

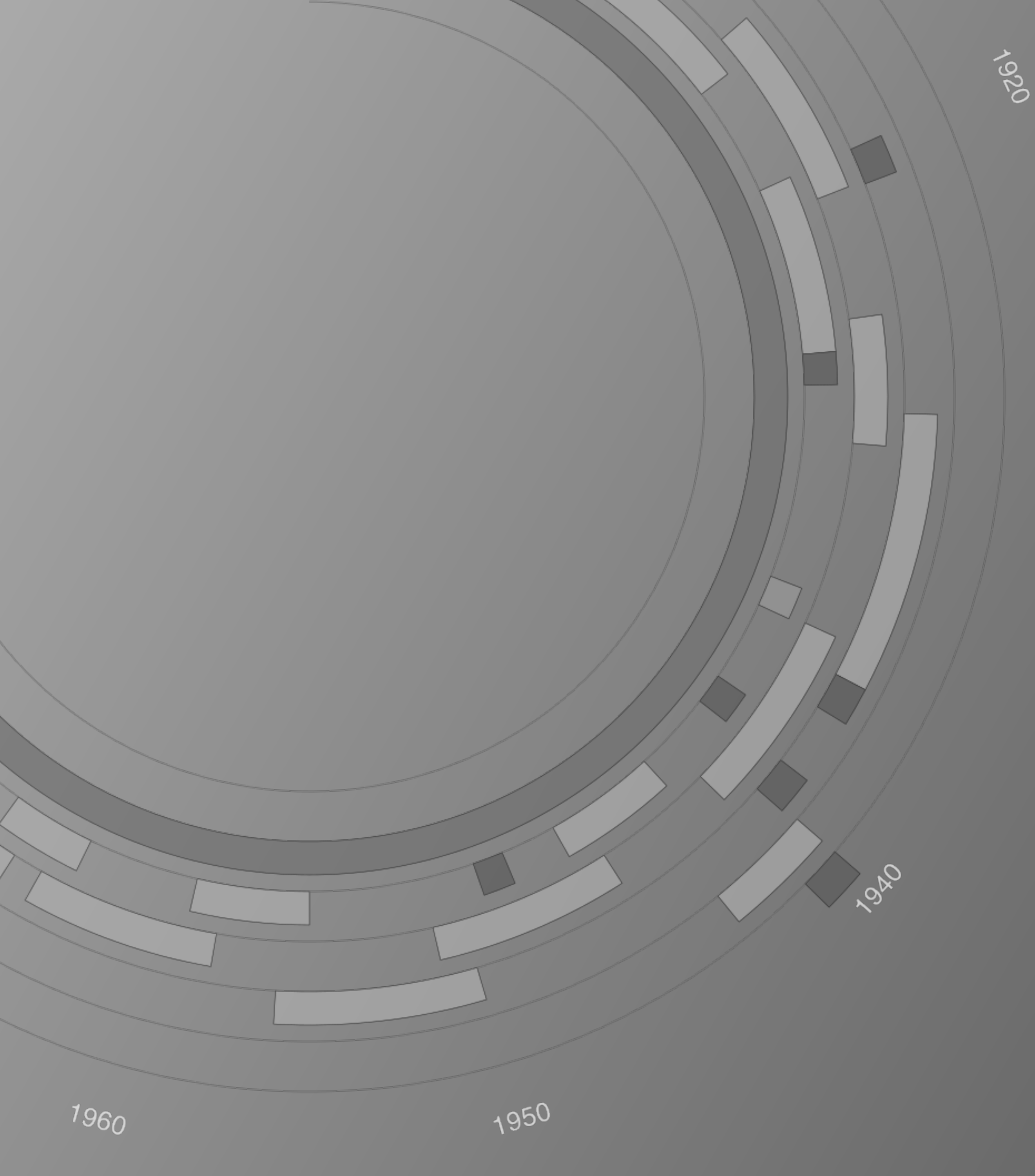
Apr 28 2017 @ Northeastern University



TIMELINES REVISITED:

Considerations for Expressive Storytelling

Matthew Brehmer
Microsoft Research
@mattbrehmer



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 ?

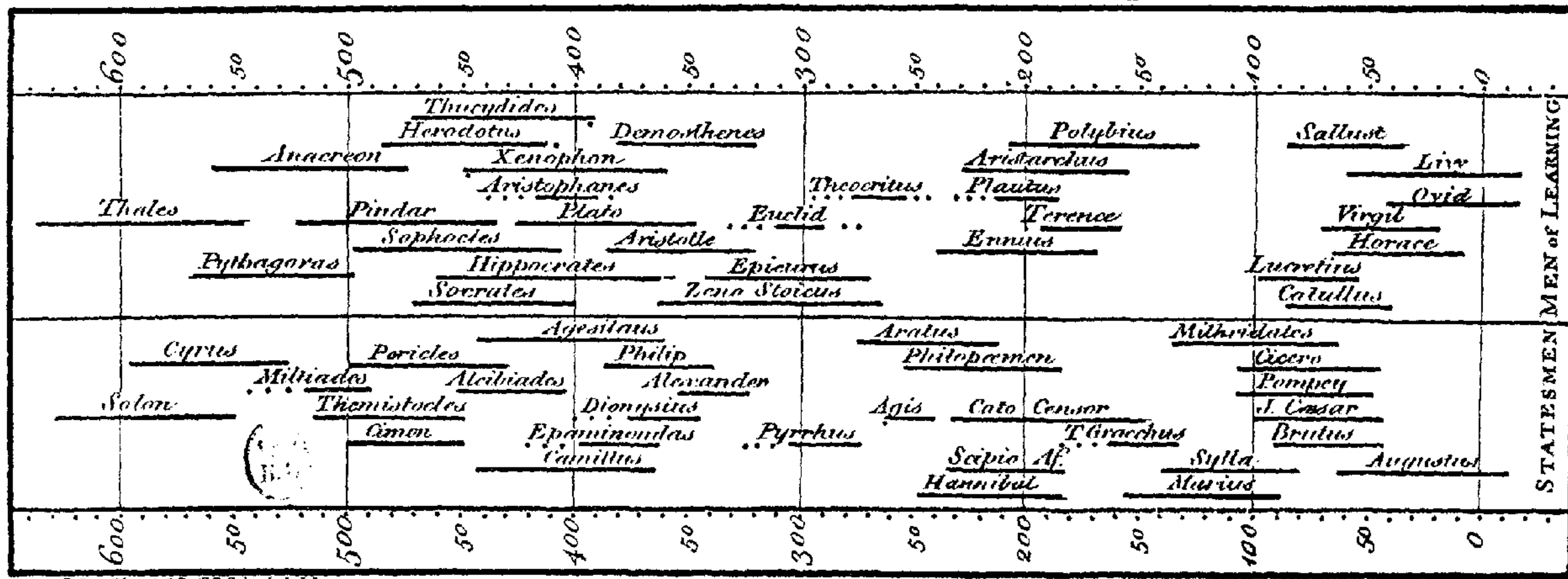


(just a few) VISUAL REPRESENTATIONS OF **TIME**

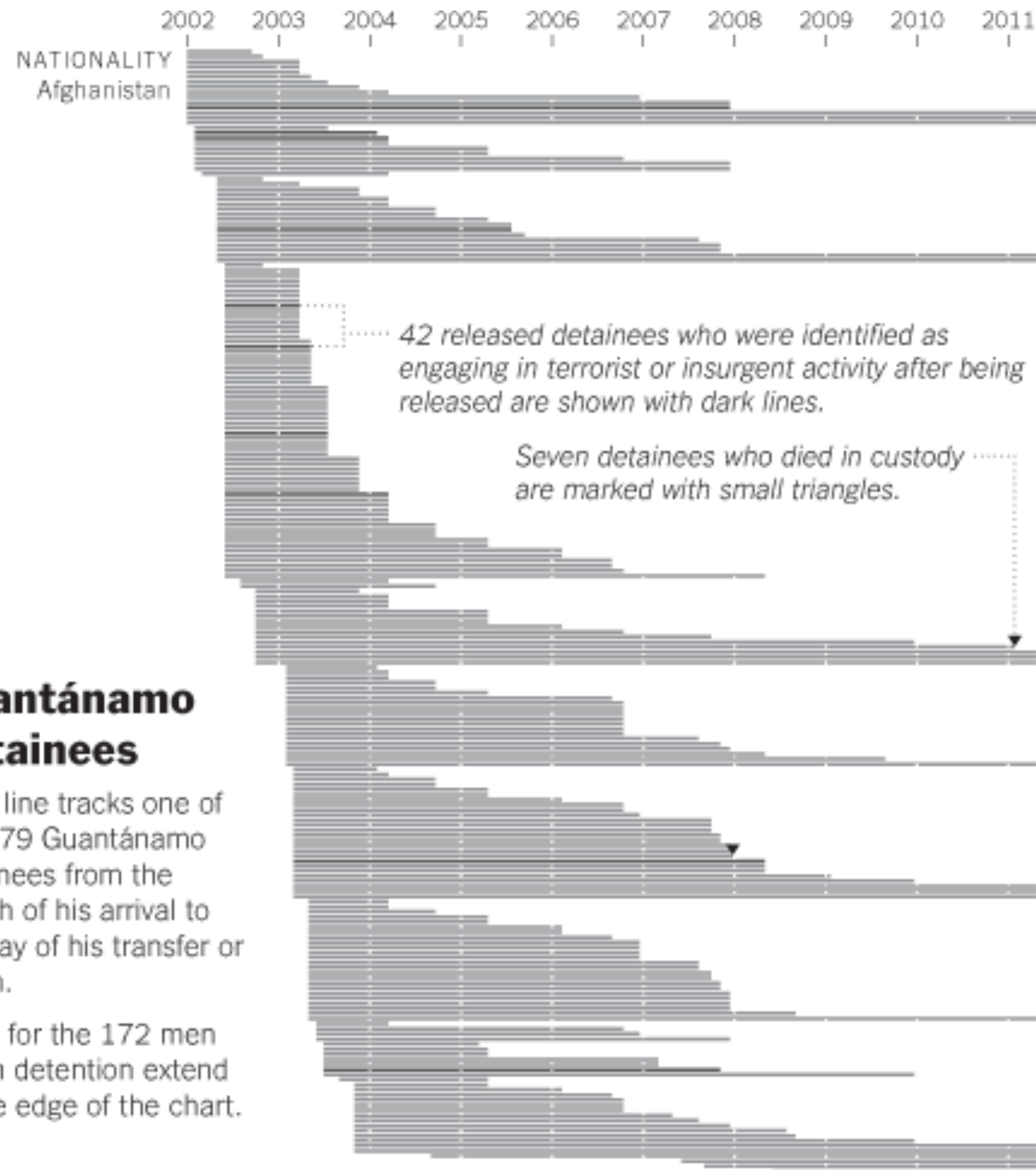




A Specimen of a Chart of Biography.



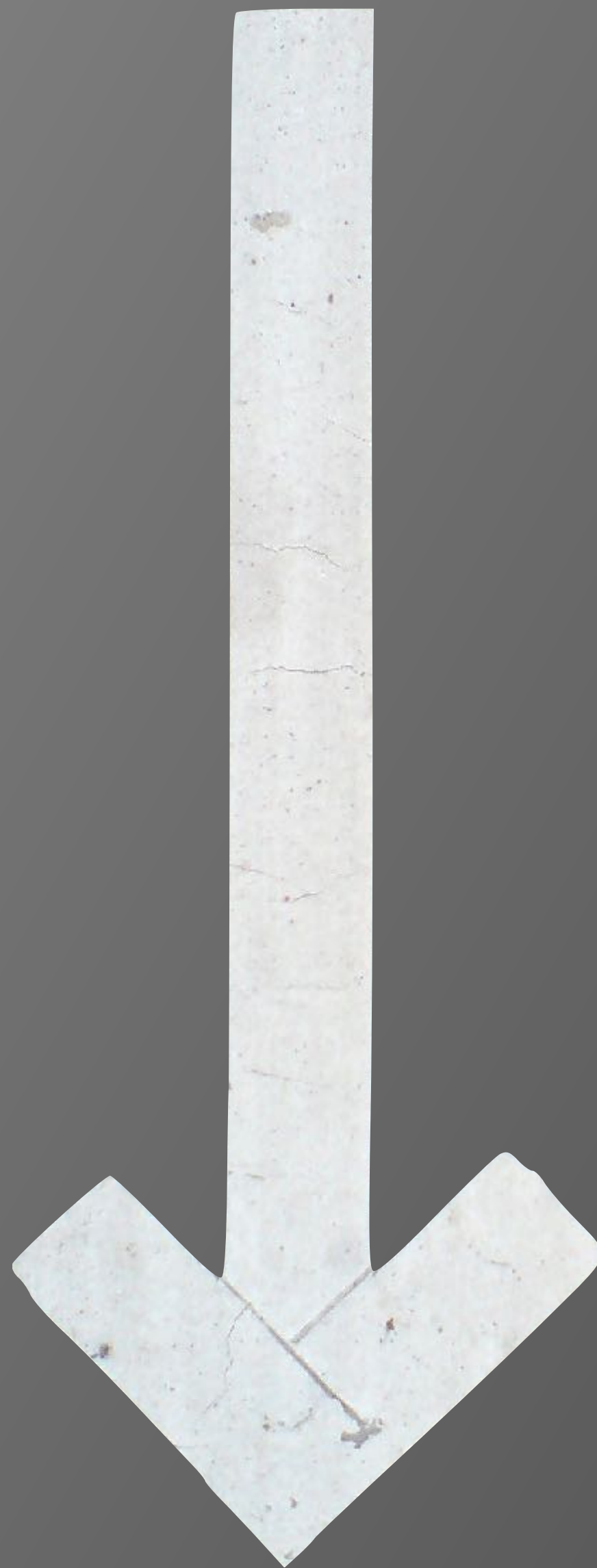
J. Priestley L.L.D. F.R.S. inv. et del.



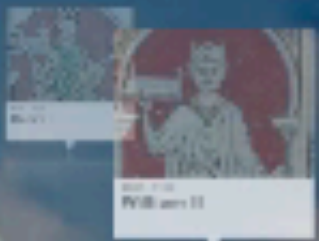
Guantánamo Detainees

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.

