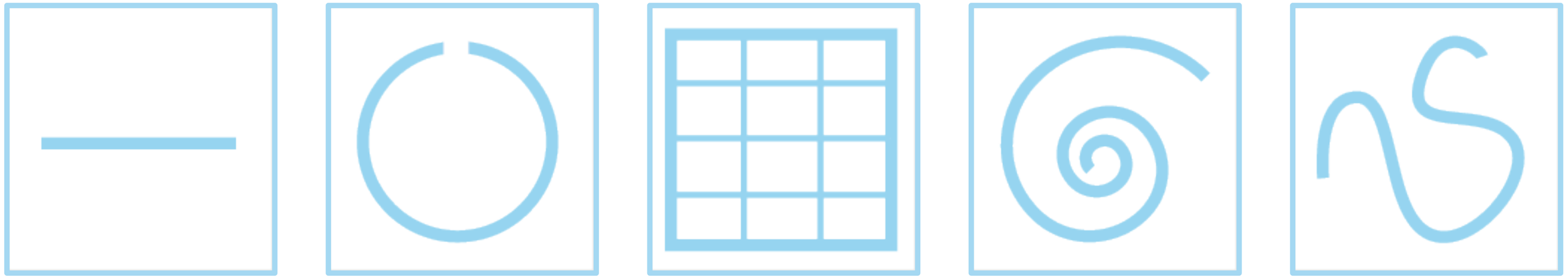


Timelines Revisited

Considerations for Expressive Storytelling

Matthew Brehmer
Microsoft Research, **@mattbrehmer**

timelinesrevisited.github.io

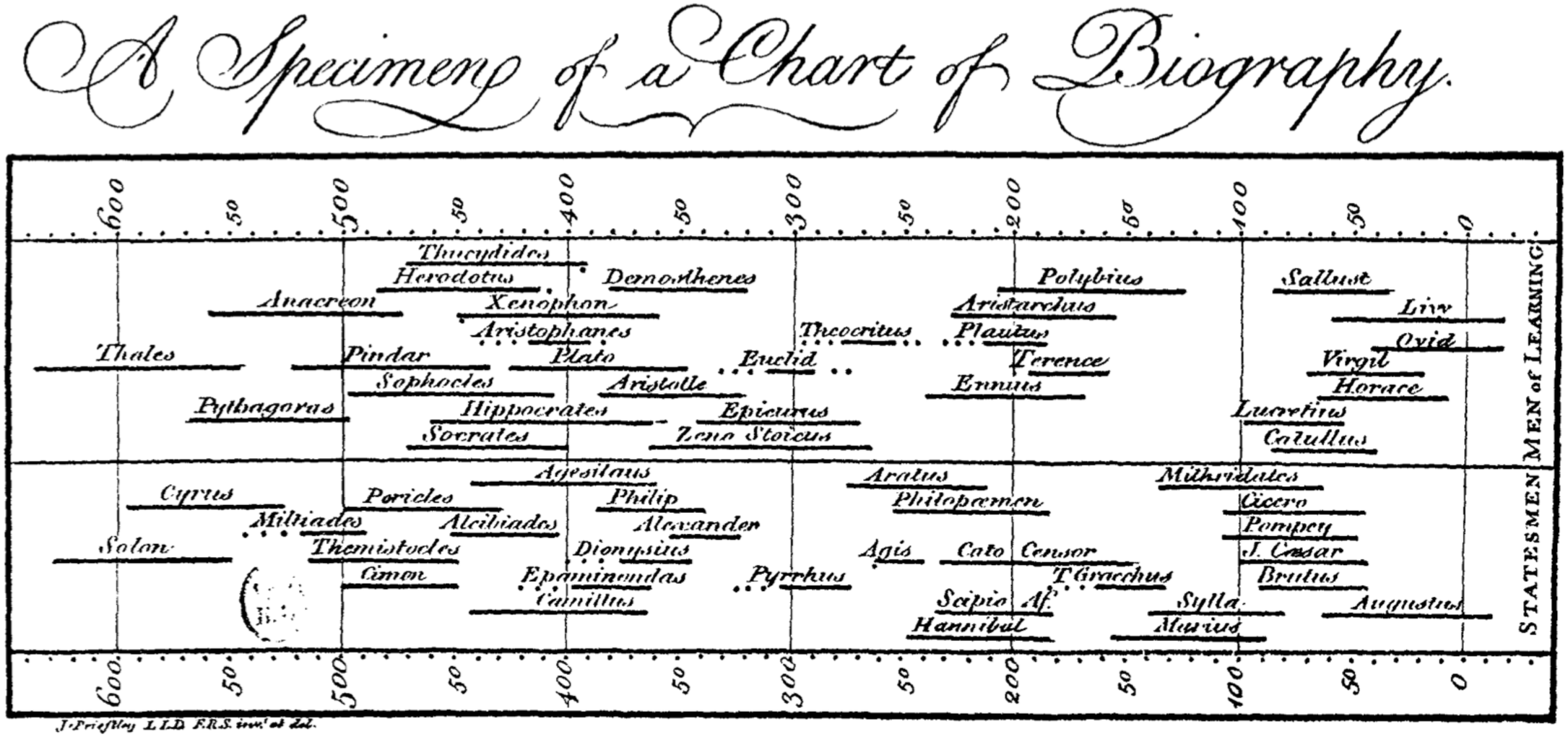
December 8, 2016 at Radcliffe Institute, Harvard University

Talk outline: the past & the future of timelines

The past: **Priestley & the design space of timelines**

The future: **Condorcet & a tool for expressive storytelling with timelines**

The prototypical timeline – Joseph Priestley (1765)



What is timeline data? What is not timeline data?

Start	End	Event Category / Description
16-12-08		“Timelines Revisited” Talk
16-12-24	17-01-01	Hannukah
16-12-25		Christmas Day

Date	Daily High (Temperature)
16-12-08	49ª F
16-12-09	48ª F
16-12-10	51ª F

What can timelines communicate?

Chronology & duration of events

Categories of events

Number & distribution of events

Chronological range

Sequences of events (irrespective of absolute chronology)

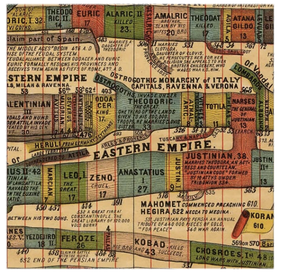
Periodic repetition (and deviations)

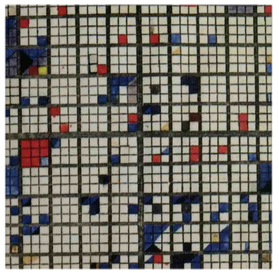
Daily, seasonal cycles

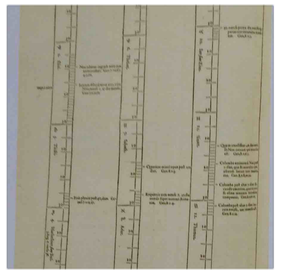
Synchronicity (co-occurrences)

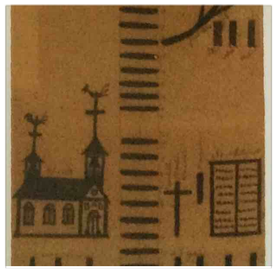
A survey of 263 timelines & timeline-producing tools

TIMELINES THROUGHOUT HISTORY









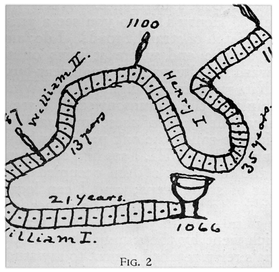
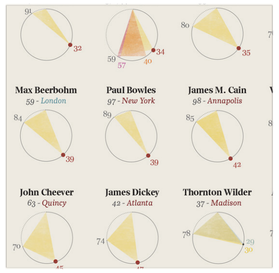
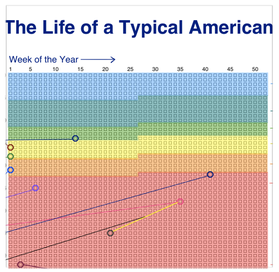


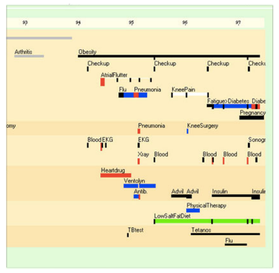
FIG. 2

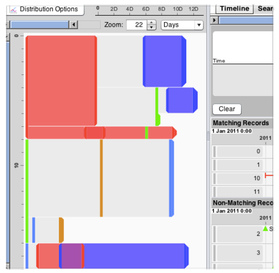
INFOGRAPHICS & BESPOKE TIMELINES

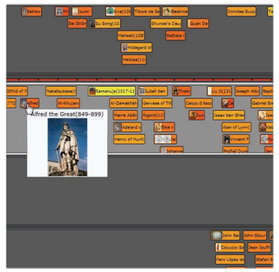




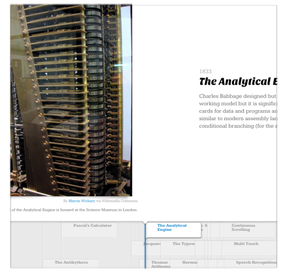
VISUALIZATION FOR EXPLORATORY DATA ANALYSIS

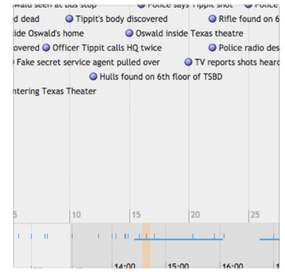


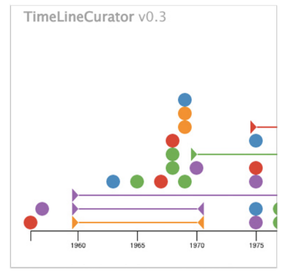




INTERACTIVE TIMELINE AUTHORING TOOLS







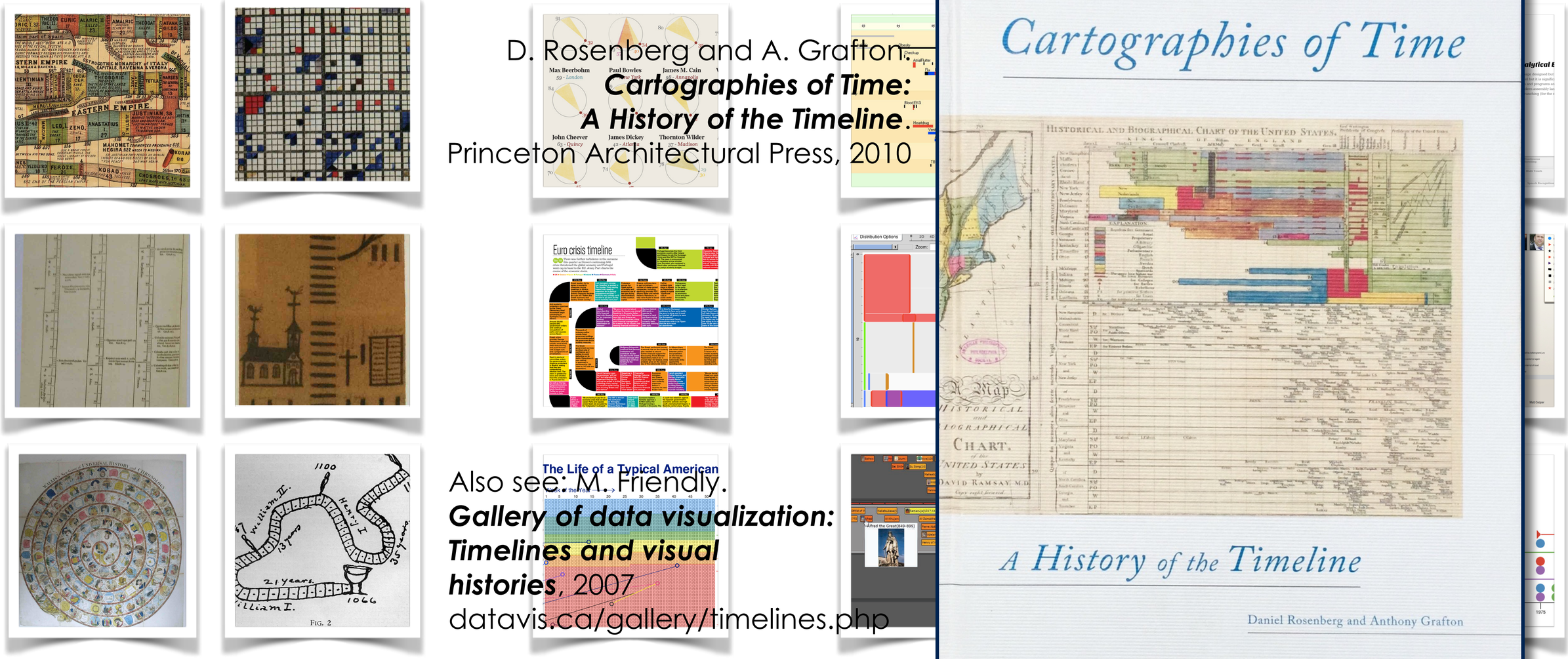
Timelines and chronologies throughout history

