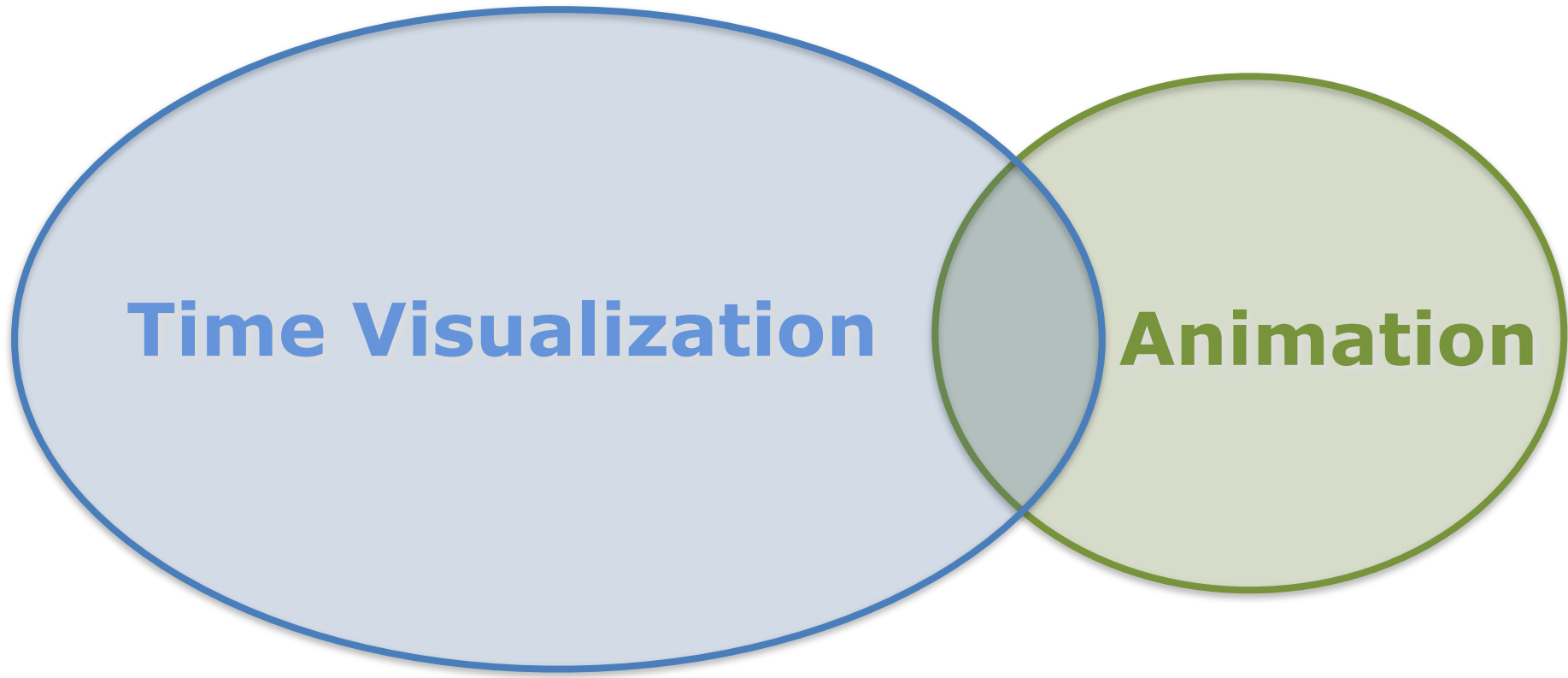


Time and Animation

M2R Info 2015/2016
Option Information Visualization

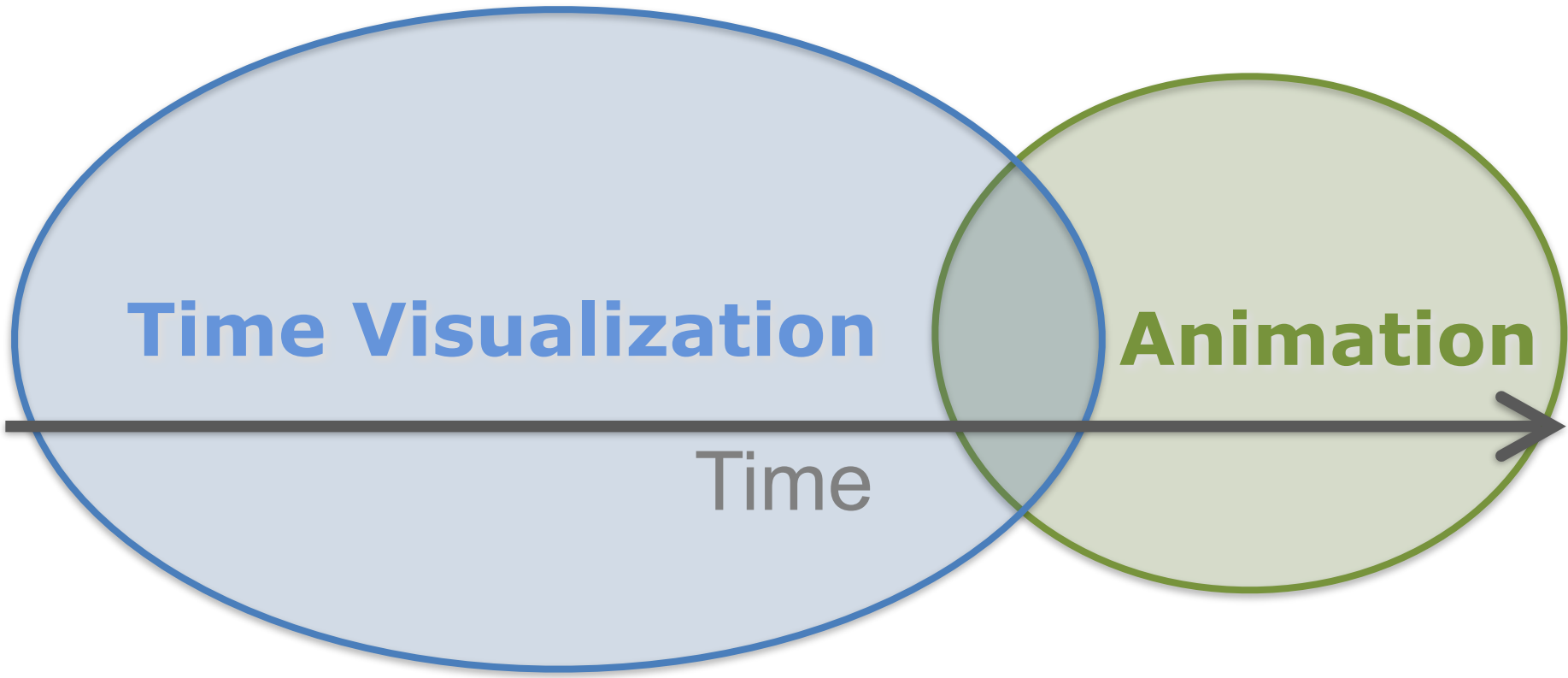


Pierre Dragicevic
Inria



Time Visualization

Animation



Time Visualization

Time

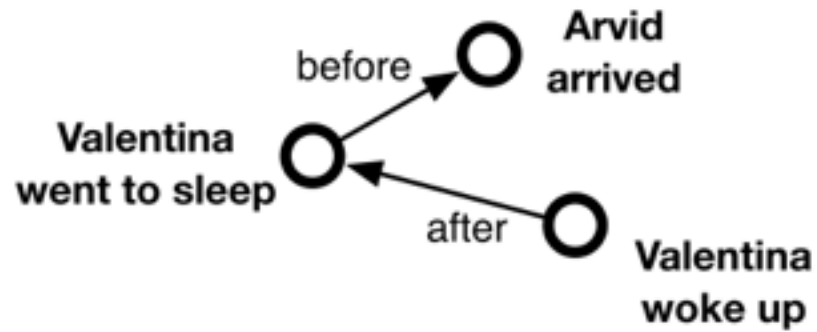
- **Is just another data dimension**
- **Why bother?**

Time

- **Is just another data dimension**
- **Why bother?**
- **What data type is it?**
 - **Nominal?**
 - **Ordinal?**
 - **Quantitative?**

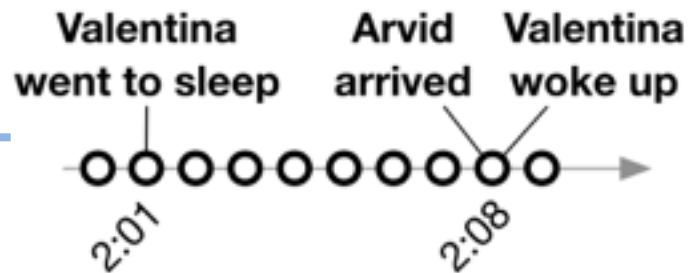
Time

- **Ordinal**

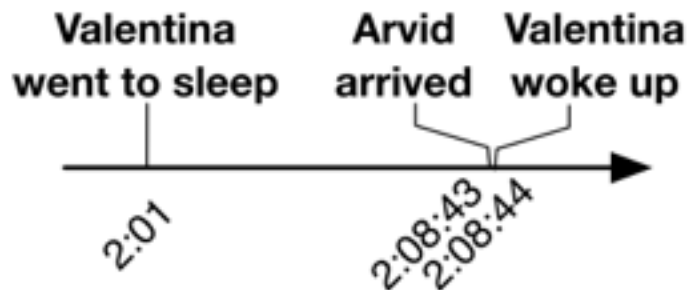


- **Quantitative**

- **Discrete**




- **Continuous**






























Time

• Visual Variable Mapping

More Accurate



Less Accurate

	Quantitative	Ordinal	Nominal
	Position 	Position 	Position 
	Length 	Density 	Hue 
	Angle 	Saturation 	Density 
	Slope 	Hue 	Saturation 
	Area 	Length 	Shape 
	Density 	Angle 	Length 
	Saturation 	Slope 	Angle 
	Hue 	Area 	Slope 
	Shape 	Shape 	Area 

[Joe Parry, 2007](#). Adapted from [Mackinlay, 1986](#)

Time

- **Periodicity**
 - **Natural: days, seasons**
 - **Social: working hours, holidays**
 - **Biological: circadian, etc.**
- **Has many subdivisions (units)**
 - **Years, months, days, weeks, H, M, S**
- **Has a specific meaning**
 - **Not captured by data type**
 - **Associations, conventions**
 - **Pervasive in the real-world**
 - **Time visualizations often considered as a separate type**

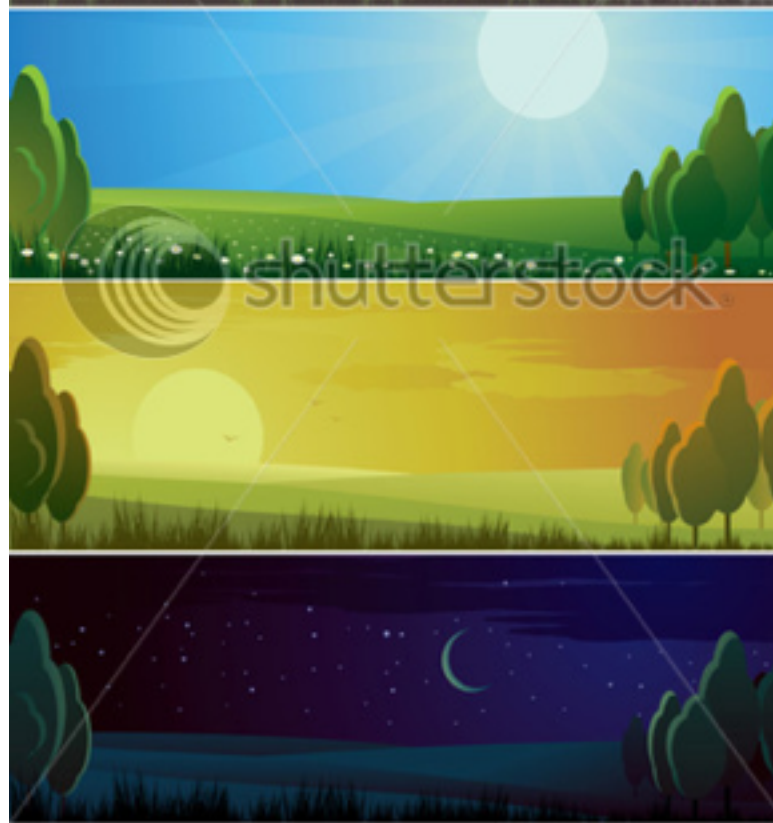
Time

- **Shneiderman:**
 - 1-dimensional data
 - 2-dimensional data
 - 3-dimensional data
 - **temporal data**
 - multi-dimensional data
 - tree data
 - network data

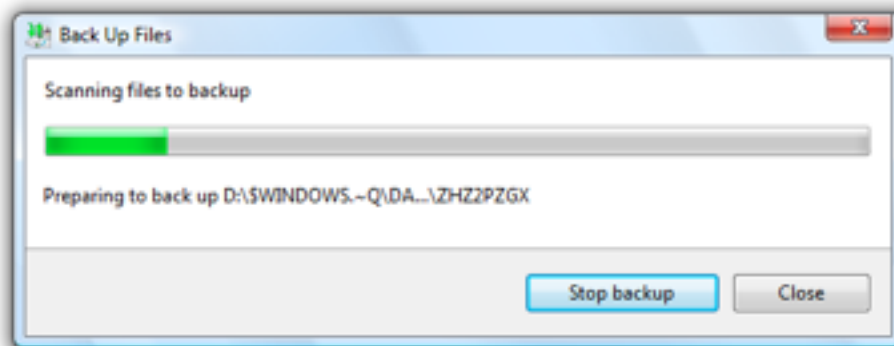
Visualizing Time



Visualizing Time



Visualizing Time

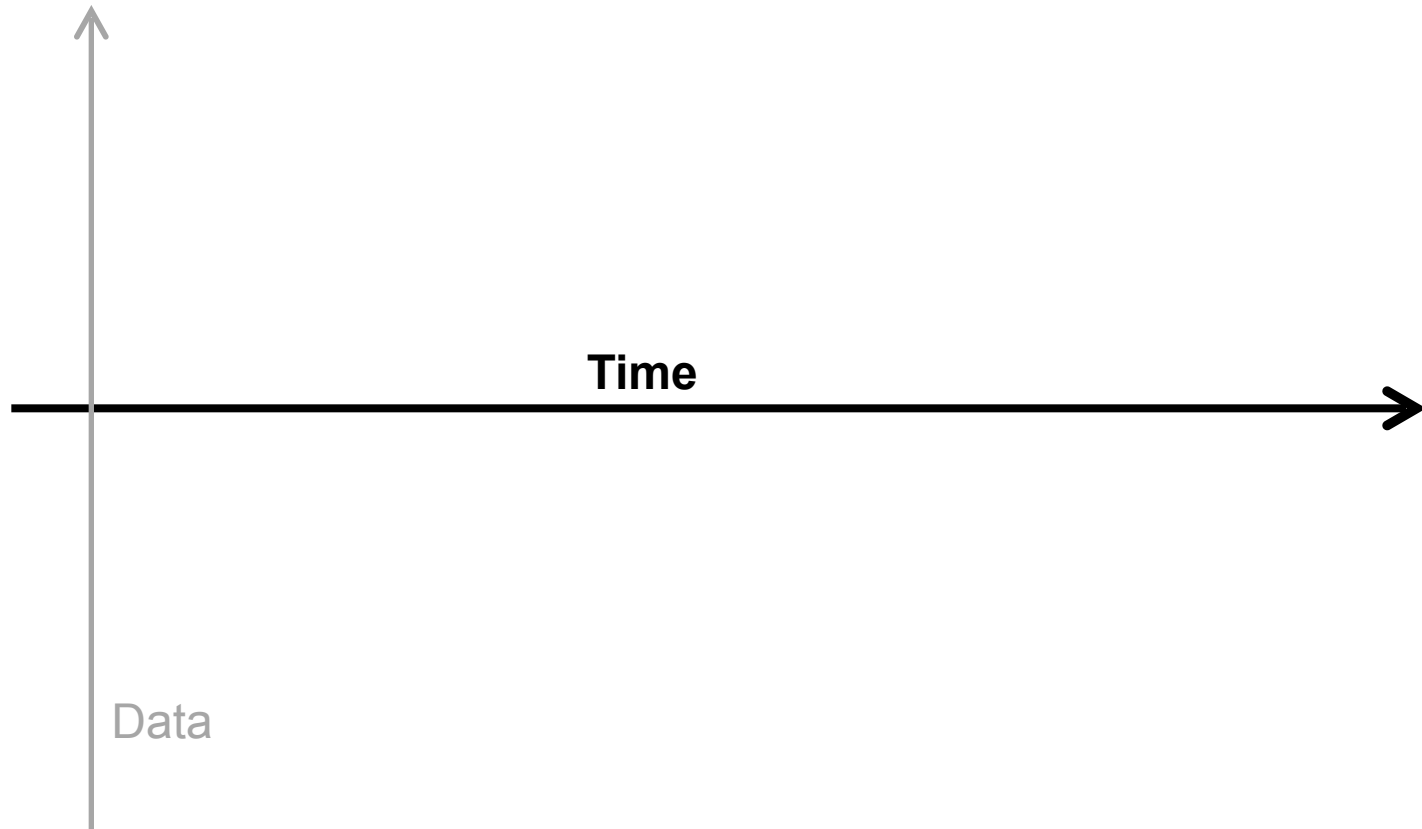


Visualizing Time

Plus Data

Mapping Time to Space

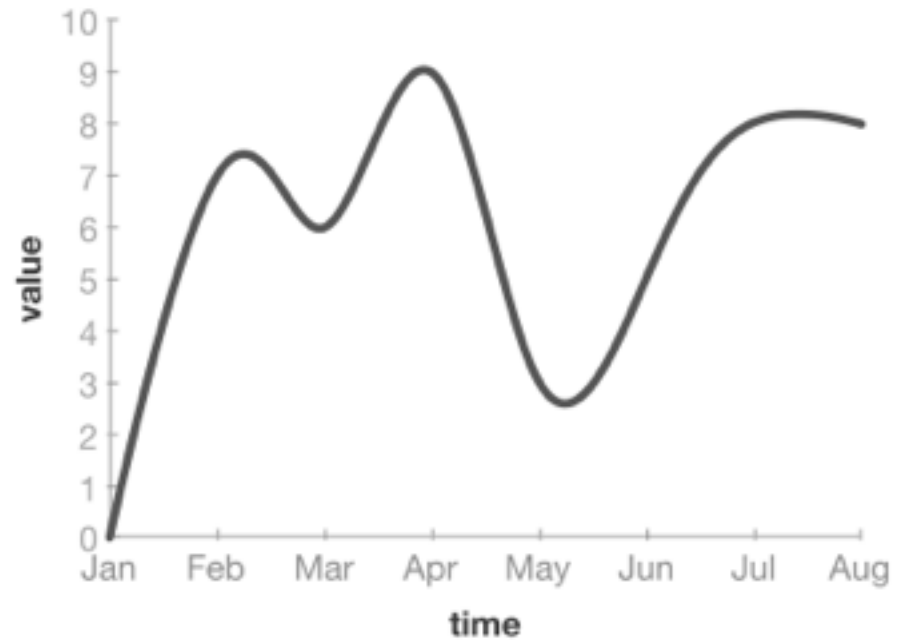
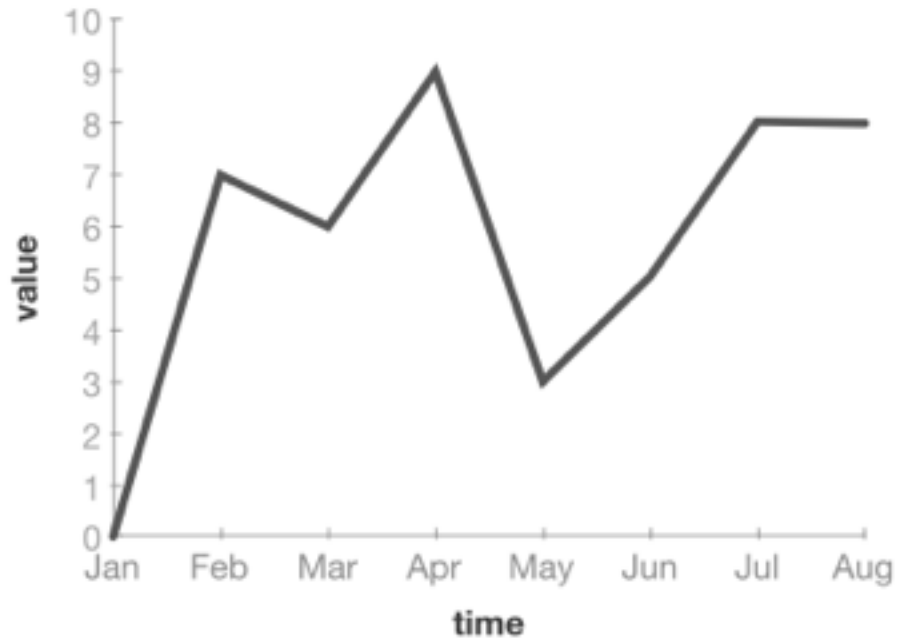
Mapping Time to an Axis