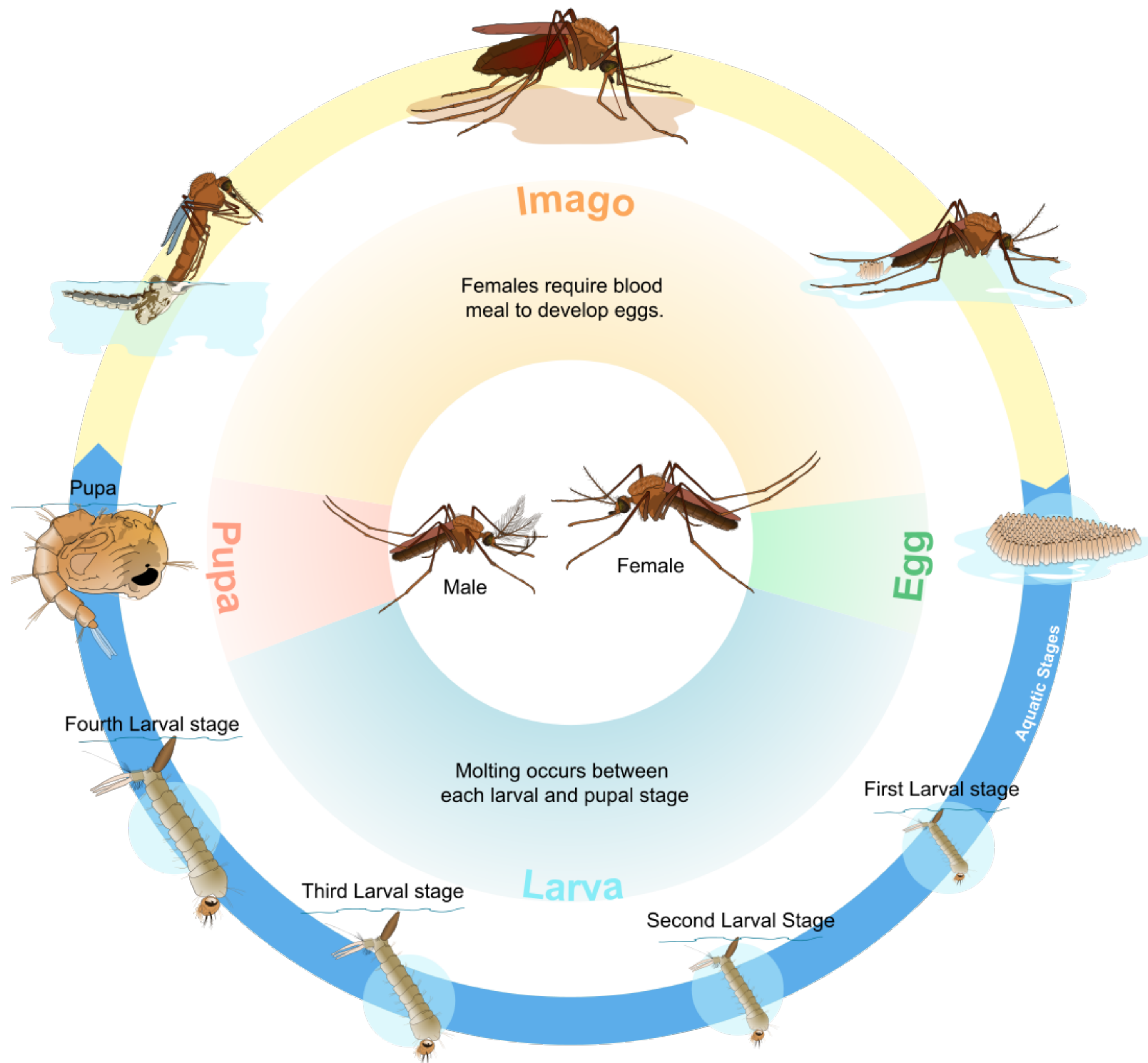


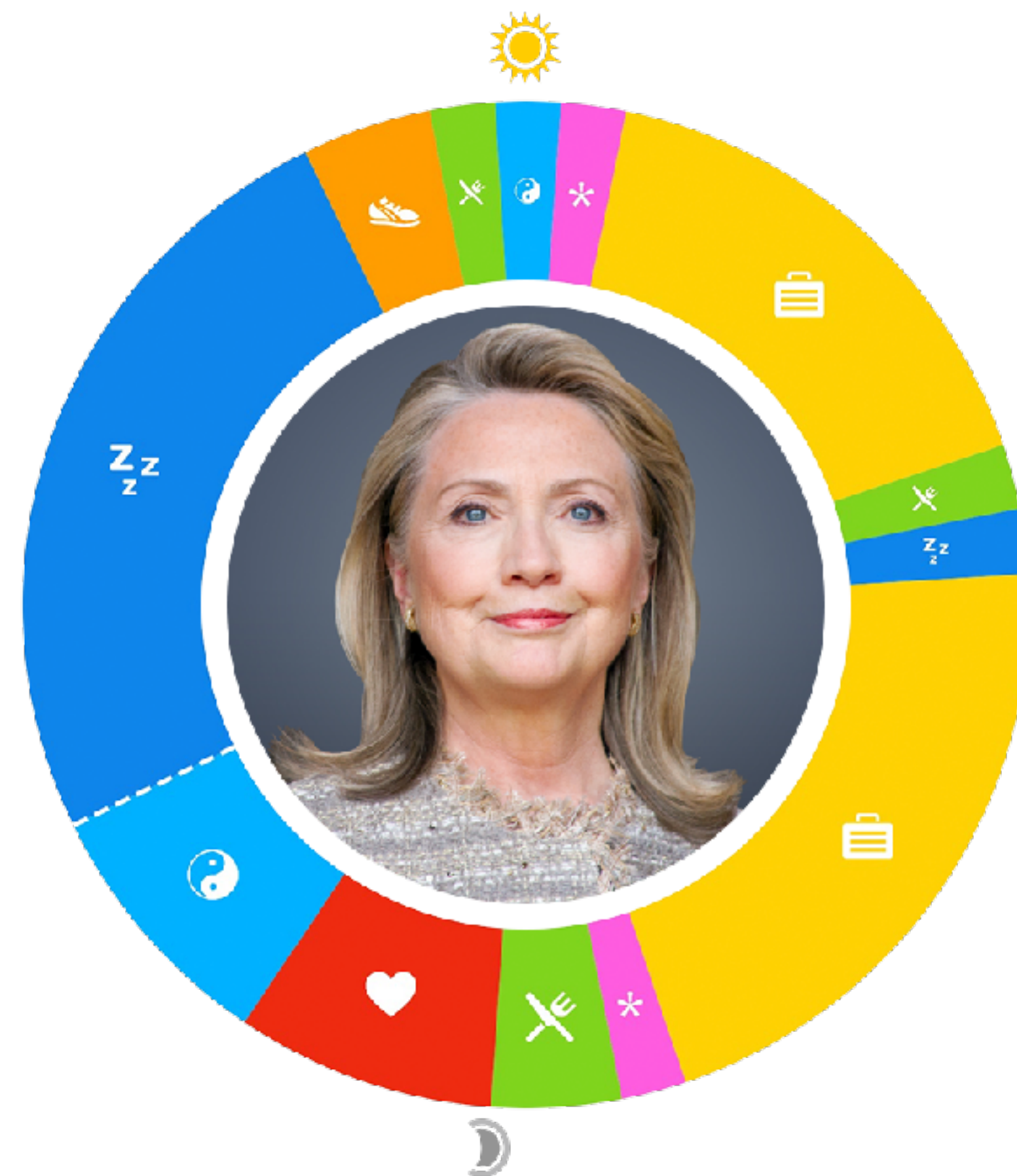


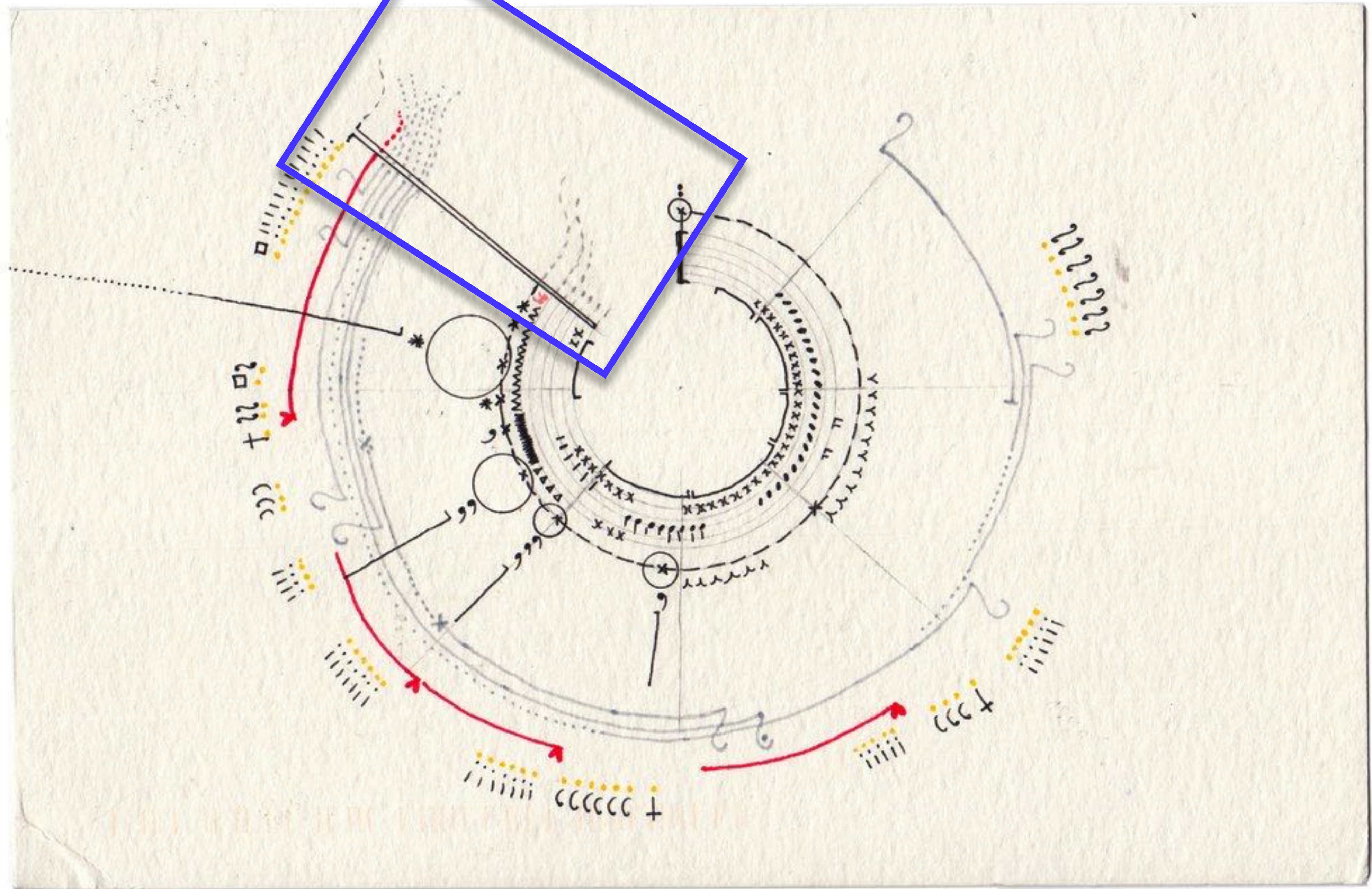


1066
The Tower Founded

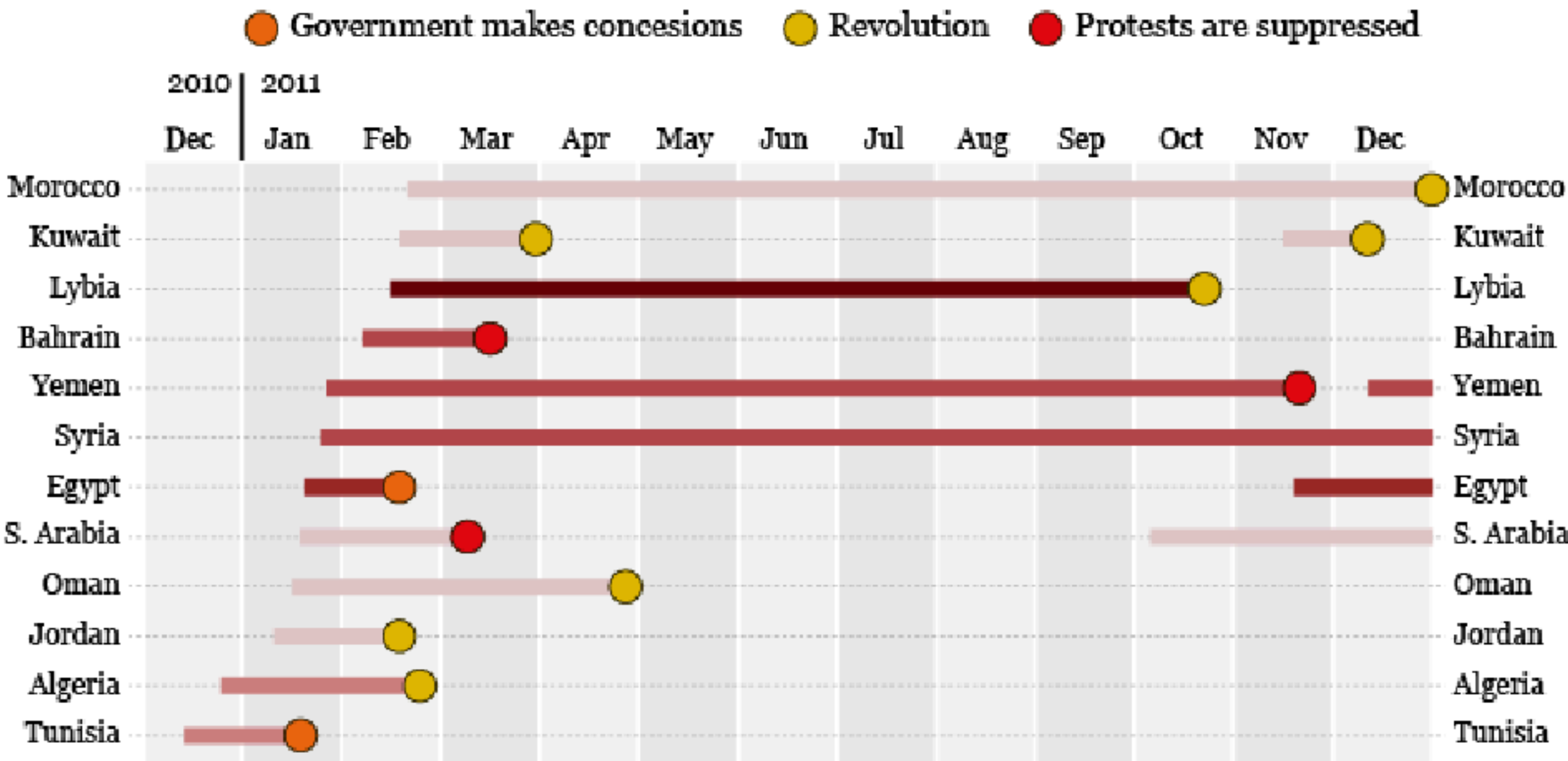
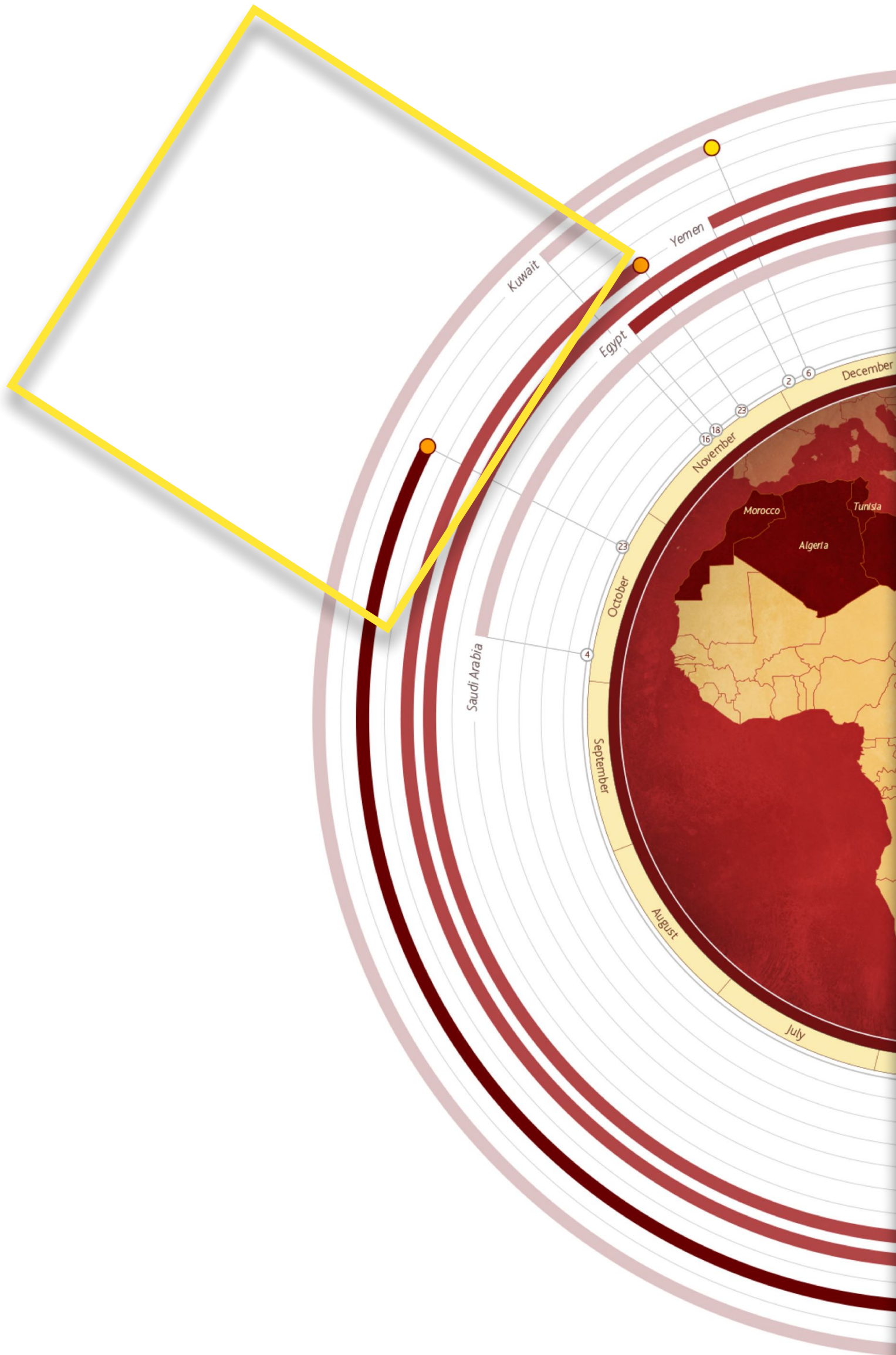








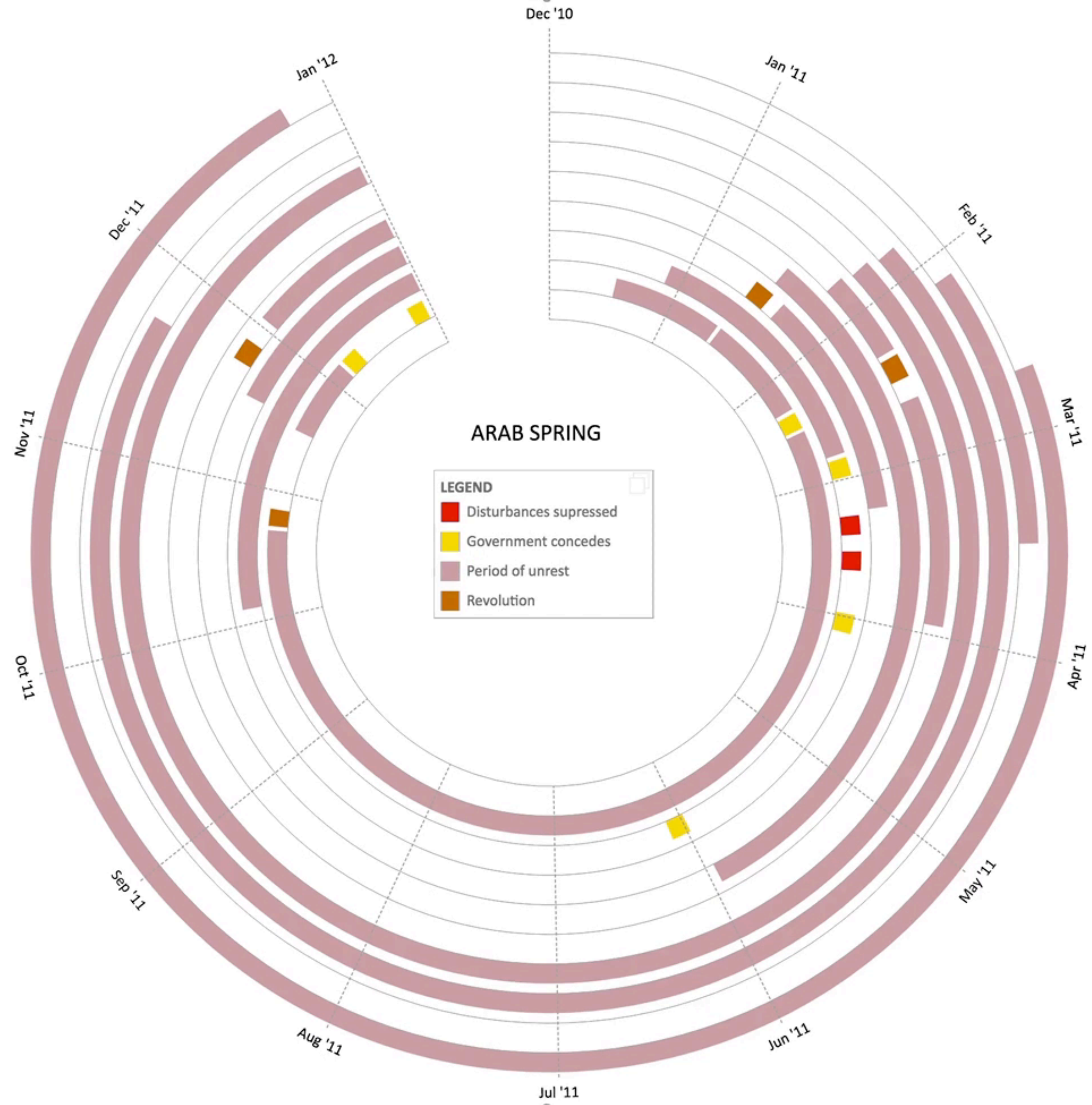
ARAB SPRING



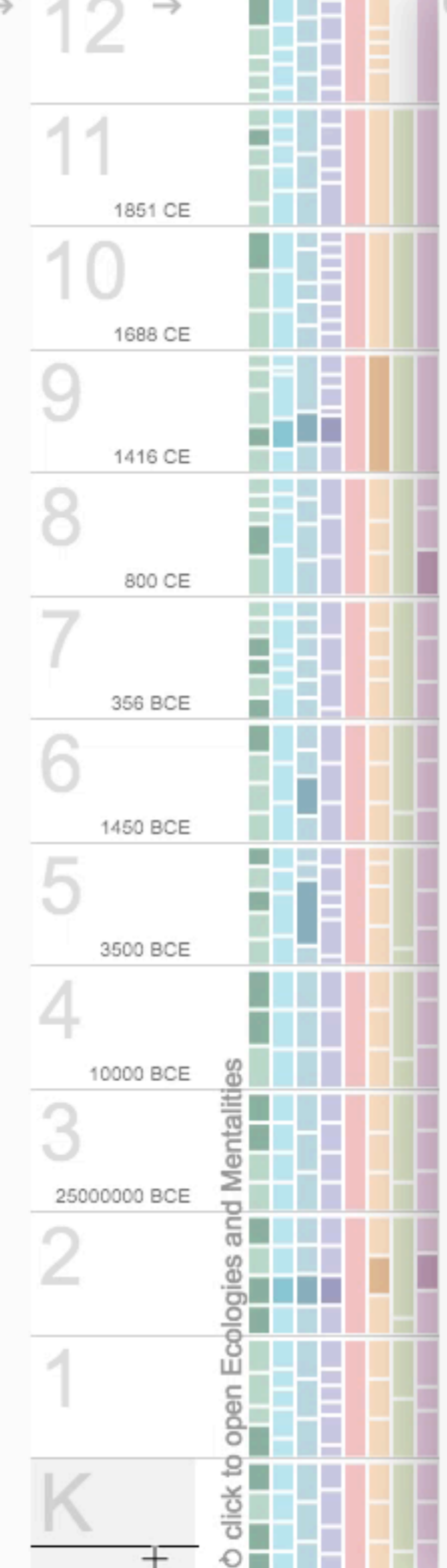
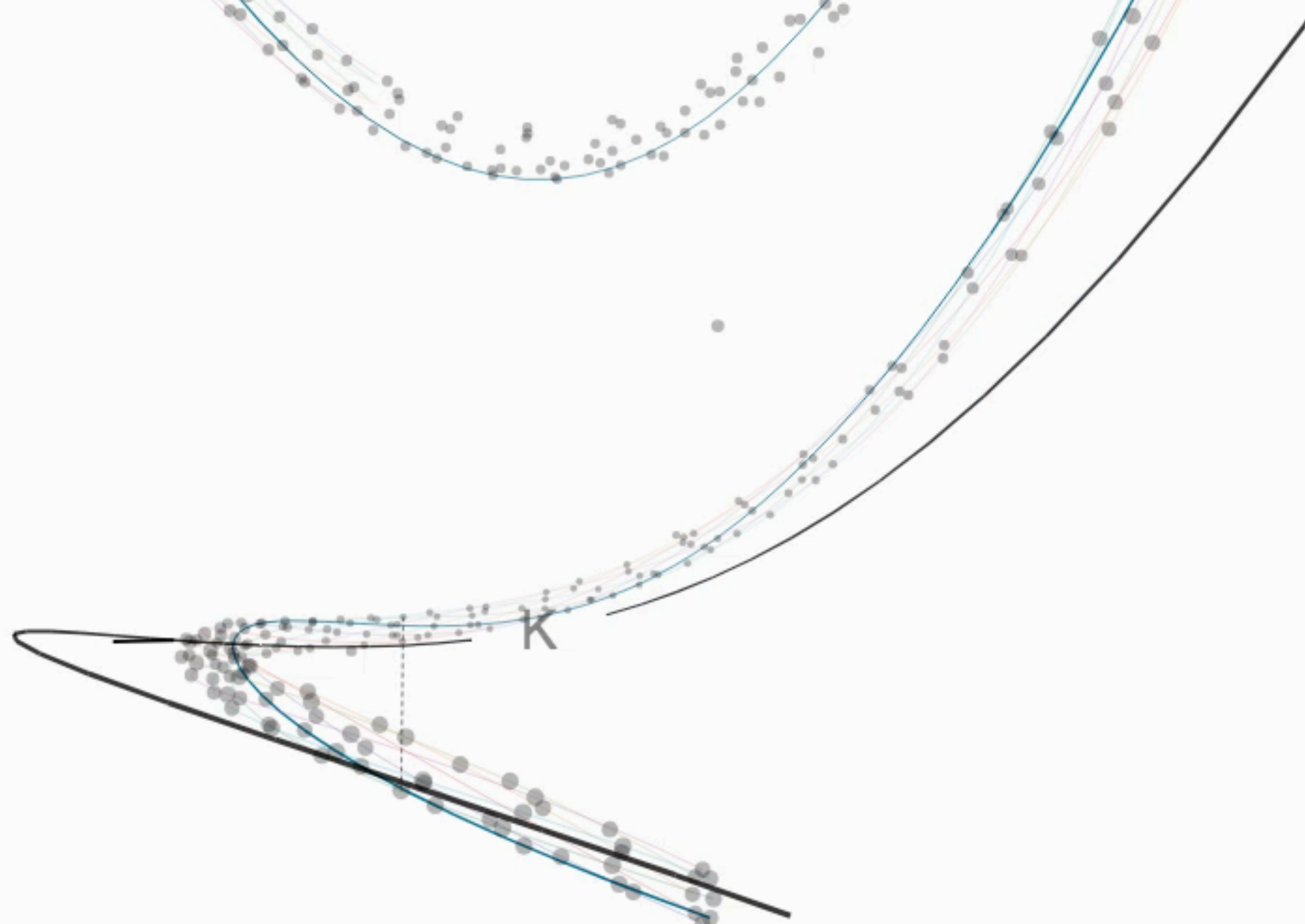
Redesign: © 2015 Alberto Cairo

Number of victims of the Arab revolution















Acuum primum.

