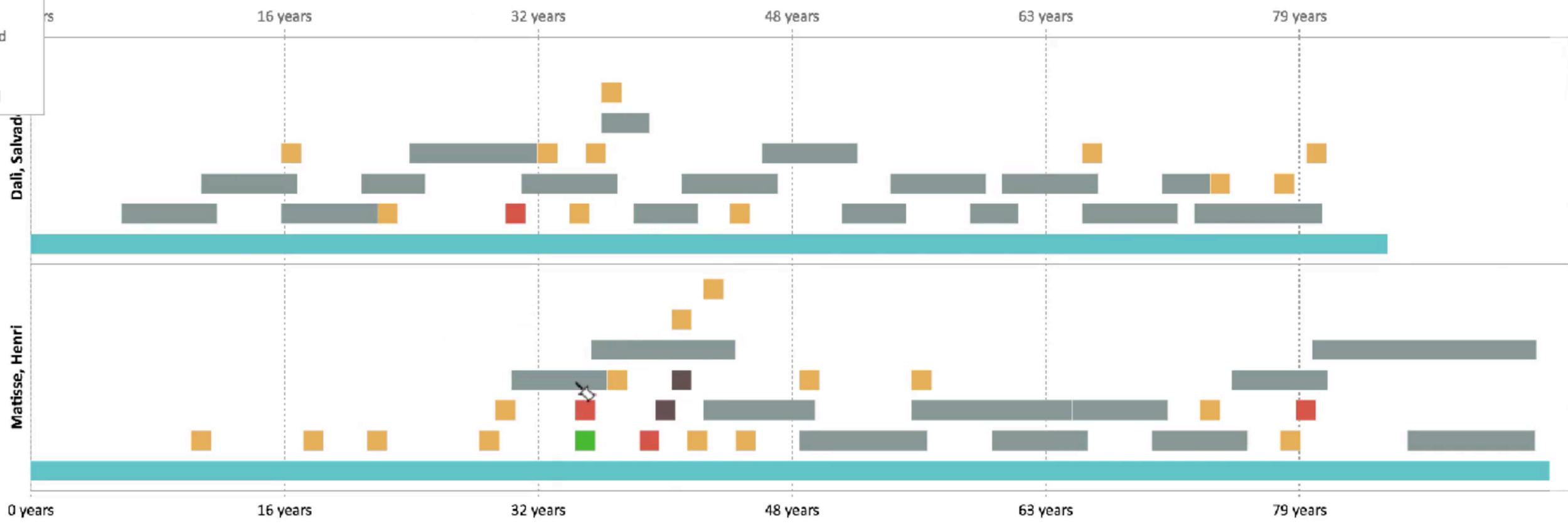
Open [folder icon]

Annotate [quote icon], [image icon]

CLEAR [quote icon]

Filter [funnel icon]

Export [download icon]



Navigation controls: stop, back, forward, zoom in, zoom out

Thumbnail view: [Timeline 1] [Timeline 2]