TIMELINES THROUGHOUT HISTORY

INFOGRAPHICS & BESPOKE TIMELINES

VISUALIZATION FOR EXPLORATORY

INTERACTIVE TIMELINE

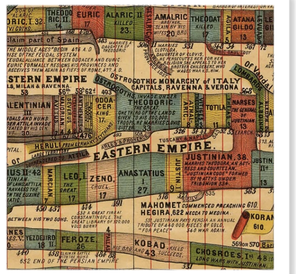


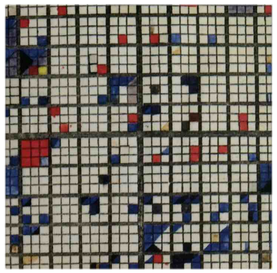
D. Rosenberg and A. Grafton.
Cartographies of Time:
A History of the Timeline.
Princeton Architectural Press, 2010

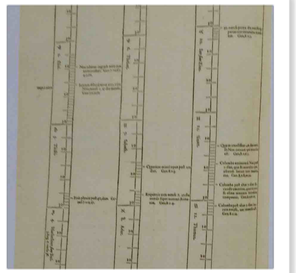
Also see: M. Friendly.
Gallery of data visualization: Timelines and visual histories, 2007
datavis.ca/gallery/timelines.php

Infographics & bespoke interactive timelines

TIMELINES
THROUGHOUT HISTORY







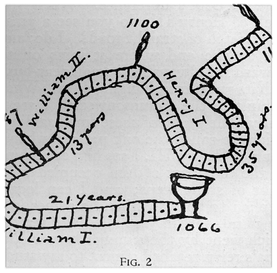
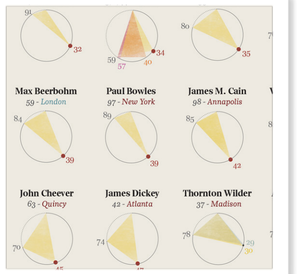
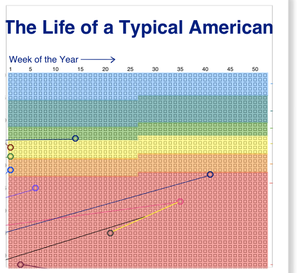


FIG. 2

INFOGRAPHICS &
BESPOKE TIMELINES



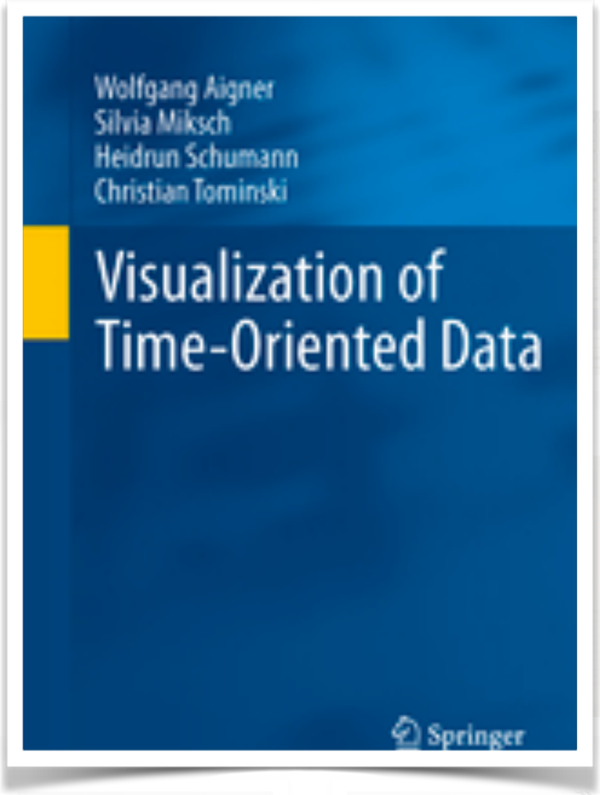


M. A. Borkin, Z. Bylinskii, N. W. Kim, C. M. Bainbridge, C. S. Yeh, D. Borkin, H. Pfister, and A. Oliva.
The Massachusetts (Massive) Visualization Dataset.
http://massvis.mit. edu

visual.ly's visual content gallery,
http://visual.ly.

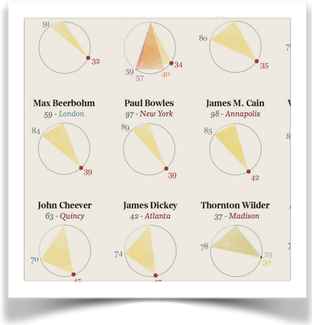
Kantar's Information is Beautiful Awards showcase.
http:// informationisbeautifulawards.com.

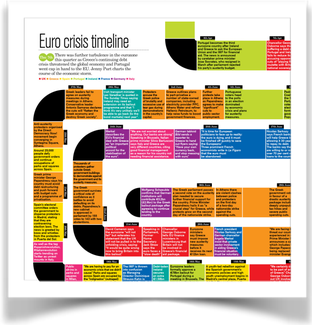
Timelines in the visualization research literature

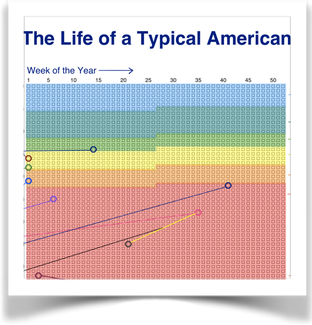


W. Aigner, S. Miksch, H. Schumann, and C. Tominski. ***Visualization of Time-Oriented Data***. Springer, 2011.

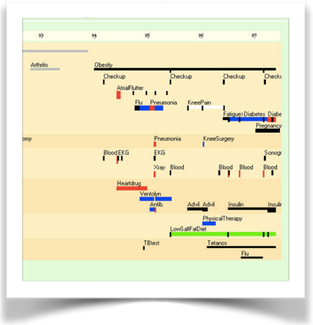
INFOGRAPHICS & BESPOKE TIMELINES

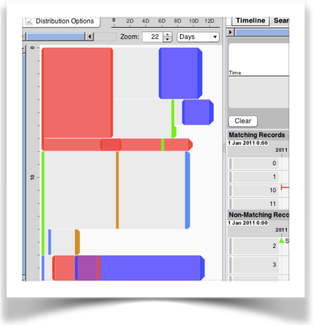


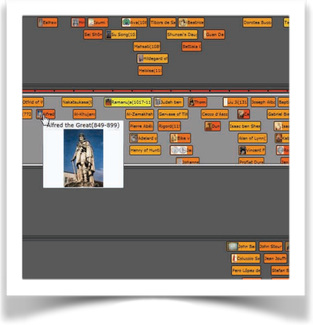




VISUALIZATION FOR EXPLORATORY DATA ANALYSIS







Temporal Visualization Projects by the Human Computer Interaction Lab at the University of Maryland Institute for Advanced Computer Studies.

http://cs.umd.edu/hcil/temporalviz

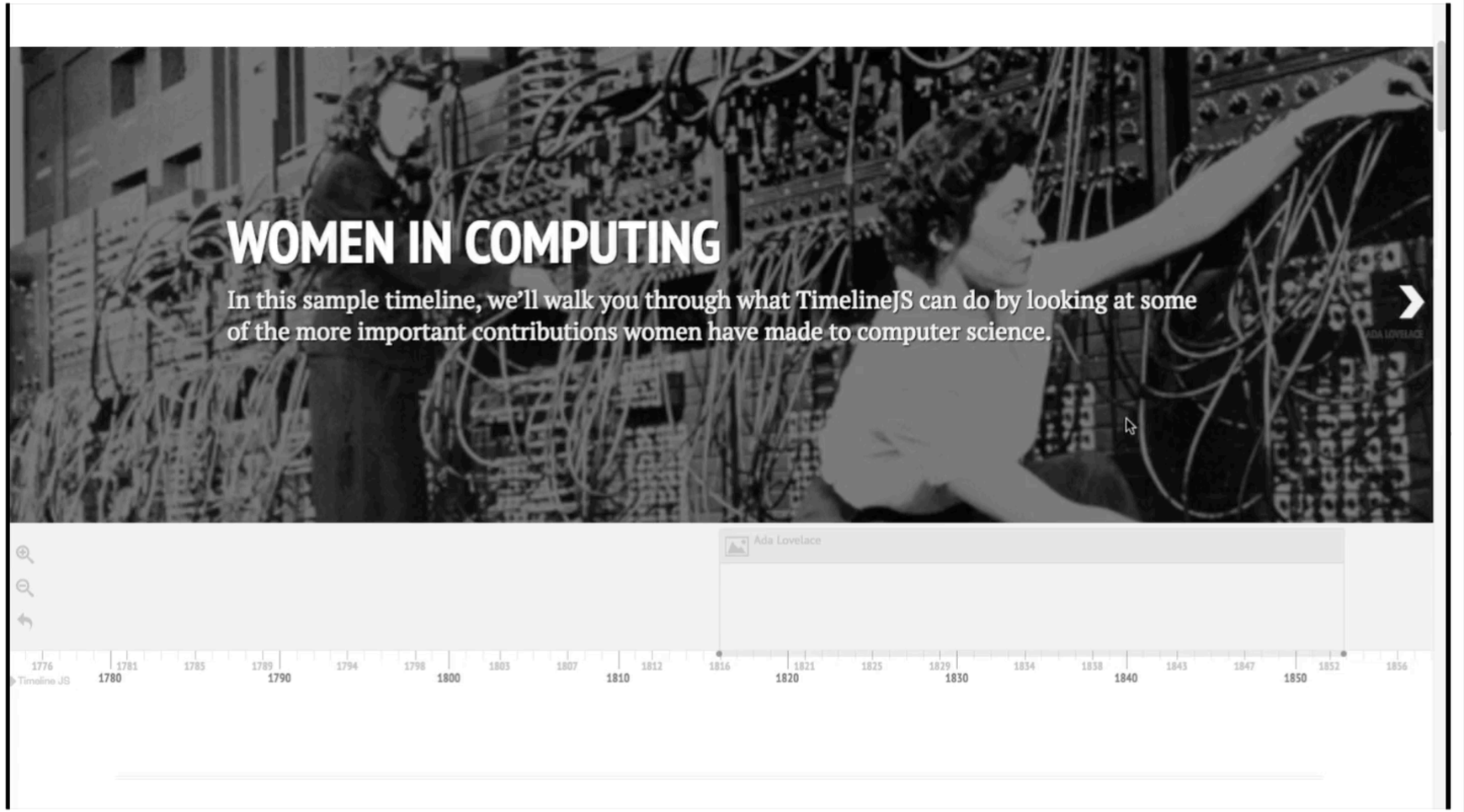
Web-based interactive timeline authoring tools