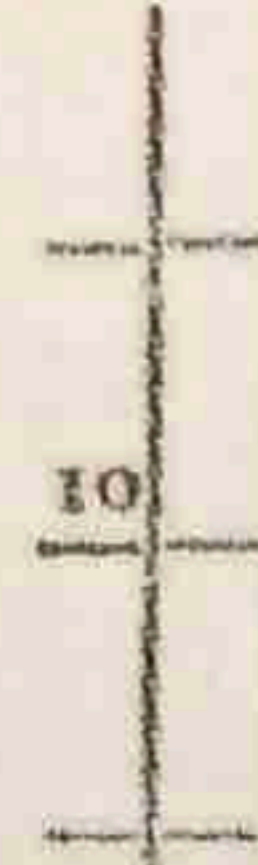
2. Prim.



5. Kildeu.



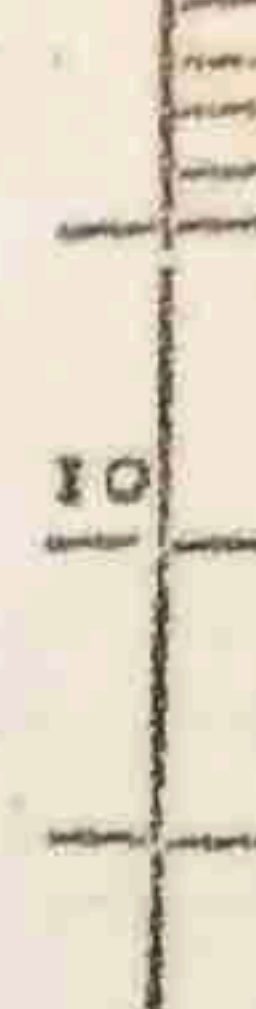
6. Thebet.



9. Nifan.



10. Iar sine Zius.

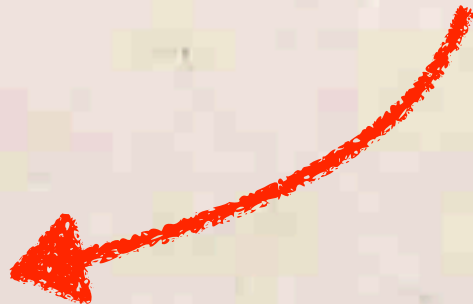


10. mense prima die mensis
paruerunt eorumque
ut. Gen. 2. v. 5.

nothing much
happening

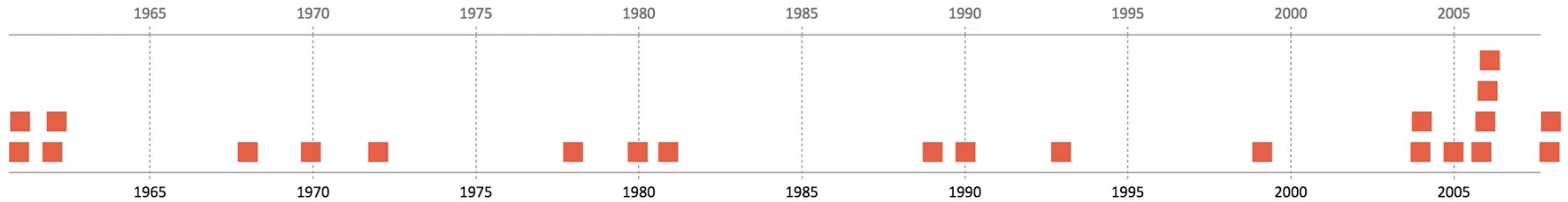


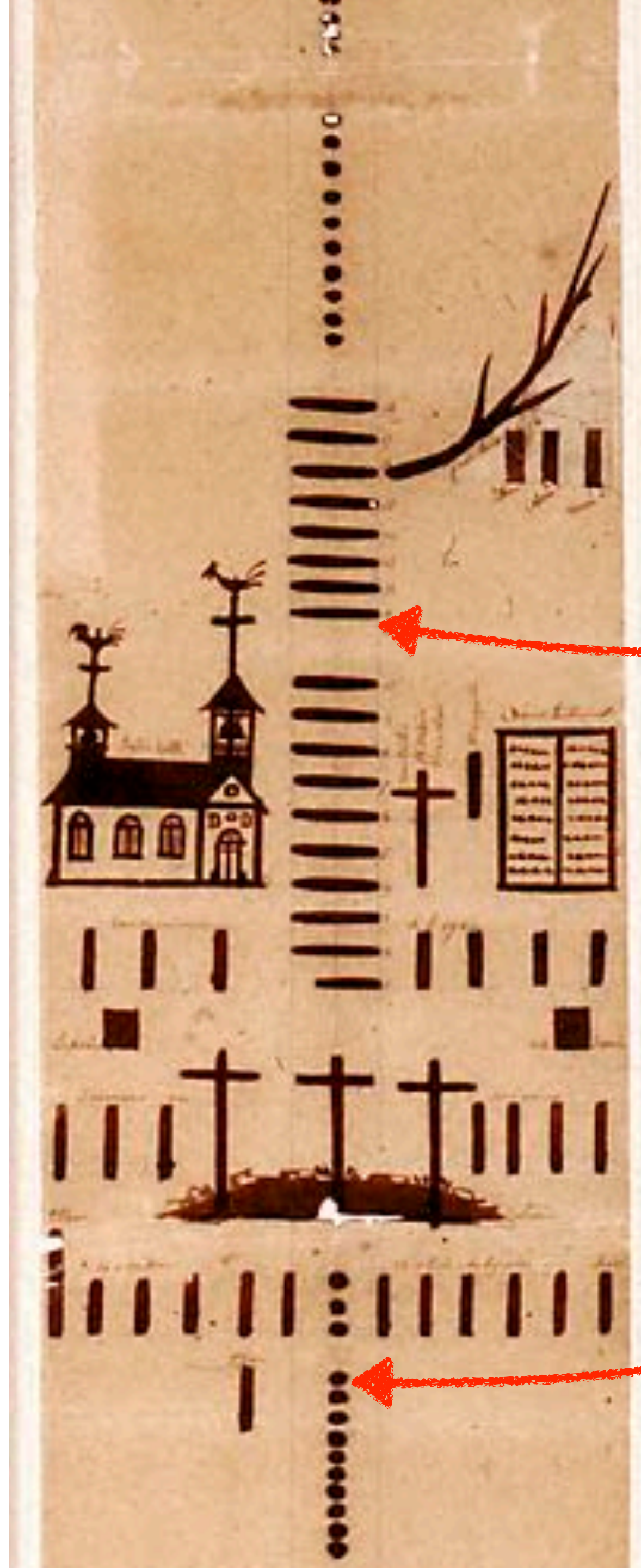
look! something
happened!



Noe iubetur ingredi arcam cum
animalibus. Gen. 7. vers. 1.
4. 5. 10.

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

Tuesday

Wednesday

Thursday

Friday

Saturday

1

2

3

4

5

6
12
19
26

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31



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...

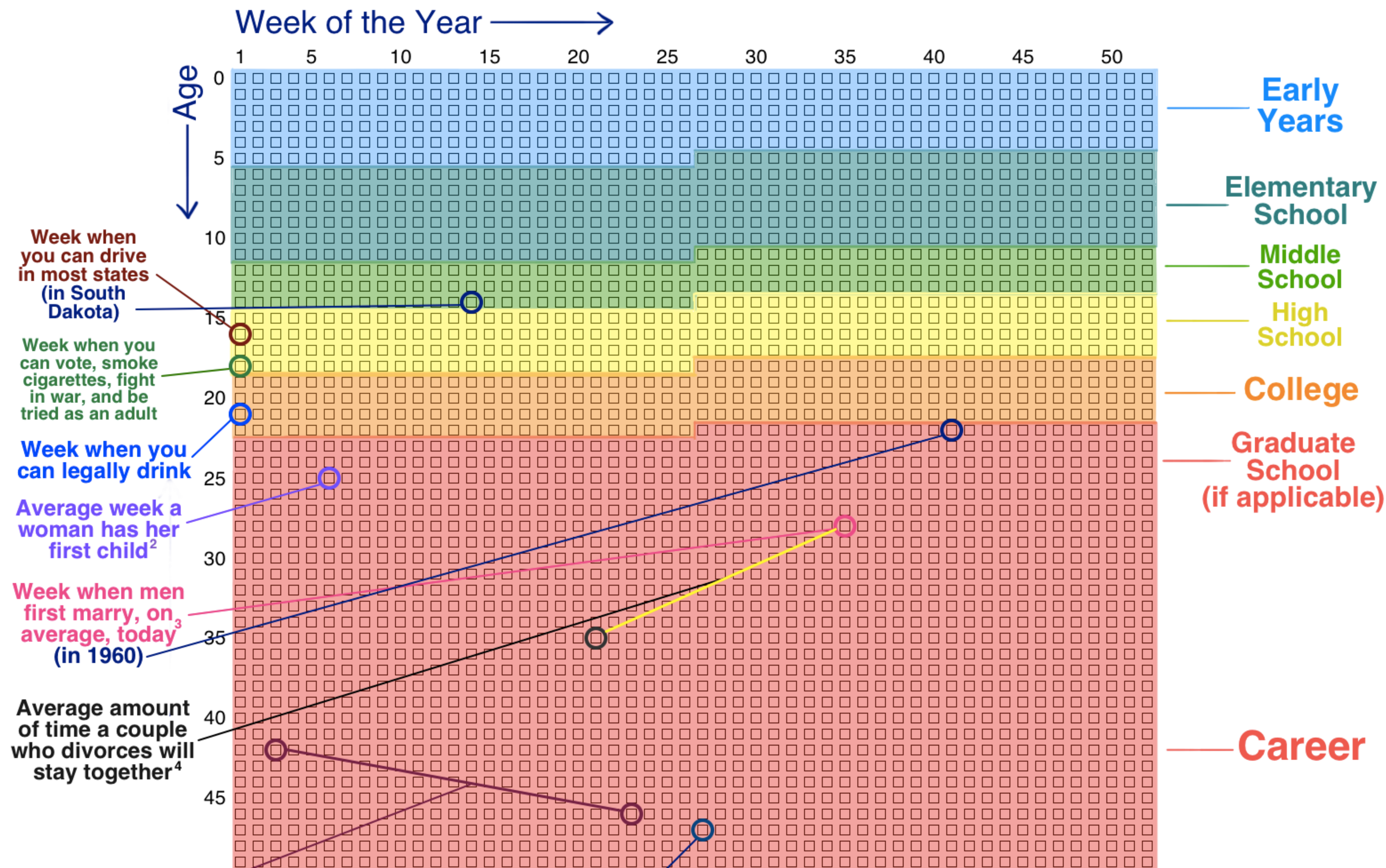


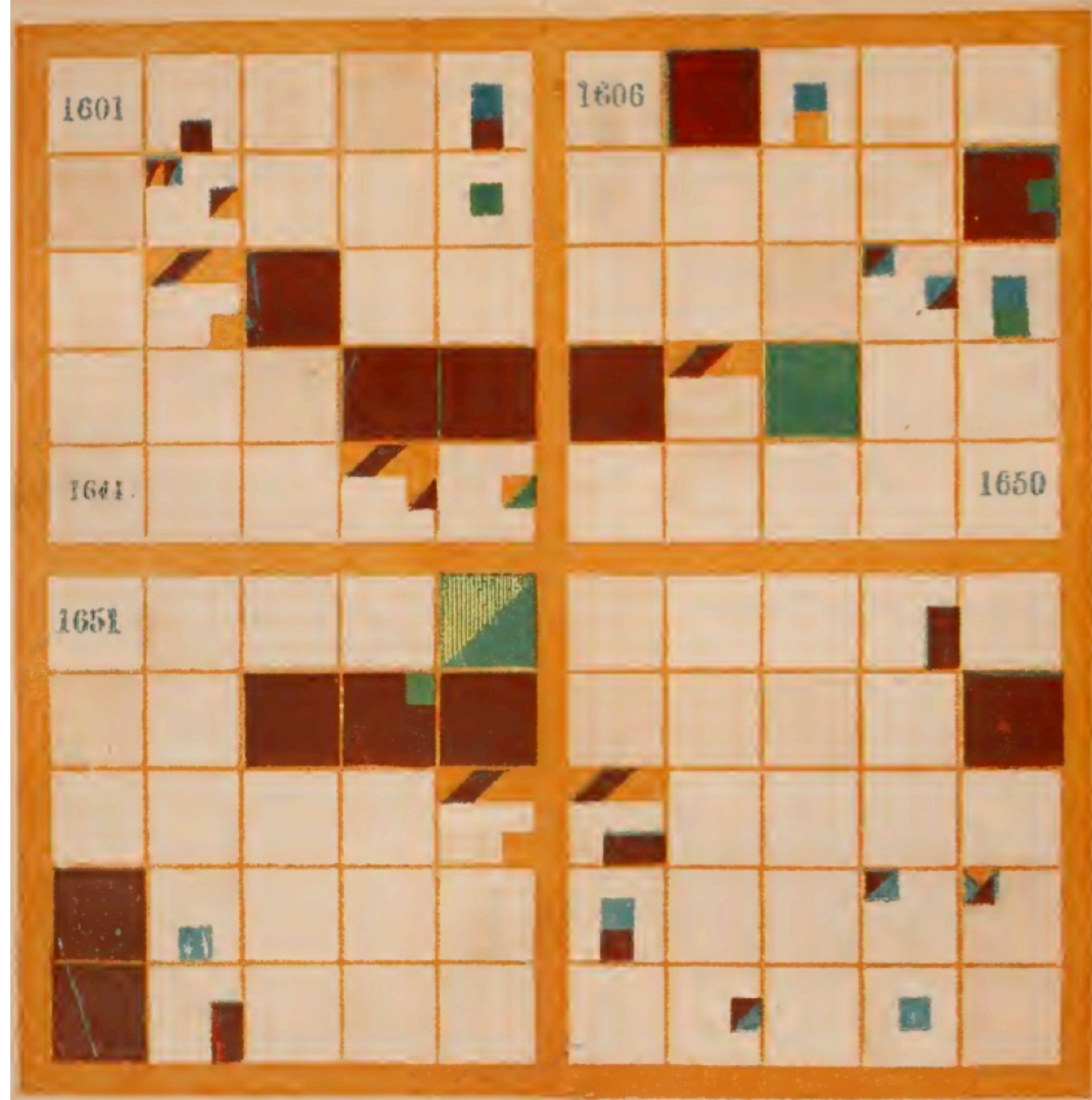
All those kings and battles, migrations and inventions, wars and loves, everything in the history books happened here in the last seconds of the cosmic calendar.



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

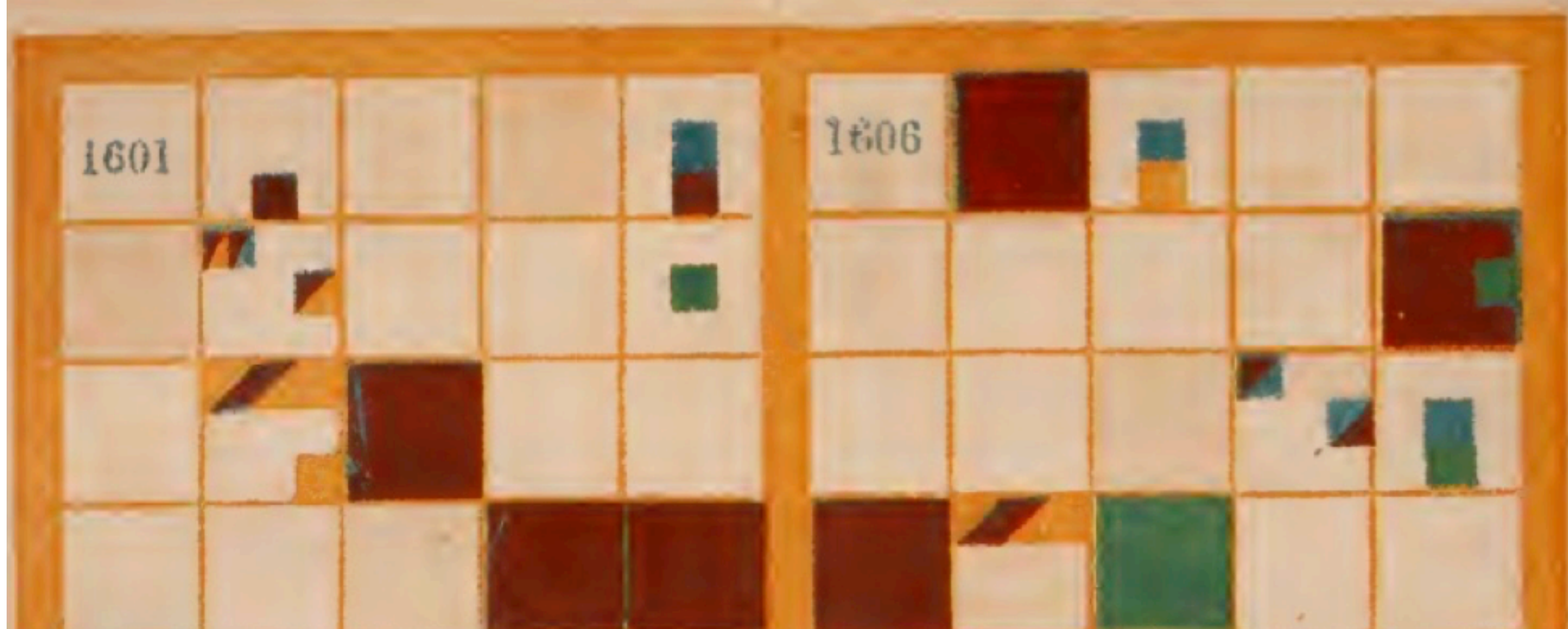






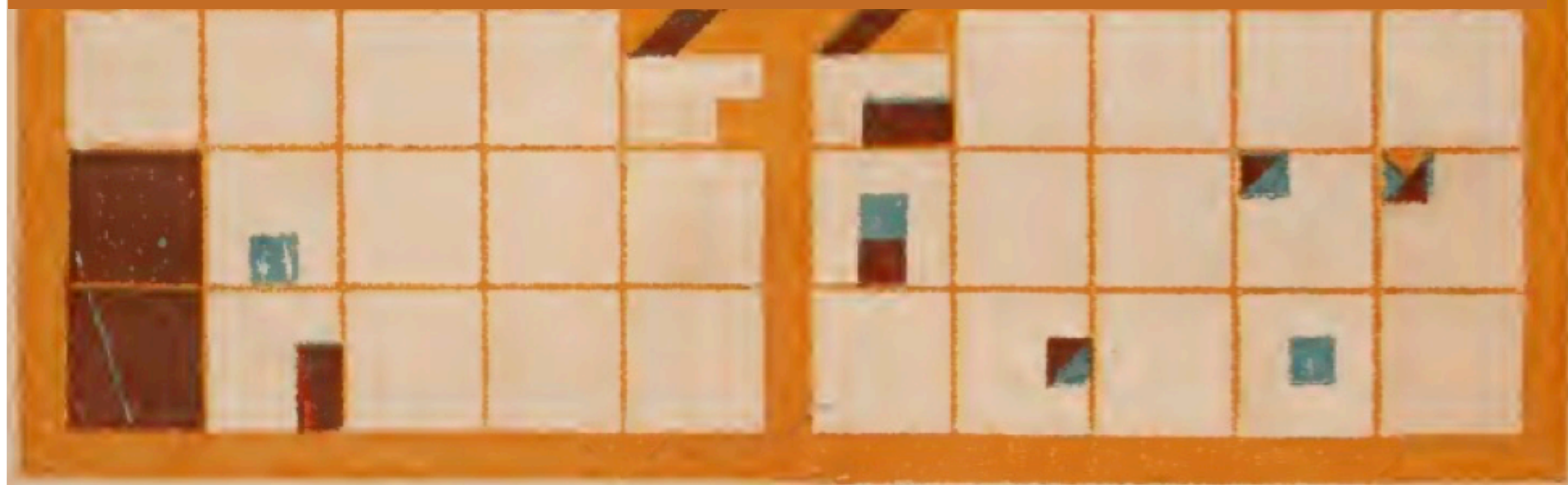
Peabody's
*Polish American
System of Chronology*
(mid 19th century)