Time-Series Data

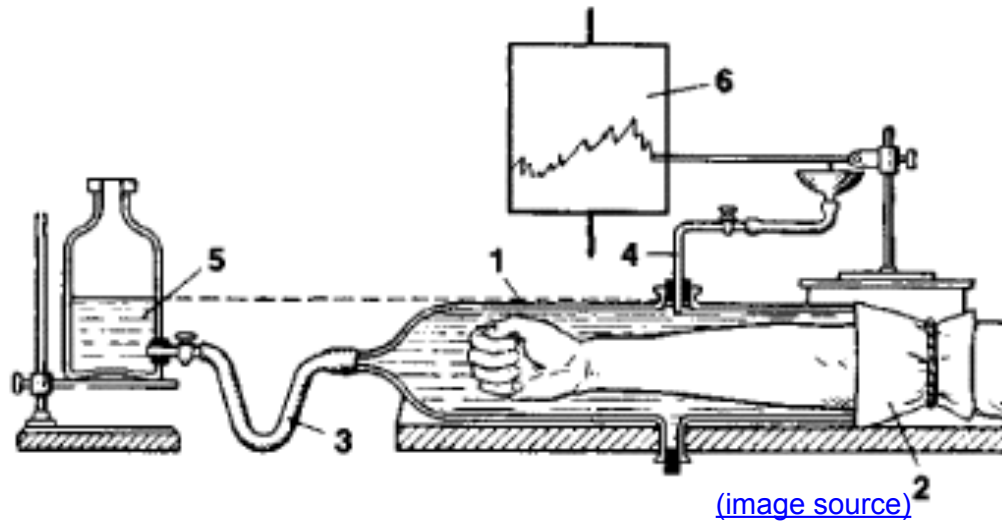
- **From a Statistics Book:**
 - A set of observations x_t , each one being recorded at a specific time t
- **From Wikipedia:**
 - A sequence of data points, measured typically at successive time instants spaced at uniform time intervals

Line Charts

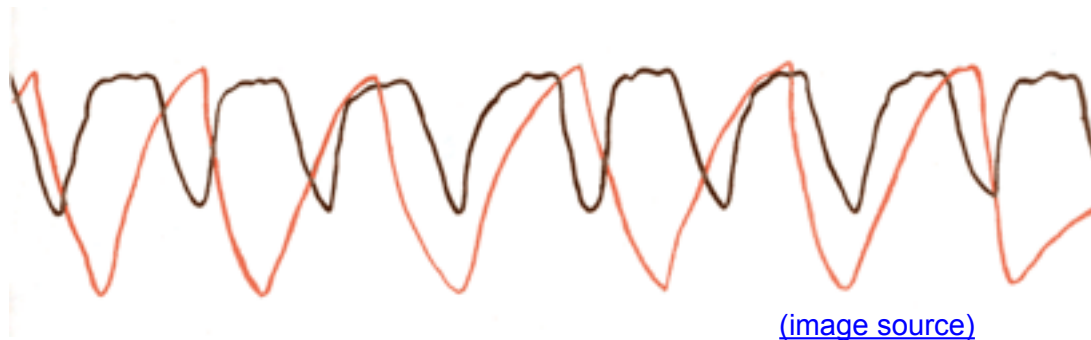


Line Charts

Marey's Physiological Recordings



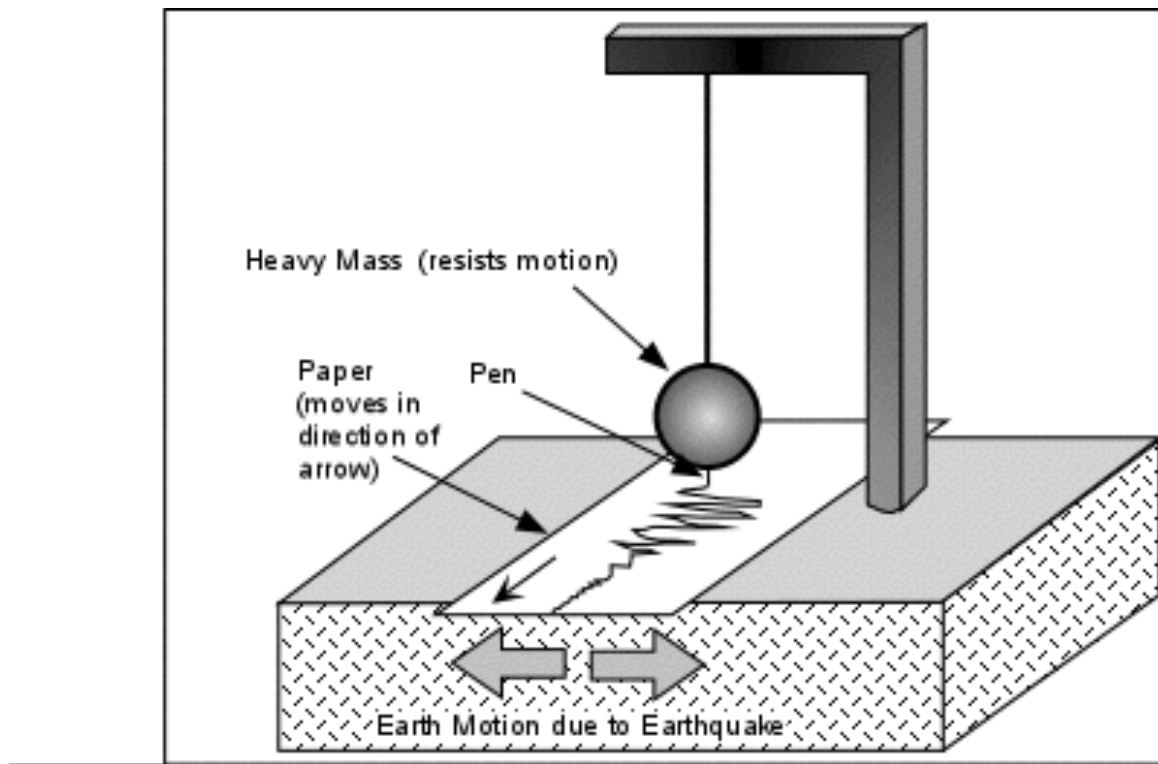
Plethysmograph
Étienne-Jules Marey, 1876



Pneumogram
Étienne-Jules Marey, 1876

Line Charts

Pendulum Seismometer

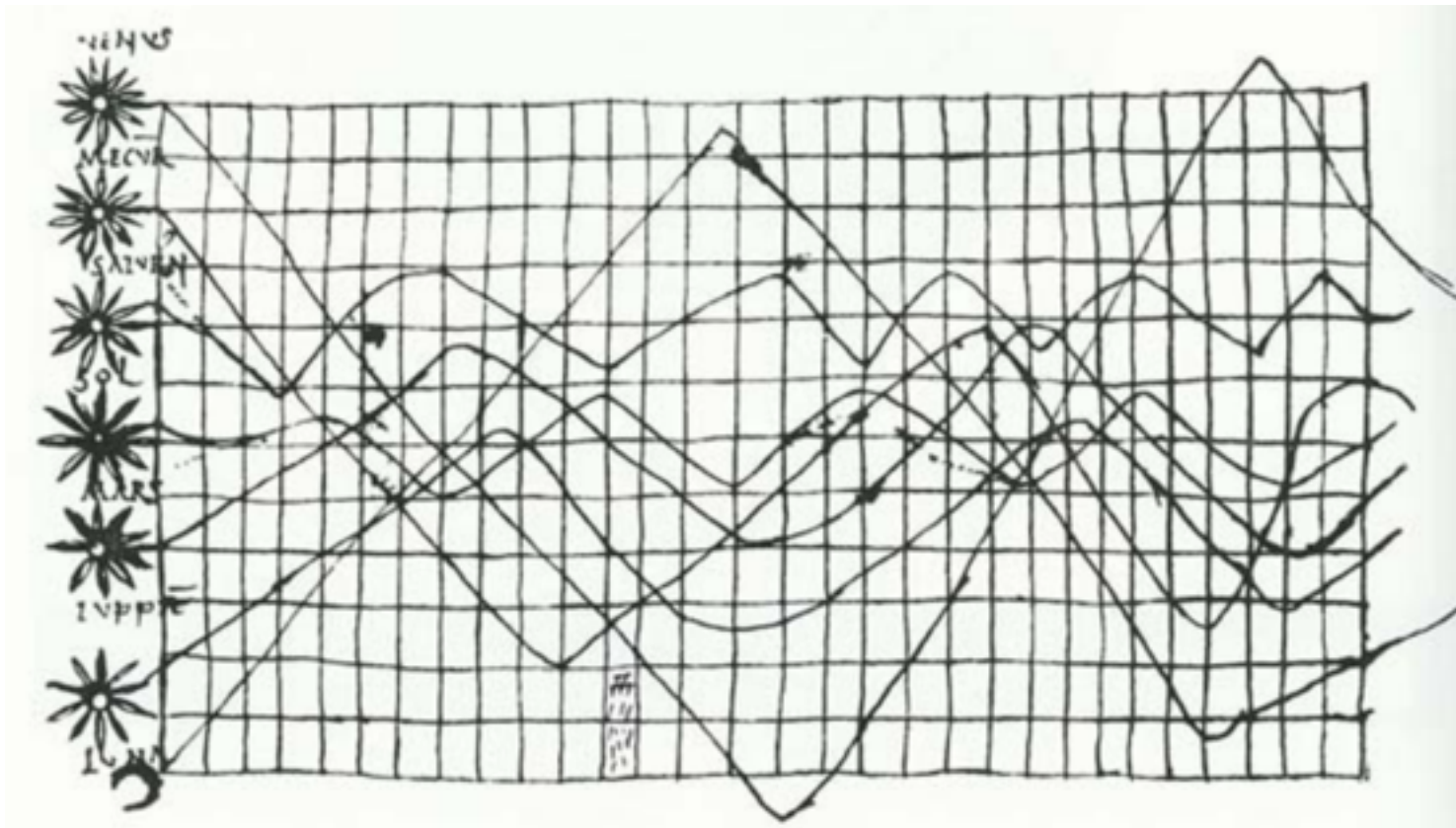


[\(image source\)](#)

Andrea Bina, 1751
Possibly also 17th century [\(source\)](#)

Line Charts

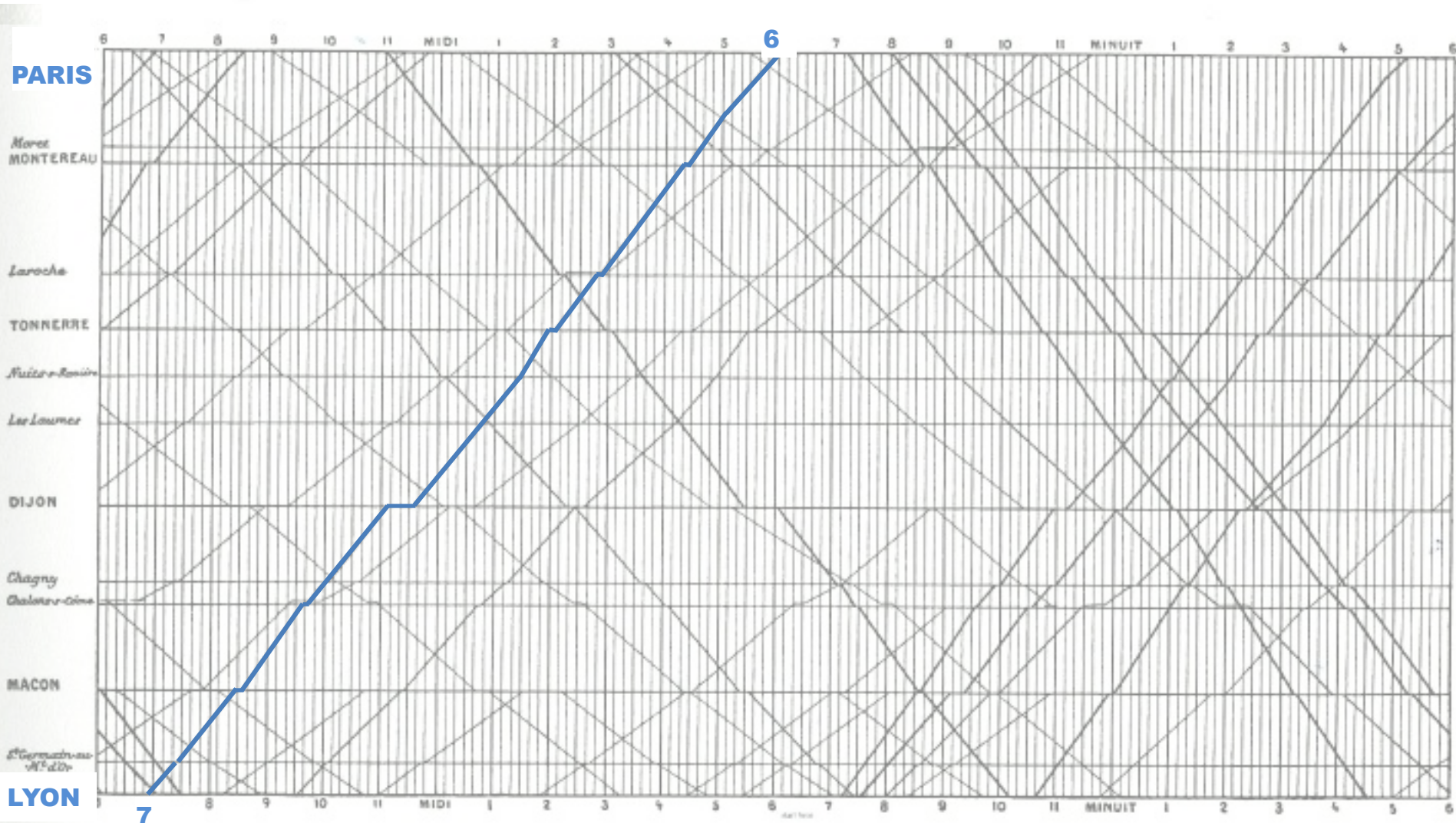
Inclinations of planetary orbits



Macrobius, 10th or 11th century
cited in [Kendall, 1990](#)

Line Charts

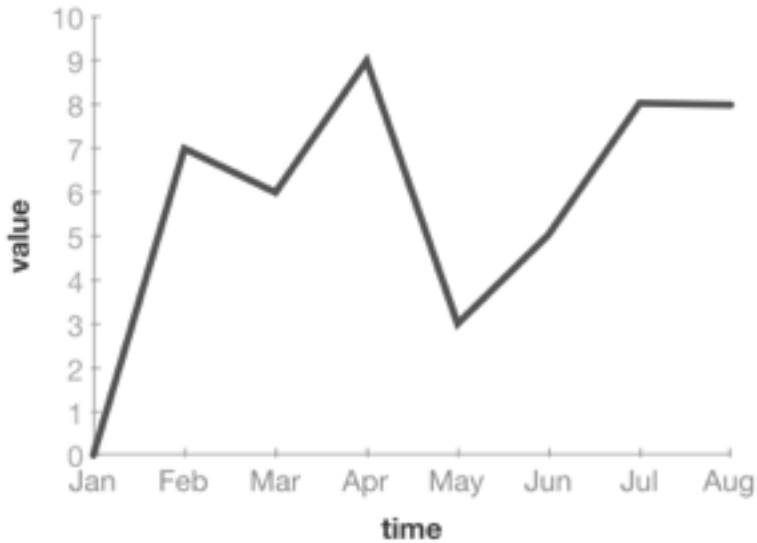
Marey's Train Schedule



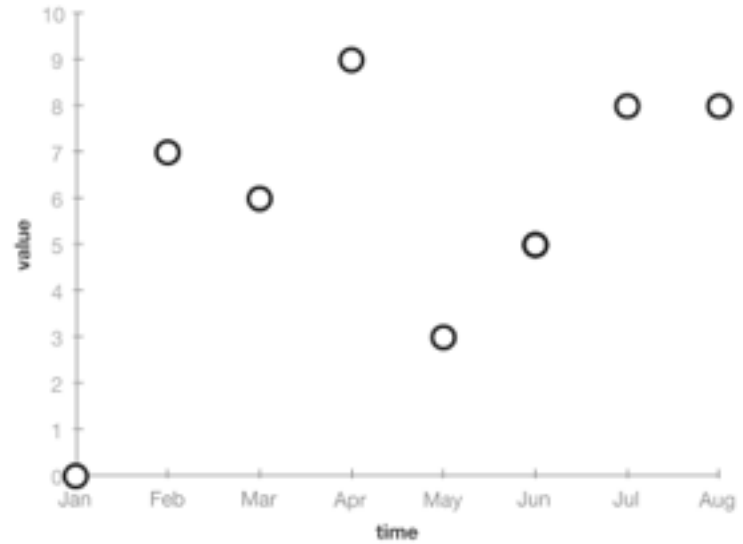
Etienne-Jules Marey, 1885, cited in [Tufte, 1983](#)

Other Charts

Line Plots



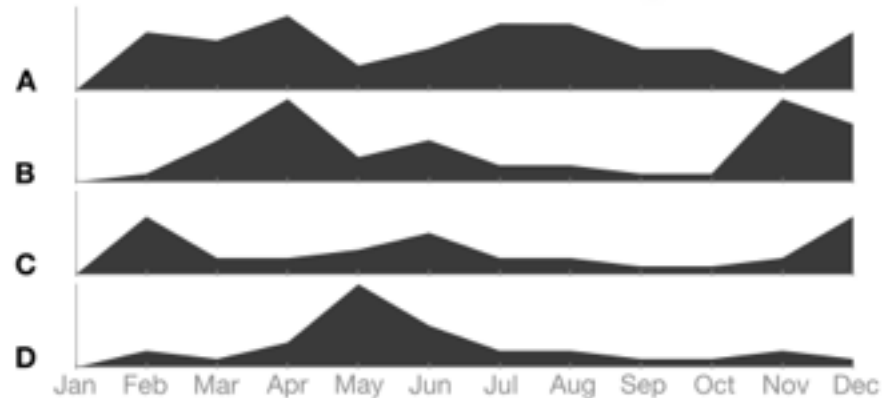
Point Plots



Bar Charts

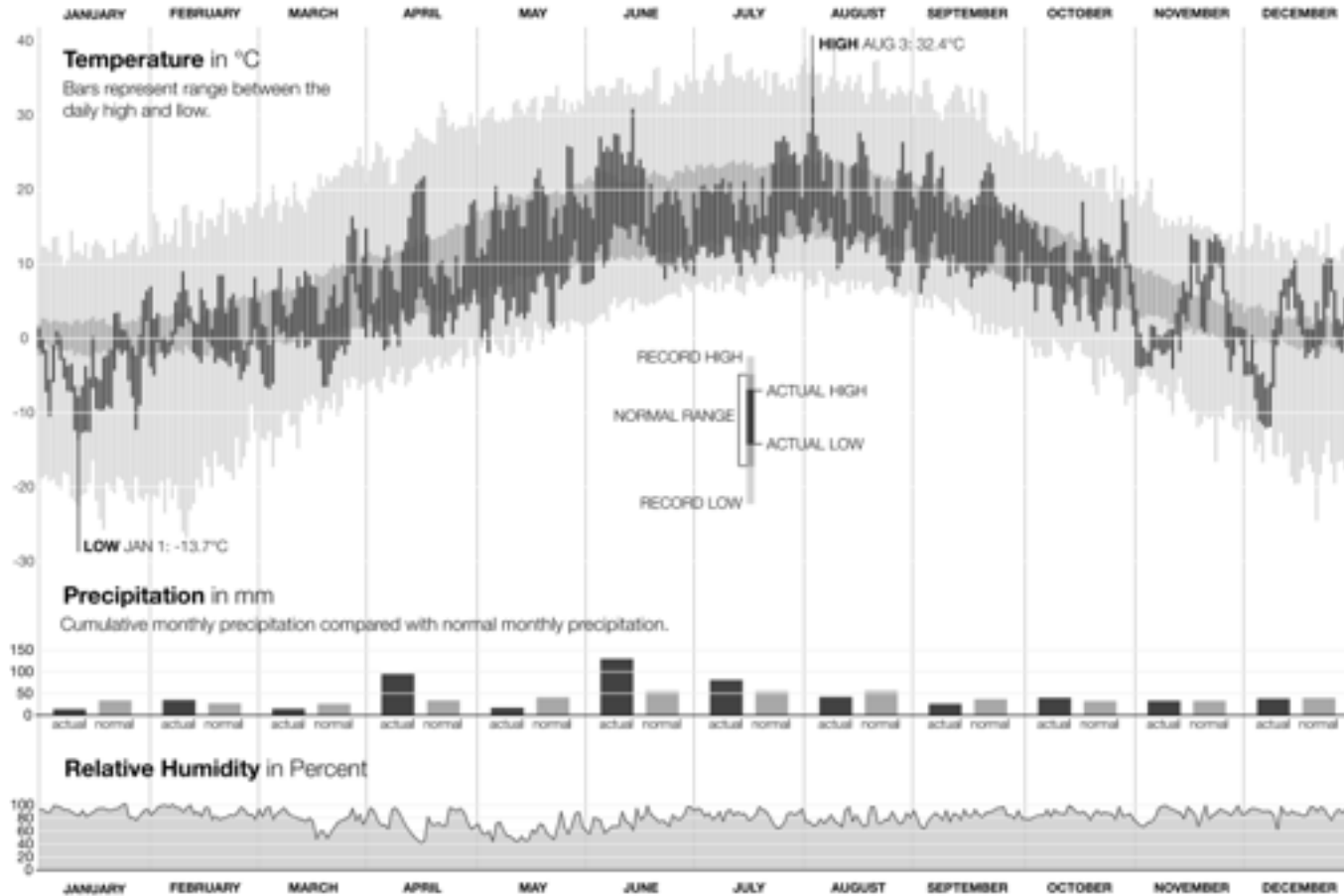


Silhouette Graphs



Other Charts

Combination - New York Times Weather Chart



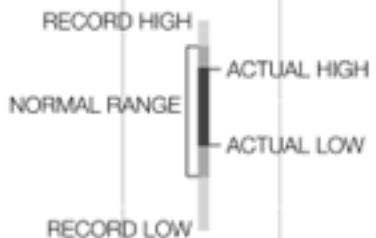
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Temperature in °C

Bars represent range between the daily high and low.