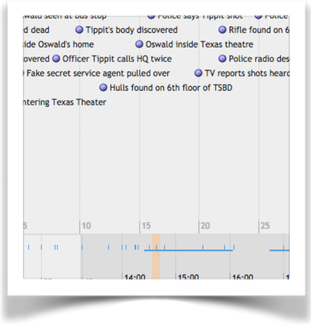
TIMELINES THROUGHOUT HISTORY

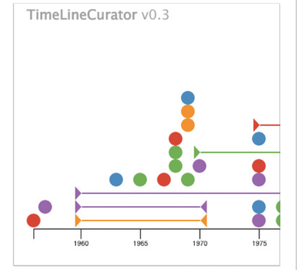
INFOGRAPHICS & BESPOKE TIMELINES

VISUALIZATION FOR EXPLORATORY DATA ANALYSIS

INTERACTIVE TIMELINE AUTHORING TOOLS

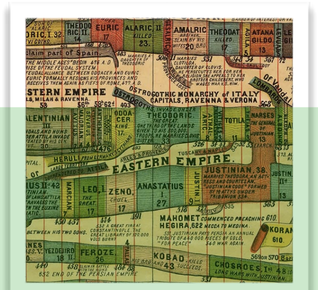


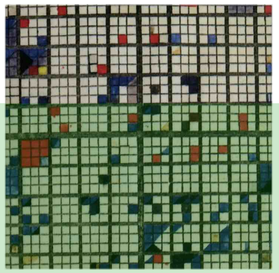
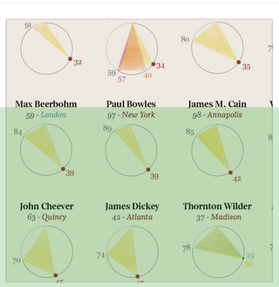


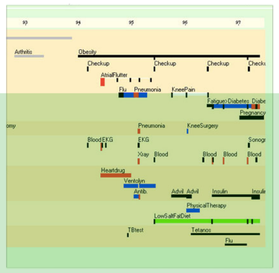


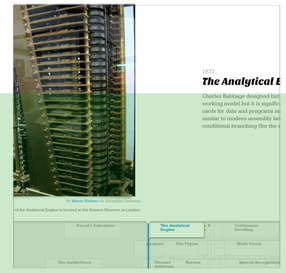
Northwestern University Knight Lab's **TimelineJS**. https://timeline.knightlab.com/

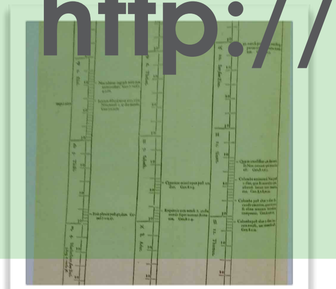
Survey directory & survey gallery:

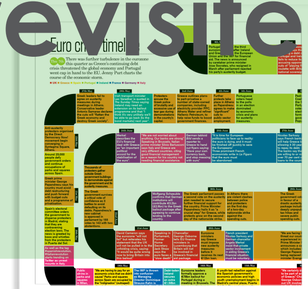


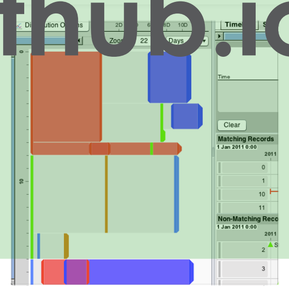





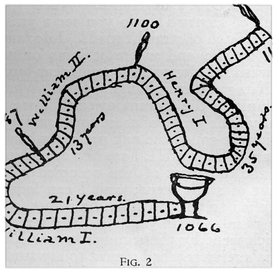



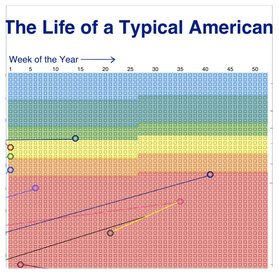


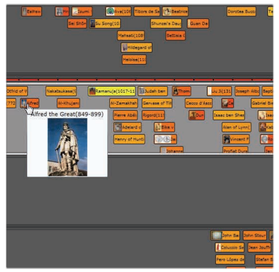


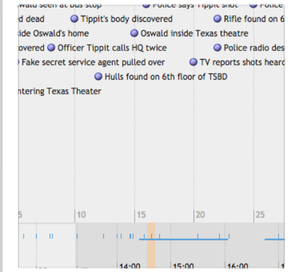


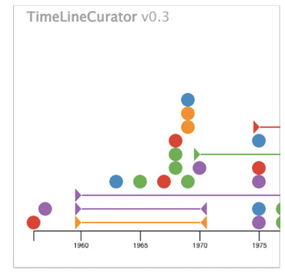












http://timelinesrevisited.github.io/supplemental/

A design space for expressing stories with timelines

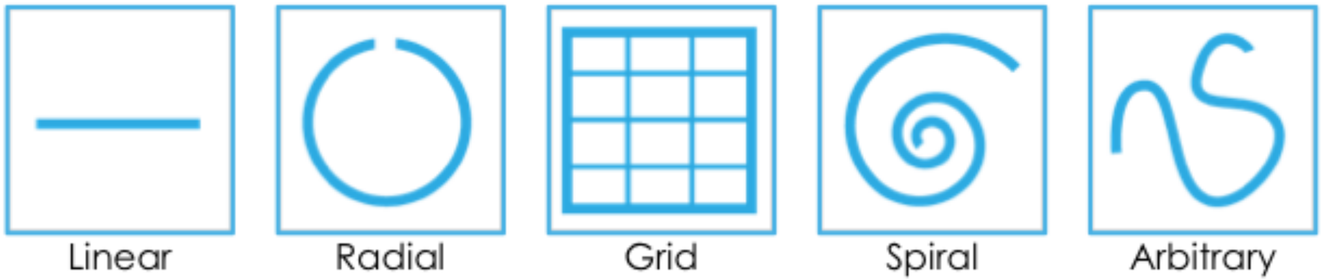
Representation

Scale

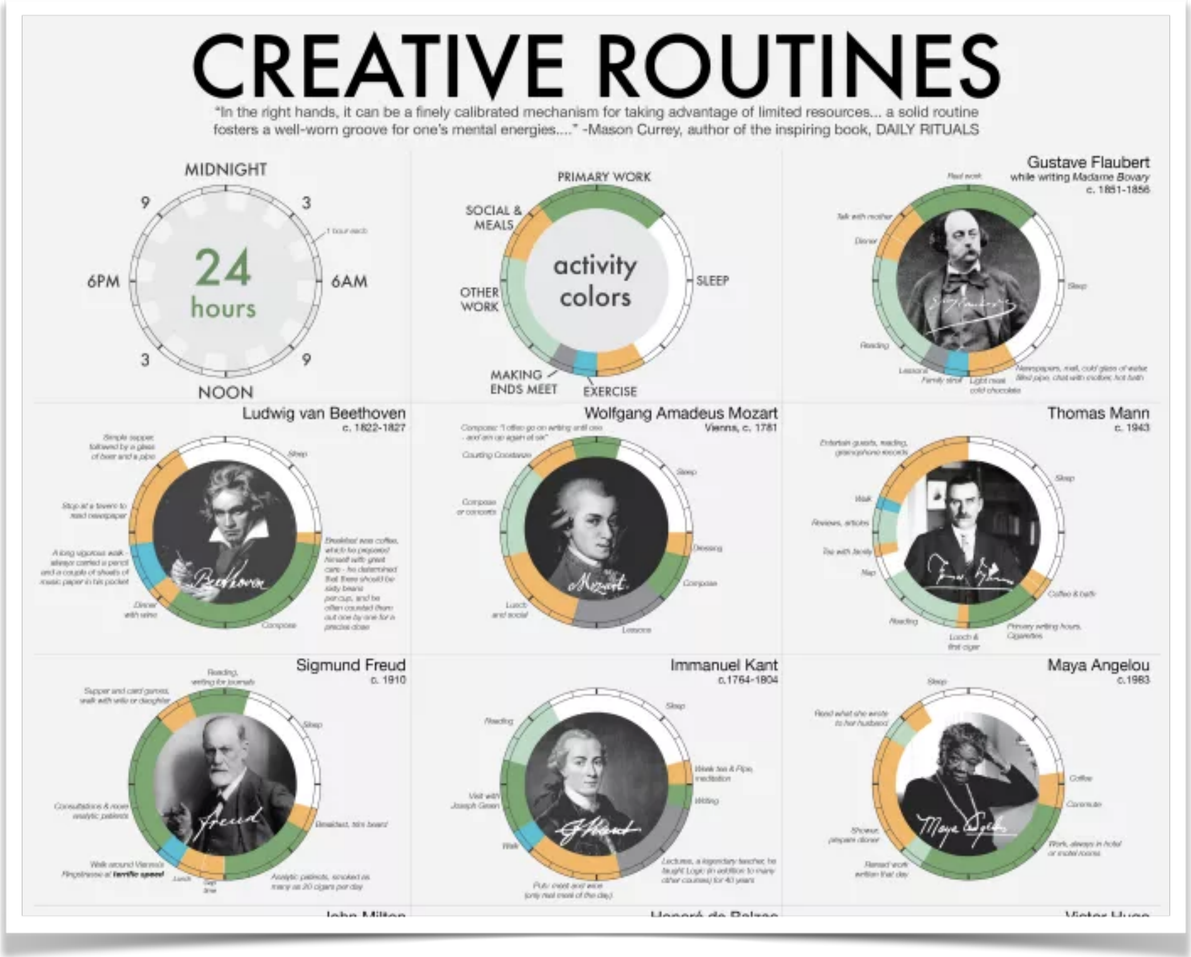
Layout

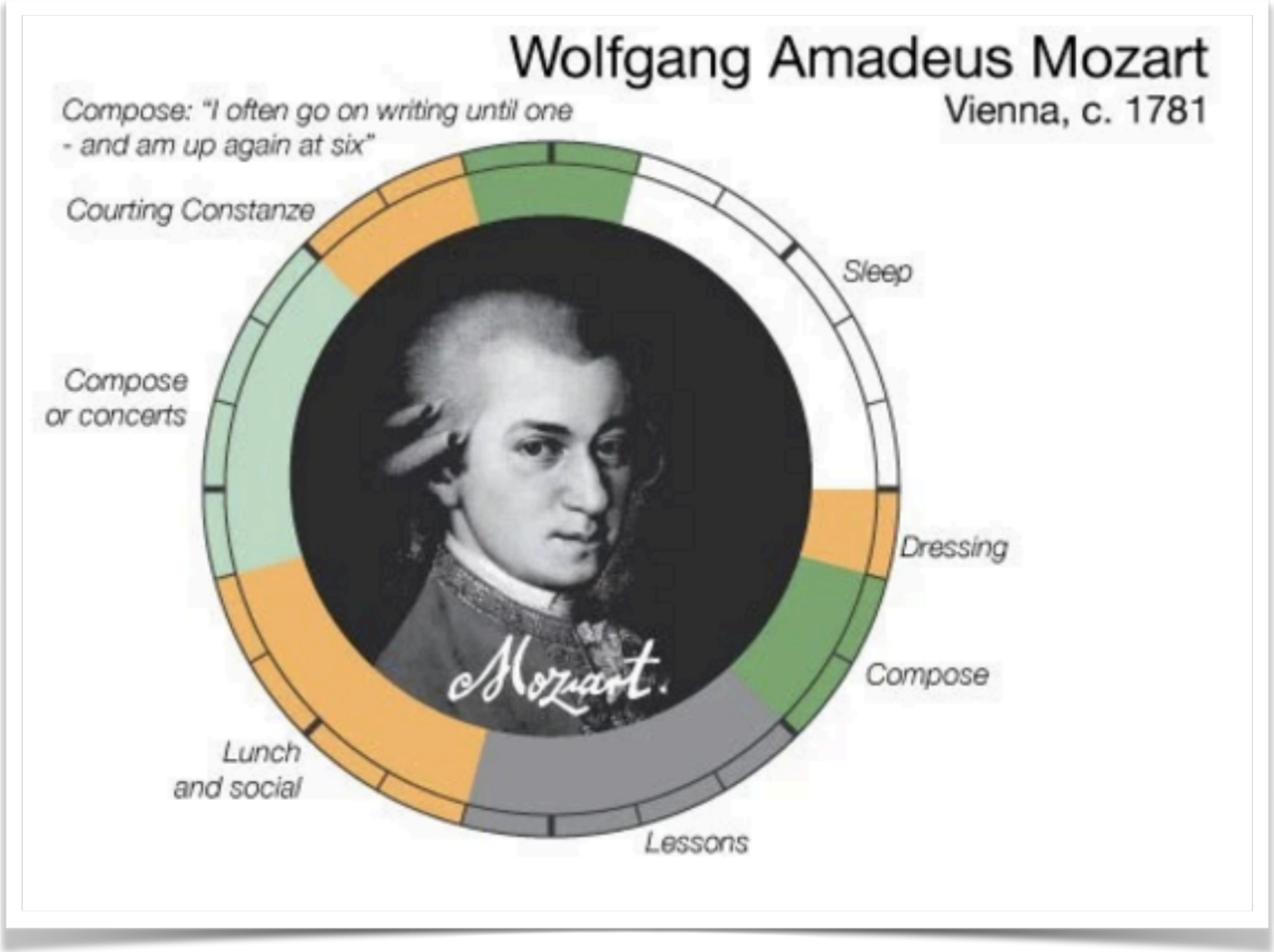
First design choice: representation

Representation



A design featuring a radial representation



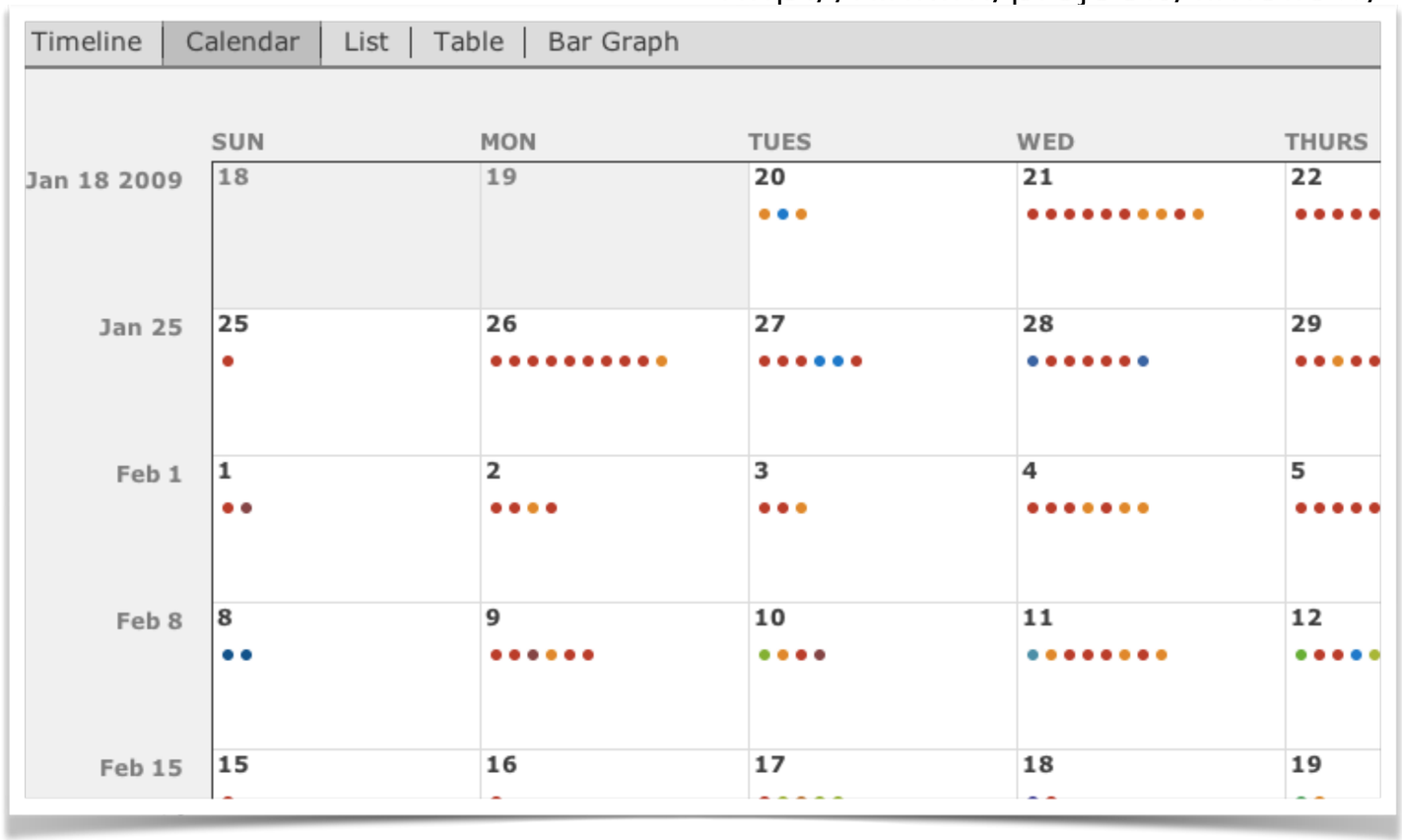


R. J. Andrews. ***Creative routines***, 2014. http://infowetrust.com/creative-routines/

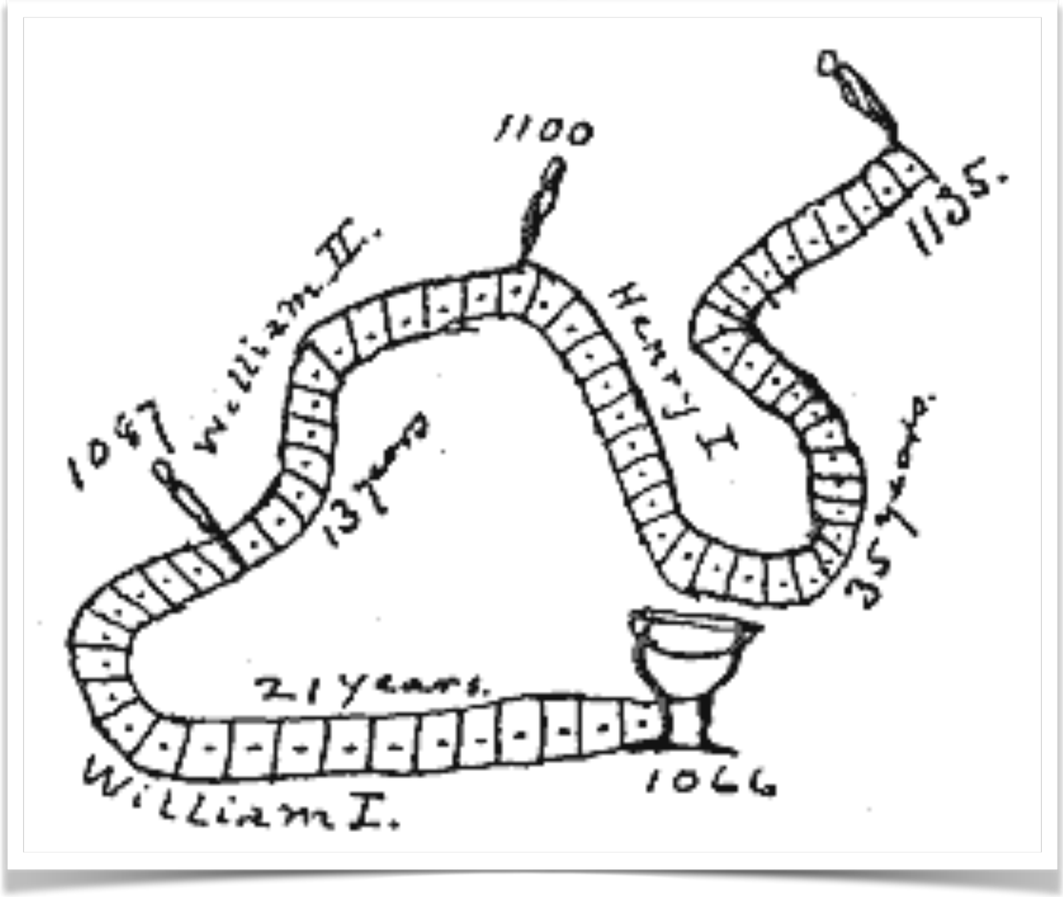
Designs featuring a grid representation

E. Peabody's
Polish-American System of Chronology (10x10 grid),
mid 19th century.

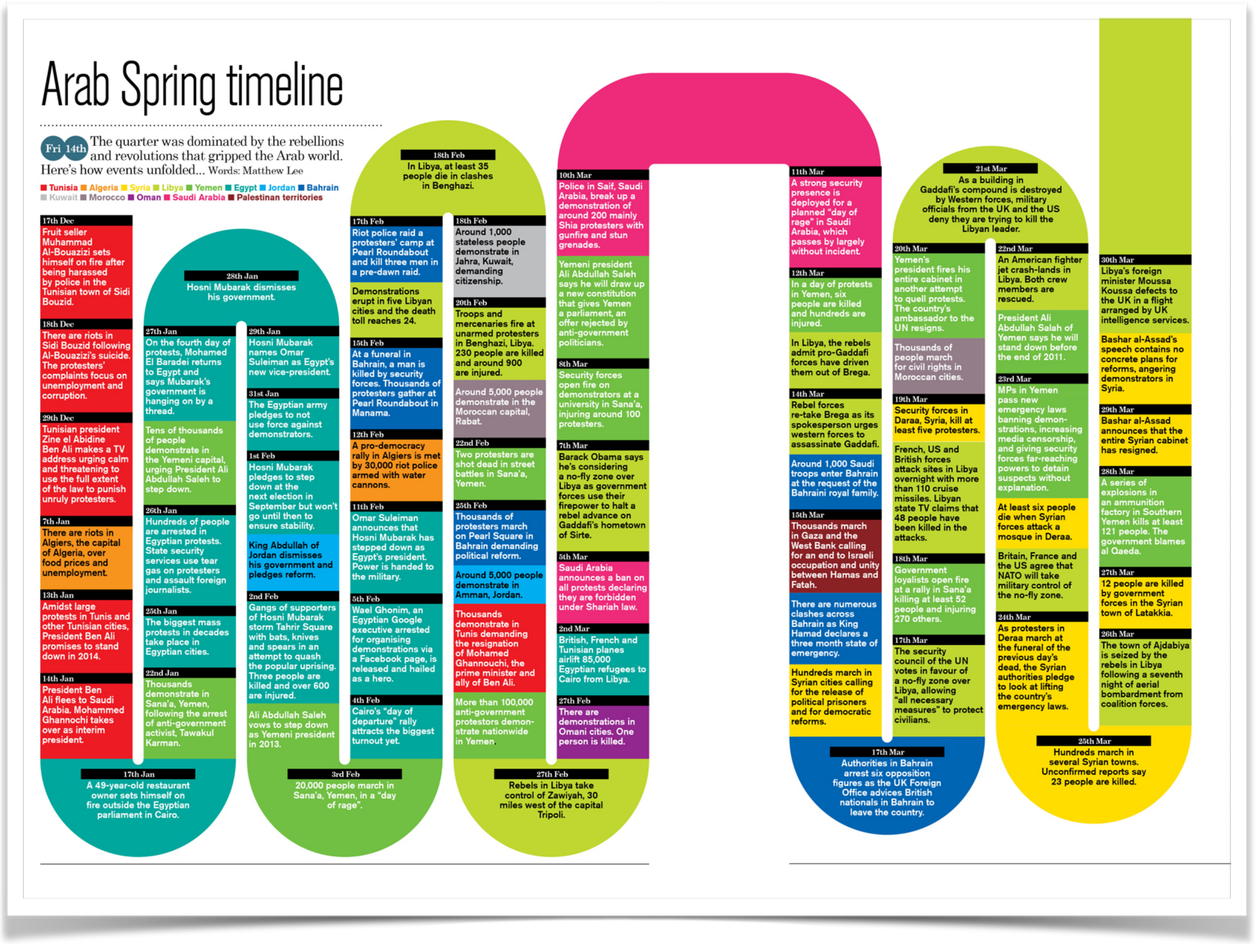
F. B. Viégas, M. Wattenberg, and S. Cohen. **Timeflow**, 2010.
http://hint.fm/projects/timeflow/