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. DCCCLXXV



How to Make
History Dates Stick
By Mark Twain

With Many Illustrations by the Author

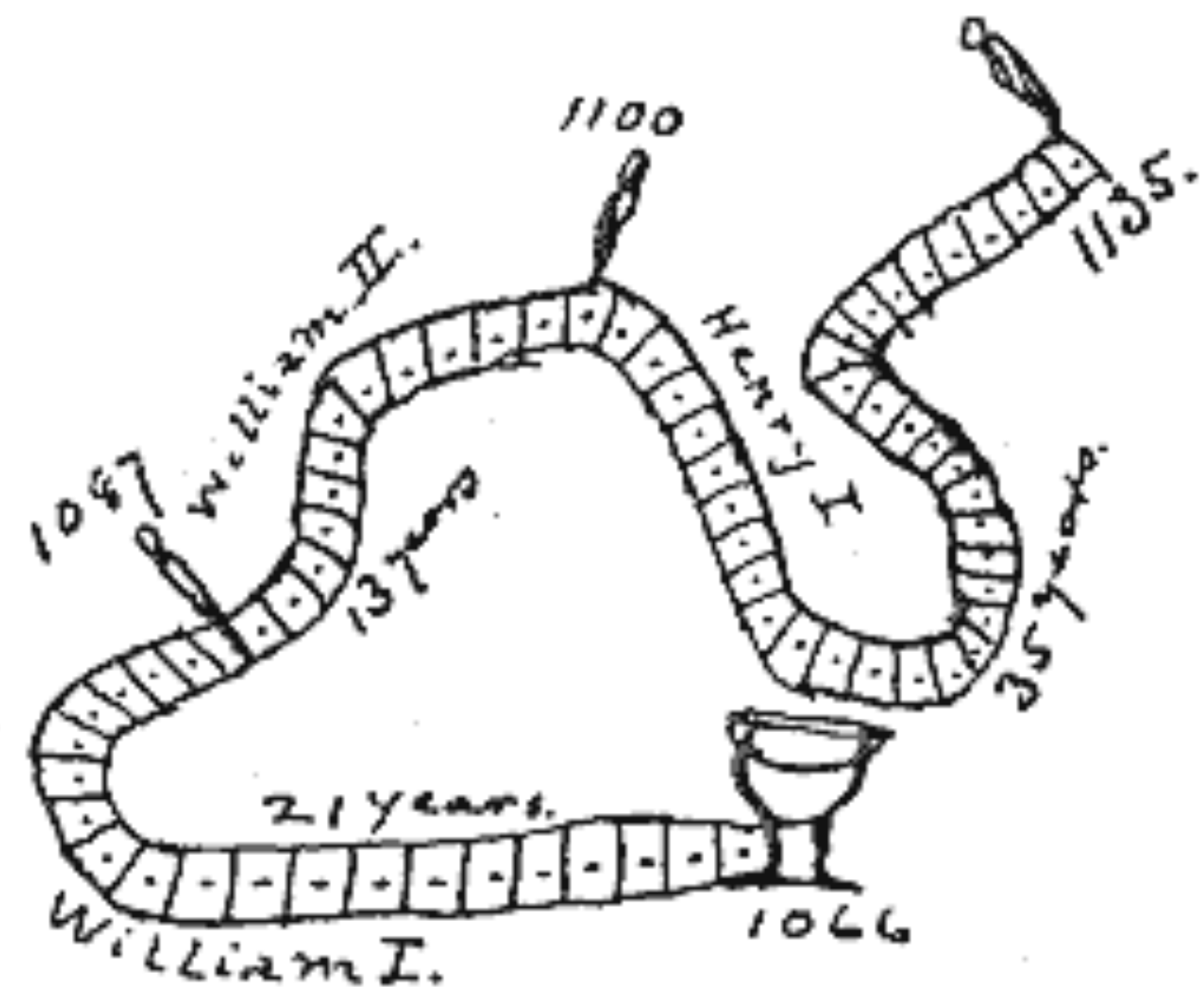


FIG. 2

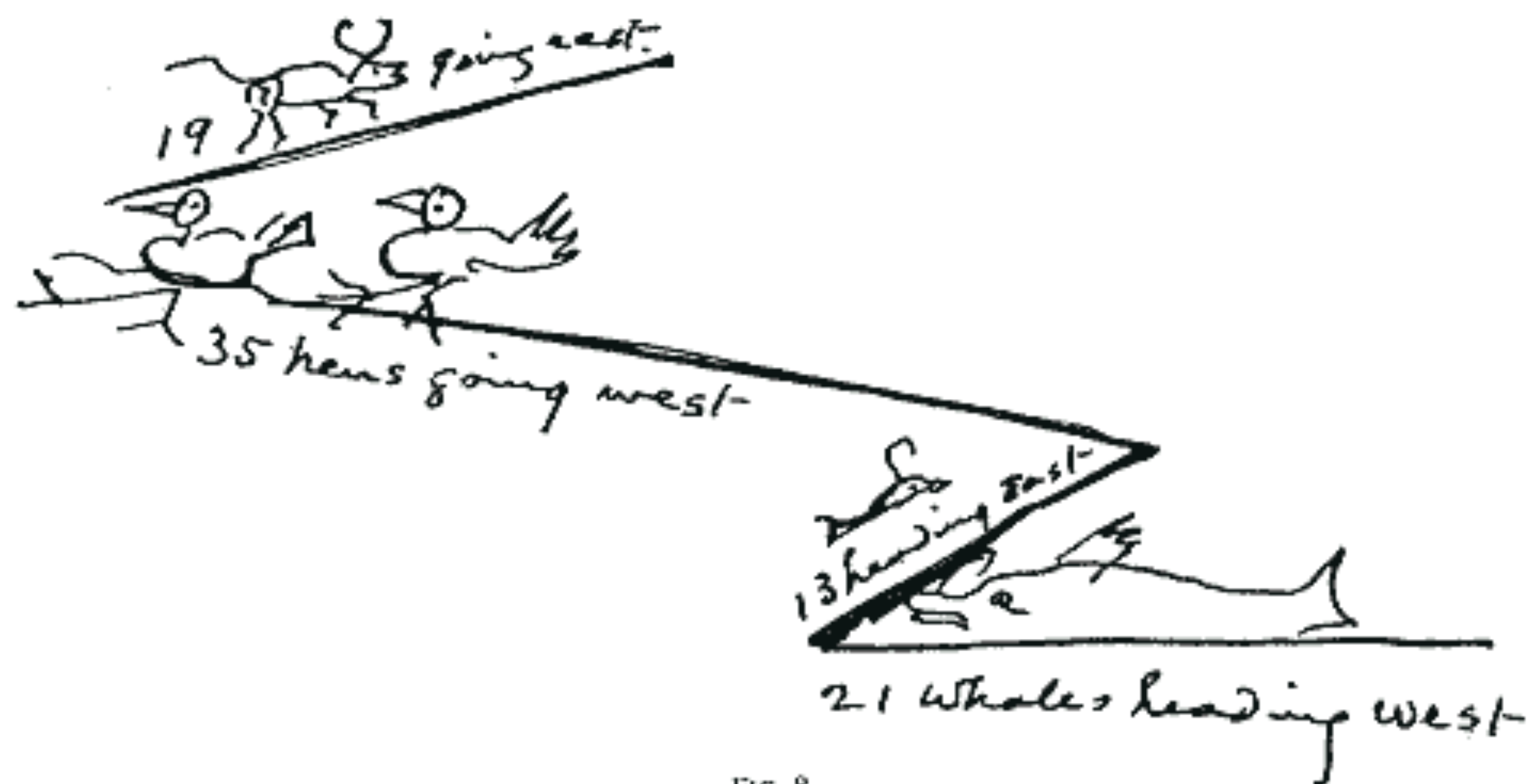
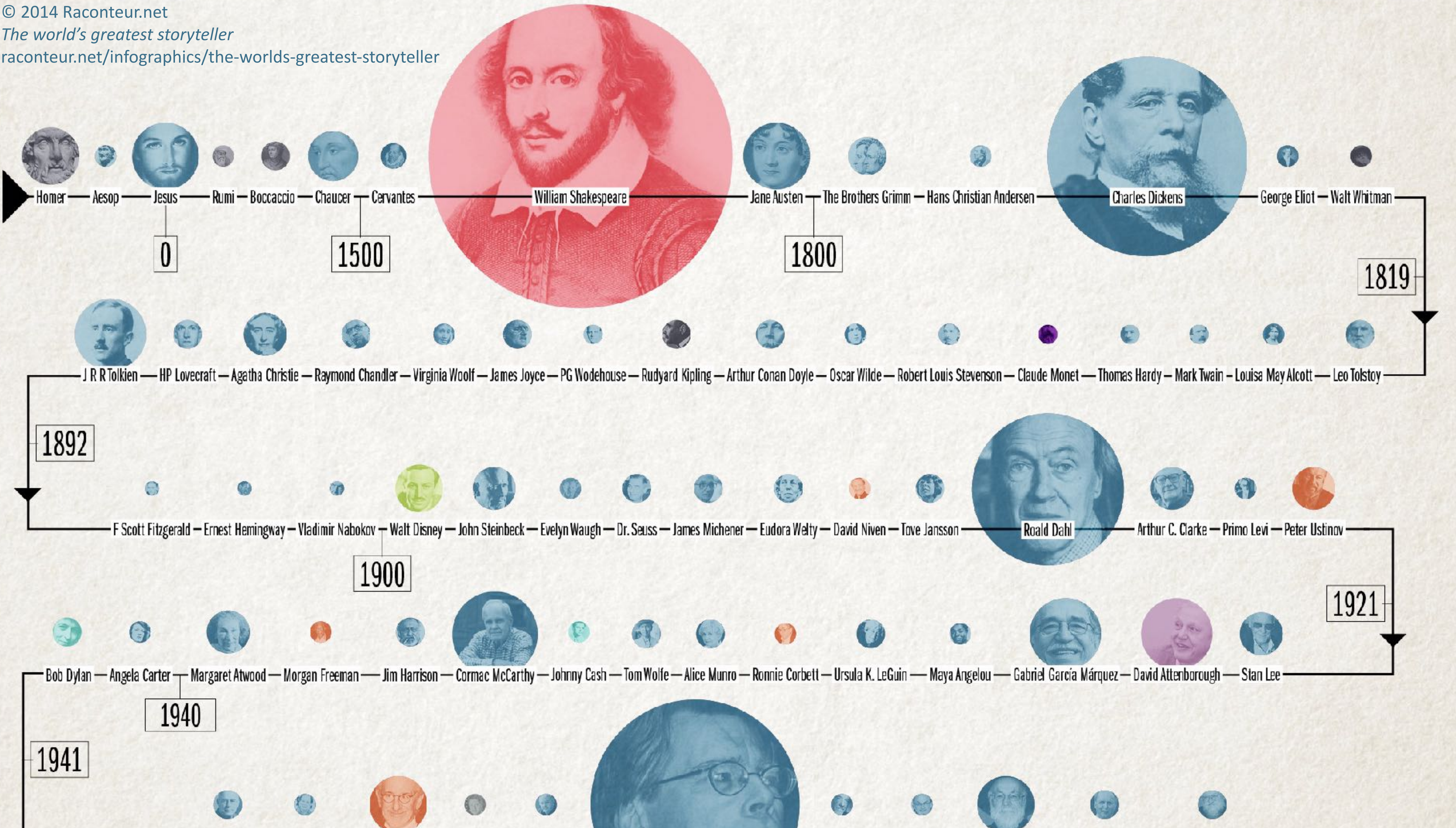
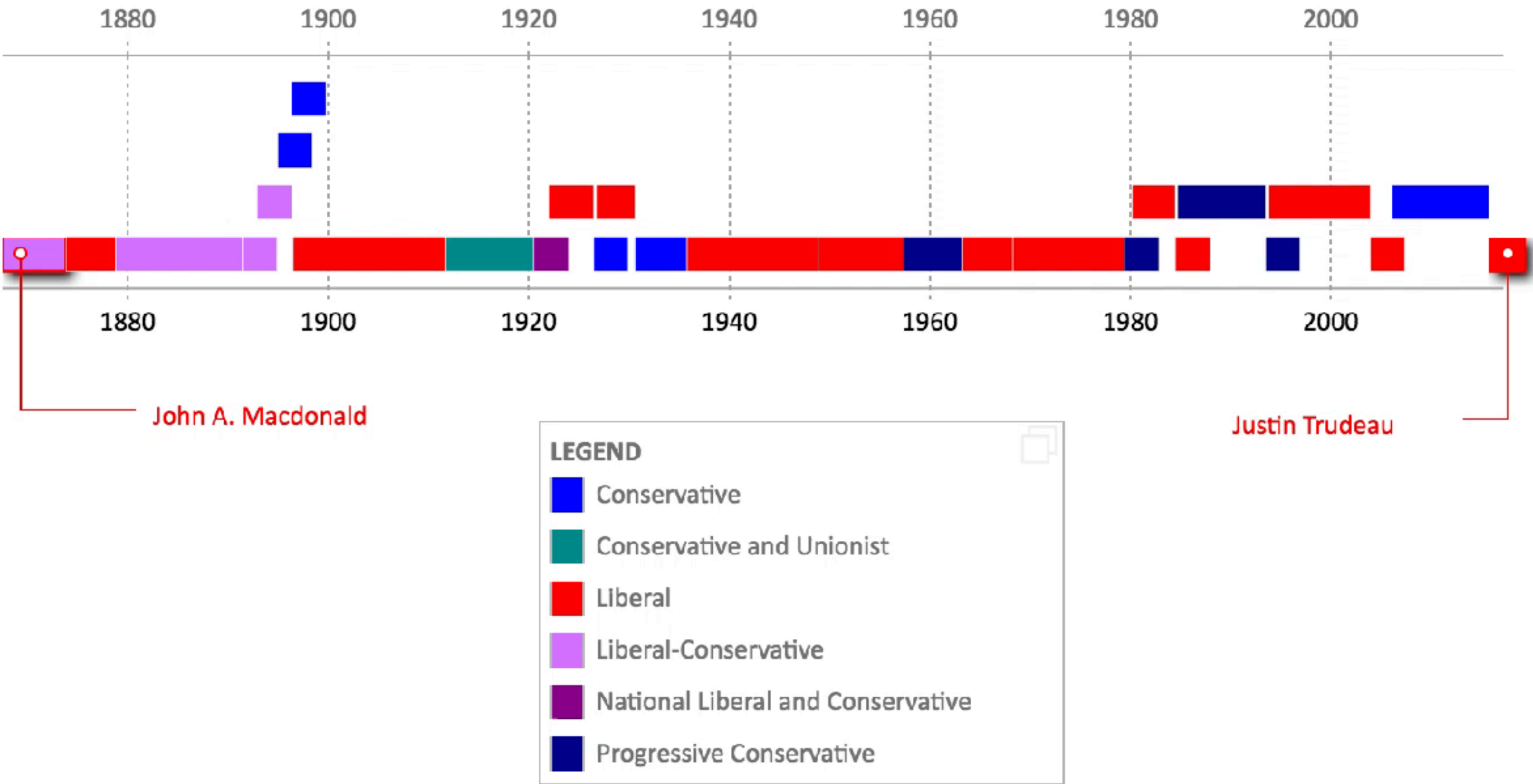


FIG. 8

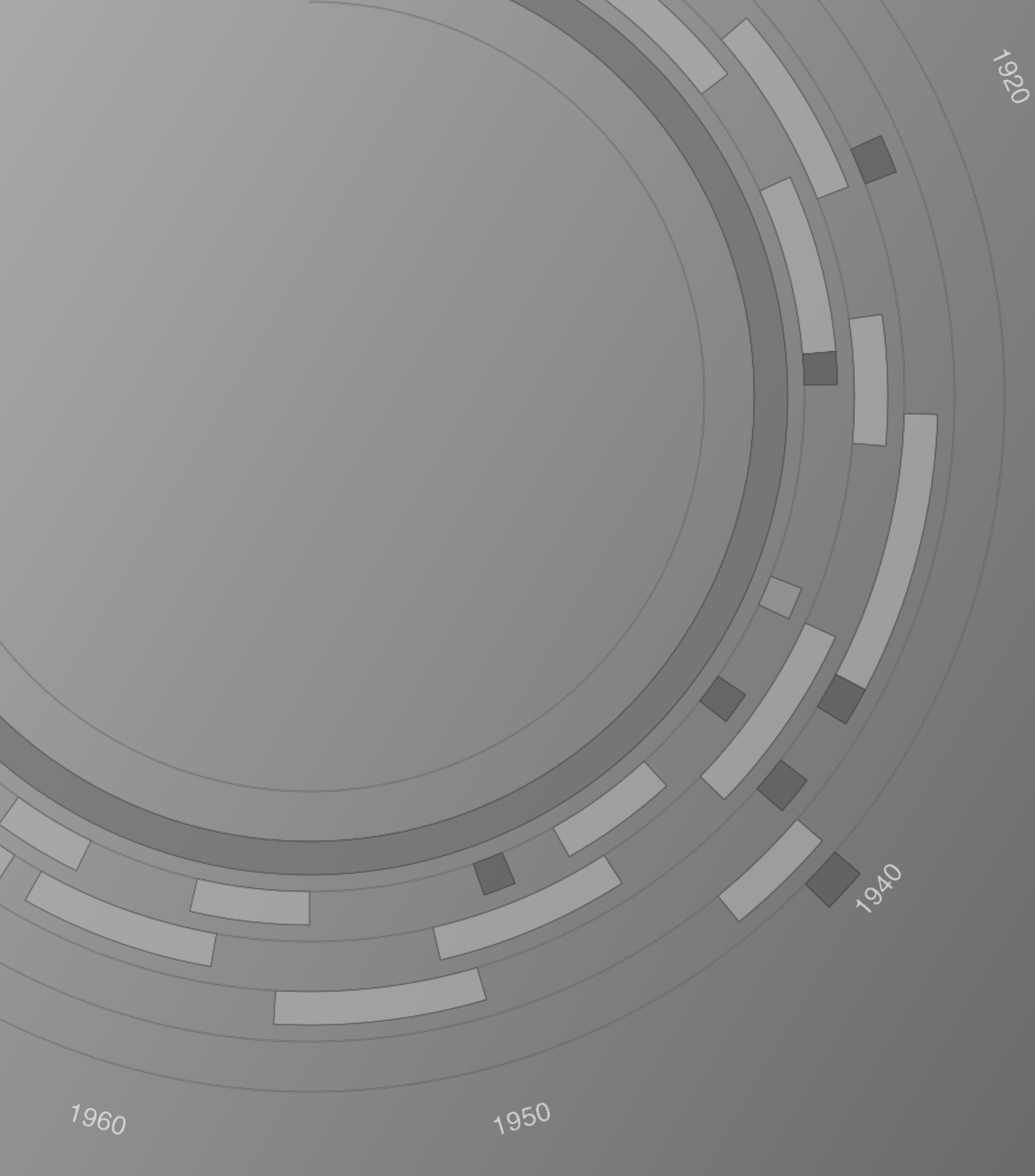


Prime Ministers of Canada



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





WHAT IS A
TIMELINE FOR?

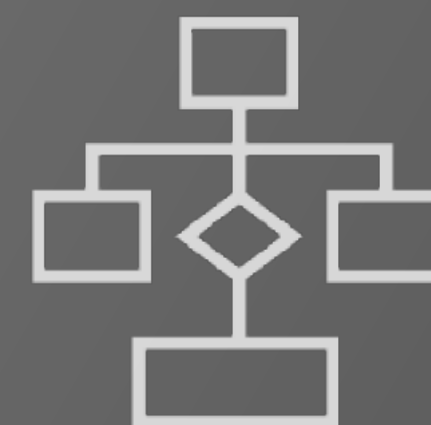
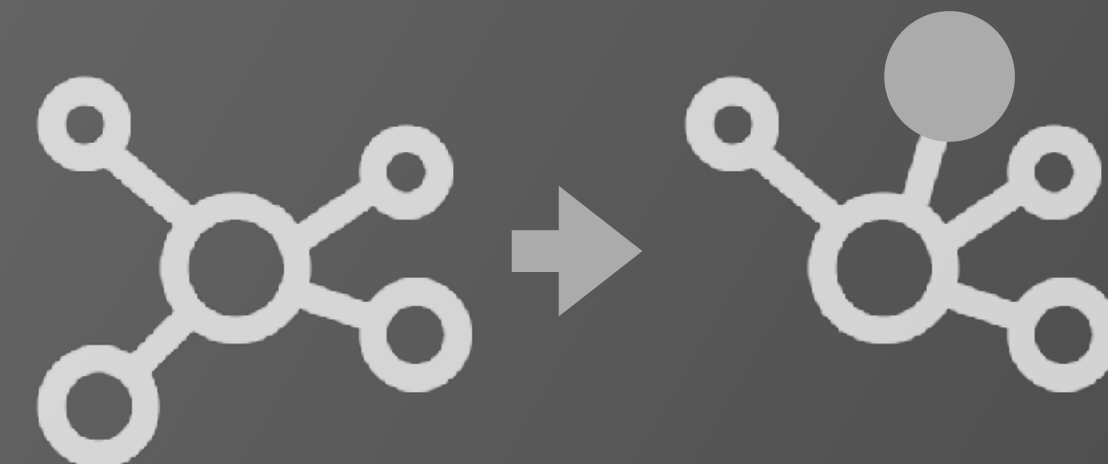
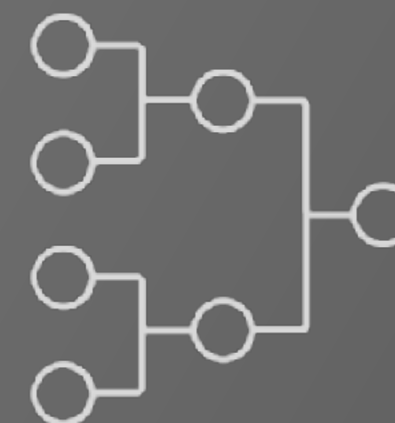
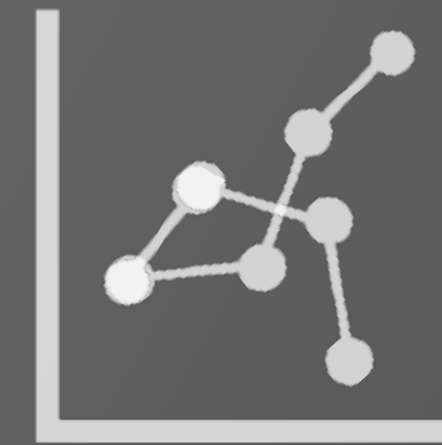
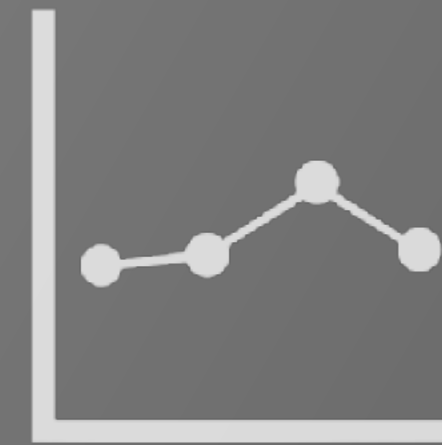
WHAT HAPPENED WHEN?