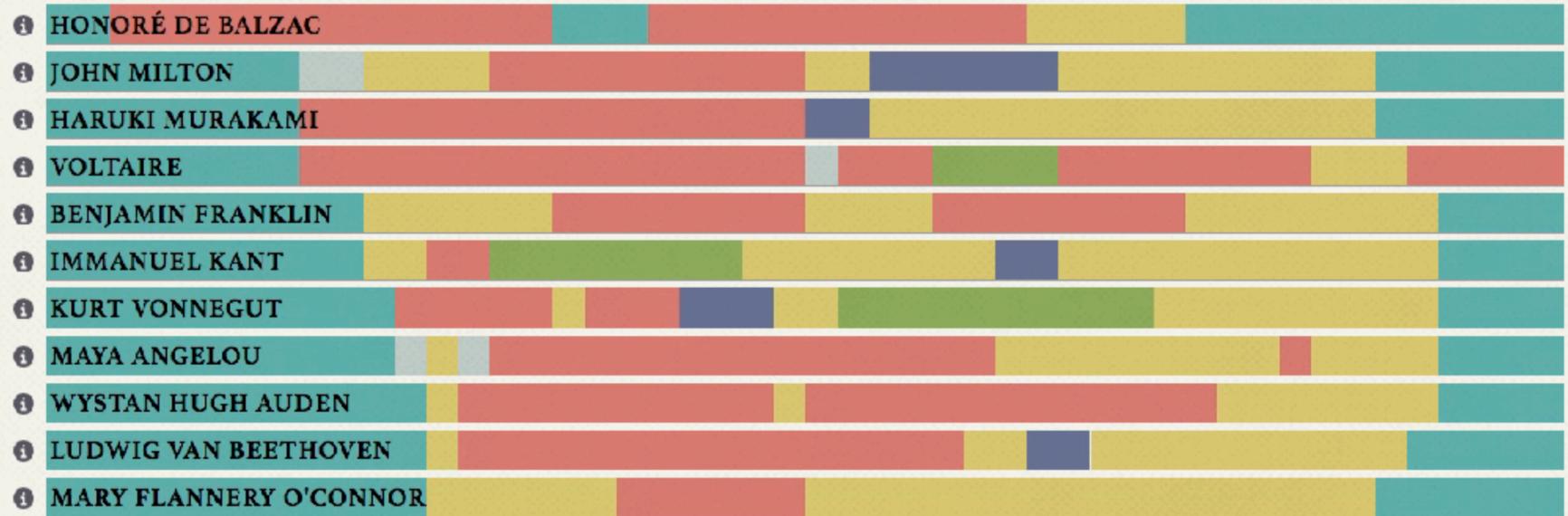
3 x speed

THE DAILY ROUTINES OF FAMOUS CREATIVE PEOPLE

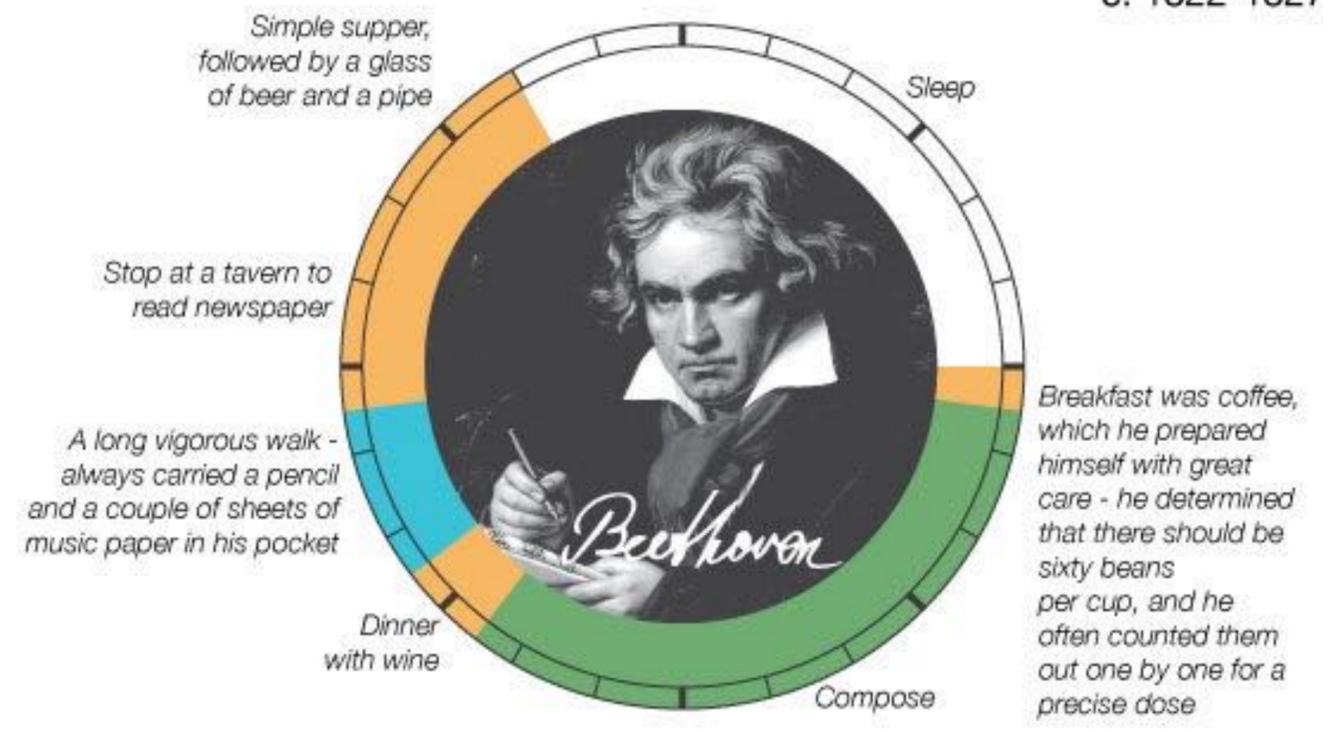
Turns out great minds don't think alike. Discover how some of the world's most original artists, writers and musicians structured their day, based on 'Daily Rituals' by Mason Currey. Filter the different categories by toggling on or off, and hover over the colored bars to learn more about the daily routines.