Designs featuring a curve representation



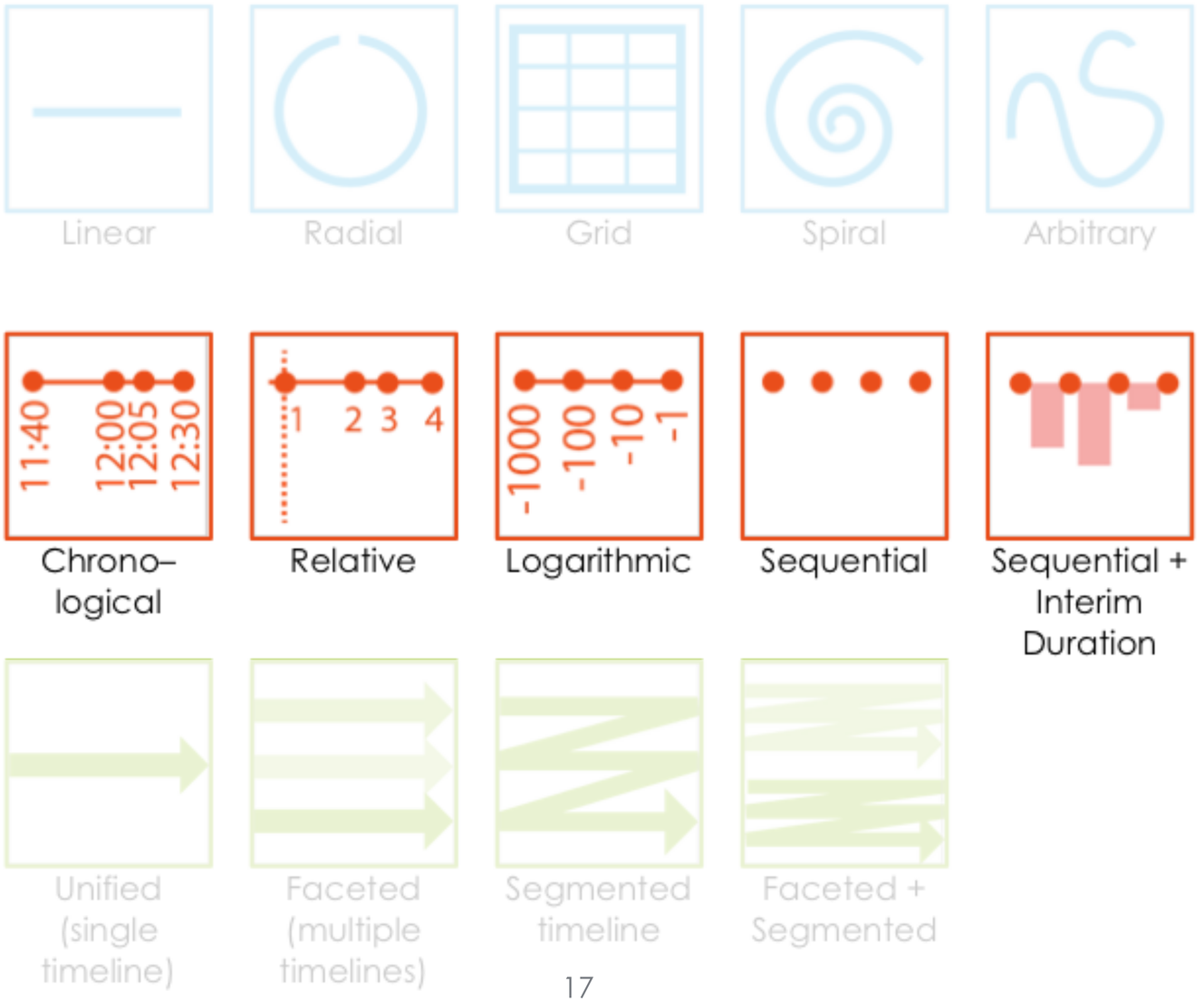
M. Twain. ***How to make history dates stick***.
Harper's Monthly Magazine, 1914.
www.twainquotes.com/HistoryDates/HistoryDates.html



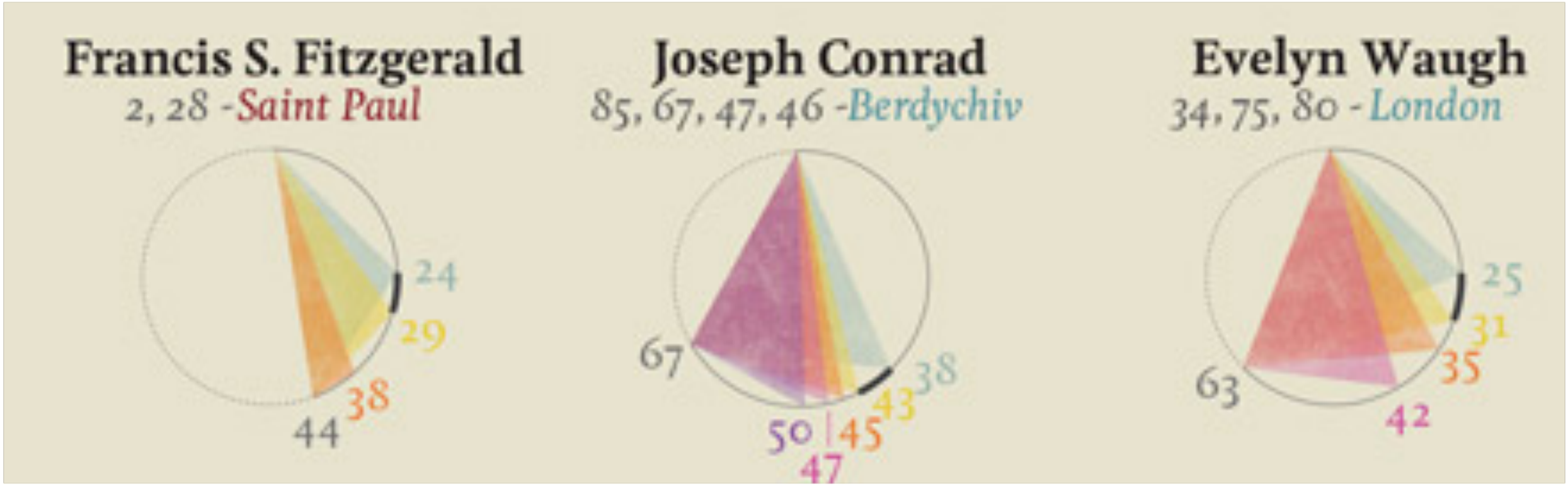
M. Lee. ***Arab Spring timeline***. Delayed Gratification, 2011.
http: //slow-journalism.com/arab-spring-timeline.

Second design choice: scale

Scale

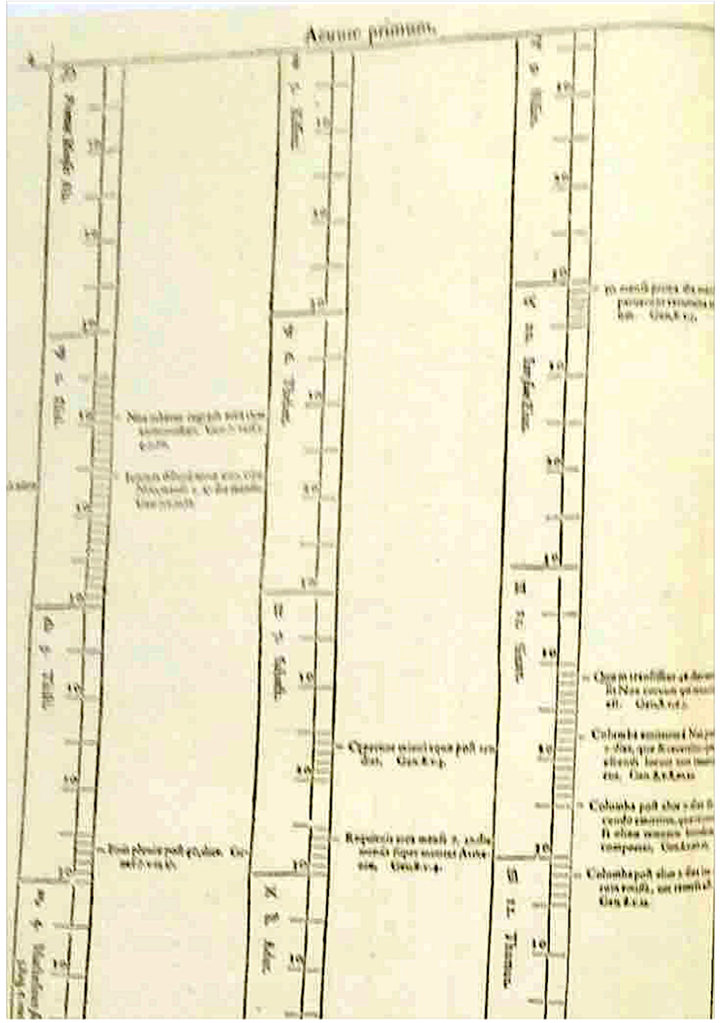


A design featuring a relative time scale

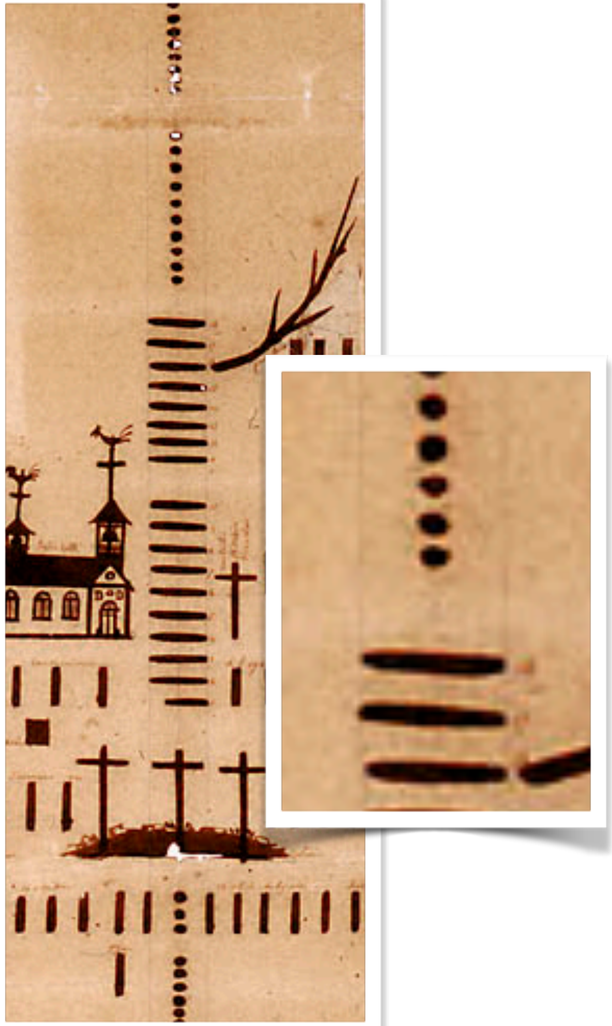


Detail from ***From first published to masterpieces*** by Accurat, 2013.
http://flickr.com/photos/accurat/11052331736/