WHEN & HOW MUCH?

WHERE, WHAT, & WHEN?

WHAT WAS RELATED WHEN?

WHAT IF & WHEN?



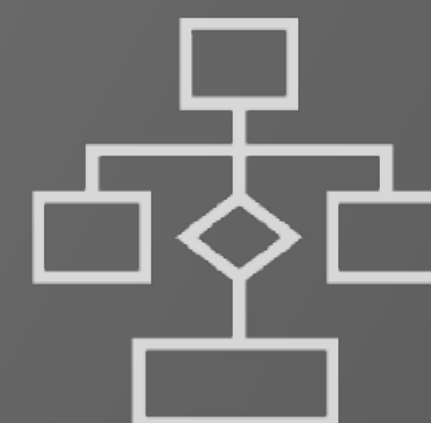
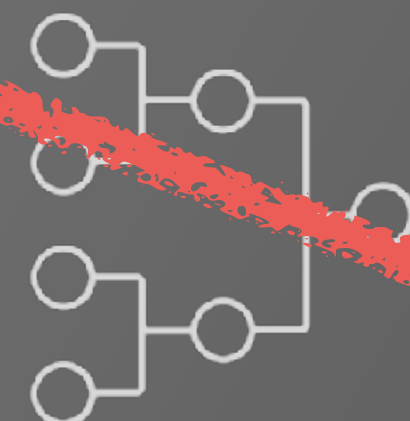
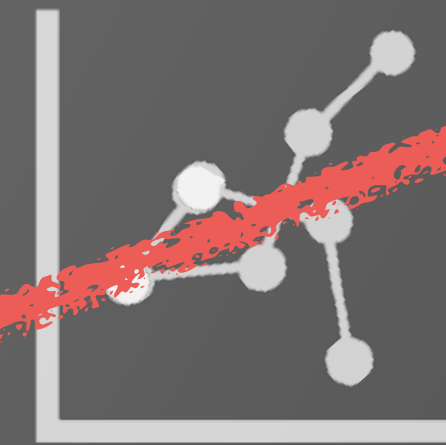
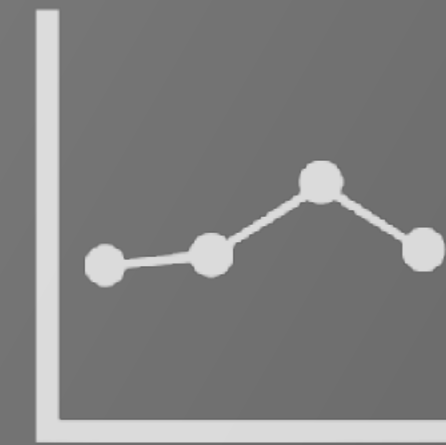
WHAT HAPPENED WHEN?

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

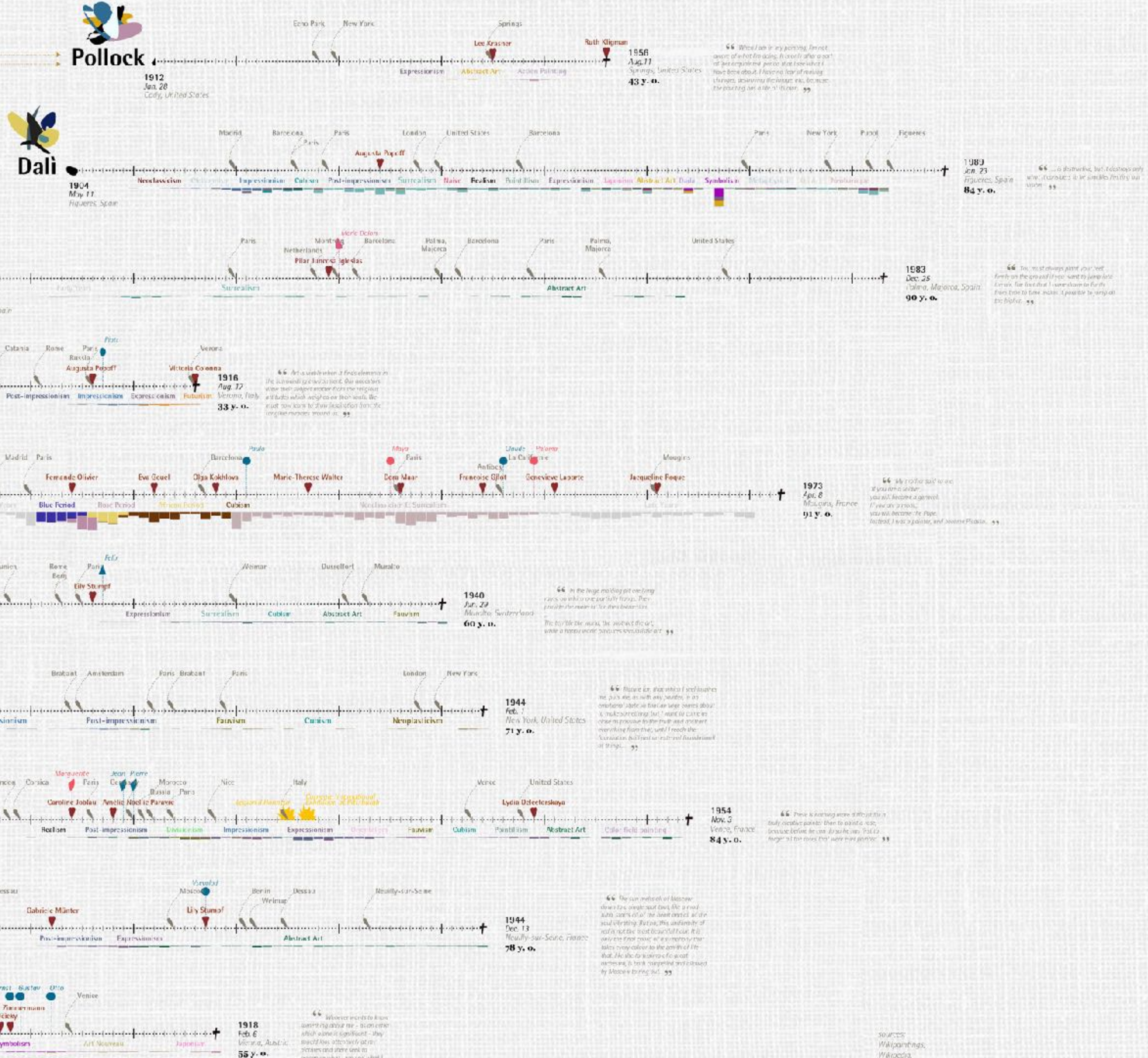
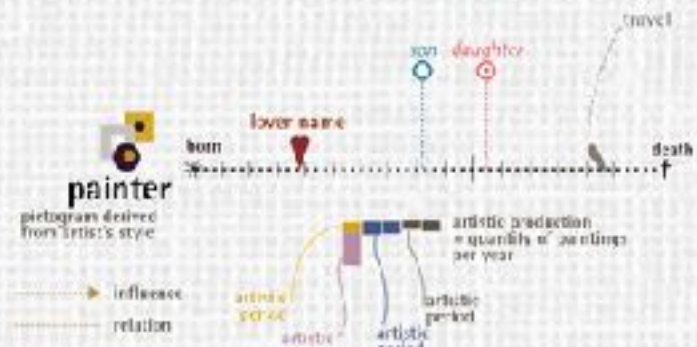
1940

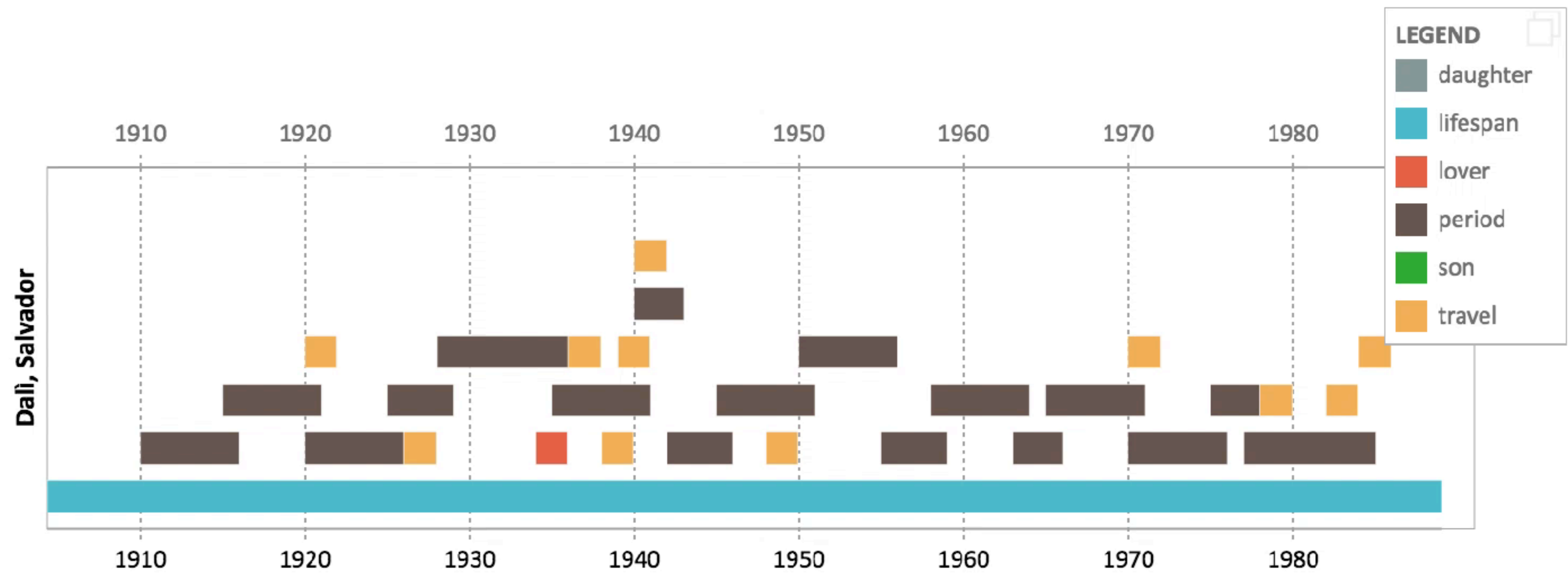
1950

Visualising painters' lives

a project by Accurat (www.accurat.it)
directed by Giorgia Lupi and Michela Buttignol

how to read it:
shapes, elements, forms

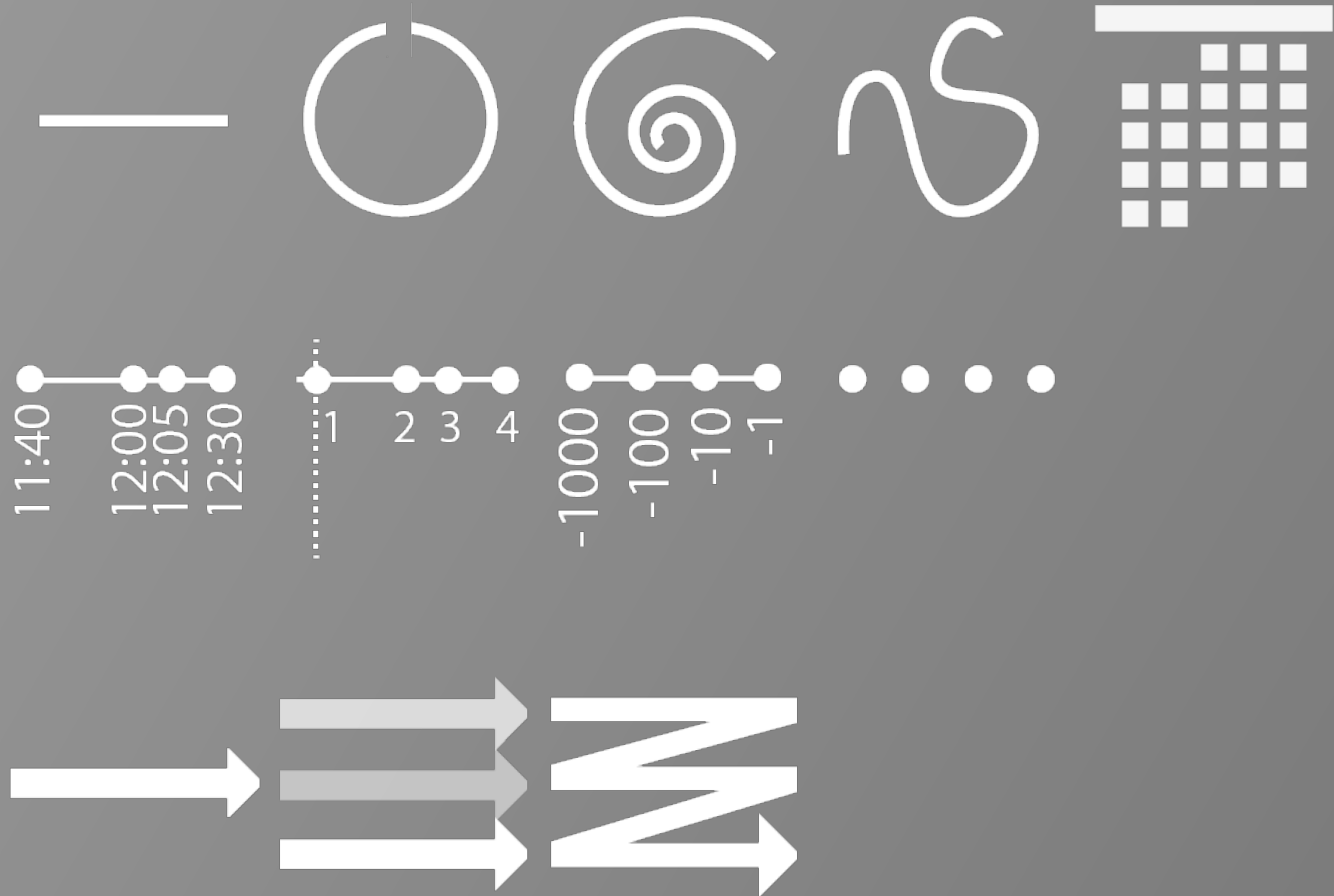




REPRESENTATION

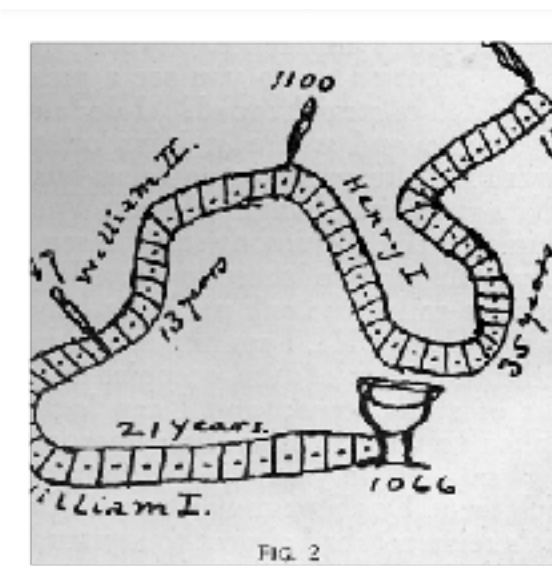
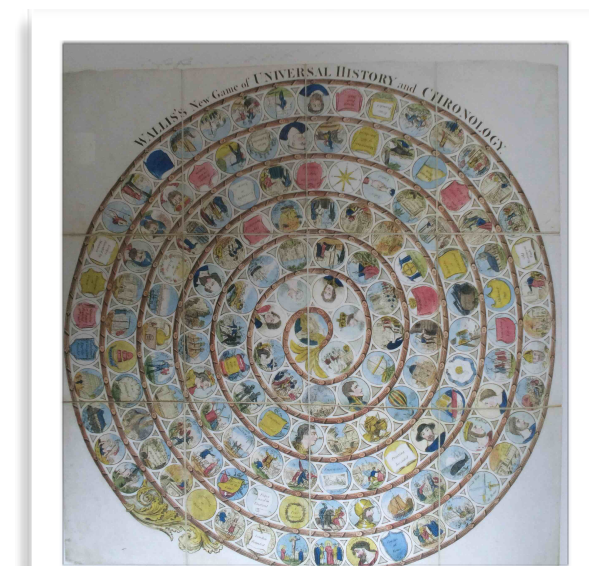
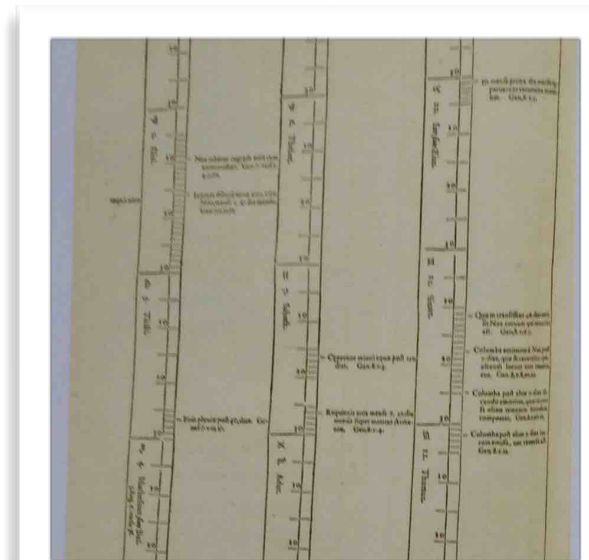
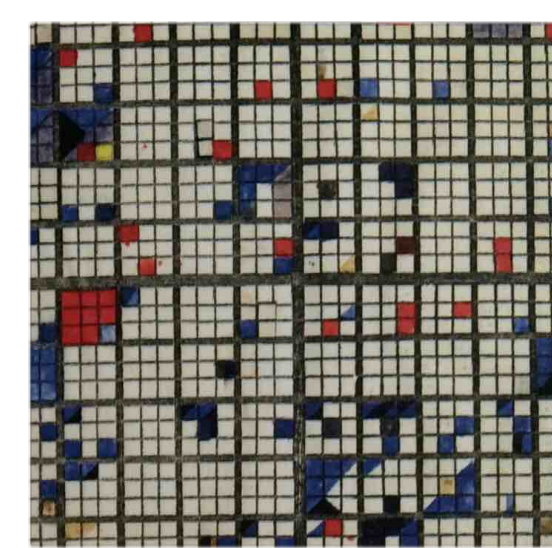
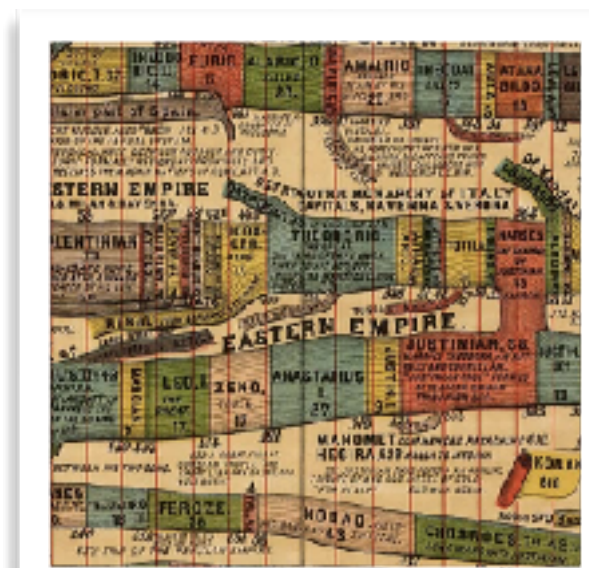
SCALE