■ SLEEP
 ■ CREATIVE WORK
 ■ DAY JOB/ADMIN
 ■ FOOD/LEISURE
 ■ EXERCISE
 ■ OTHER

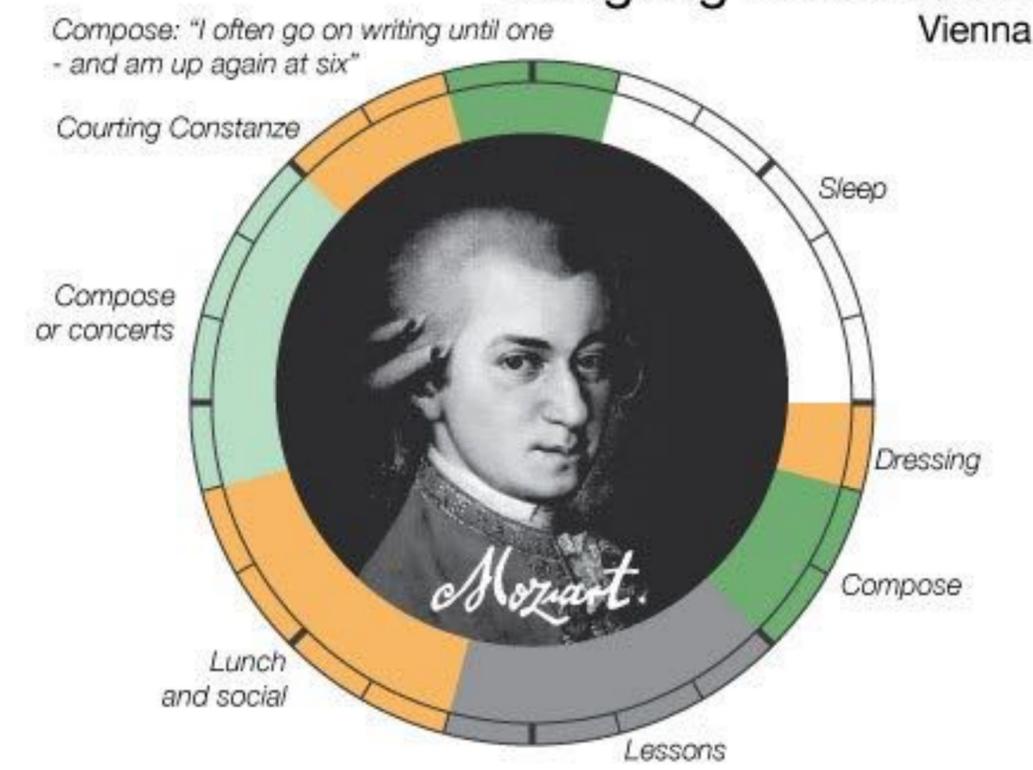
12 AM → 1 2 3 4 5 6 7 8 9 10 11 12 PM → 1 2 3 4 5 6 7 8 9 10 11 12