Designs that show sequence with interim duration

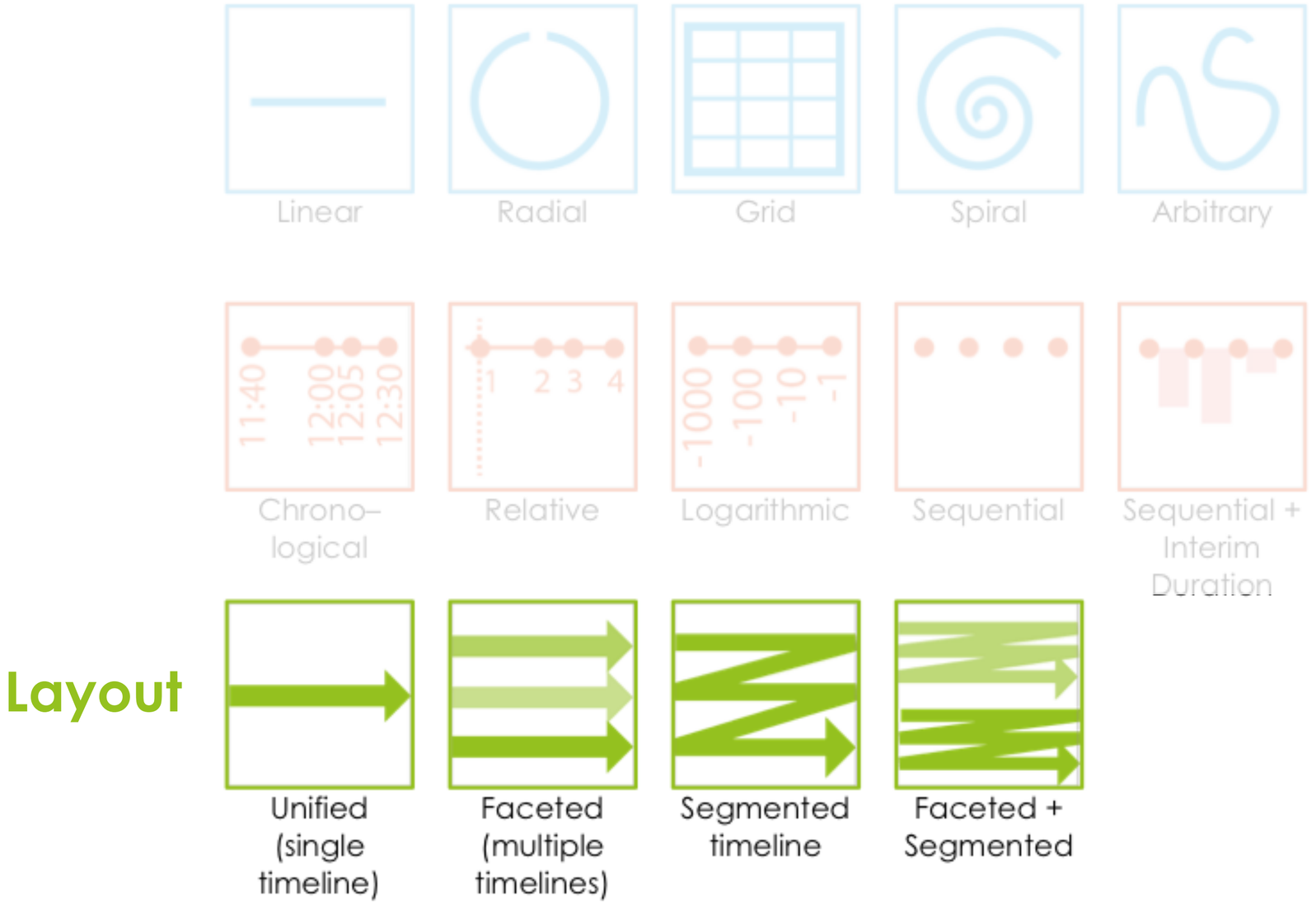


G. Mercator's
Chronology
(axis encodes interim time elapsed),
1569.

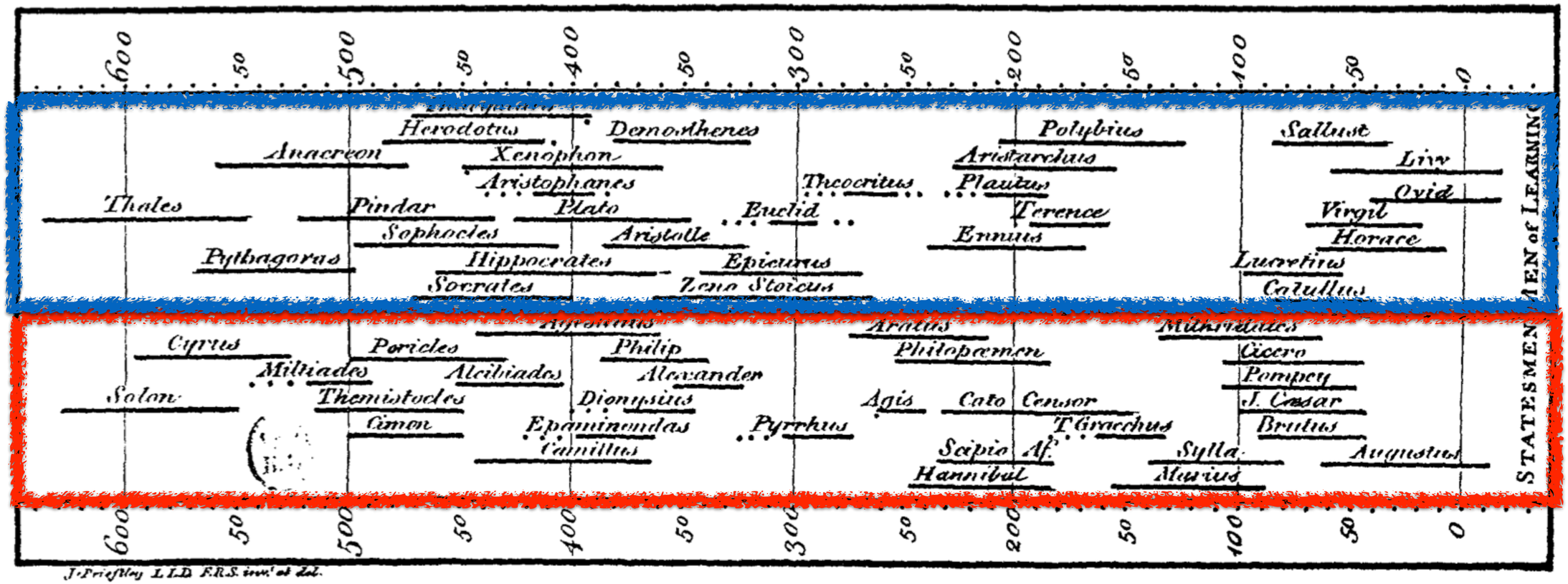


A ***Catholic Ladder***,
mid 19th century
http:// oregonhistoryproject.org/
articles/historical-records/catholic-
ladder/

Third design choice: layout



A faceted timeline

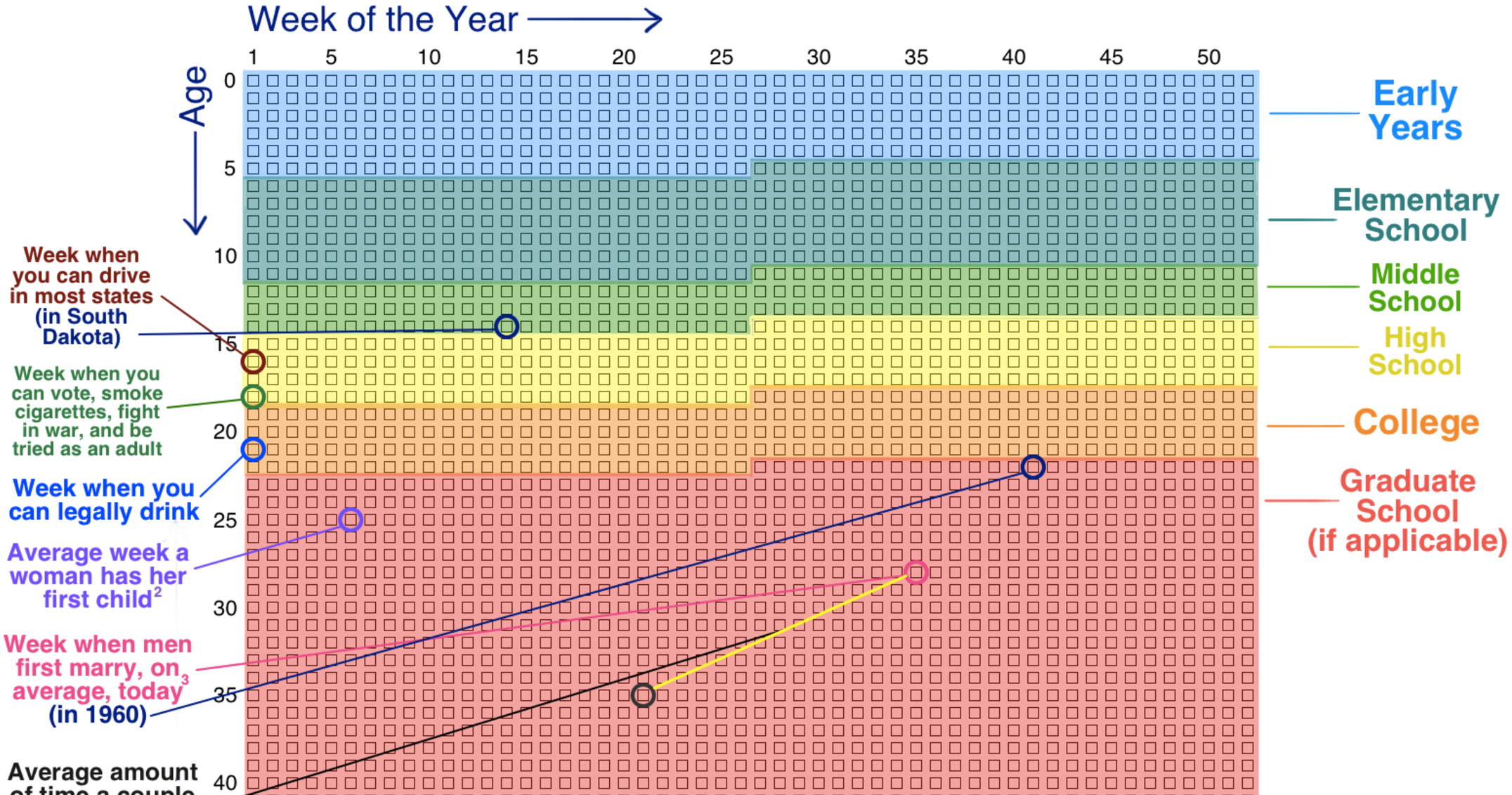


Facet 1
"Men of learning"

Facet 2
"Statesmen"

A Specimen of a Chart of Biography by J. Priestley, 1765.

A timeline segmented by year



Your life in weeks
by T. Urban, 2014.
http://waitbutwhy.com/2014/05/life-weeks.html.

Prevalence of design choices in survey corpus (N: 263)

Representation

192 11 5 12 47

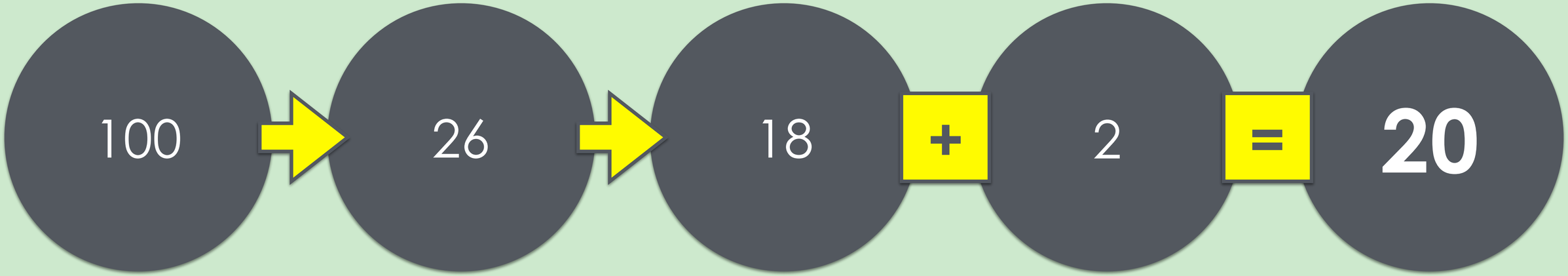
Scale

148 16 6 104 2

Layout

147 110 12 1

Combinations of design choices?