LAYOUT

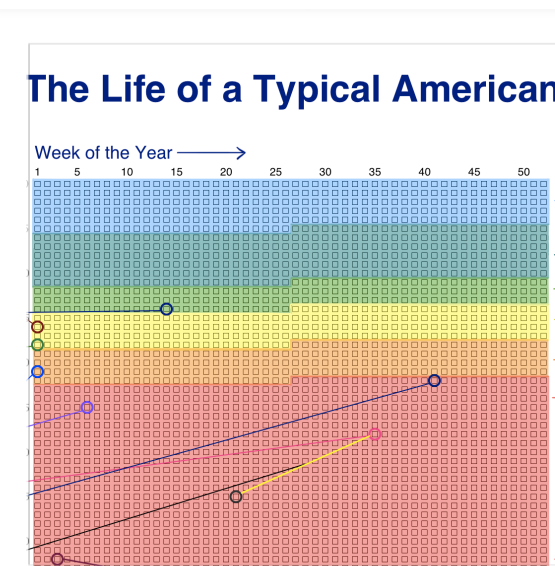
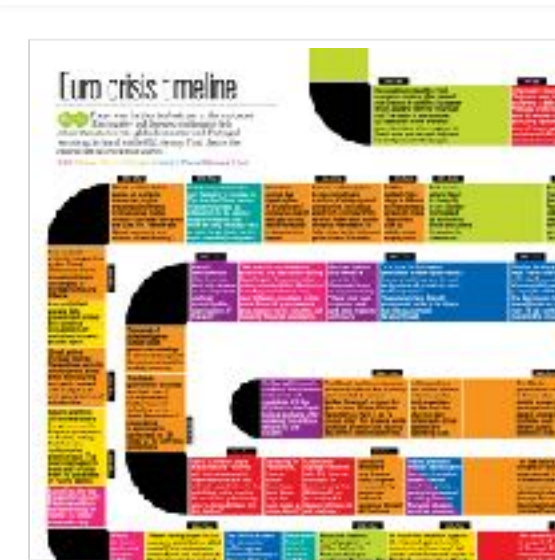
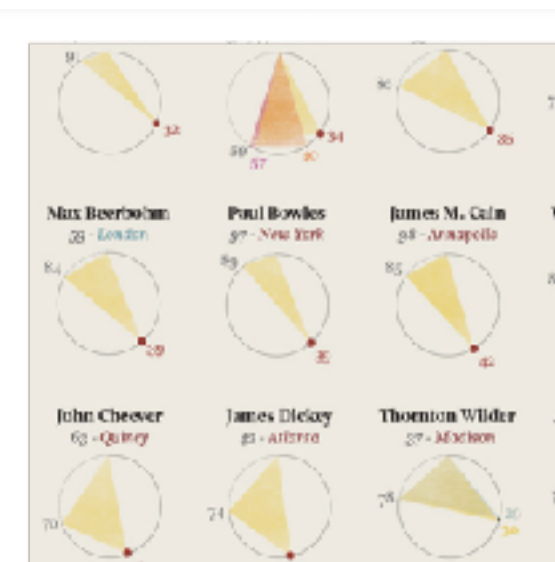


A survey of 263 timelines & timeline-producing tools

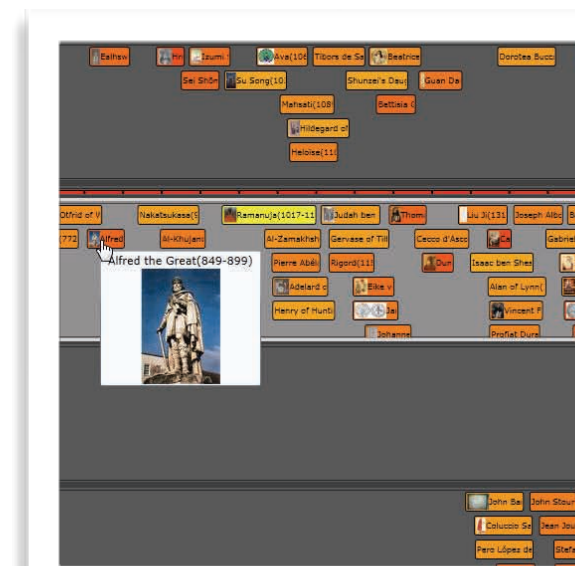
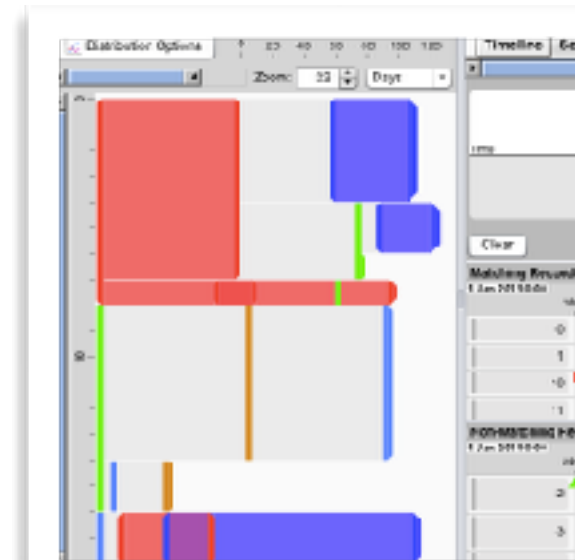
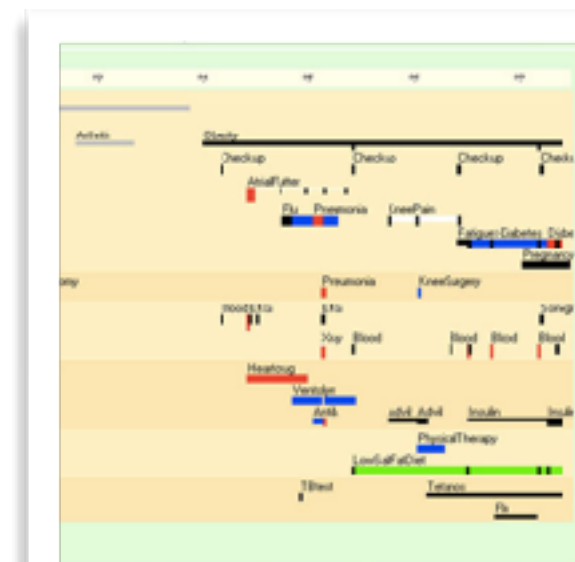
TIMELINES THROUGHOUT HISTORY



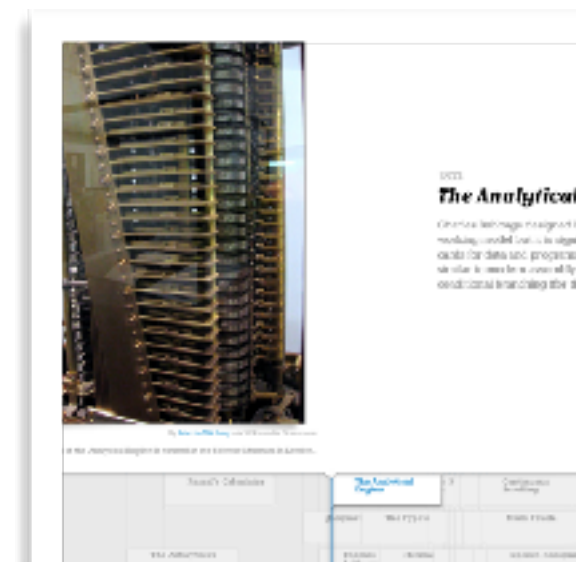
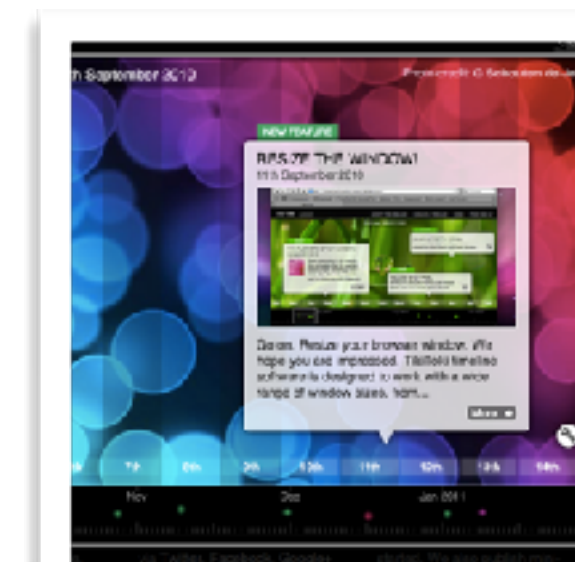
INFOGRAPHICS & BESPOKE TIMELINES



VISUALIZATION FOR EXPLORATORY DATA ANALYSIS



INTERACTIVE TIMELINE AUTHORING TOOLS



A design space for expressive storytelling with timelines

Representation



Linear



Radial



Grid



Spiral

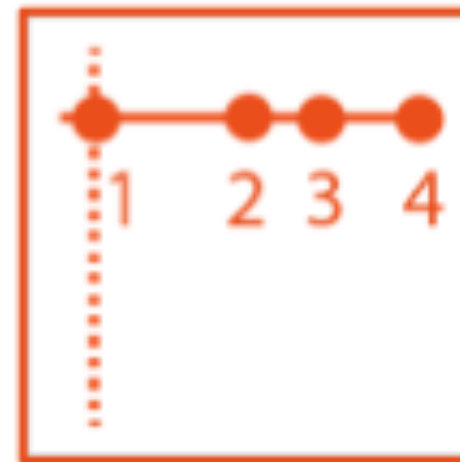


Arbitrary

Scale



Chrono-
logical



Relative



Logarithmic



Sequential



Sequential +
Interim
Duration

Layout



Unified
(single
timeline)



Faceted
(multiple
timelines)

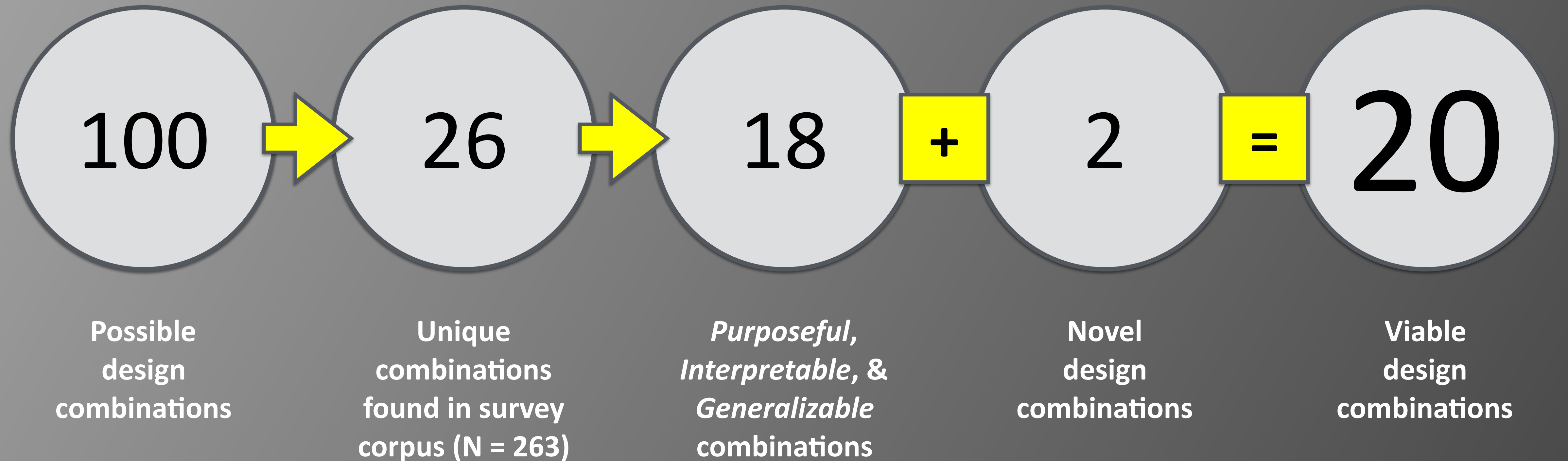


Segmented
timeline

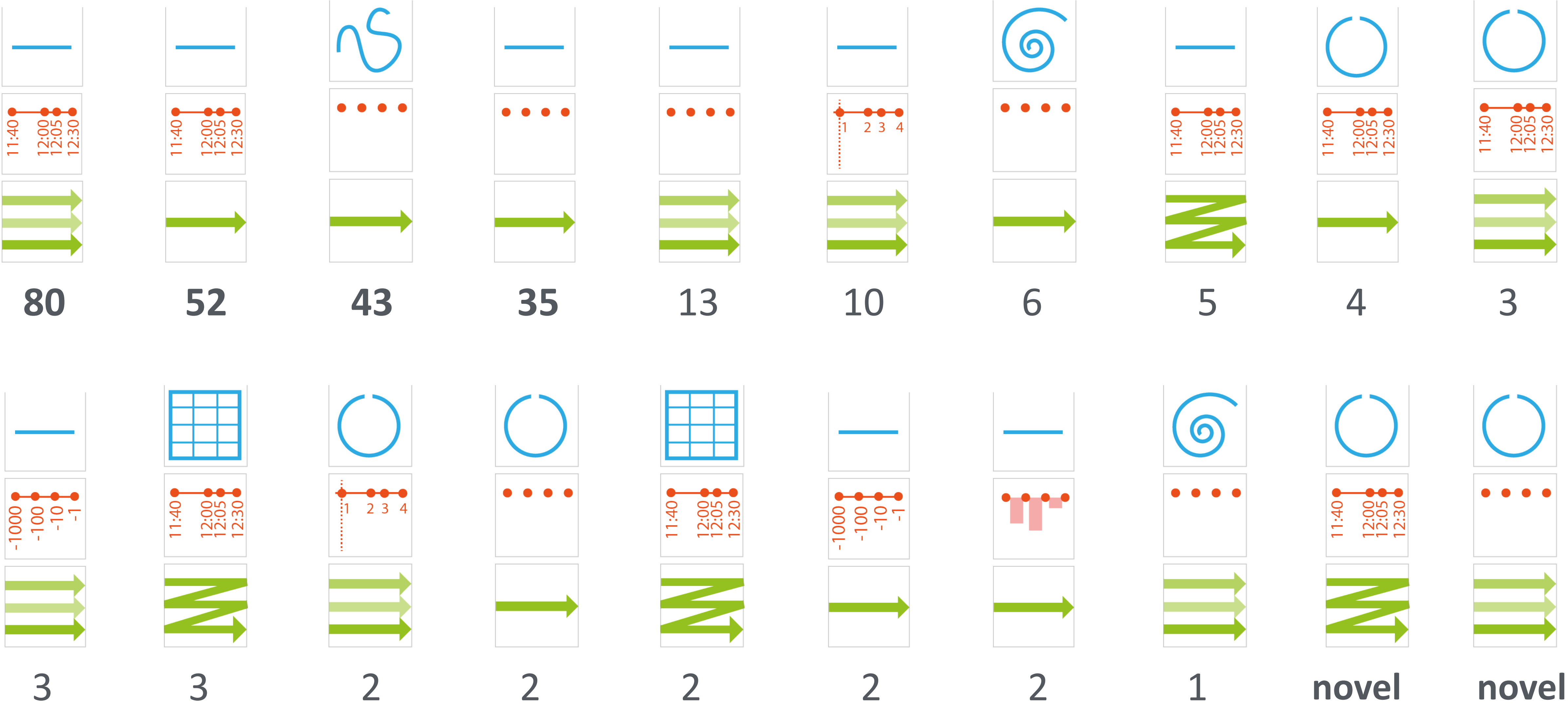


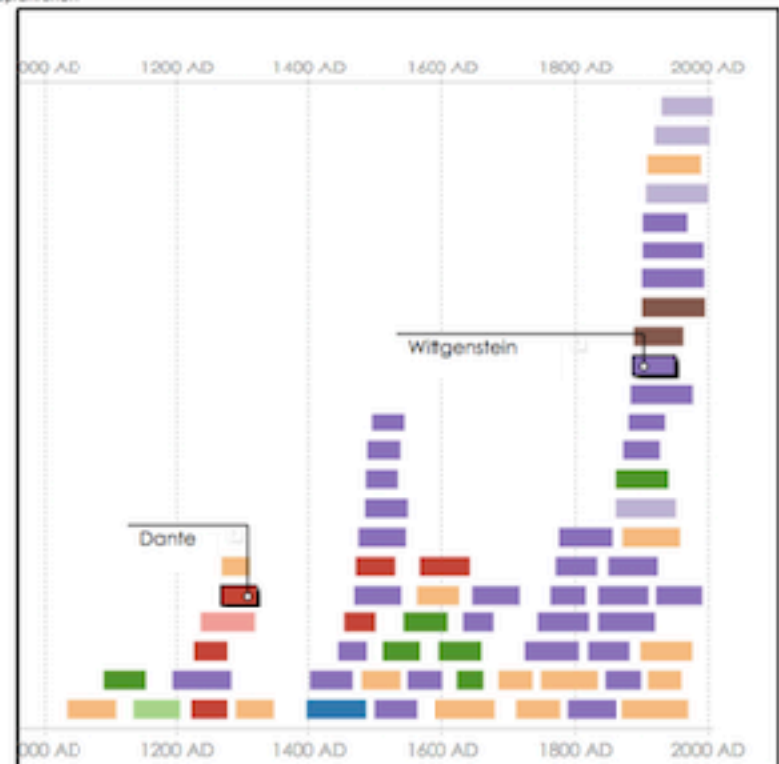
Faceted +
Segmented

Combinations of timeline design choices

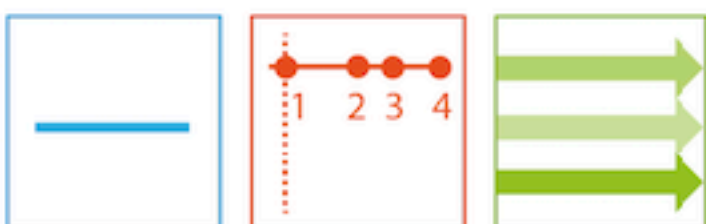
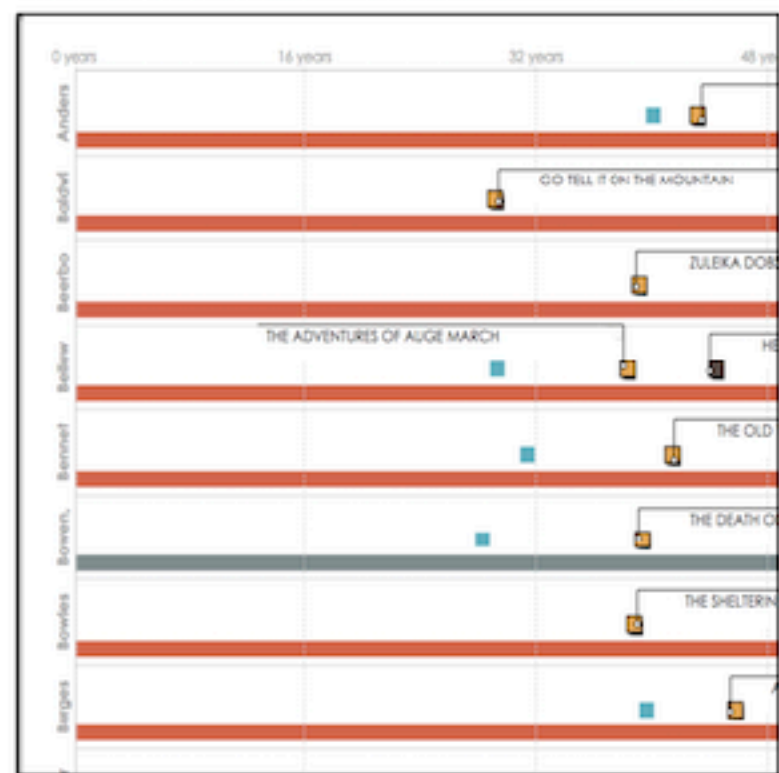


20 viable combinations of timeline design choices

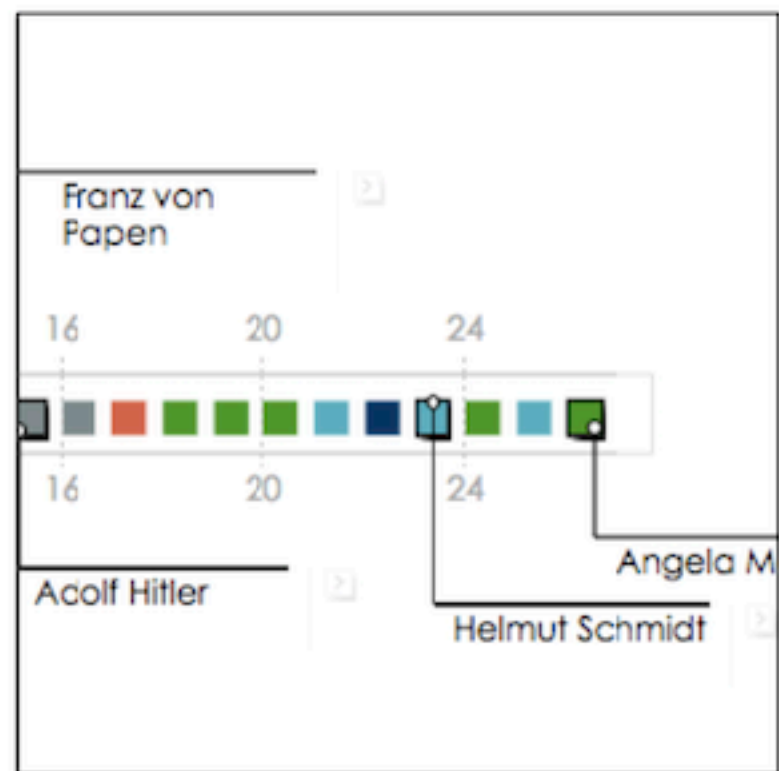




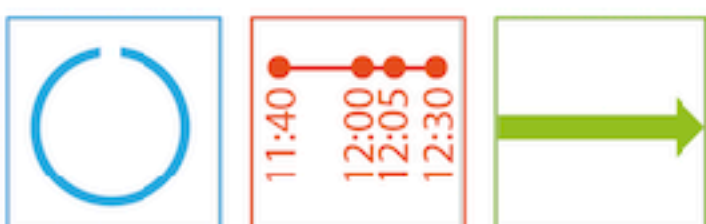
Narrative point: present chronology, duration of events.
Perceptual task: bar length and position judgment.
Comment: supported by most tools.