Ludwig van Beethoven c. 1822-1827



Wolfgang Amadeus Mozart Vienna, c. 1781

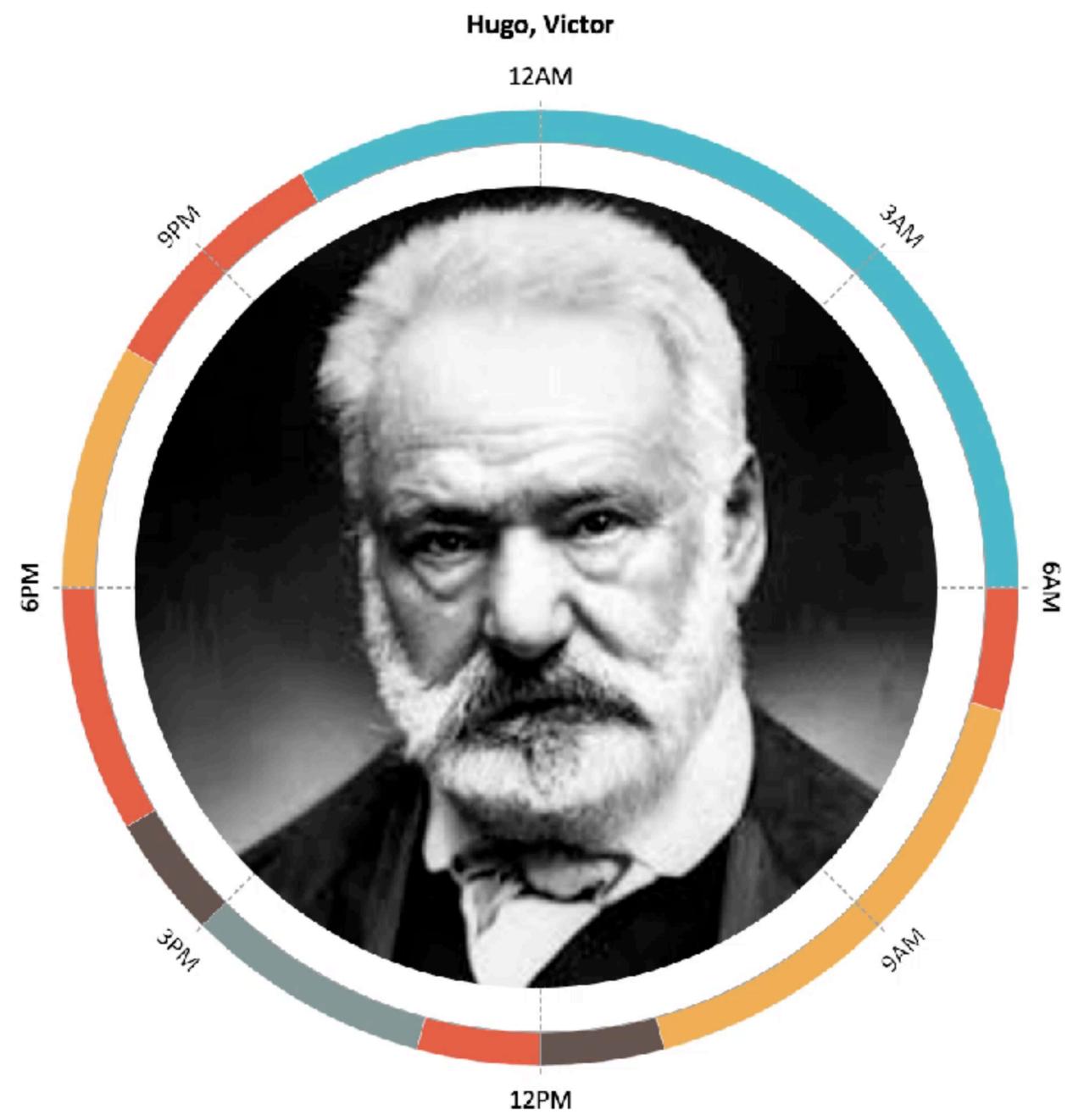


Left: © 2014 Podio, podio.com/site/creative-routines
 Right: © 2014 RJ Andrews, infowetrust.com/creative-routines

Consider the 24 hours daily routine of French writer Victor Hugo.

LEGEND

- creative work
- day job / admin
- exercise
- food / leisure
- other
- sleep



Navigation controls: back, forward, search, and a series of thumbnails representing different views of the data.

THE **TIMELINE** DESIGN SPACE

STORYTELLING CONSIDERATIONS

Different combinations of timeline representation and scale tell different stories about your data.

Don't limit yourself to a single combination!

Use animated transitions and annotation for incremental reveal, and to connect consecutive narrative points.

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now with Cumul8

TIMELINE

PROJECTS:

- timelinesrevisited.github.io (*survey w/ 250+ entries, journal paper*)
- timelinecurator.org (*text → timeline tool, open-source*)
- timelinstoryteller.com (*presentation tool, open-source*)
- [Timeline Consortium](#) (*toward a standard for timeline data*)

CONTACT:

- [@mattbrehmer](#) (*mattbrehmer.github.io, mabrehme@microsoft.com*)

“Timelines Revisited: A Design Space & Considerations for Expressive Storytelling”

Matthew Brehmer, Bongshin Lee, Benjamin Bach, Nathalie Henry Riche, & Tamara Munzner.
To appear in *IEEE Transactions on Visualization & Computer Graphics* (TVCG).

CITATIONS:

“TimeLineCurator: Visual Timelines From Unstructured Text”

Johanna Fulda, **Matthew Brehmer**, & Tamara Munzner.

In *IEEE Transactions on Visualization & Computer Graphics* (2016, *Proceedings of the 2015 Conference on Visual Analytics Systems and Technology / VAST*).

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