HIGH AUG 3: 32.4°C

LOW JAN 1: -13.7°C

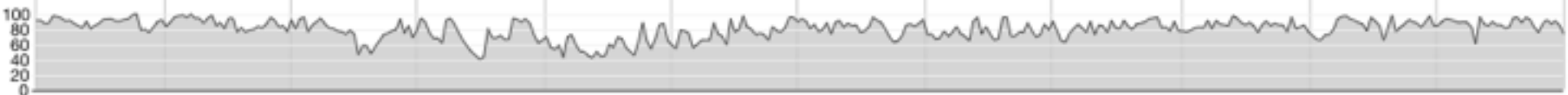


Precipitation in mm

Cumulative monthly precipitation compared with normal monthly precipitation.

actual normal actual normal actual normal actual normal actual normal actual normal actual normal actual normal actual normal actual normal actual normal actual normal

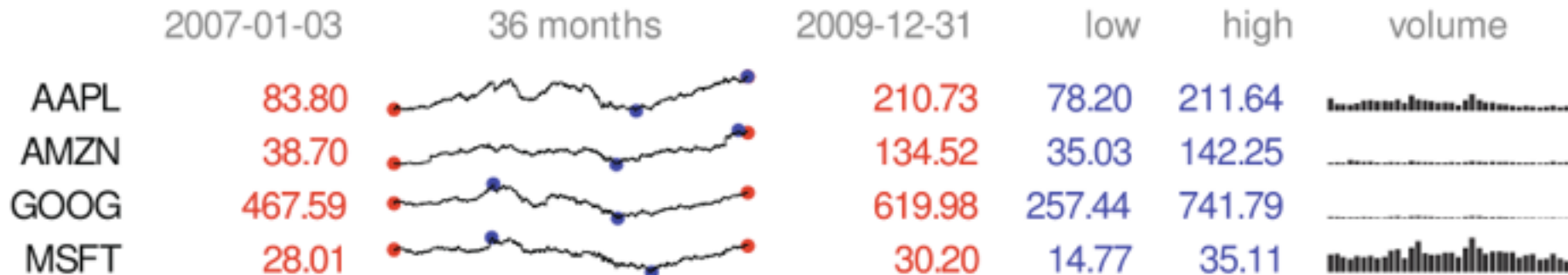
Relative Humidity in Percent






JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Other Charts

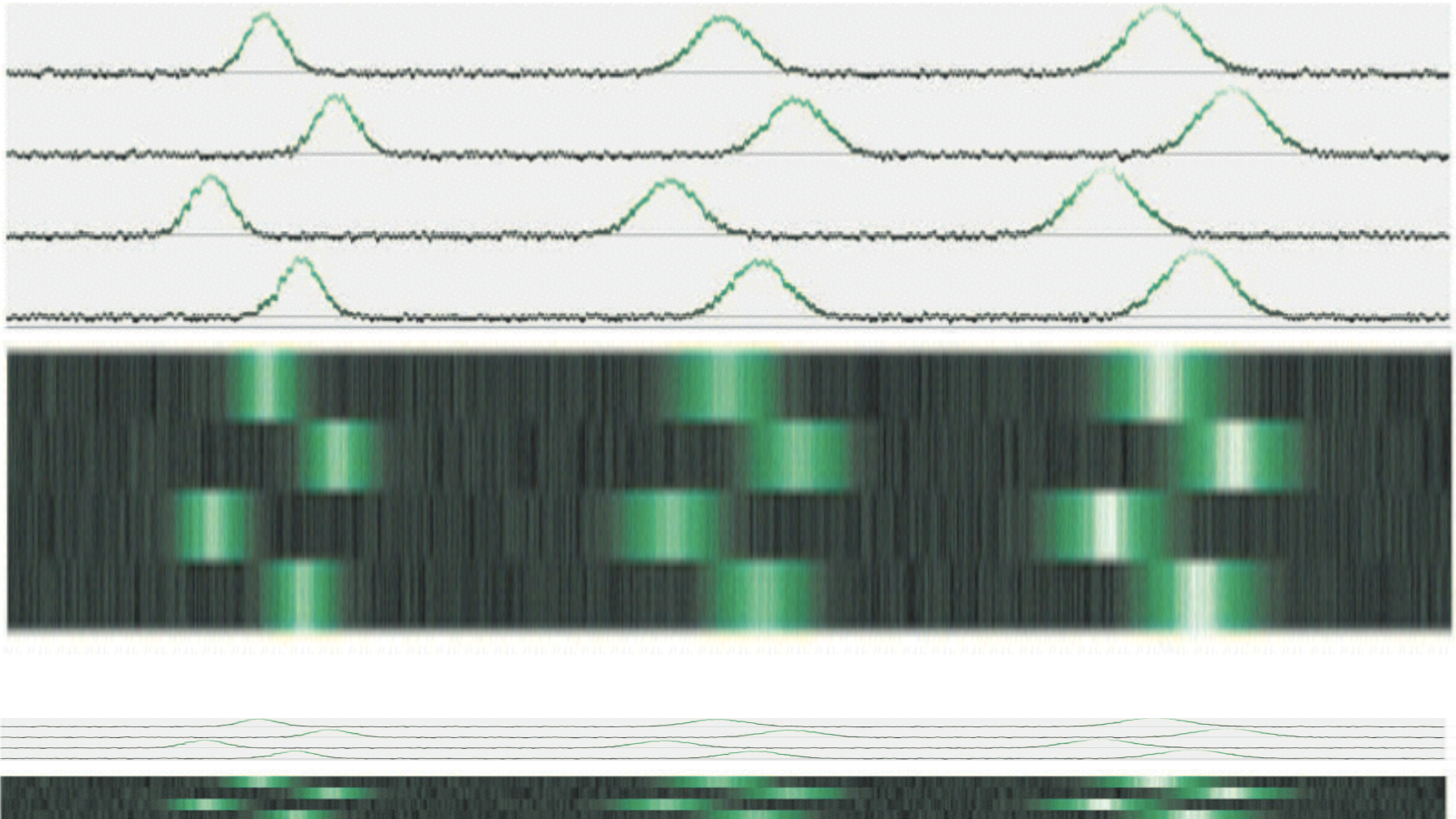
Sparklines



Usually, miniaturized versions of line plots  (↔ p. 153) and bar graphs  (↔ p. 154) are employed to represent data. For the special case of binary or three-valued data, special bar graphs can be applied that use ticks extending up and down a horizontal baseline . One use for this kind of data are wins and losses of sports teams where the history of a whole season can be presented using very little space. For line plots, the first and last value can be emphasized by colored dots (•) and printing the values themselves textually

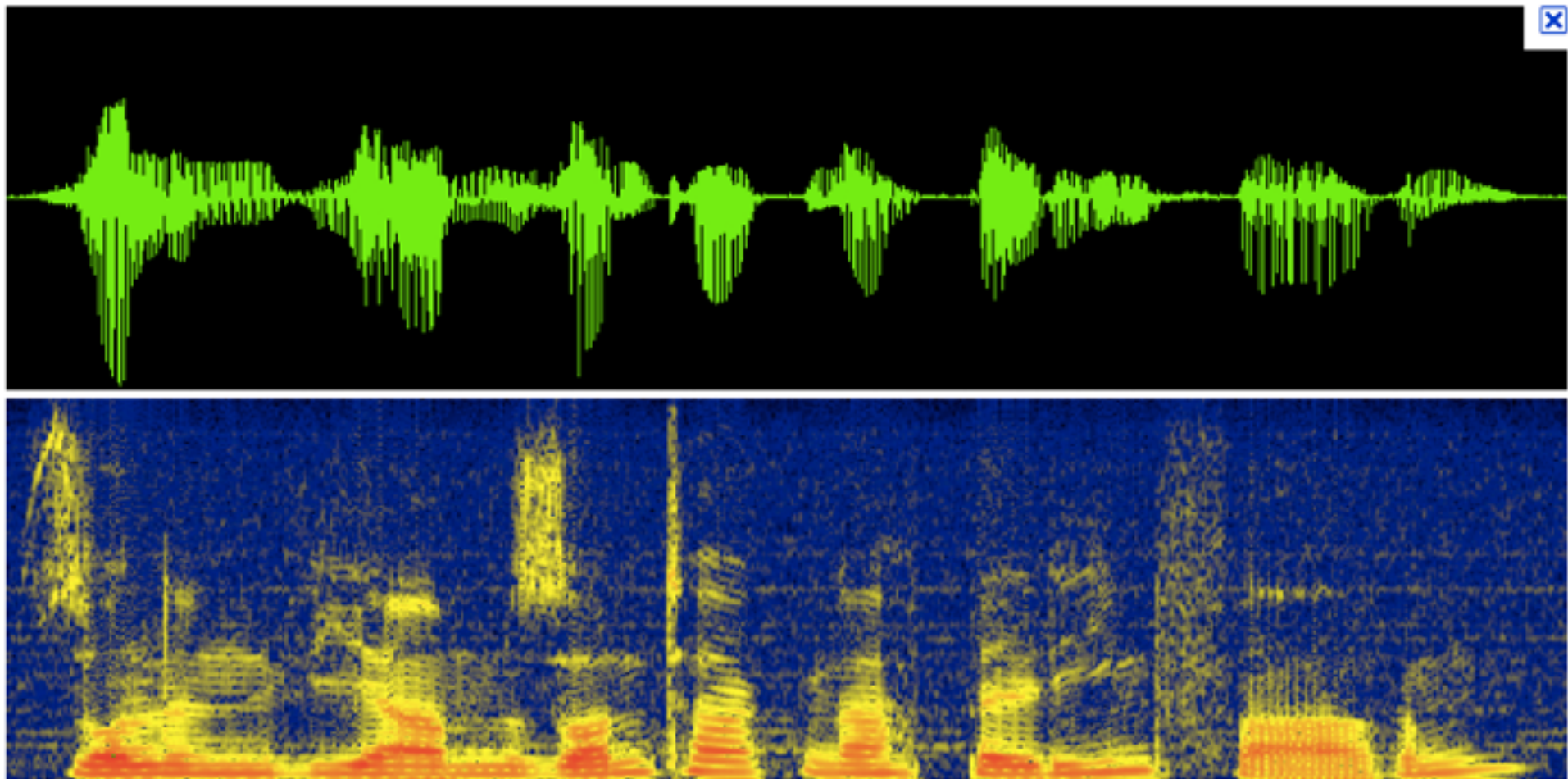
Other Charts

Color Encoding



Other Charts

Color Encoding - FFT Spectrum

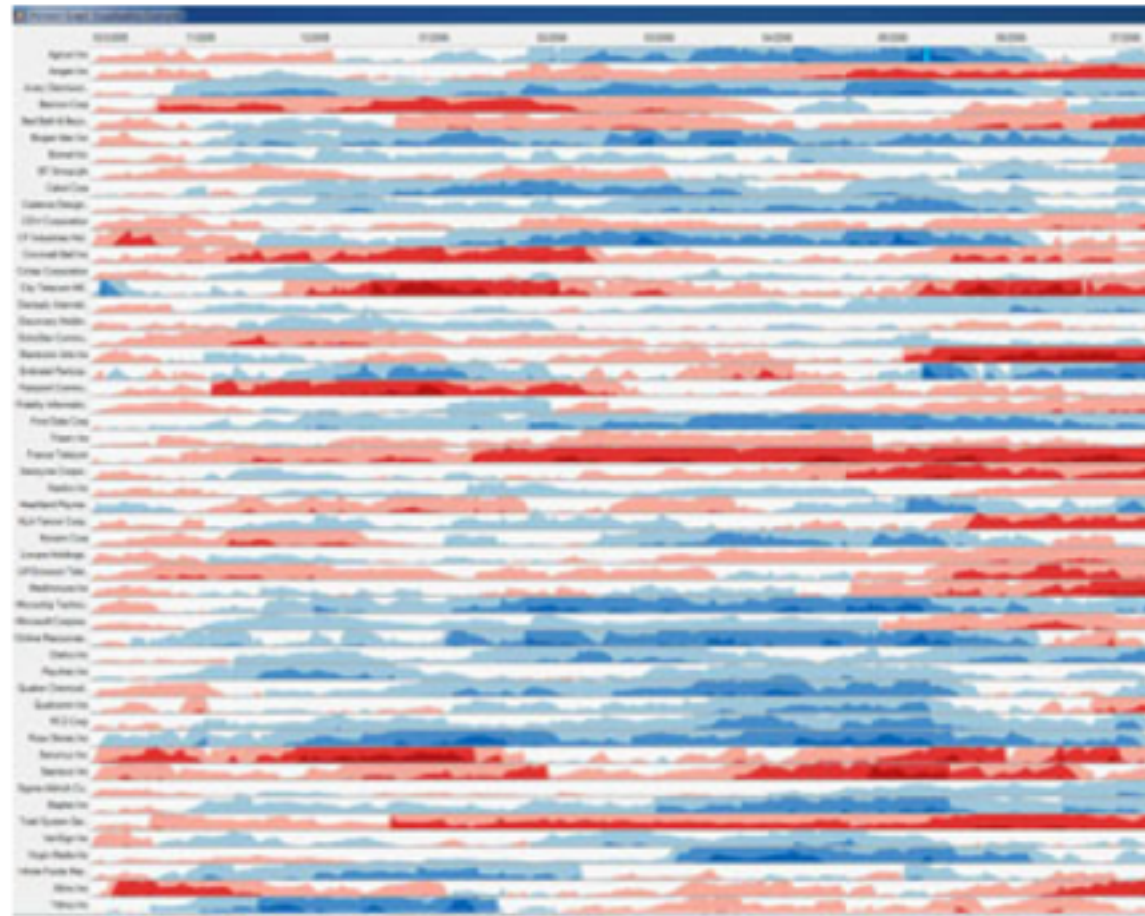
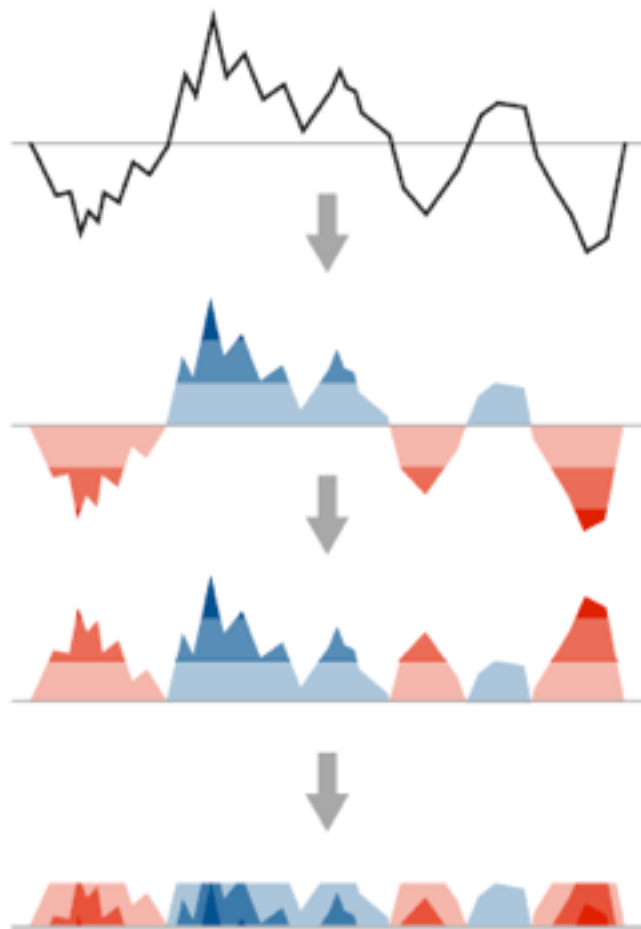


[\(image source\)](#)

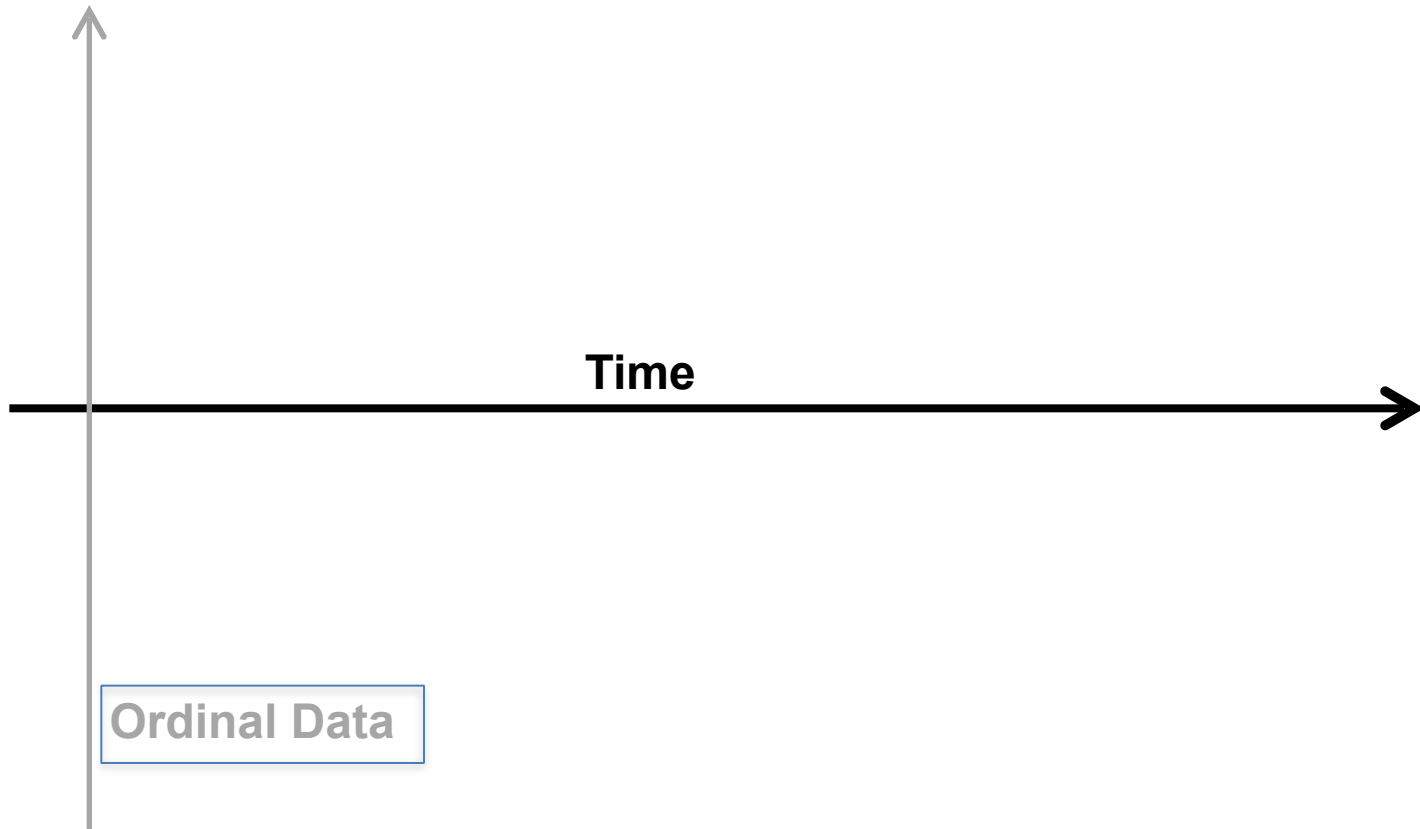
Other Charts

Horizon Graphs

[paper presentation
on interactive version]