Possible design combinations

Unique combinations found in survey corpus (N = 263)

***Purposeful*, *Interpretable*, & *Generalizable* combinations**

Novel design combinations

Viable design combinations

20 viable combinations of timeline design choices

80

52

43

35

13

10

6

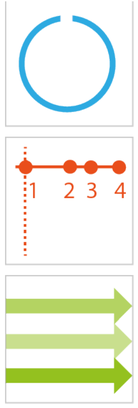
5

4

3

3

3



2

2

2

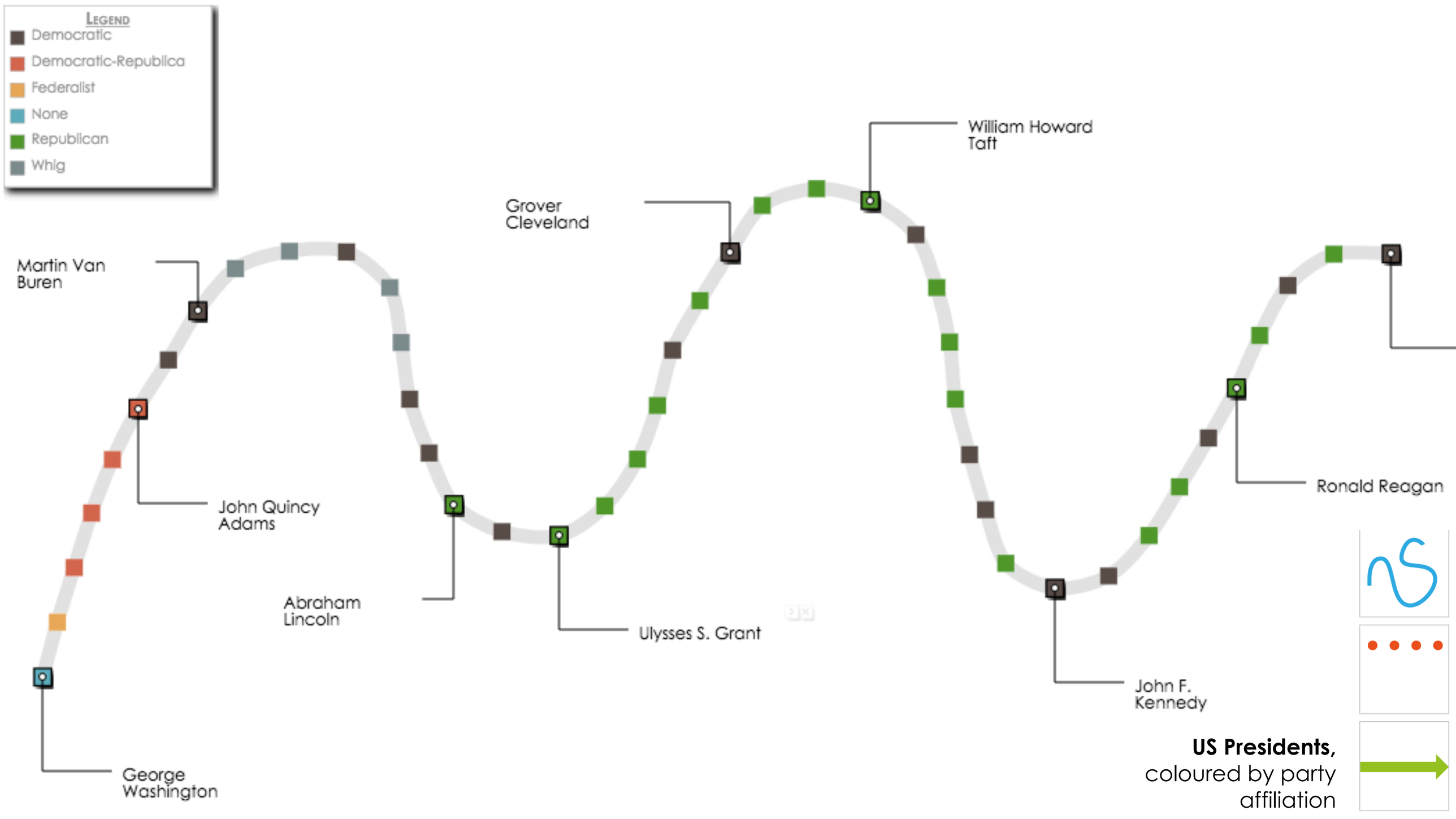
2

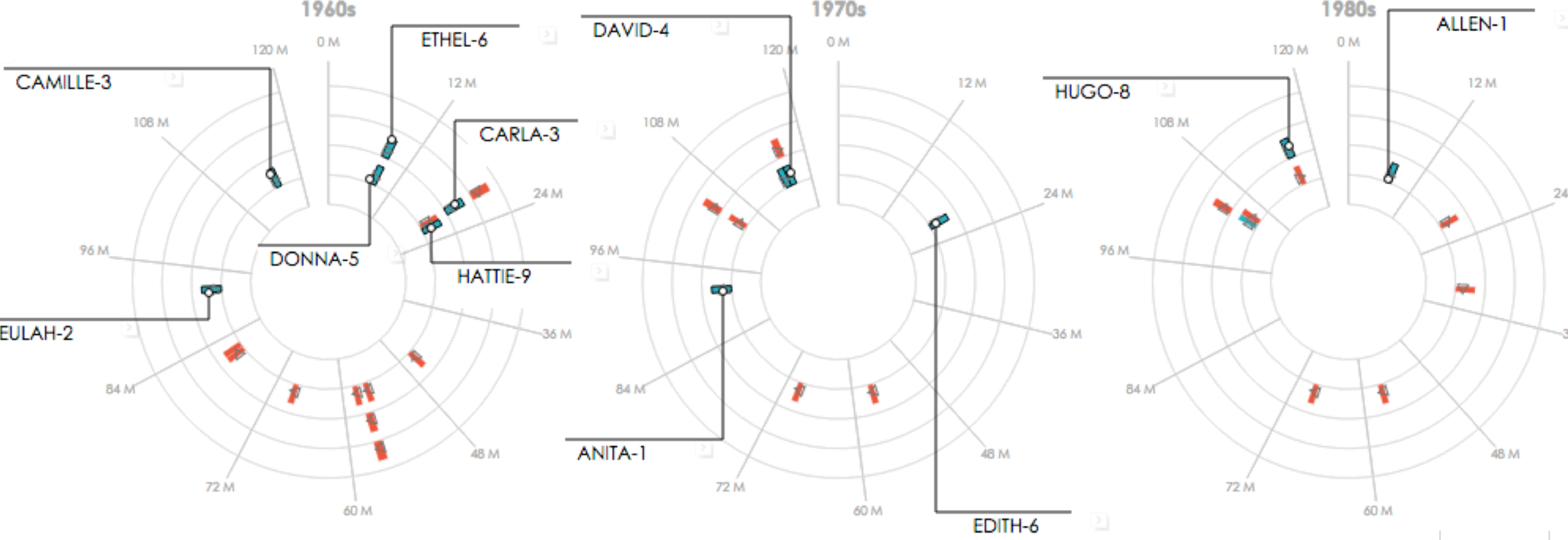
2

1

novel

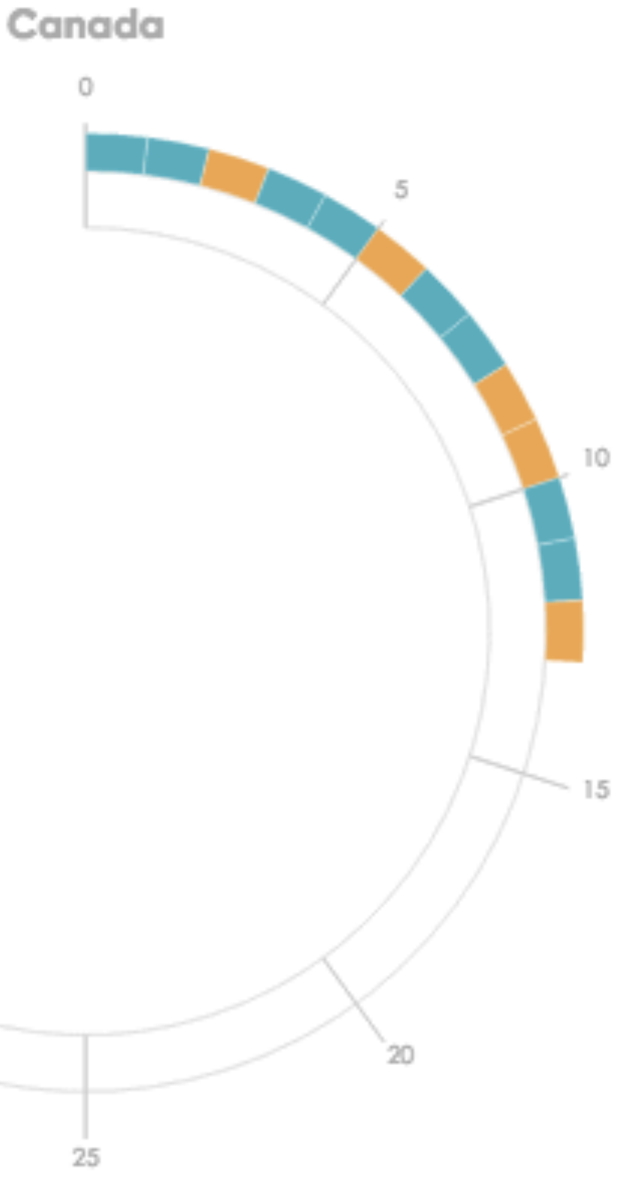
novel

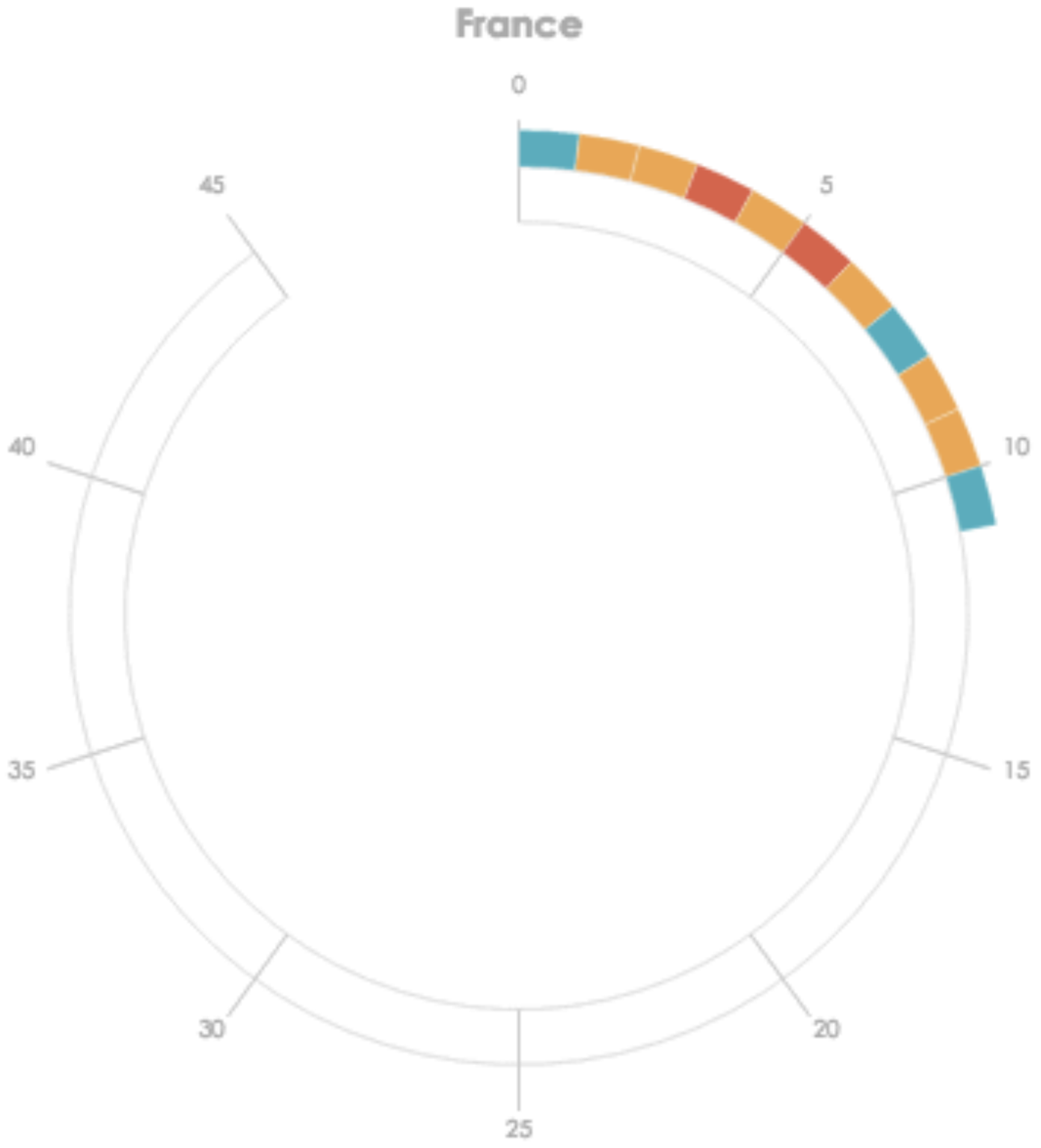

Legend
Democratic
Democratic-Republica
Federalist
None
Republican
Whig
George Washington
John Quincy Adams
Martin Van Buren
Abraham Lincoln
Ulysses S. Grant
Grover Cleveland
William Howard Taft
John F. Kennedy
Ronald Reagan
US Presidents,
coloured by party affiliation

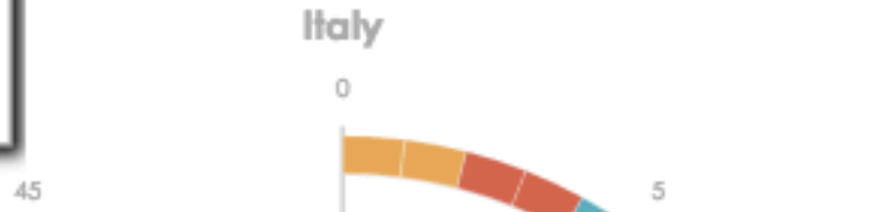


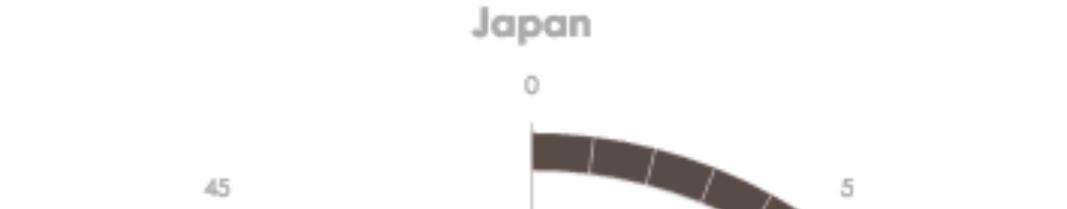
C4 & C5
Hurricanes by decade showing periodicity (and departures from it)

Sequential timelines of **G7 leaders since WWII**, comparing length and categorical variation.