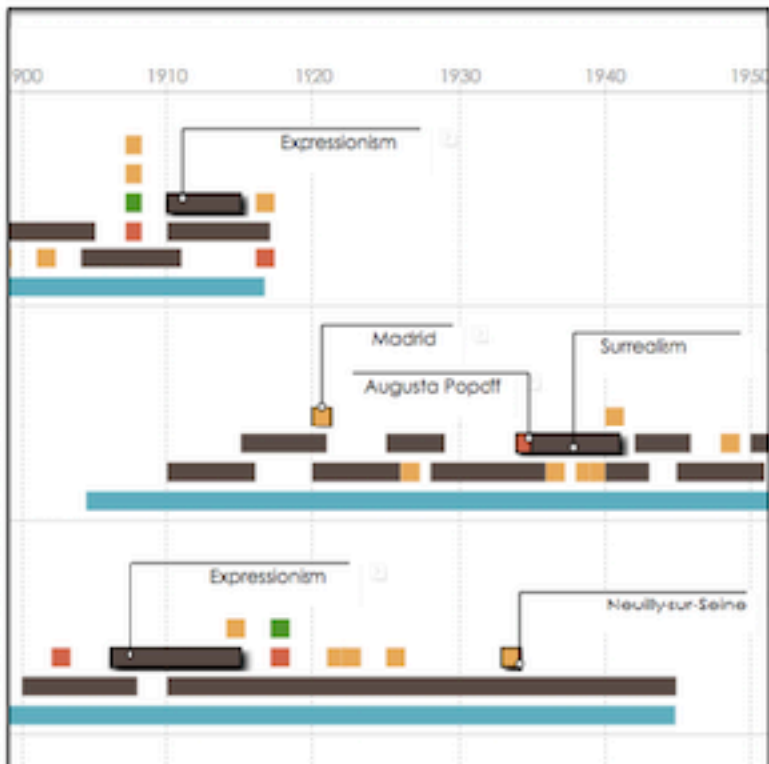
Narrative point: compare relative chronology, duration of events between facets; present relative synchronicities.
Perceptual task: bar length and position comparisons.



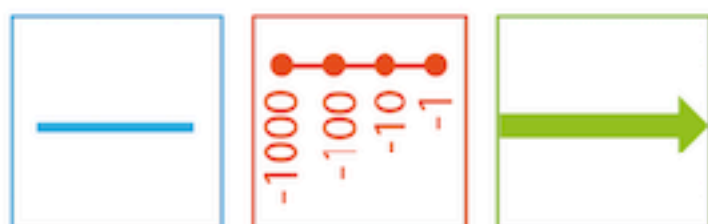
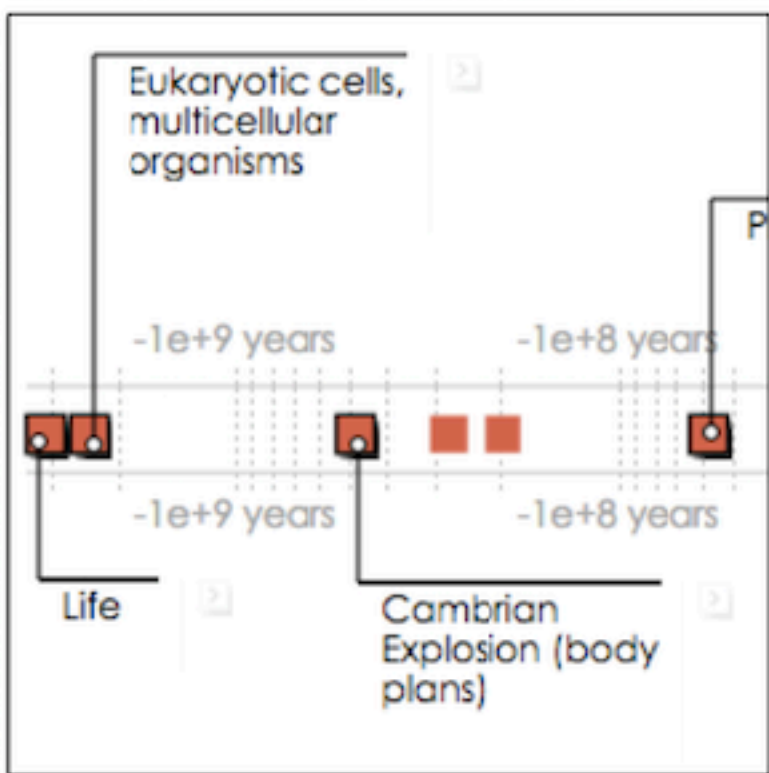
Narrative point: present a sequence of events.
Perceptual task: bar position judgments.
Comment: wide aspect ratio.



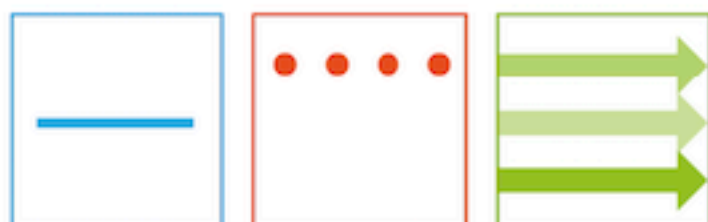
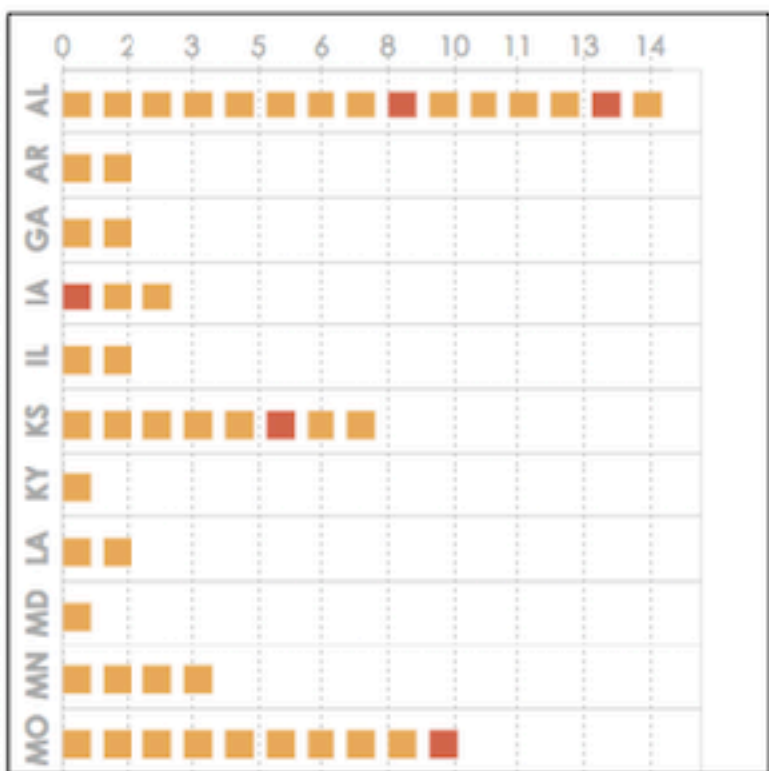
Narrative point: present chronology, duration of events.



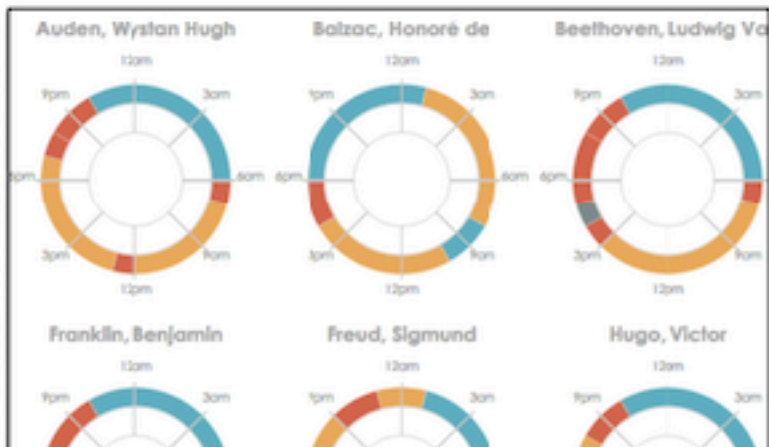
Narrative point: compare chronology, duration of events between facets; present synchronicities (coinciding events).
Perceptual task: bar length and position comparisons.



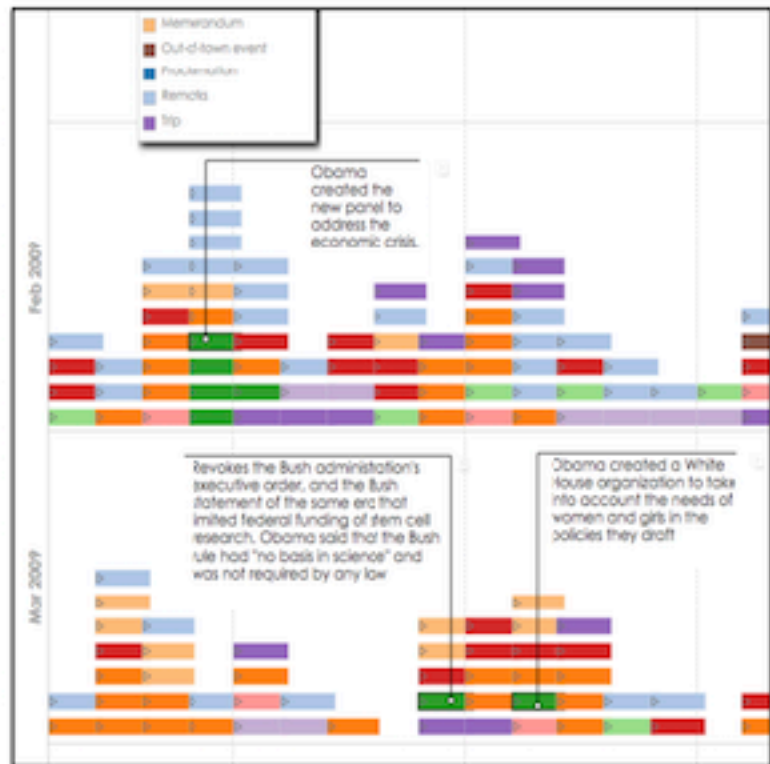
Narrative point: present chronology of a timeline with emphasis on recent events.
Perceptual task: bar position judgment.
Comment: do not start story with log scale.



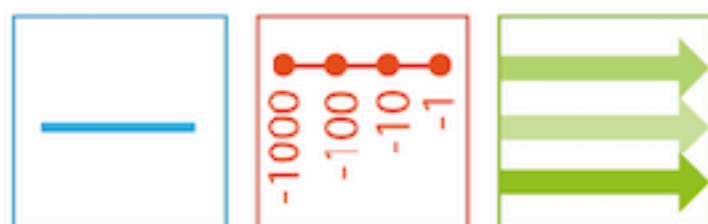
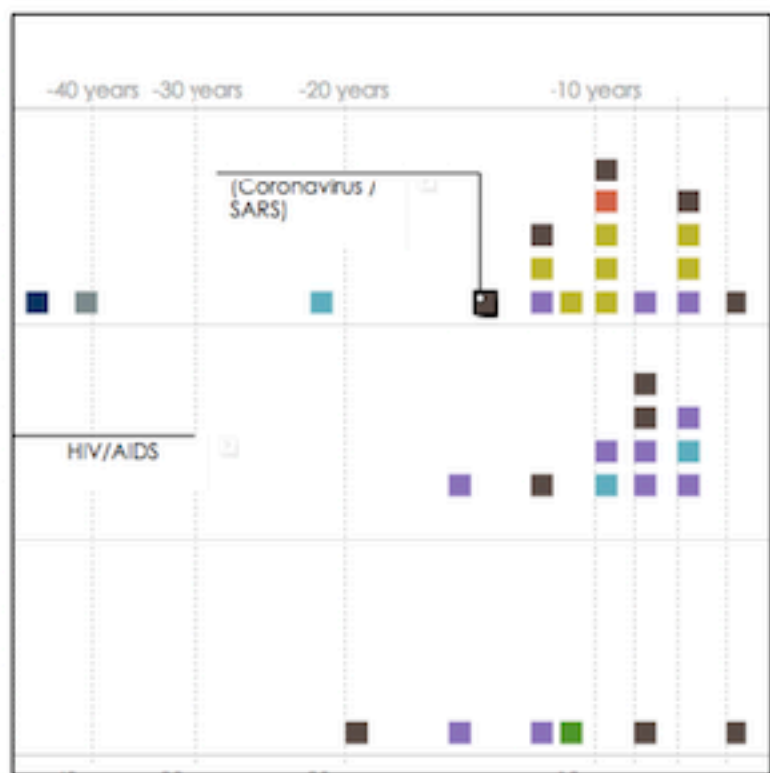
Narrative point: (accurately) compare lengths of sequences between facets.



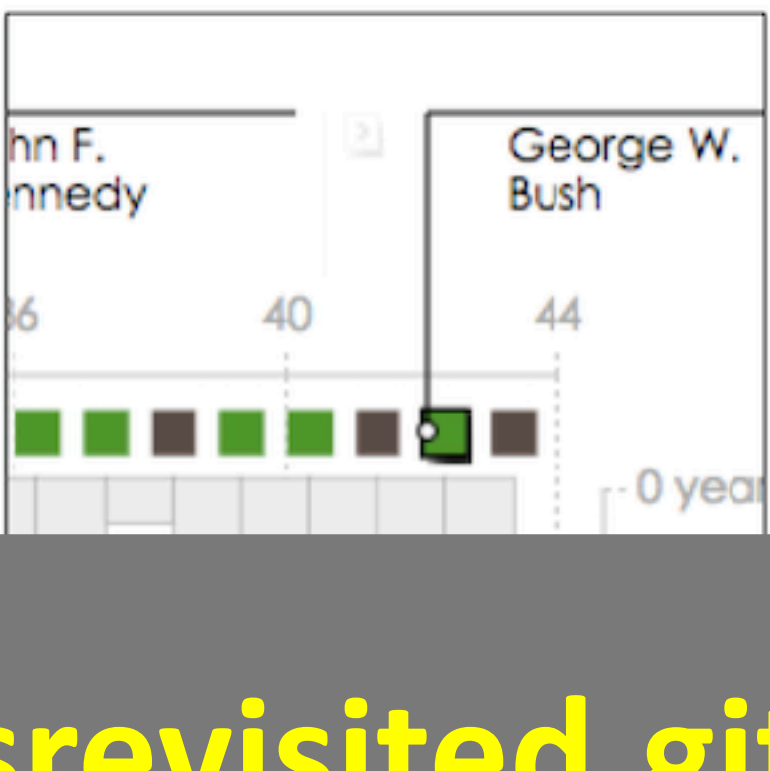
Narrative point: compare chronology, duration of events between facets.



Narrative point: compare chronology, duration, periodicity of events between segments.
Perceptual task: bar length and position comparisons.



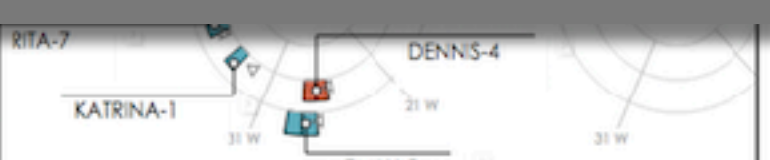
Narrative point: compare chronologies with emphasis on recent events between facets; show synchronicity.
Perceptual task: bar position comparisons.
Comment: do not start story with log scale.



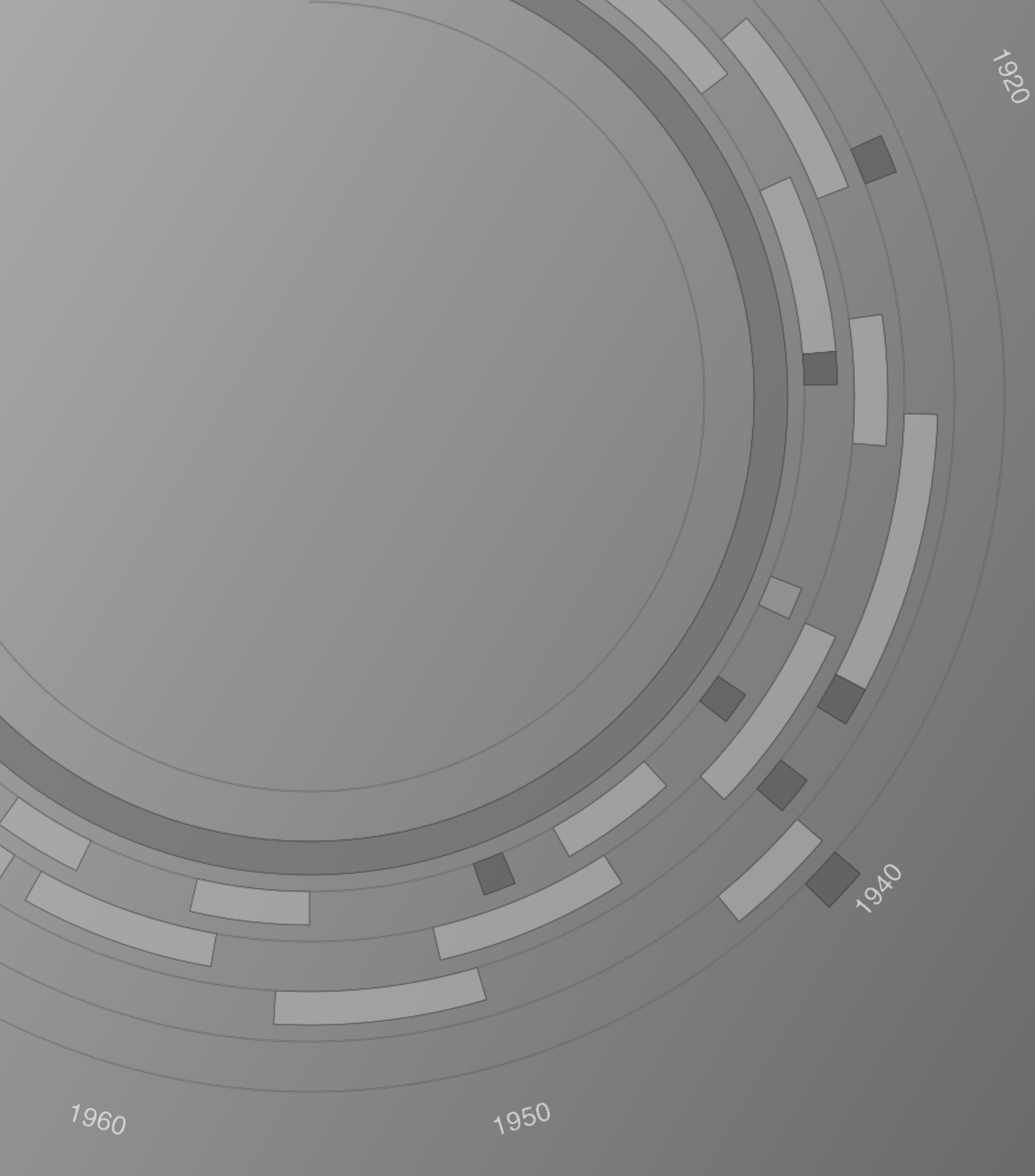
Narrative point: present a sequence of events with distribution of time elapsed between events.

timelinesrevisited.github.io

journal paper + survey + example galleries



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



STORYTELLING
WITH TIMELINES



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

all | none

★ Wilson's factfinding mission to Niger

● Bush's State of the Union with "16 words"