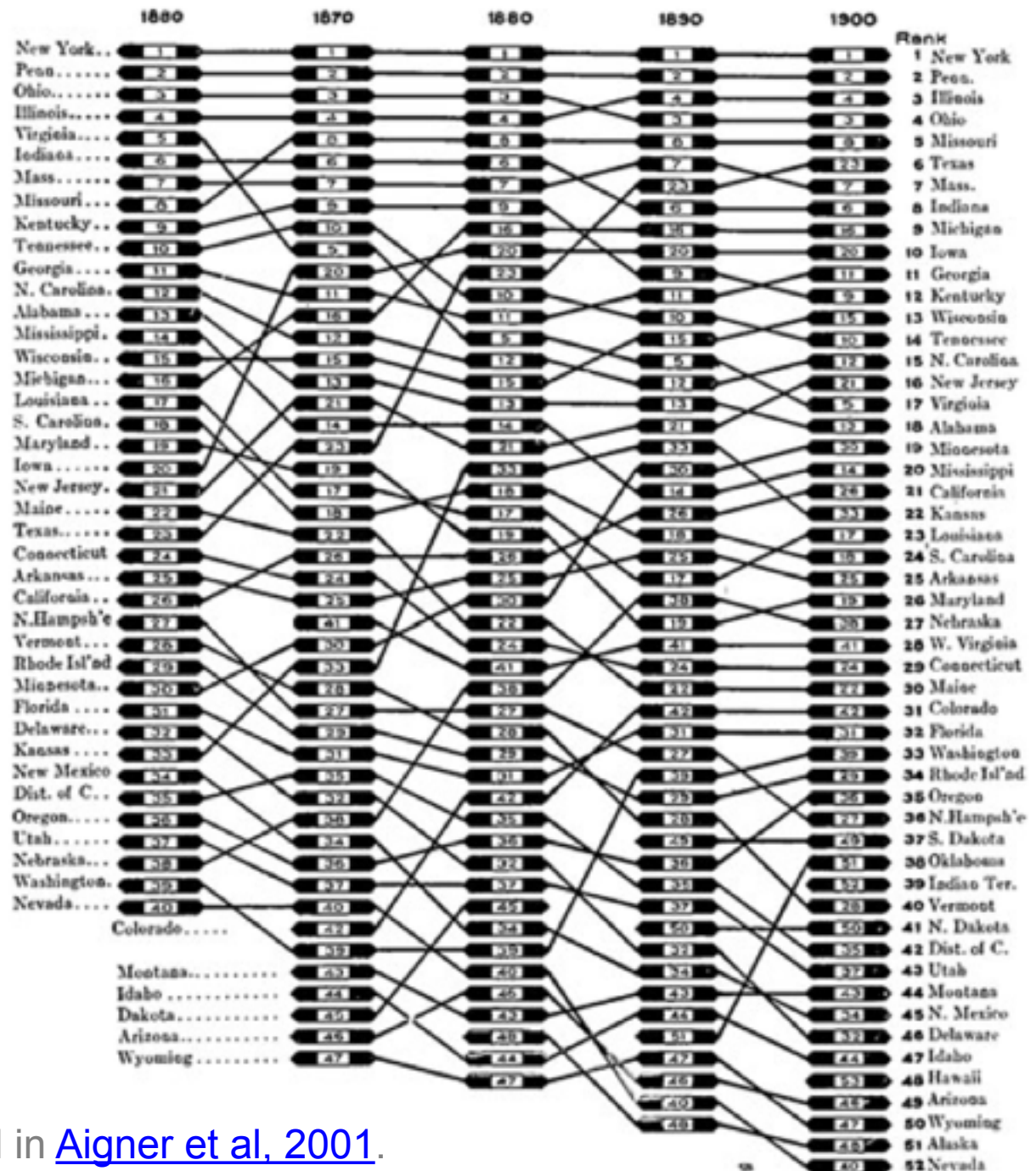


Other Data Types



Other

Slopegraph



[Brinton, 1914.](#) Cited in [Aigner et al, 2001.](#)

Other

Slopegraph

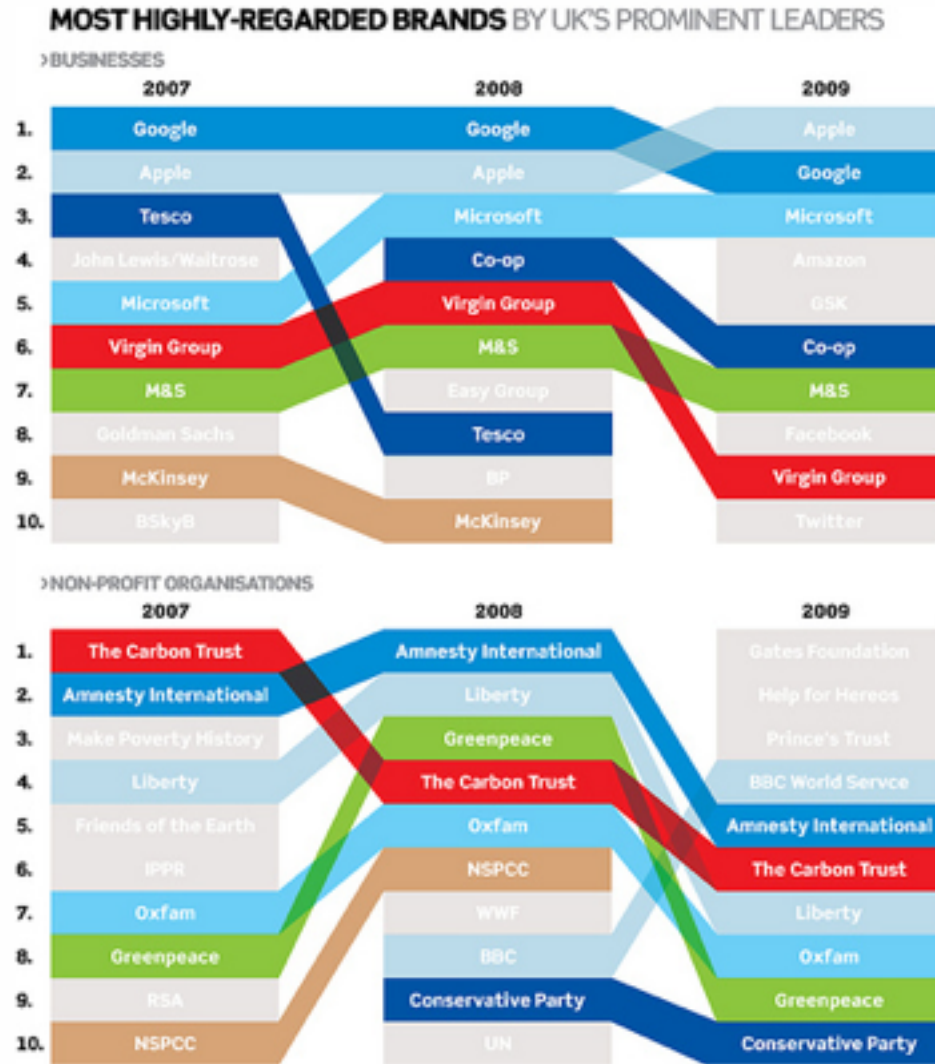
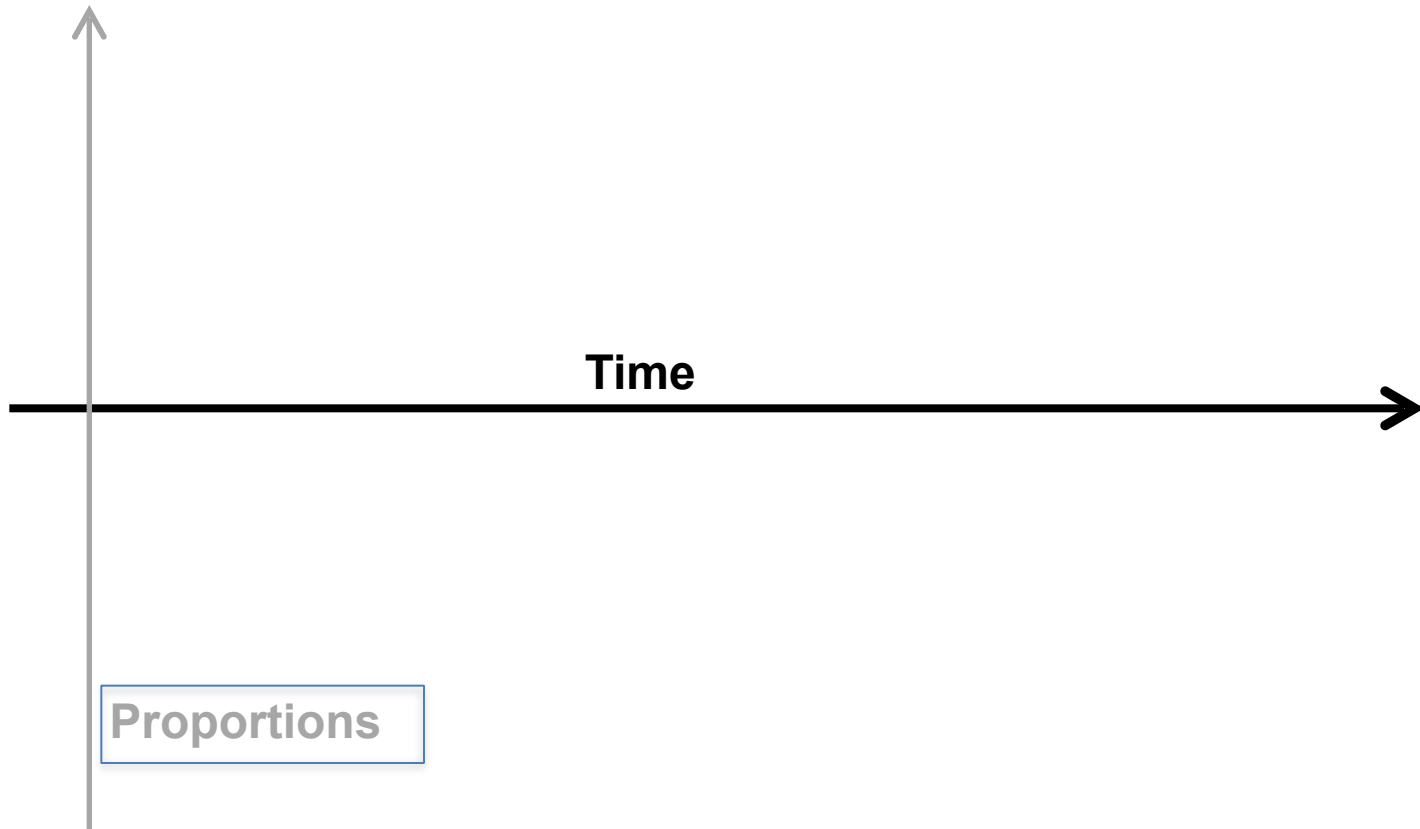


Chart showing the top ten brands' standing over the last three years

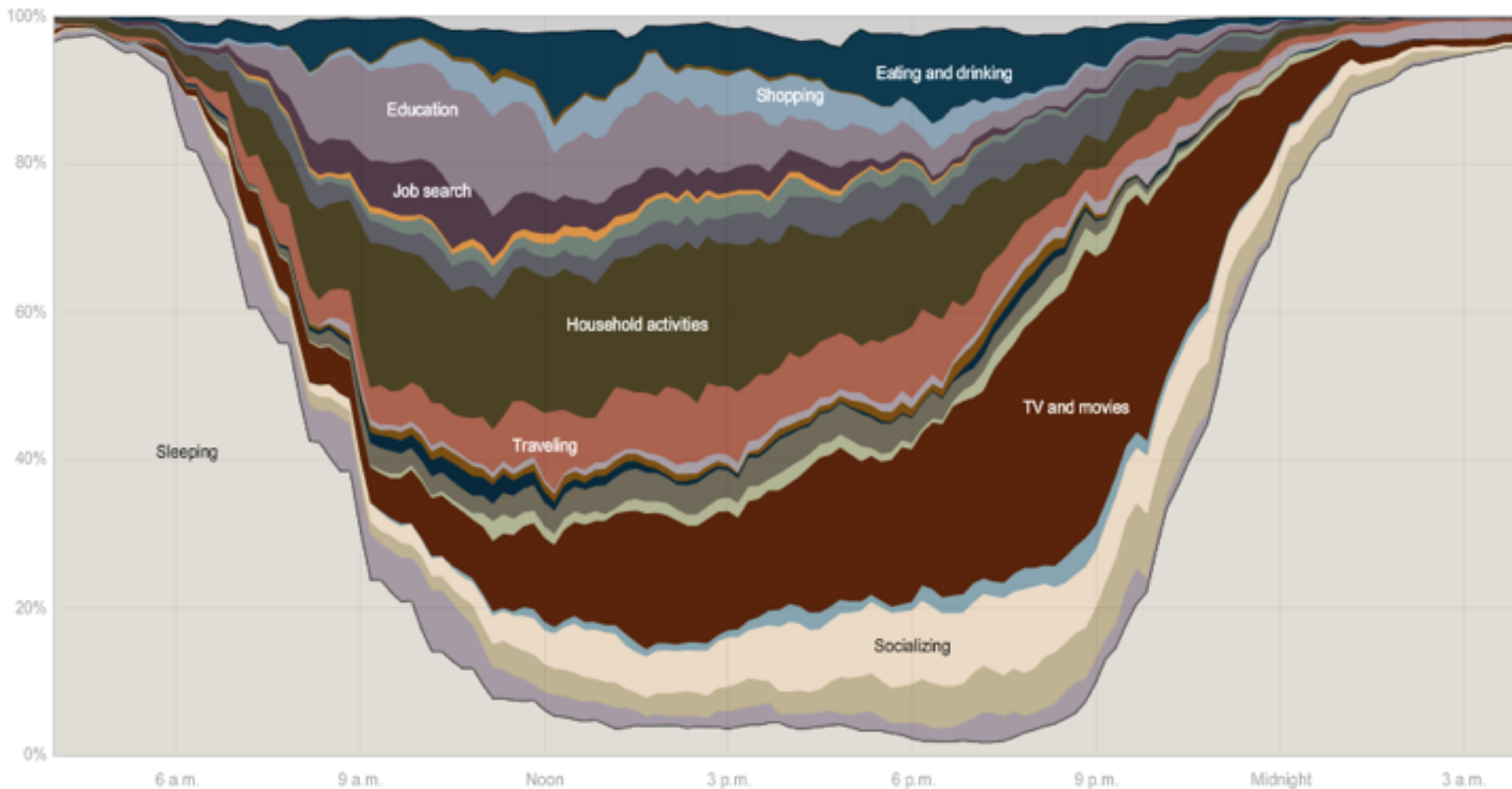
Other Data Types



Other Charts

Stacked Area Chart

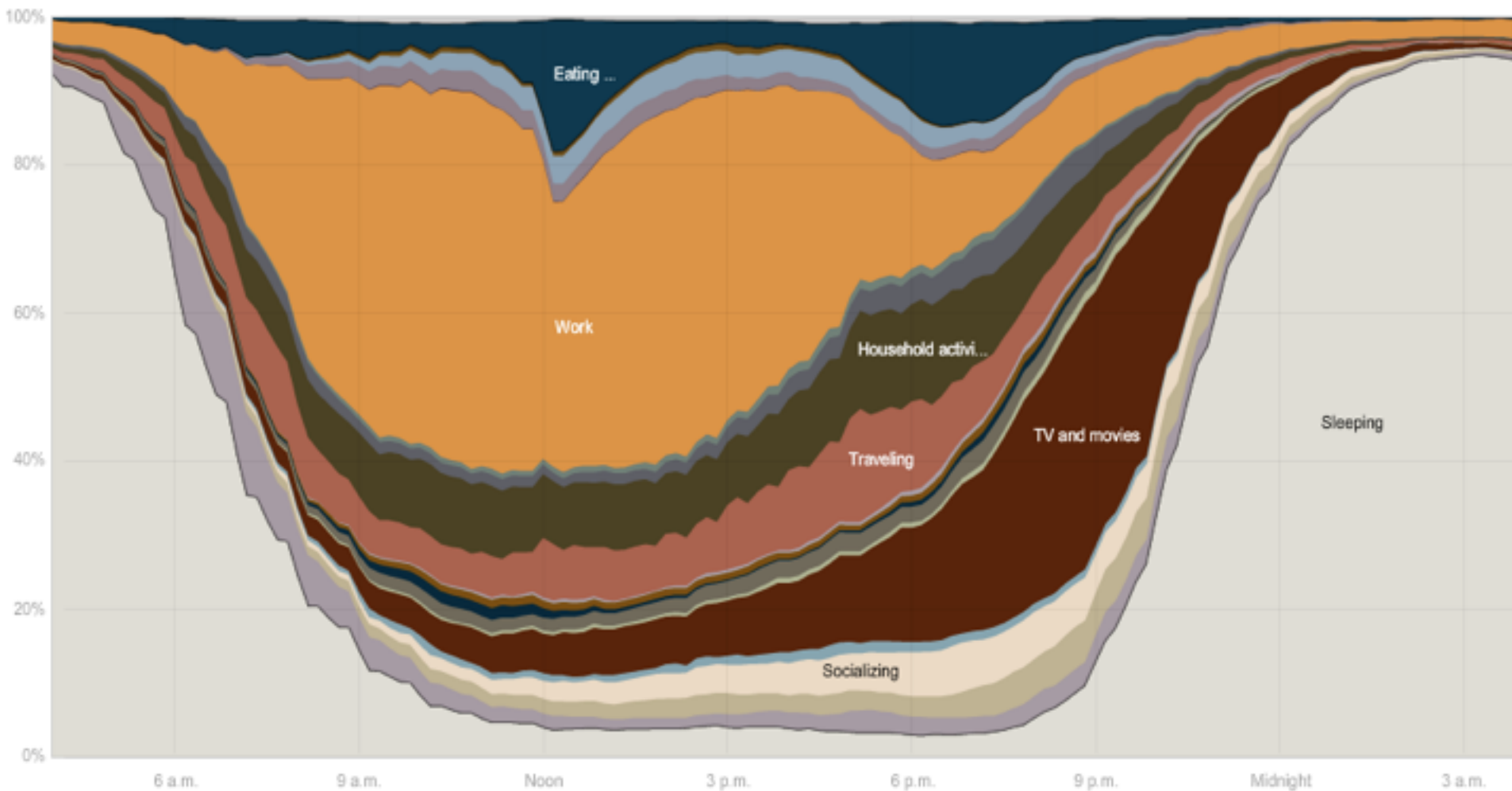
Stacked Graph
Area Chart
ThemeRiver
StreamGraph