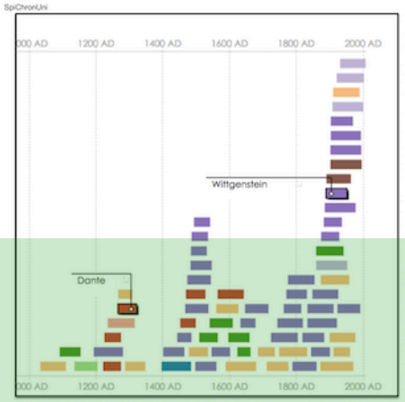




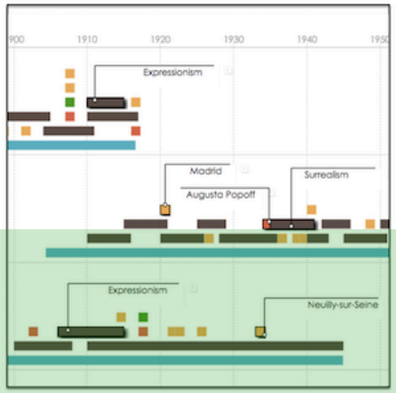




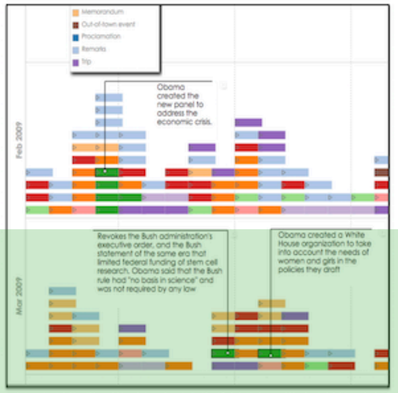
Gallery of 20 viable timeline design combinations



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

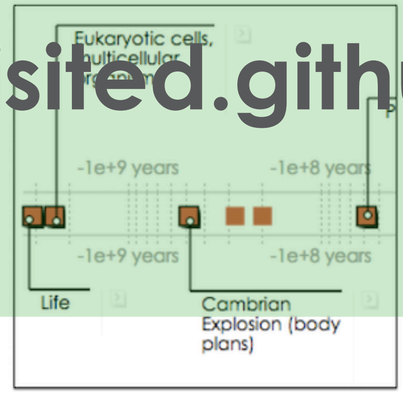


Narrative point: compare chronology, duration of events between facets; present synchronicities (coinciding events).
Perceptual task: bar length and position comparisons.

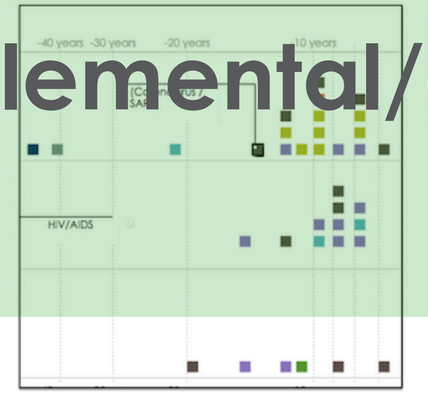


Narrative point: compare chronology, duration, periodicity of events between segments.
Perceptual task: bar length and position comparisons.

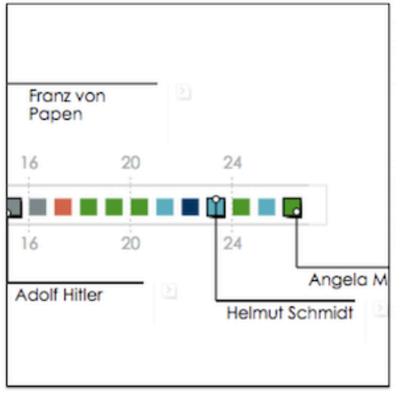
Narrative point: compare relative chronology, duration of events between facets; present relative synchronicities.
Perceptual task: bar length and position comparisons.



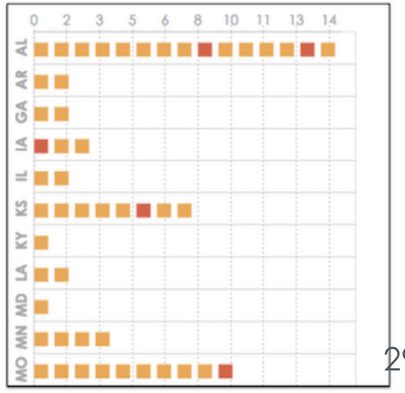
Narrative point: present chronology of a timeline with emphasis on recent events.
Perceptual task: bar position judgment.
Comment: do not start story with log scale.



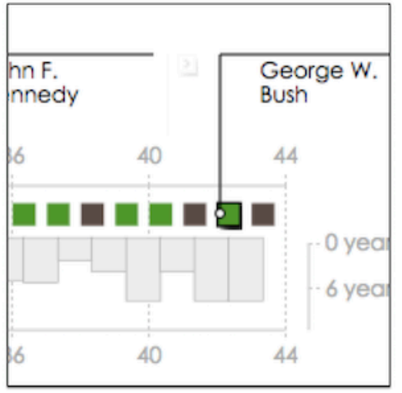
Narrative point: compare chronologies with emphasis on recent events between facets; show synchronicity.
Perceptual task: bar position comparisons.
Comment: do not start story with log scale.



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



Narrative point: (accurately) compare lengths of sequences between facets.
Perceptual task: bar position comparisons.
Comment: effectively a bar chart.

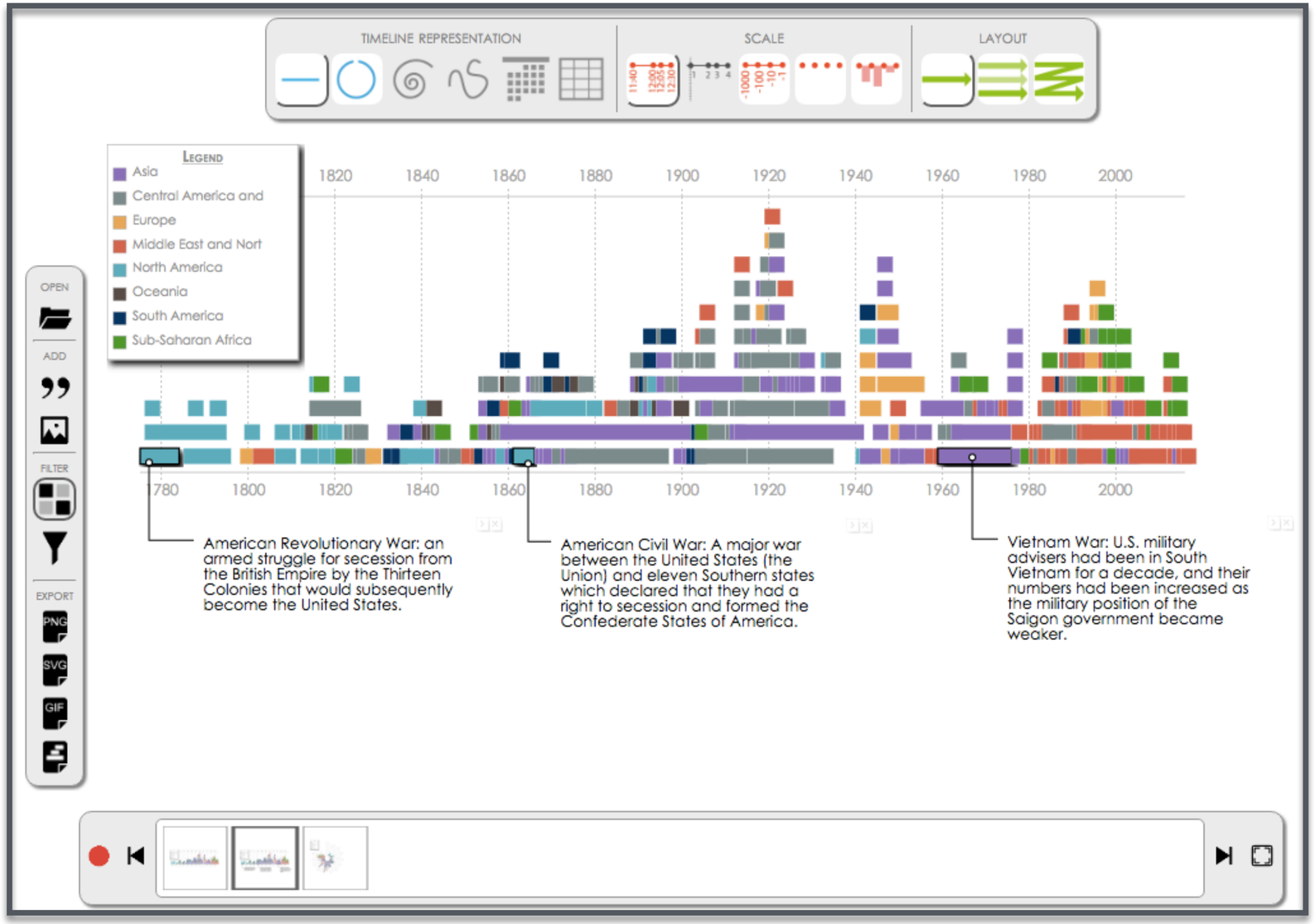


Narrative point: present a sequence of events with distribution of time elapsed between events.
Perceptual task: bar length and position judgments.
Comment: non-uniform chronological distributions.

Condorcet

A web-based expressive timeline storytelling environment

Condorcet: An expressive timeline storytelling tool



According to Rosenberg & Grafton (2010):

Condorcet attempted to design a different visual system after Priestley.

Cross-referencing chronology, relative historical stages, and categorical dimensions.

"Using the tools at his disposal he never arrived at a successful graphical format for his system…"

Timeline storytelling with Condorcet

A story can be assembled as a sequence of scenes.

Progressive (non-linear) disclosure of events, hiding events.

Stories can feature more than one combination of representation, scale, and layout.

Animated transitions between scenes can preserve context & coherency.

Export timeline stories as animated GIF or as interactive experience.

Ongoing and future research & development

Condorcet prototype to be released online in early 2017.

Recommending design combinations based on data characteristics.

Comparing the interpretability of existing design combinations.

Identifying additional (generalizable) novel design combinations.

Storytelling with timelines: a summary

263 Timelines Surveyed

3 Design Dimensions

20 Viable Combinations

Considerations for Expressive Storytelling

Condorcet

Stay in touch, get updates about Condorcet: **mabrehme@microsoft.com**

For IEEE TVCG journal paper, survey corpus, design resources, & supplemental materials:
timelinesrevisited.github.io

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