★ Wilson's "What I didn't find in Africa" published in NYT

▶ Novak's Column "outs" Plame

▶ Cooper ordered to jail

● Rove's 4th grand jury appearance

■ Libby sentenced to 30 months, fine

▶ Washington Post: Rove = Cooper's source

■ Judge denies delay in Libby's sentence

Lewis "Scooter" Libby

■ Libby's criminal trial

● Bush commutes Libby

■ DOJ launches investigation

▶ Miller held in contempt of court

▶ Judith Miller jailed

● Rove testifies for 5th time

★ Libby found guilty on 4/5 counts

2002

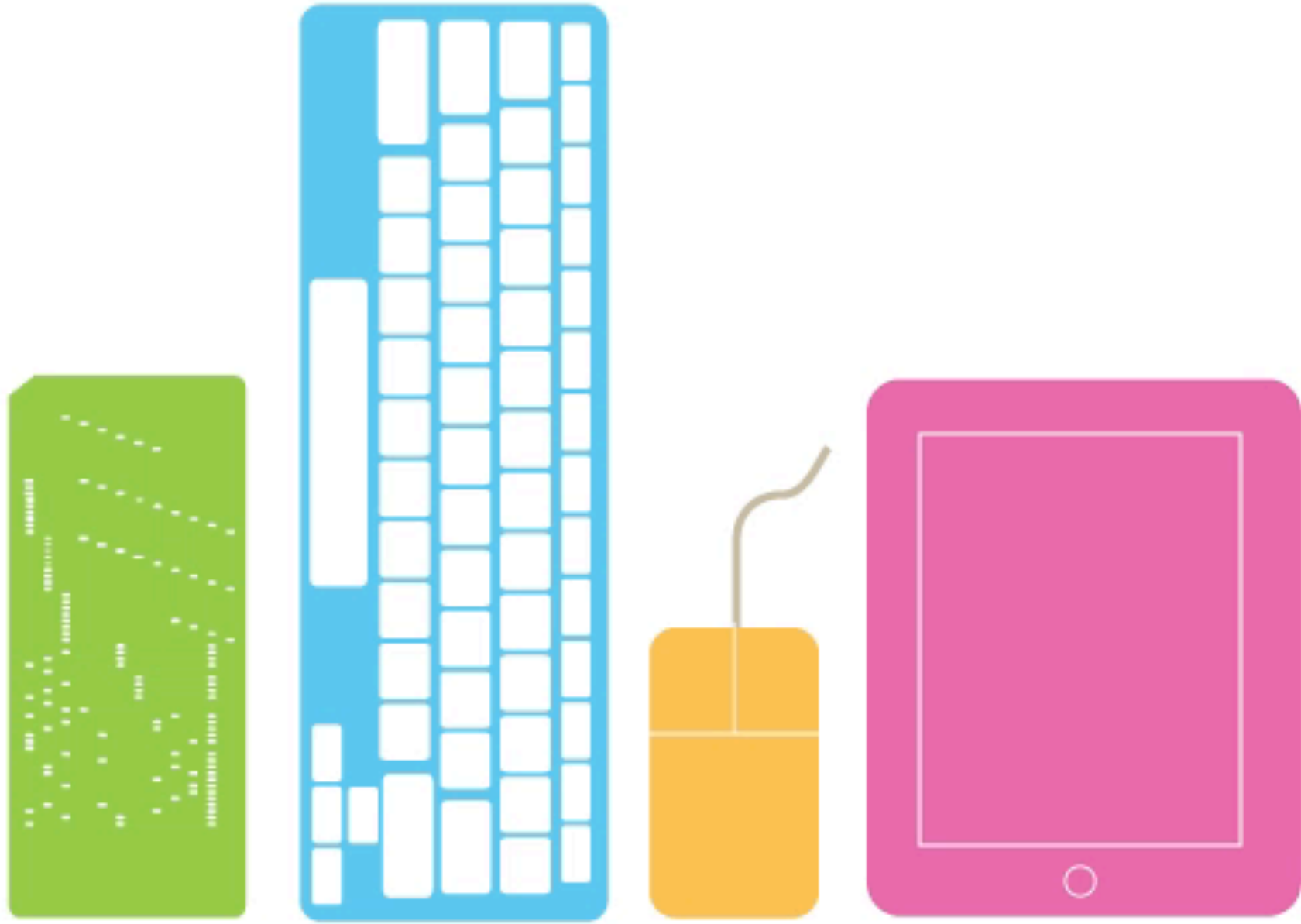
2003

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, ...*

200020012002200320042005200620072008200920102011201220132014

List View

Sort list by: Order inside document

Document View

+

Start here to add your text

Control Panel

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.



Timeline representation

Scale

Layout

TOUR ?

LEGEND

daughter

lifespan

lover

period

son

travel

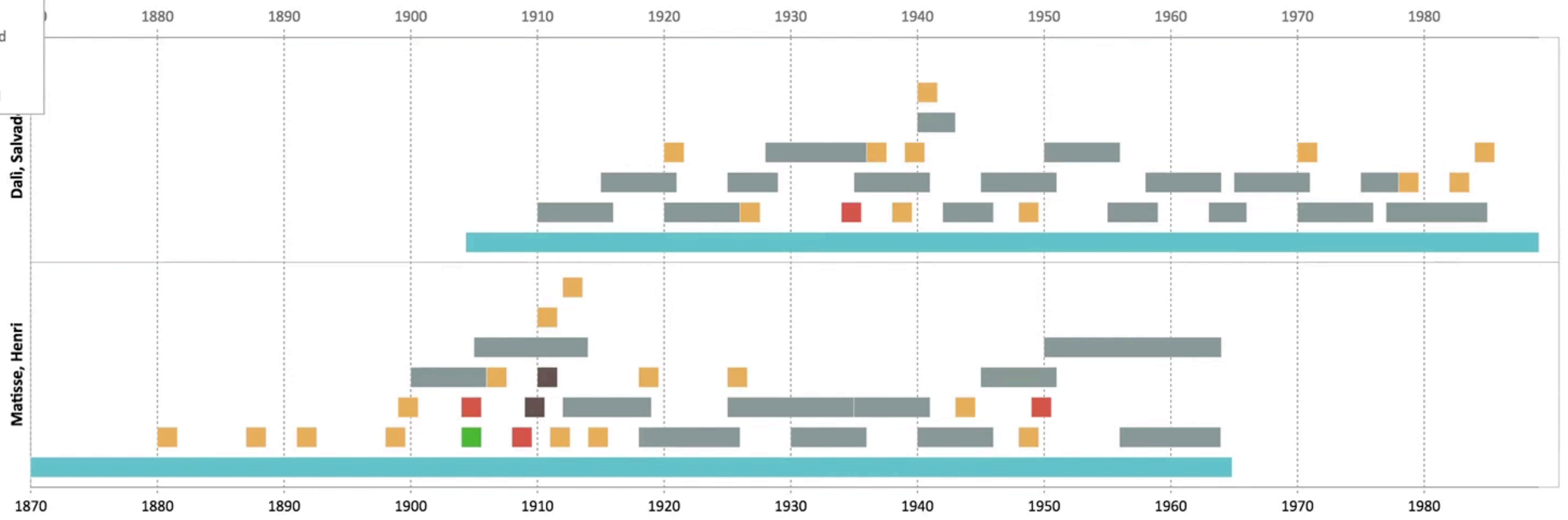
Open

Annotate

CLEAR

Filter

Export



3 x speed

Timeline navigation controls



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

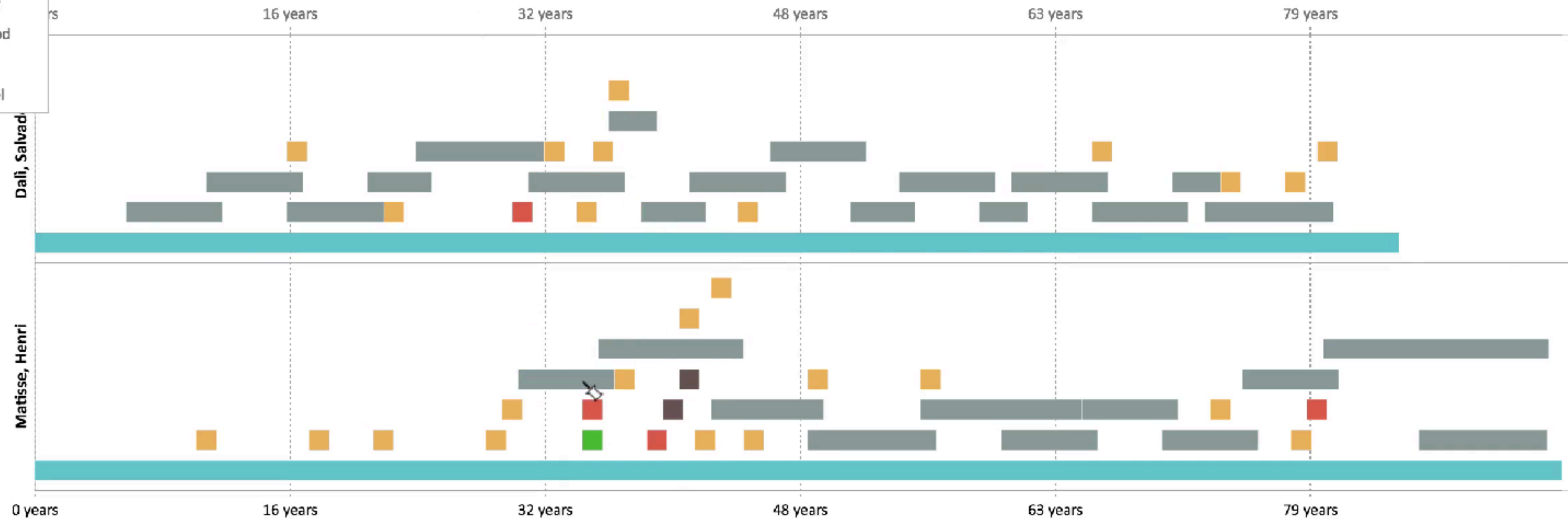
Open

Annotate

CLEAR

Filter

Export



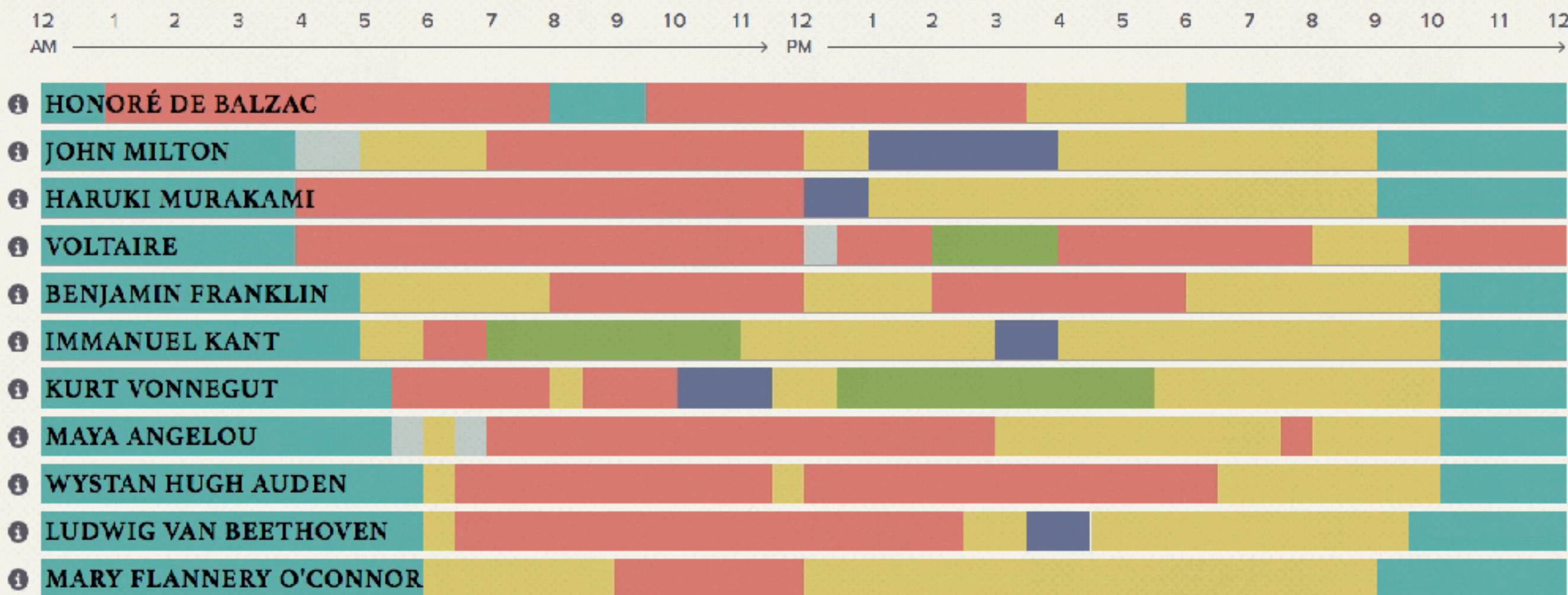
Navigation controls: Play, Previous, Next, Full Screen, and a thumbnail view of the timeline.

3 x
speed

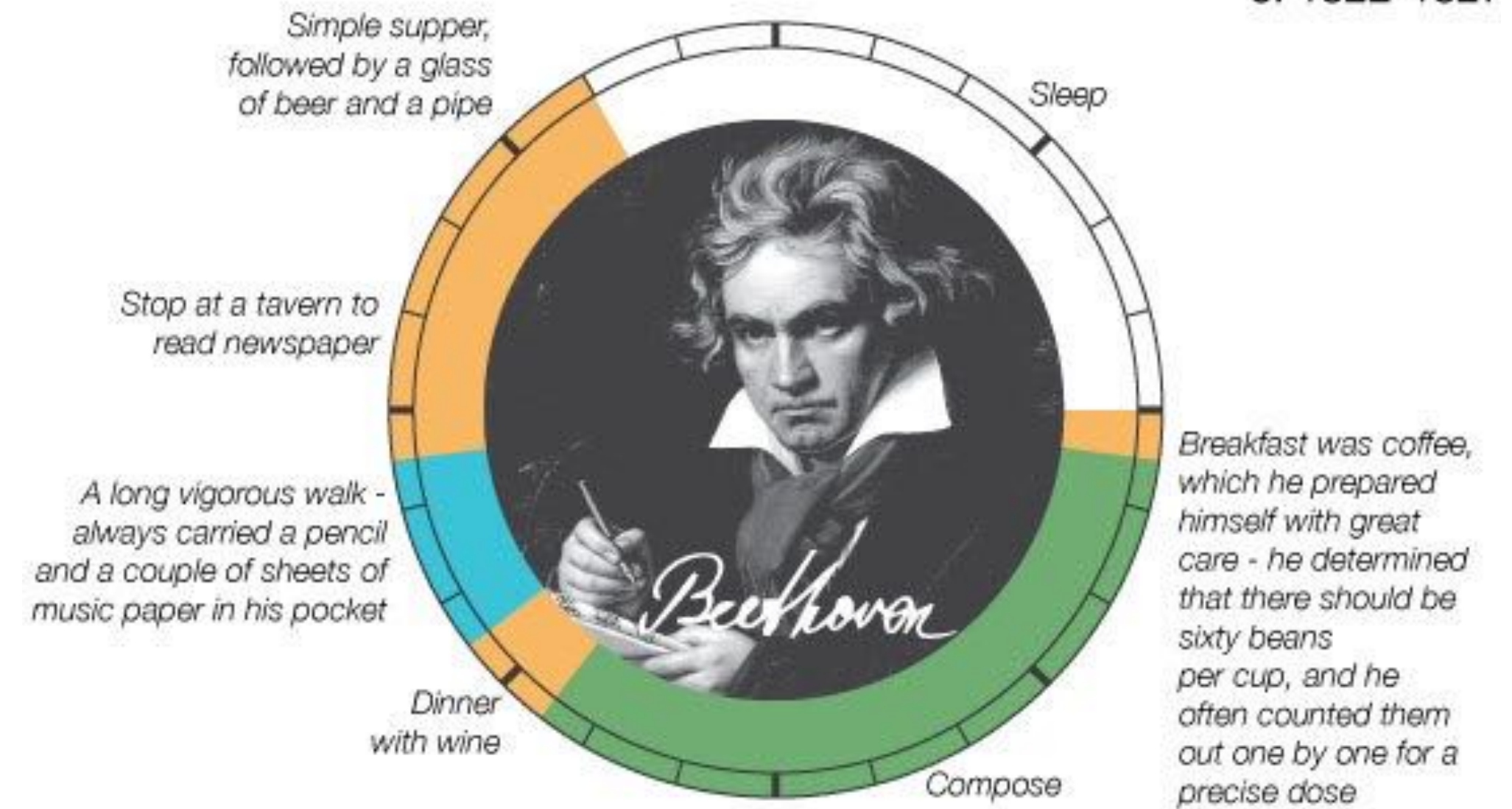
THE DAILY ROUTINES OF FAMOUS CREATIVE PEOPLE

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



Ludwig van Beethoven c. 1822-1827



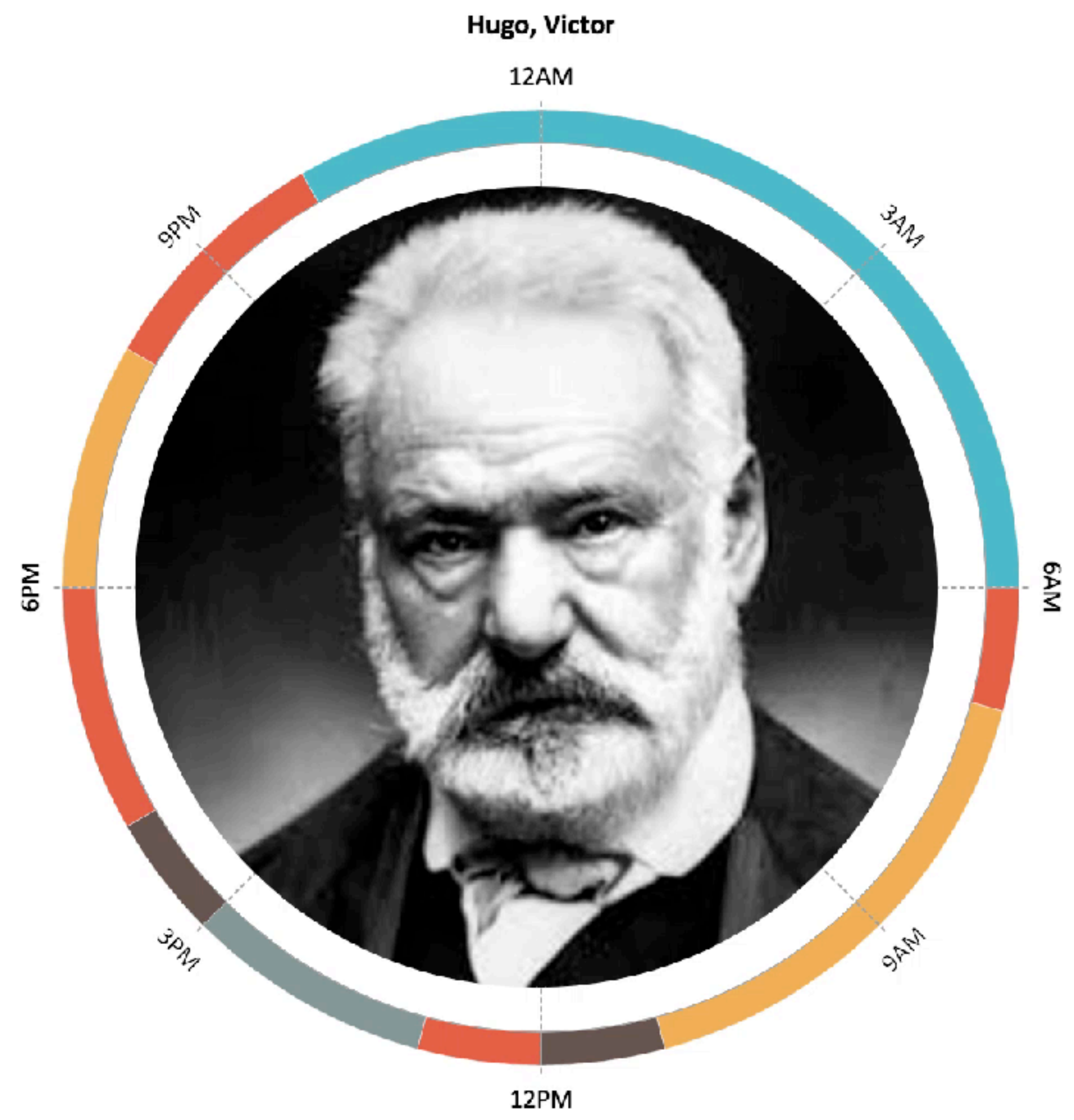
Wolfgang Amadeus Mozart Vienna, c. 1781



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

LEGEND

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



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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TIMELINE PROJECTS:

- **timelinesrevisited.github.io** (*survey w/ 250+ entries, journal paper*)
- **timelinecurator.org** (*text → timeline tool, open-source*)
- **timelimestoryteller.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*).

TIMELINE

PROJECTS:

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