Other Charts

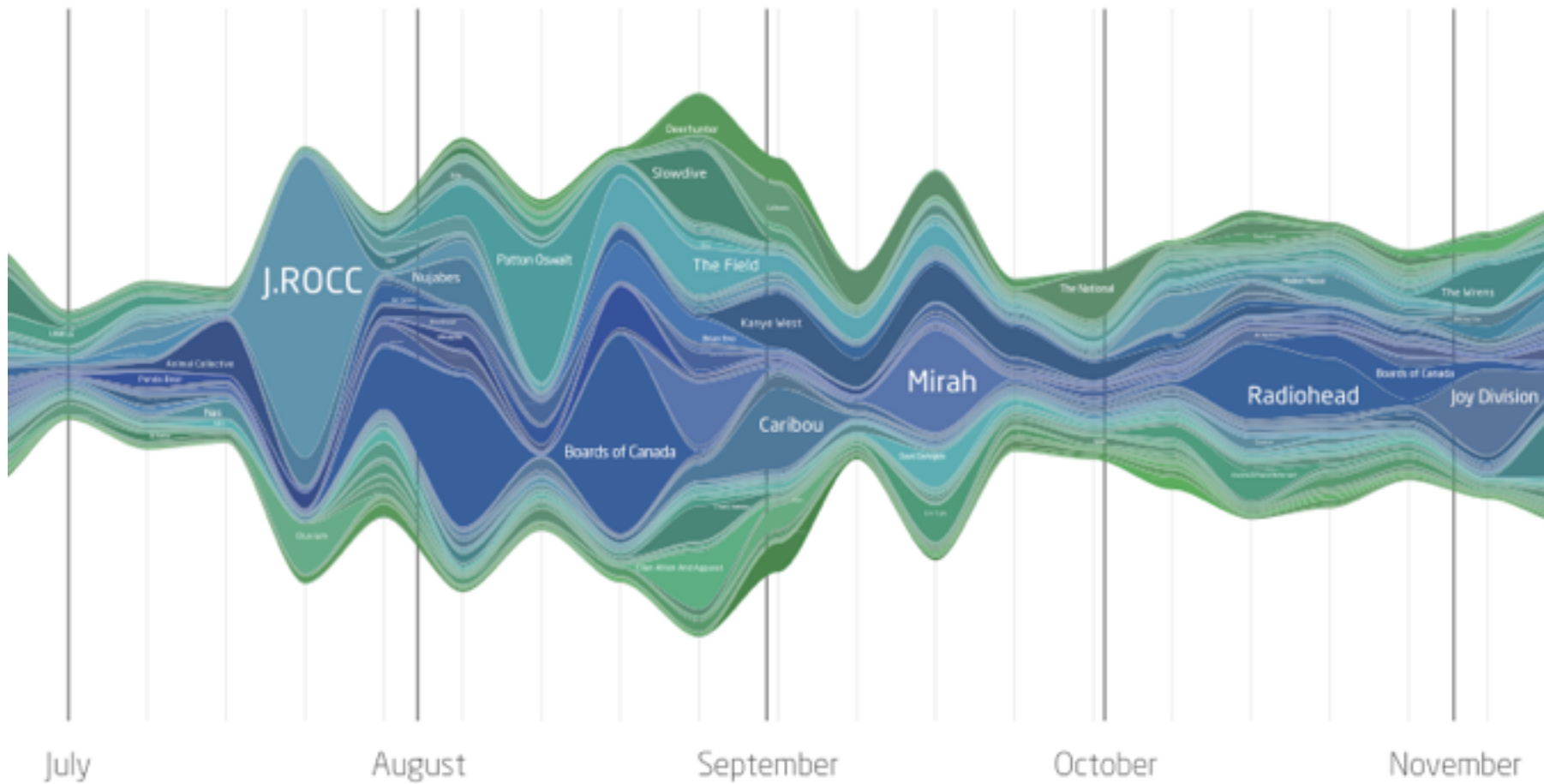
Stacked Area Chart

Stacked Graph
Area Chart
ThemeRiver
StreamGraph

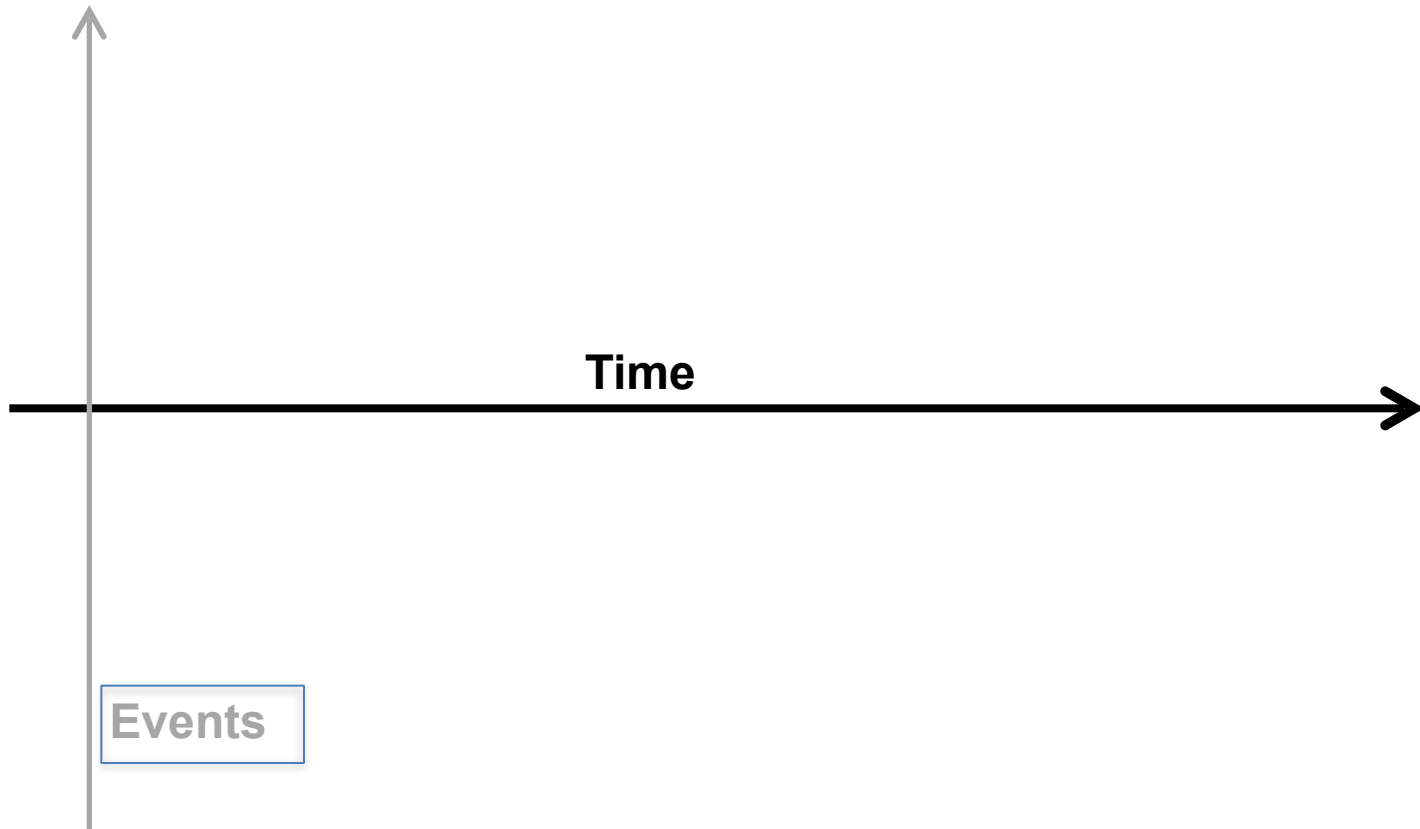


Other Charts

Stacked Area Chart



Other Data Types

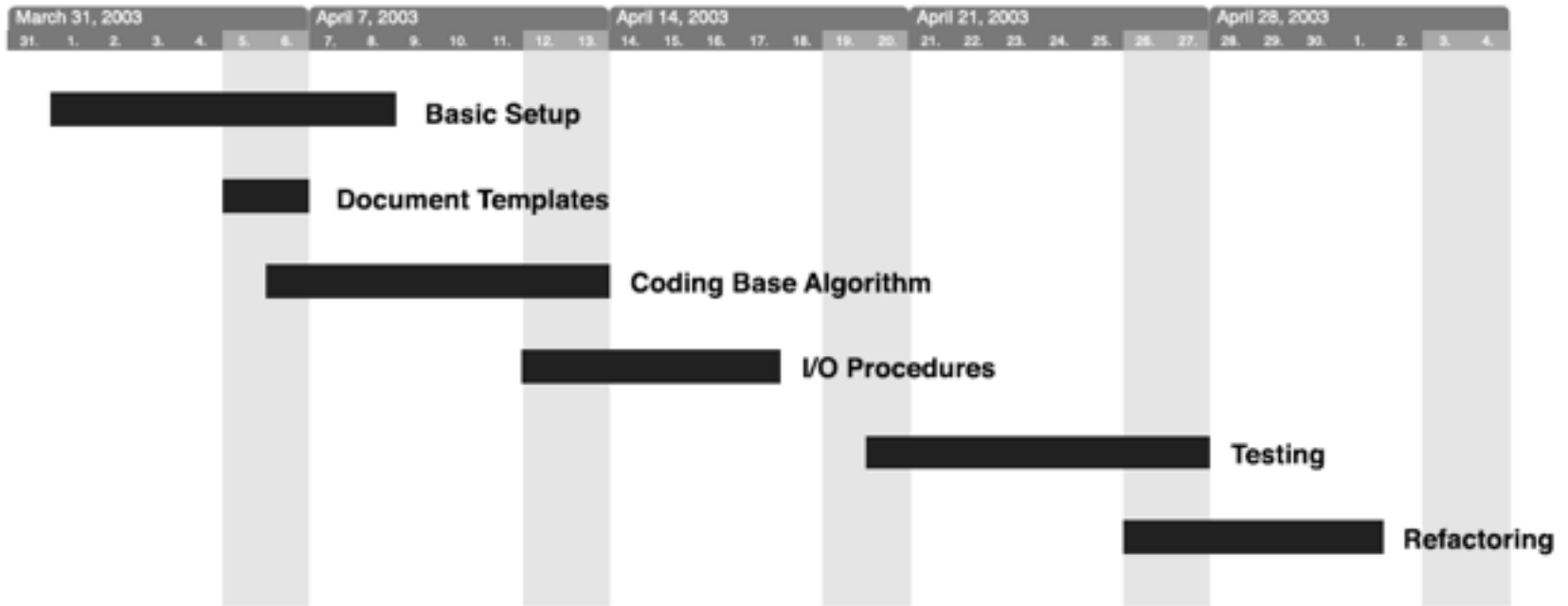


Events

- Like *observations* in time-series:
 - Data points with a time stamp
- But:
 - Most often sparse and irregular
 - Data is mostly nominal
 - Can have a duration (start + end)
 - Often, subjective / social data rather than physical measures

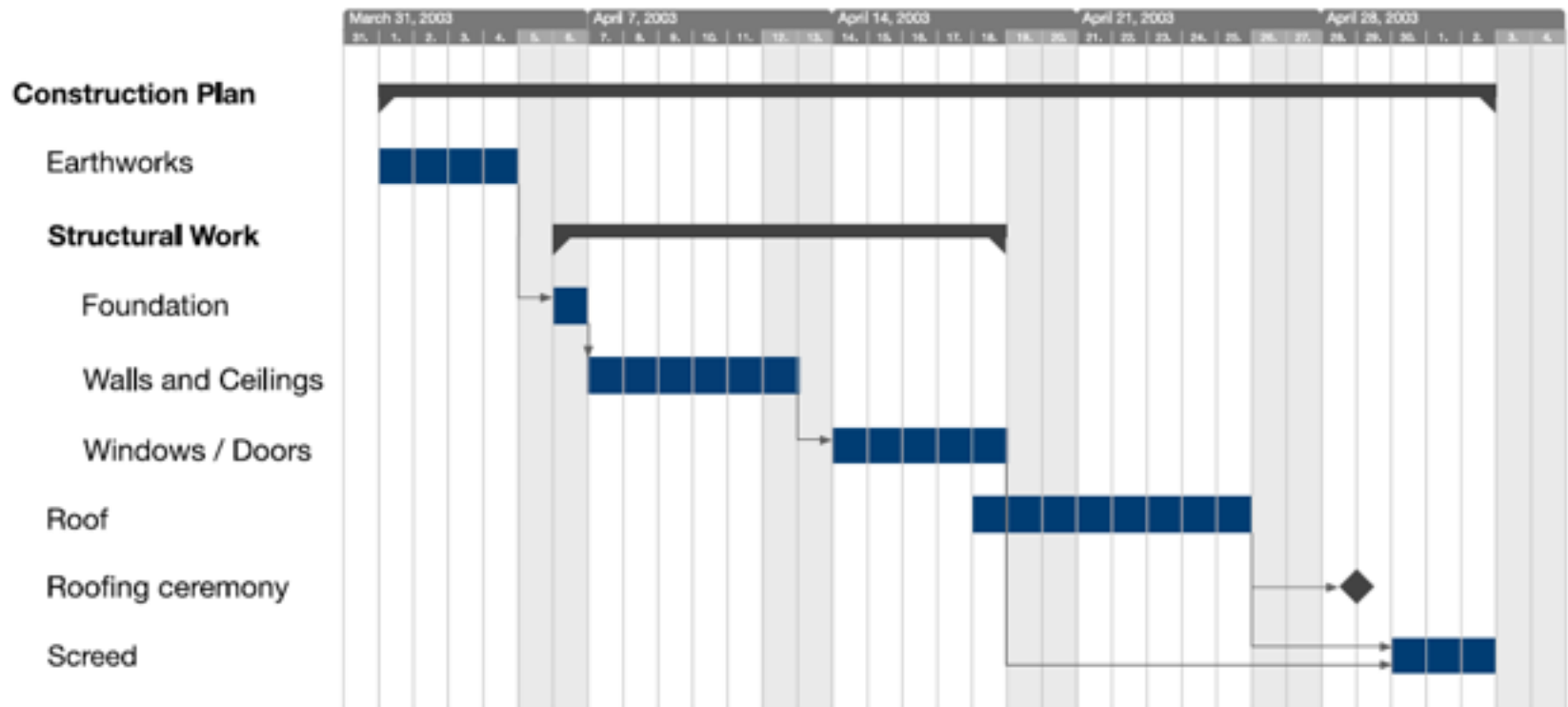
Timelines

Project Timeline



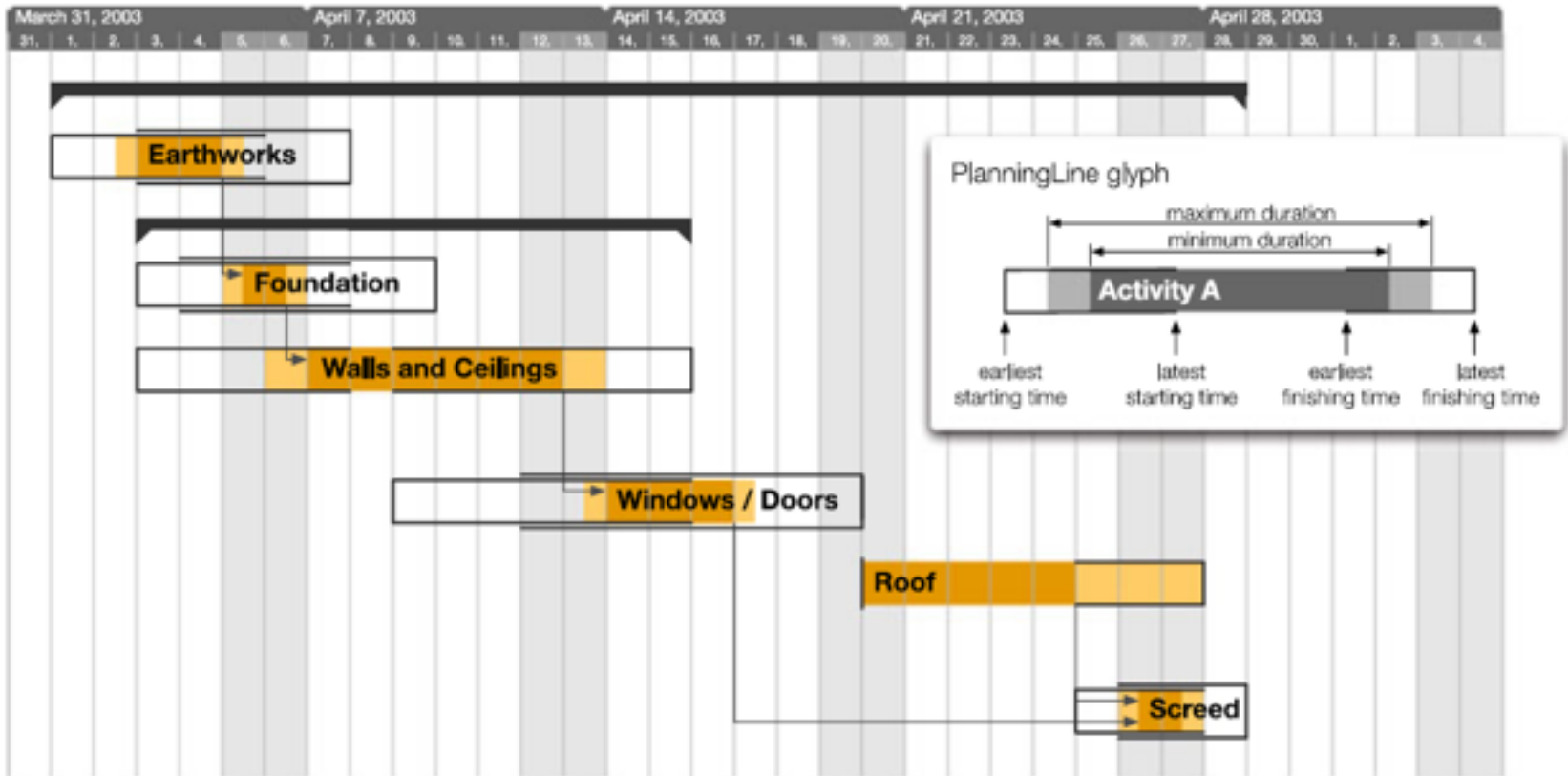
Timelines

Gantt Chart



Timelines

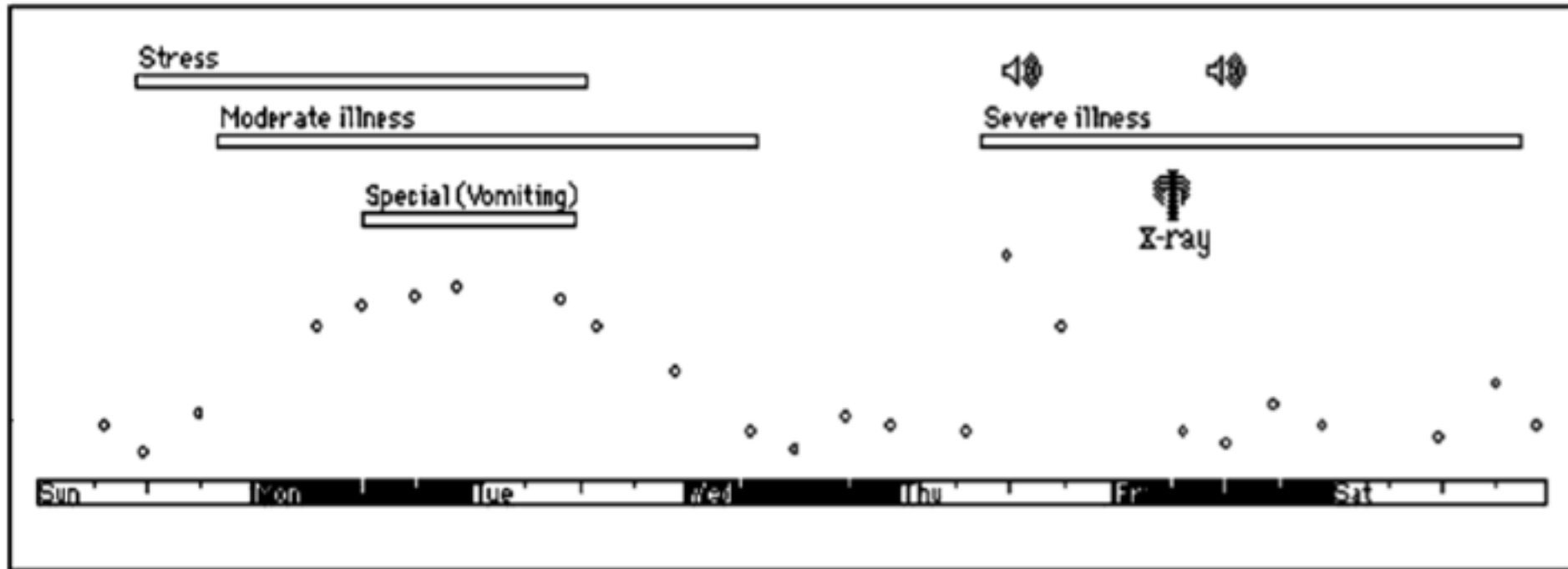
Planning Lines



Timelines

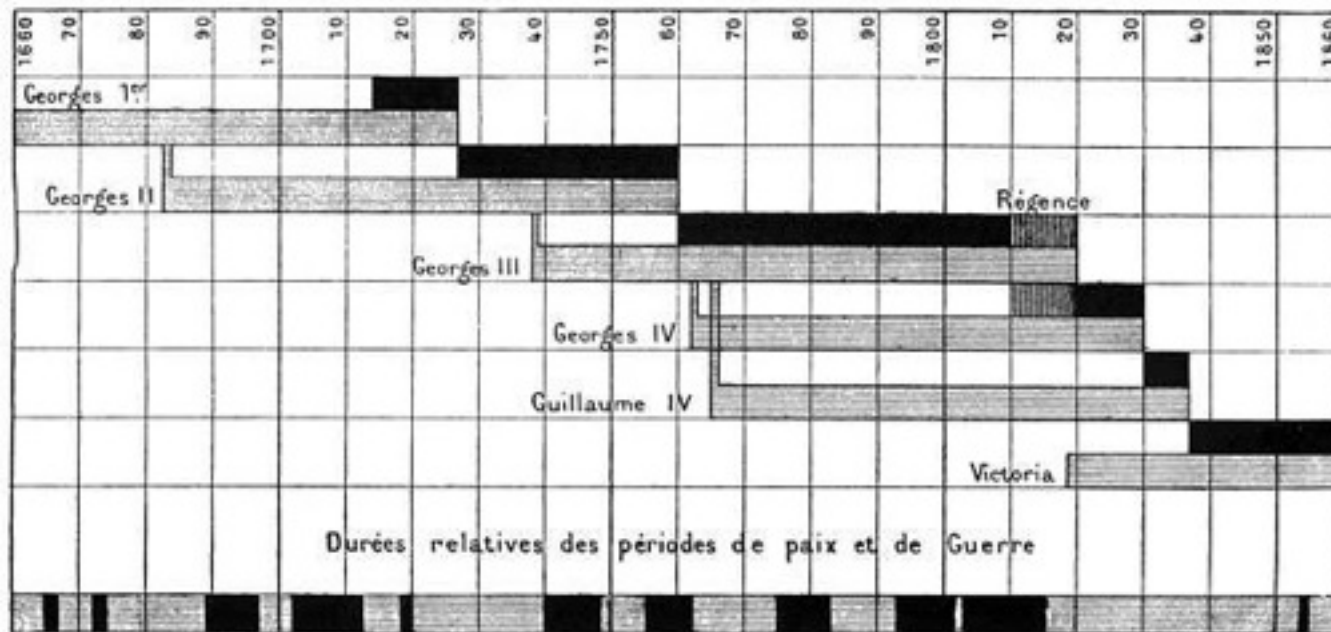
Patient Data

Patient: Joe Patient



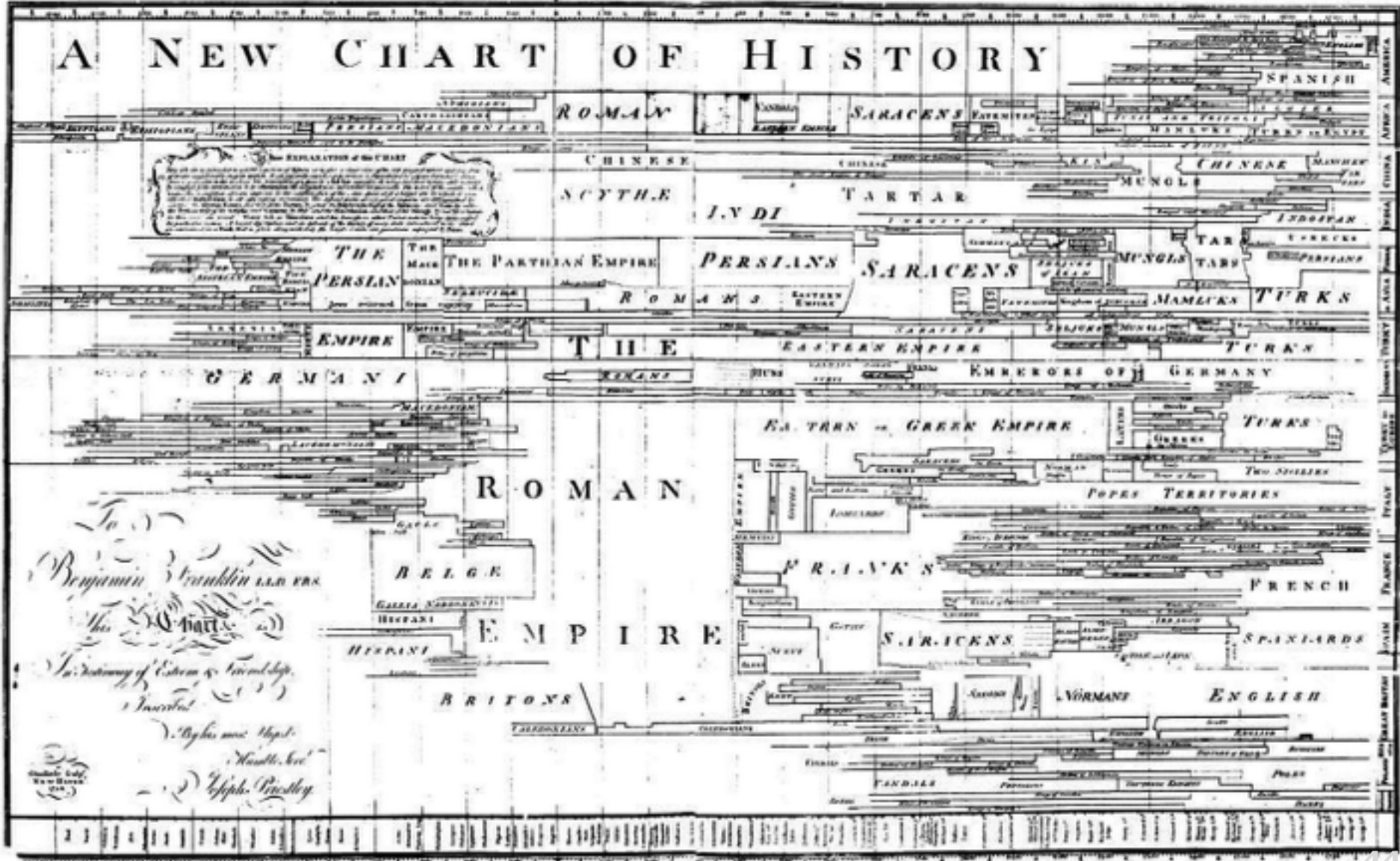
Timelines

Reigns of English Monarchs



Timelines

Illustration in Benjamin Franklin's original



Benjamin Franklin L.L.D. F.R.S.
The Art of
The Discovery of Electricity & Fireworks
Invented
*By his most Obedt.
 Humble, Servt.
 J. J. App. Priestley*

OF HISTORY

ROMAN

VANDALS
EASTERN EMPIRE

SARACENS

FATEMITES

TUNIS AND TRIPOLI

SPANISH

CHINESE

CHINESE

KIA

CHINESE

MINHUK

SCYTHIAE

TARTAR

MUNGLES

INDIA

INDUSTAN

INDOSTAN

AN EMPIRE

PERSIANS

SARACENS

SHAJKS
OF IRAN

MUNGLES

TAR

UNHECKS

PERSIANS

ROMANS

EASTERN EMPIRE

FATEMITES

EMPERORS OF

MAMLUKS

TURKS

THE

EASTERN EMPIRE

EMPERORS OF

GERMANY

ROMANS

HUNS

VARIGS

SLAVS

GERMANS

HAVING

EASTERN or GREEK EMPIRE

TURKS

TWO SICILIES

POPES TERRITORIES

MAN

EMPIRE

FRANKS

FRENCH

PIRE

EMPIRE

SARACENS

SPANIARDS

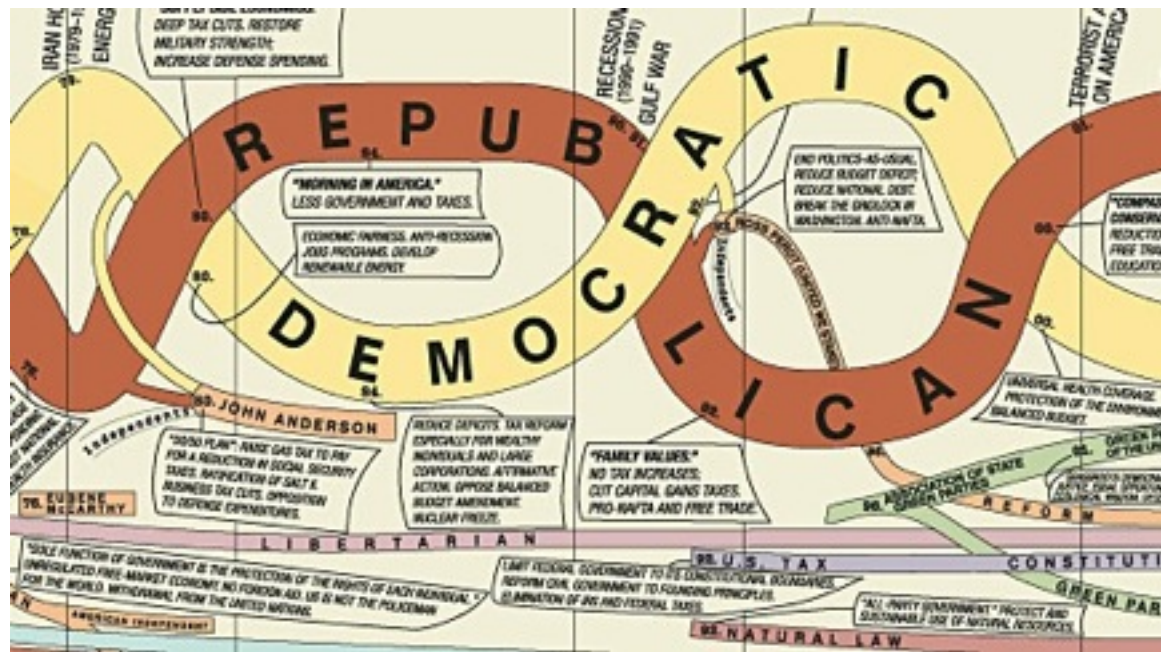
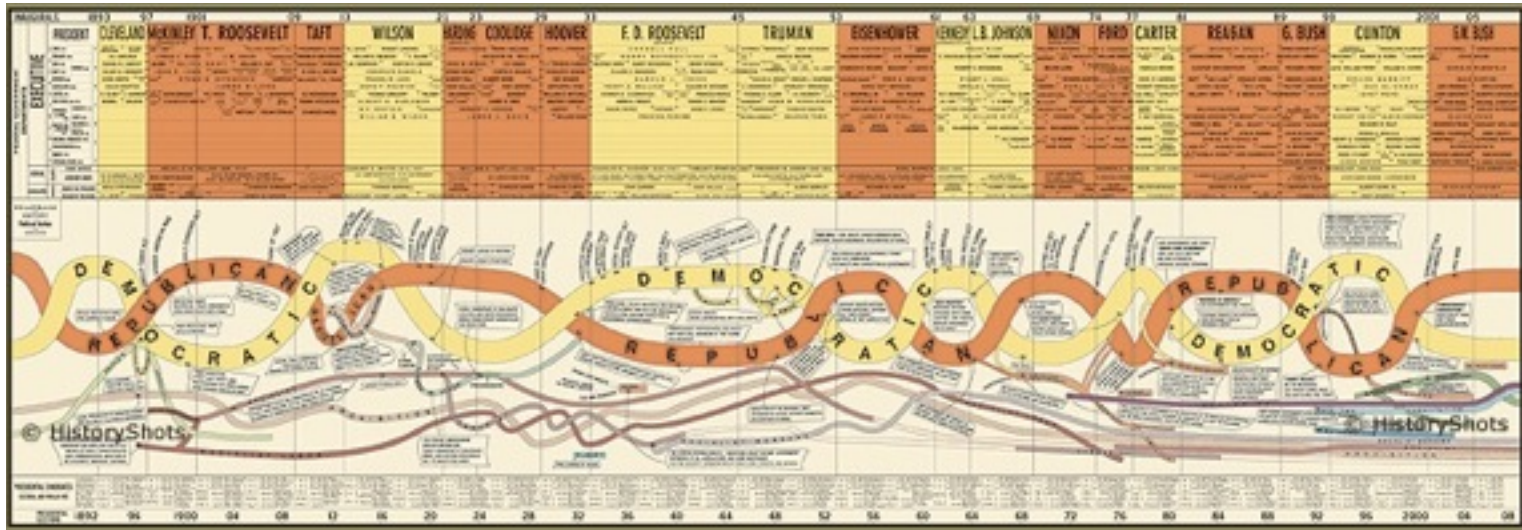
SCYTHIAE

GOths

THE JEW

AMERICA
AFRICA
CHINA
INDIA
PERSIA
ASIA
TURKEY
EUROPE
ITALY
FRANCE
SPAIN

Timelines



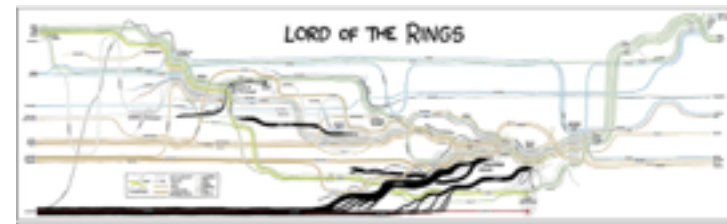
historyshots.com,

2005

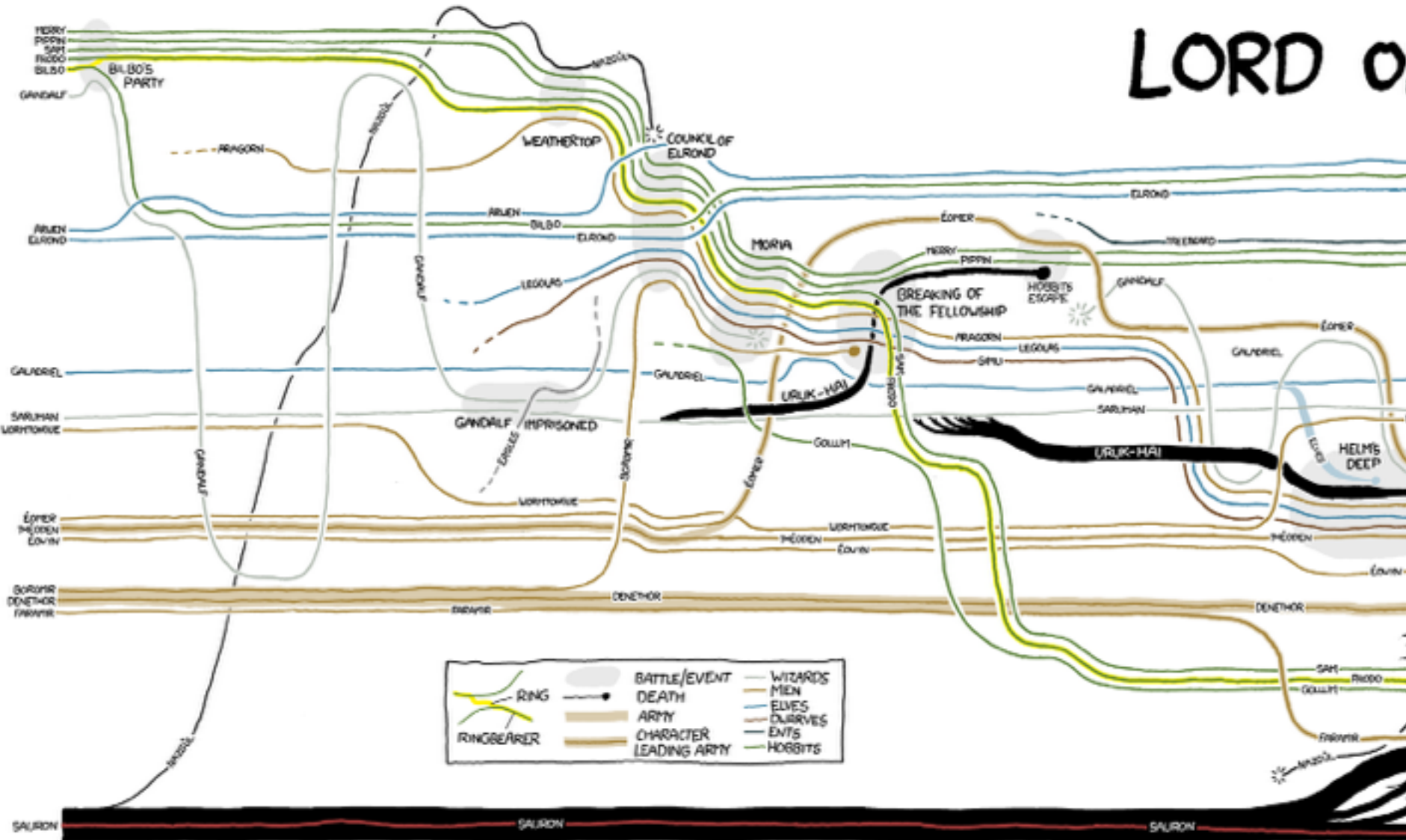
Timelines

Movie Narratives

xkcd.com, 2009

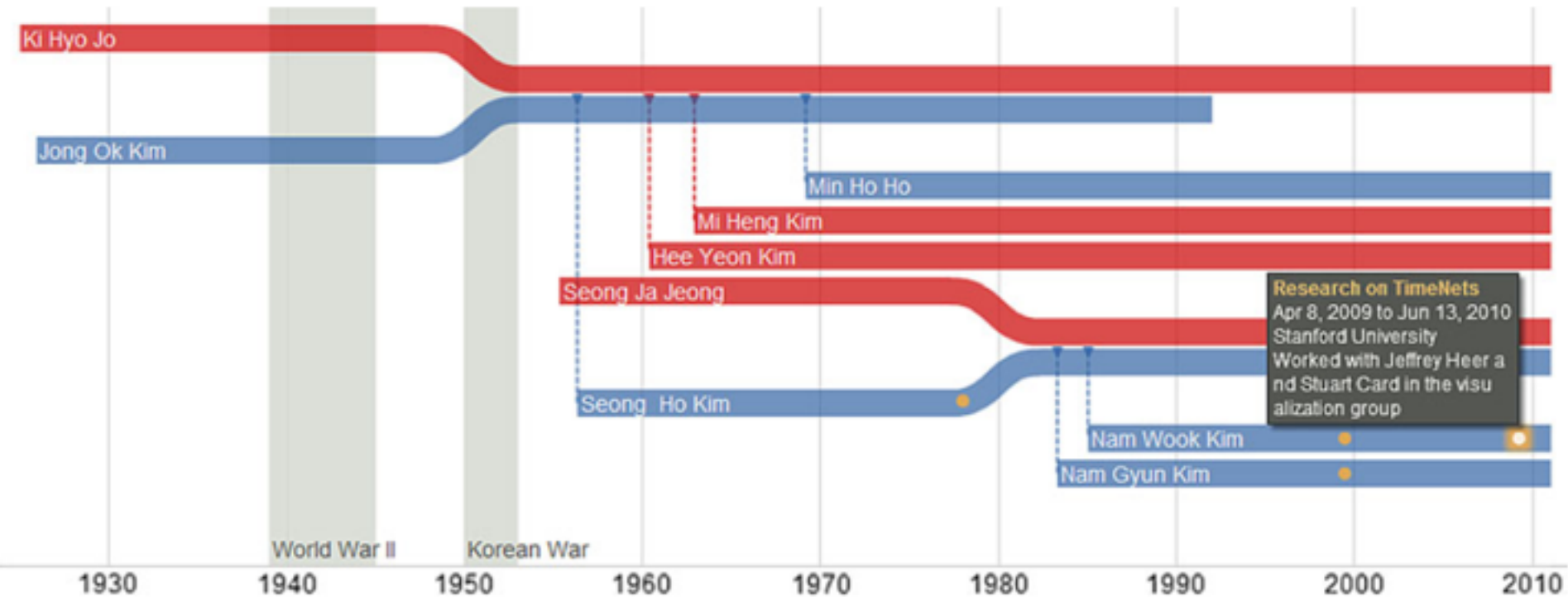


LORD OF THE RINGS

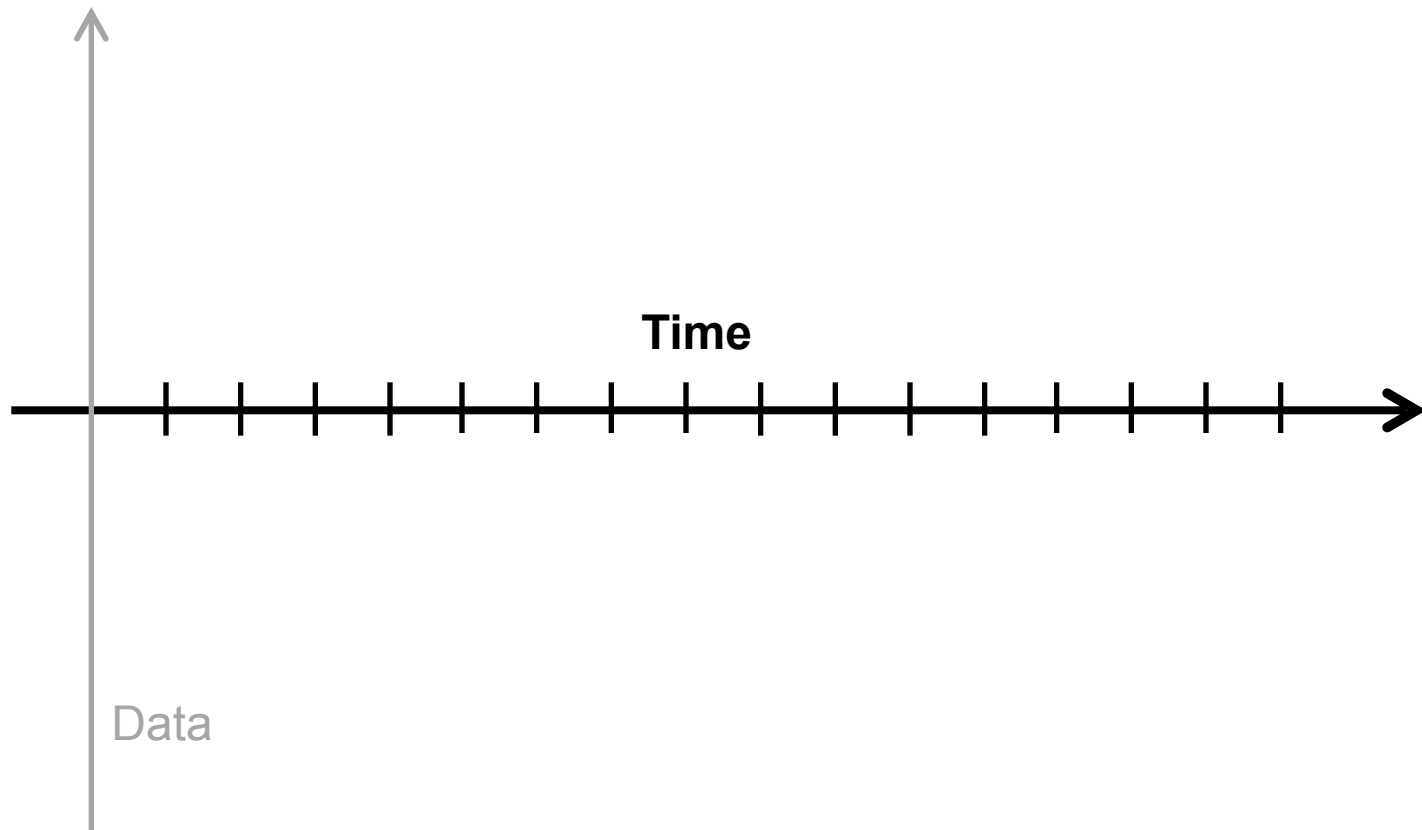


Timelines

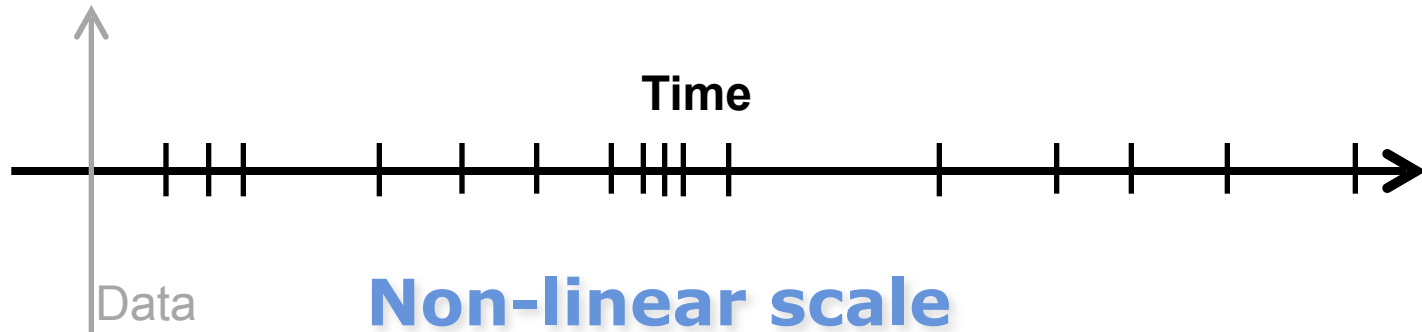
TimeNets



Mapping Time to an Axis



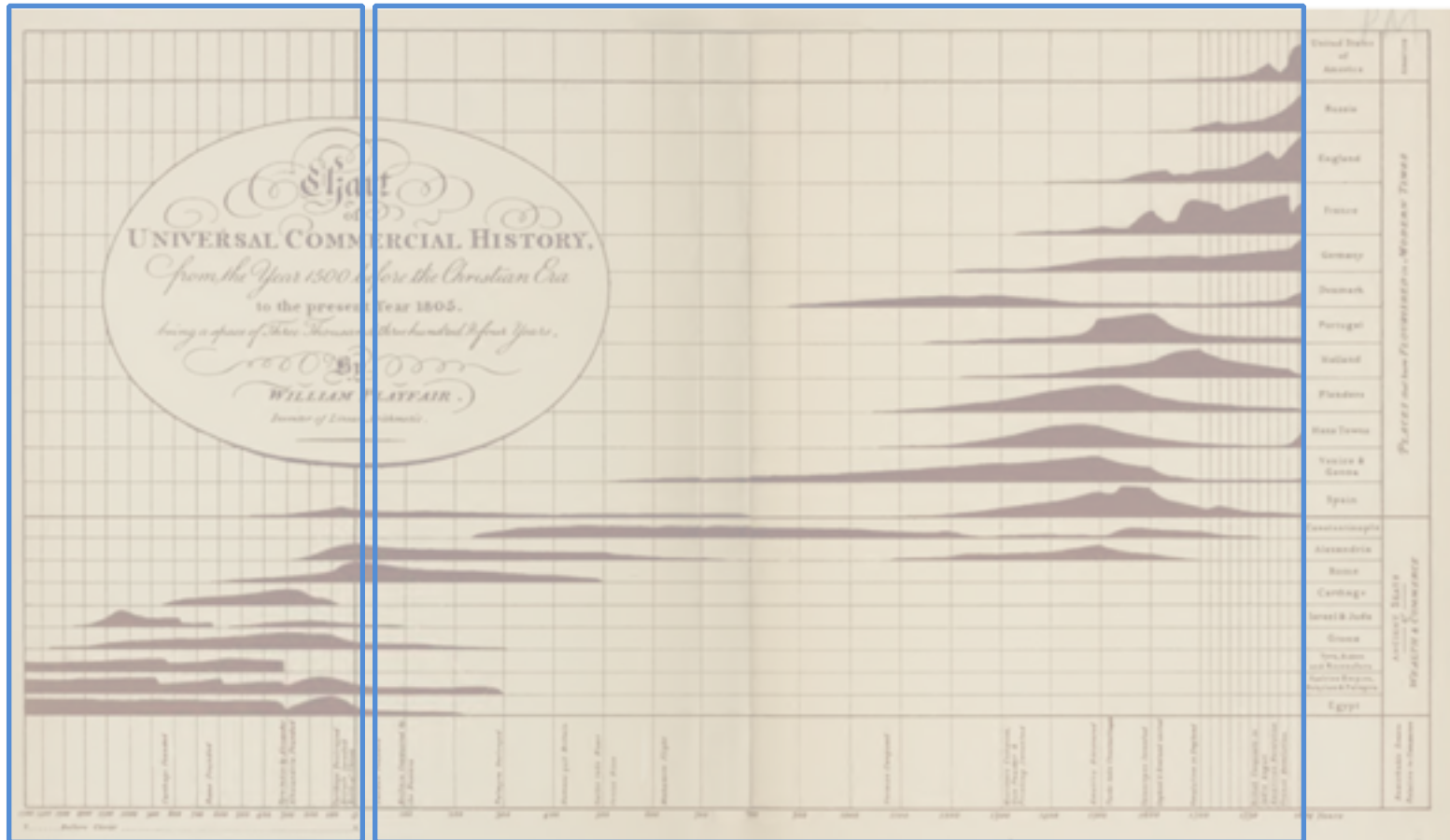
Non-Linear Time Axes



Non-Linear Time Axes

Dual-Scale Charts

Rise and fall of nations

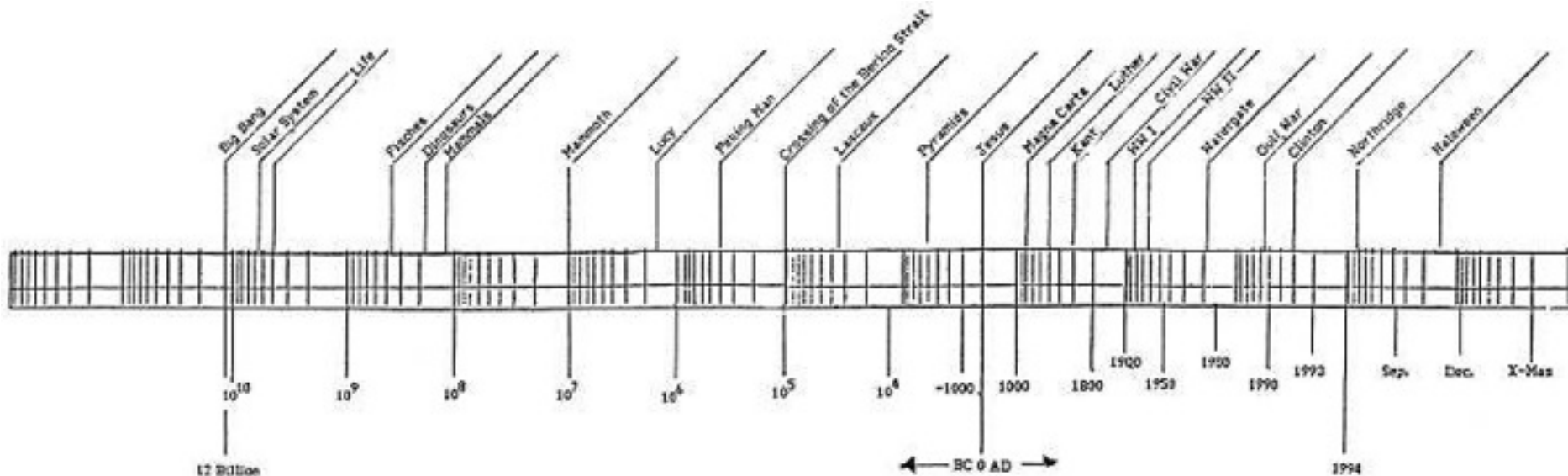


BC

William Playfair, 1805. Cited in [Aigner et al, 2011](#).

Non-Linear Time Axes

Logarithmic scale



Non-Linear

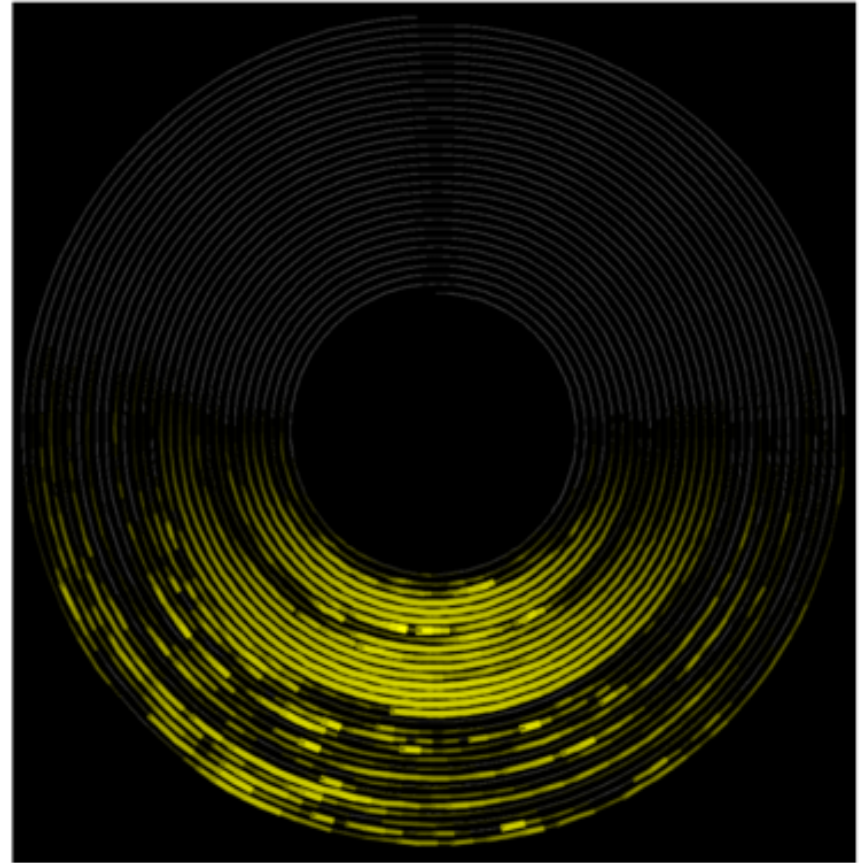
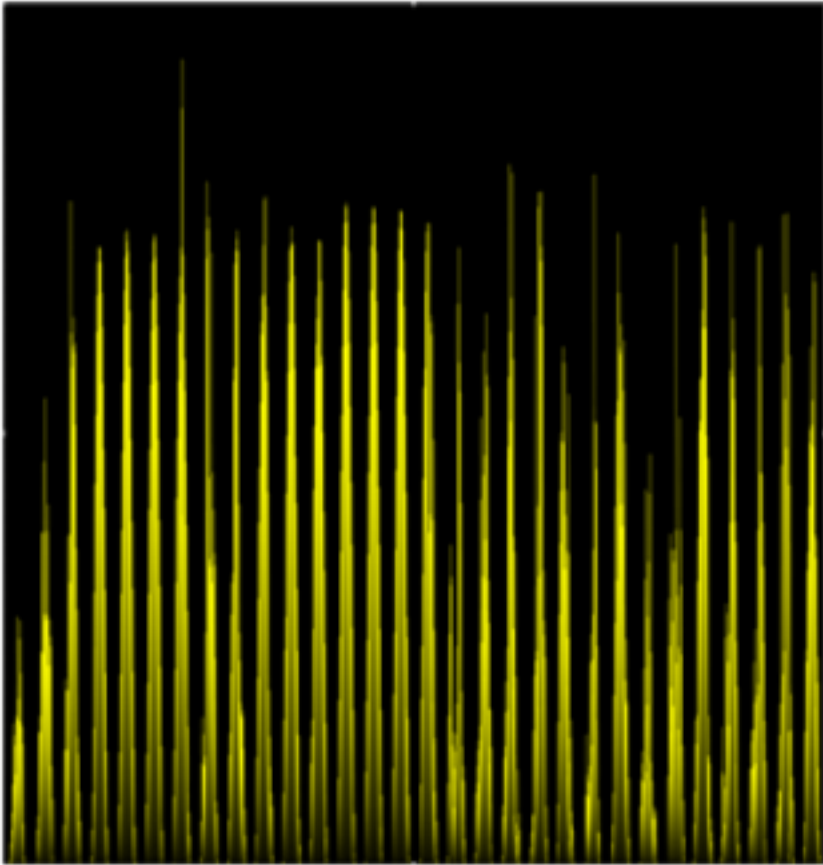
Curved



[Megan Jaegerman, 1997](#)

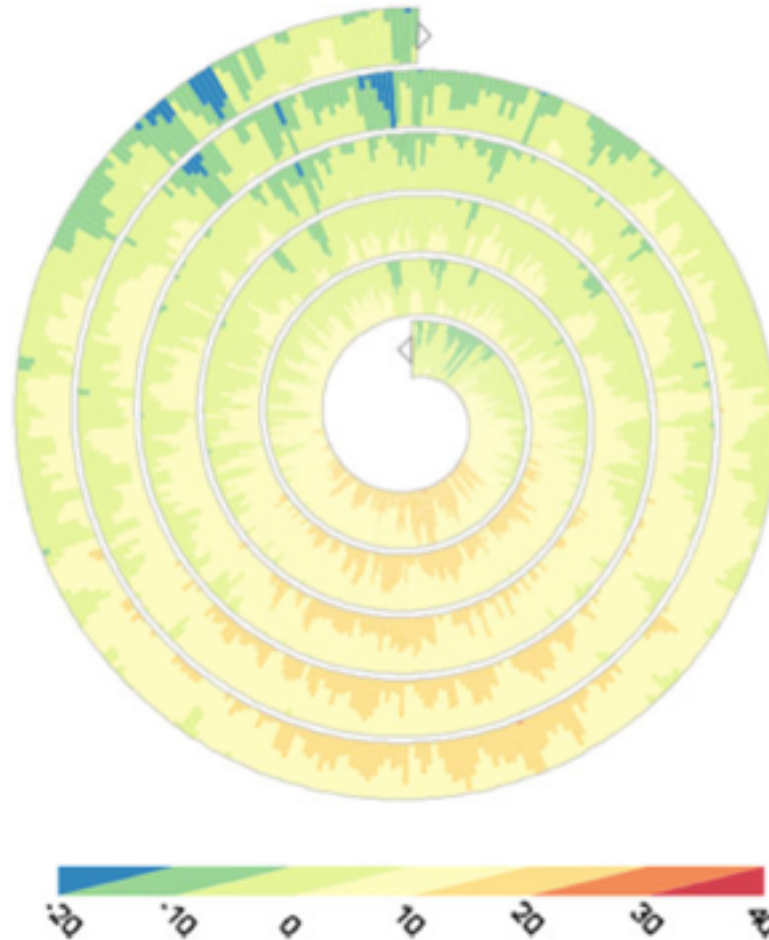
Non-Linear Time Axes

Spiral



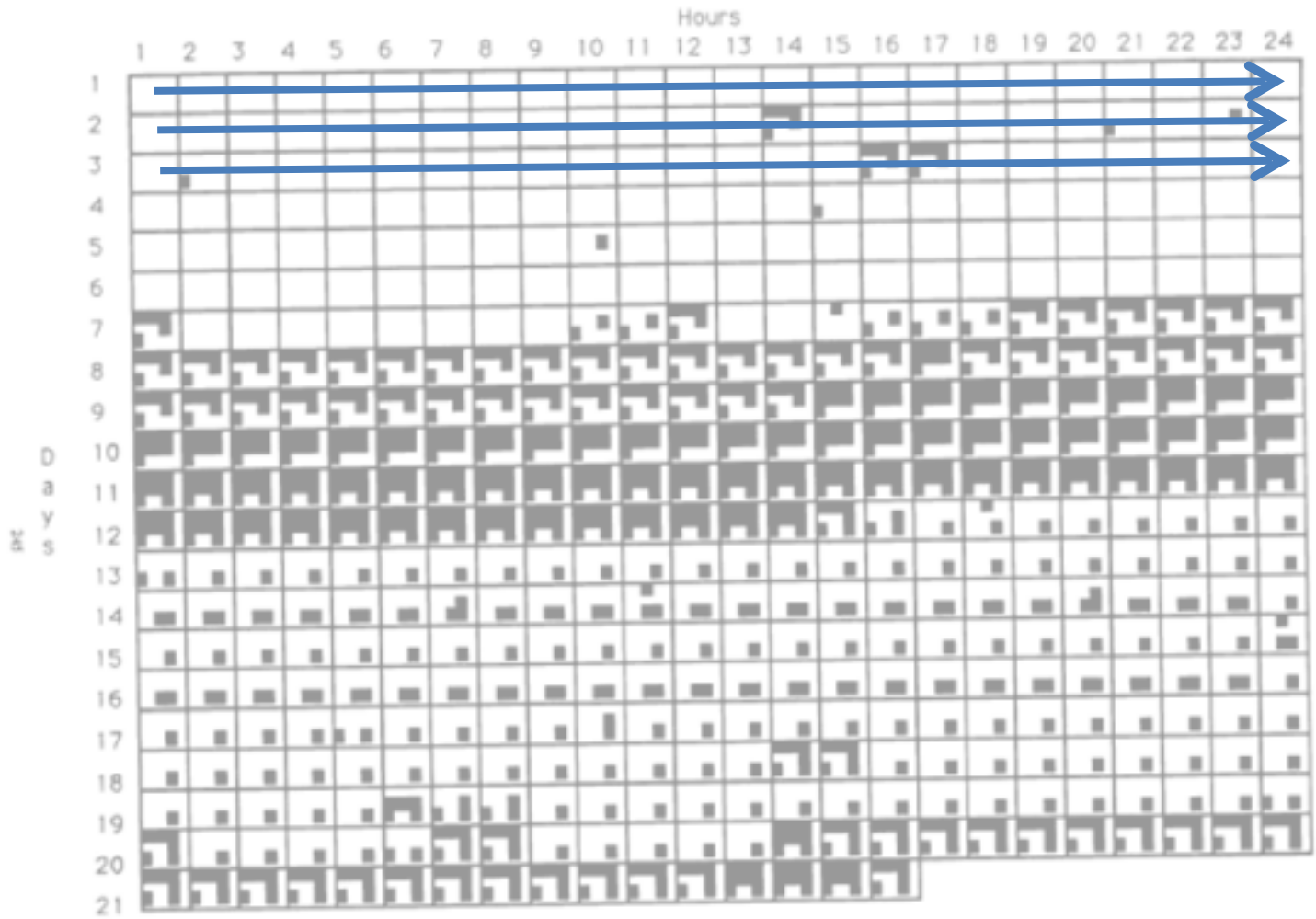
Non-Linear Time Axes

Spiral



Non-Linear Time Axes

Grid



Day by Hour: Thirteen Parameters of Magnetosphere and Solar Wind Data

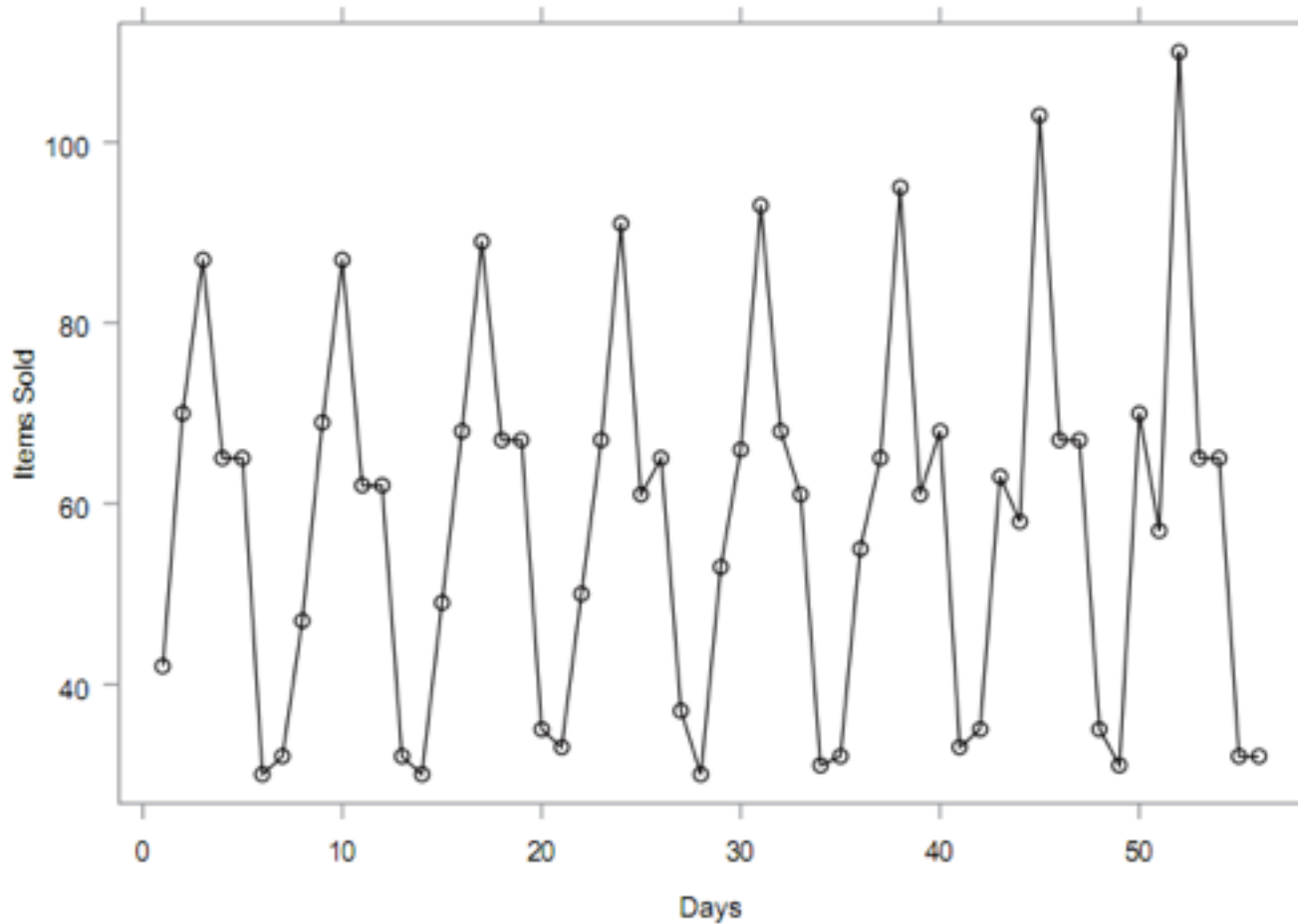
Non-Linear Time Axes

Grid - Calendar



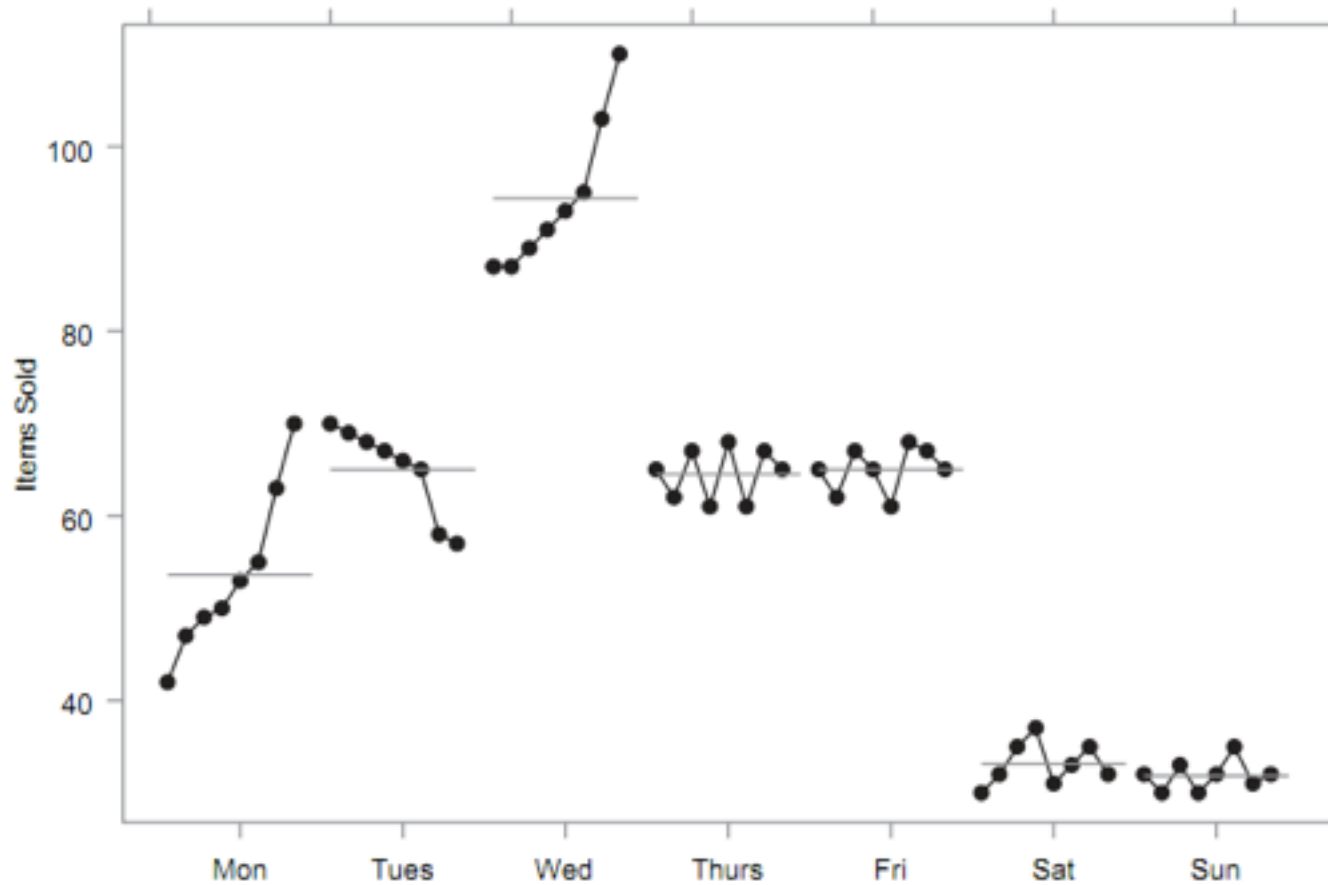
Non-Linear Time Axes

Cycle Plots

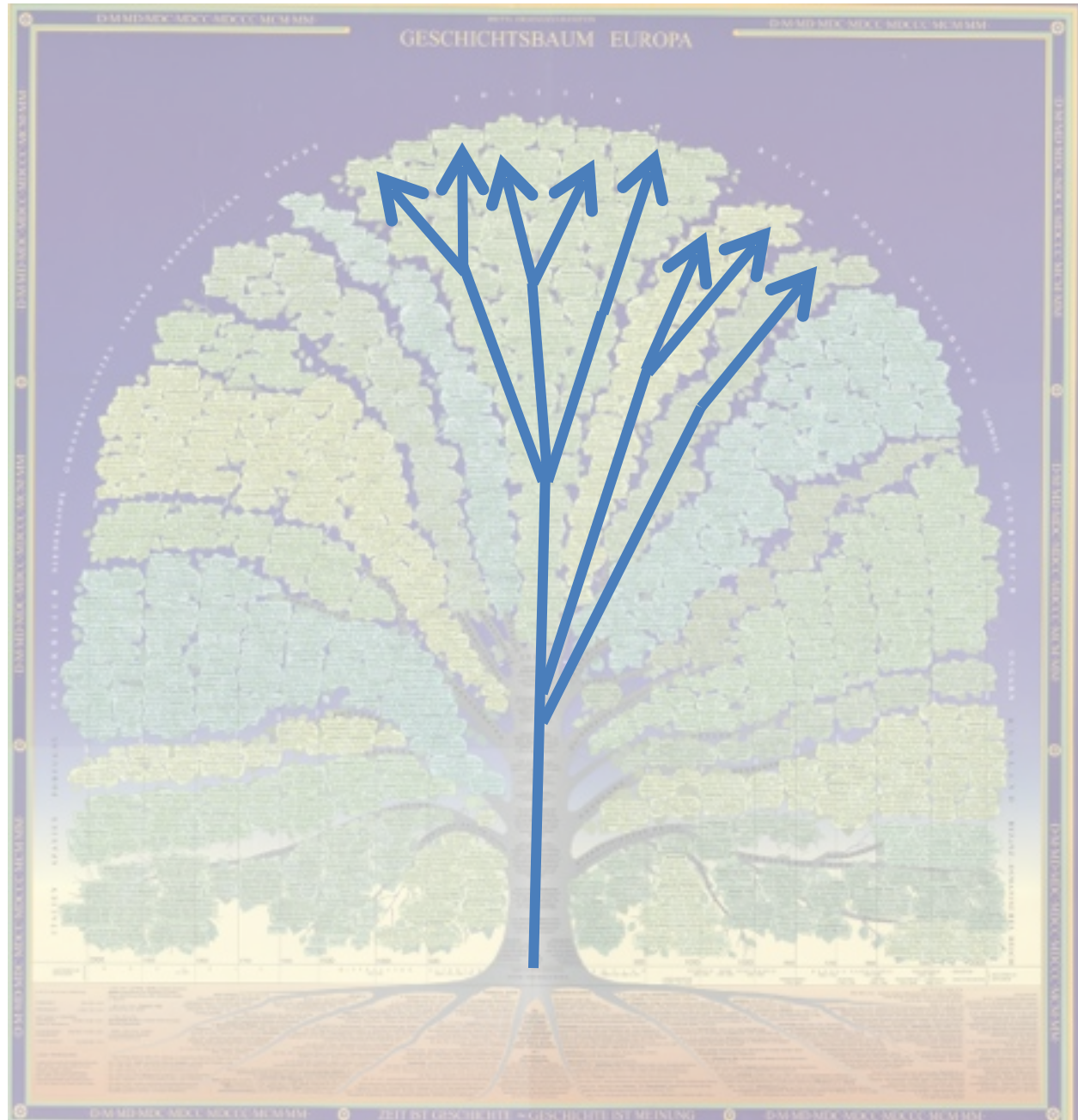


Non-Linear Time Axes

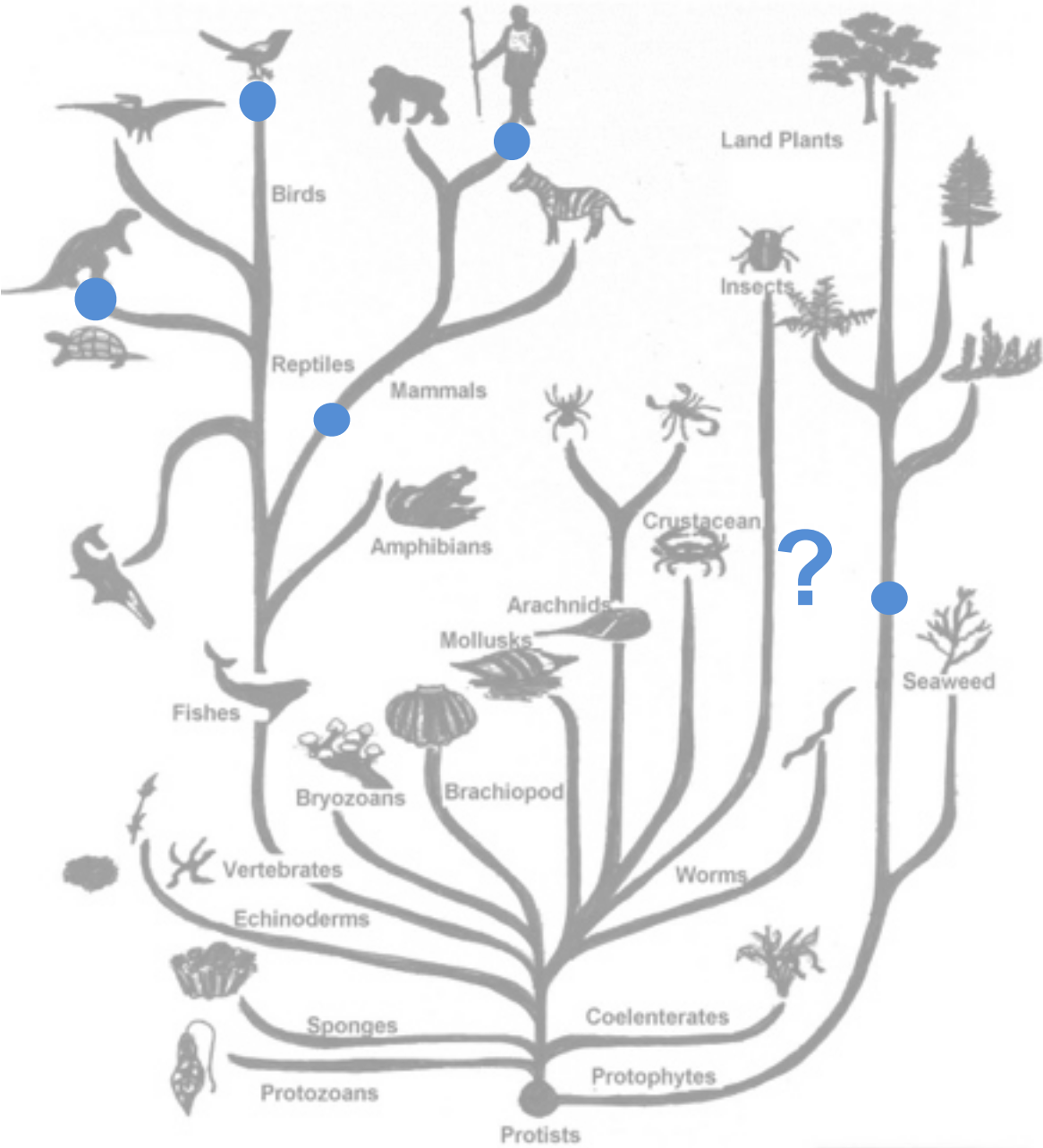
Cycle Plots



Trees



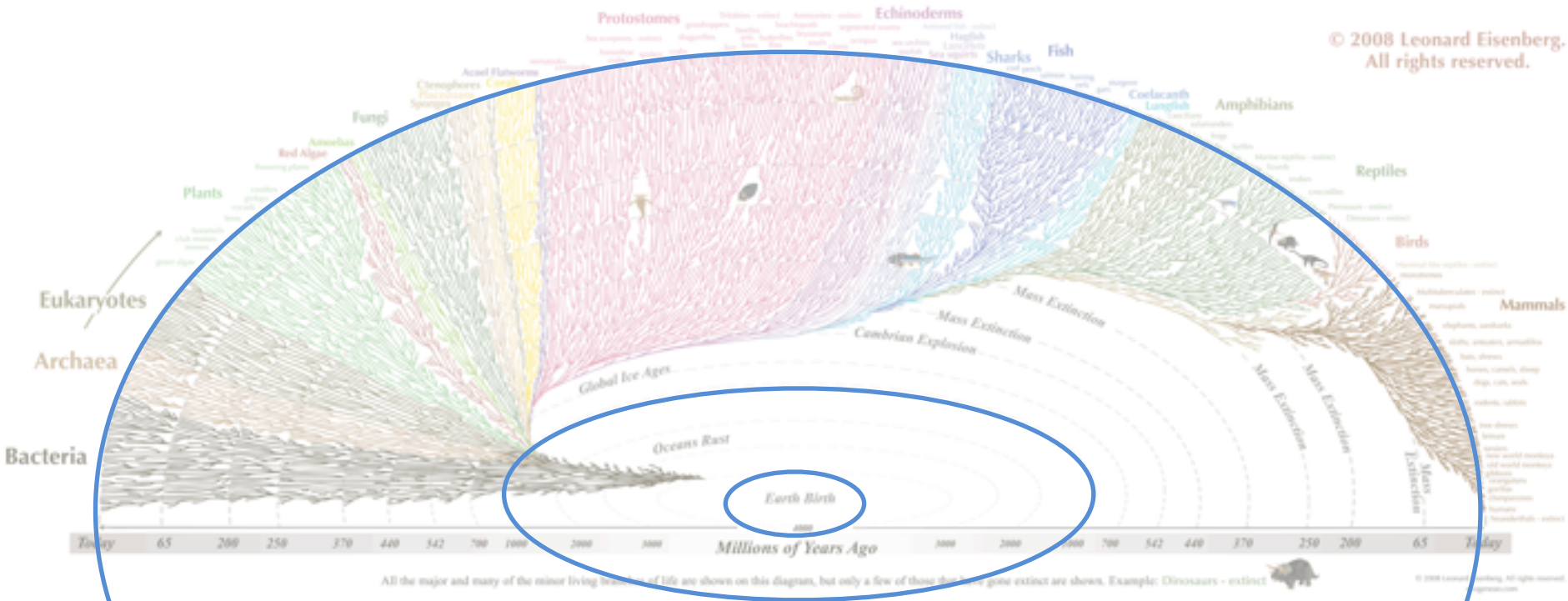
Phylogenetic Tree



anonymous

Non-Linear Time Axes

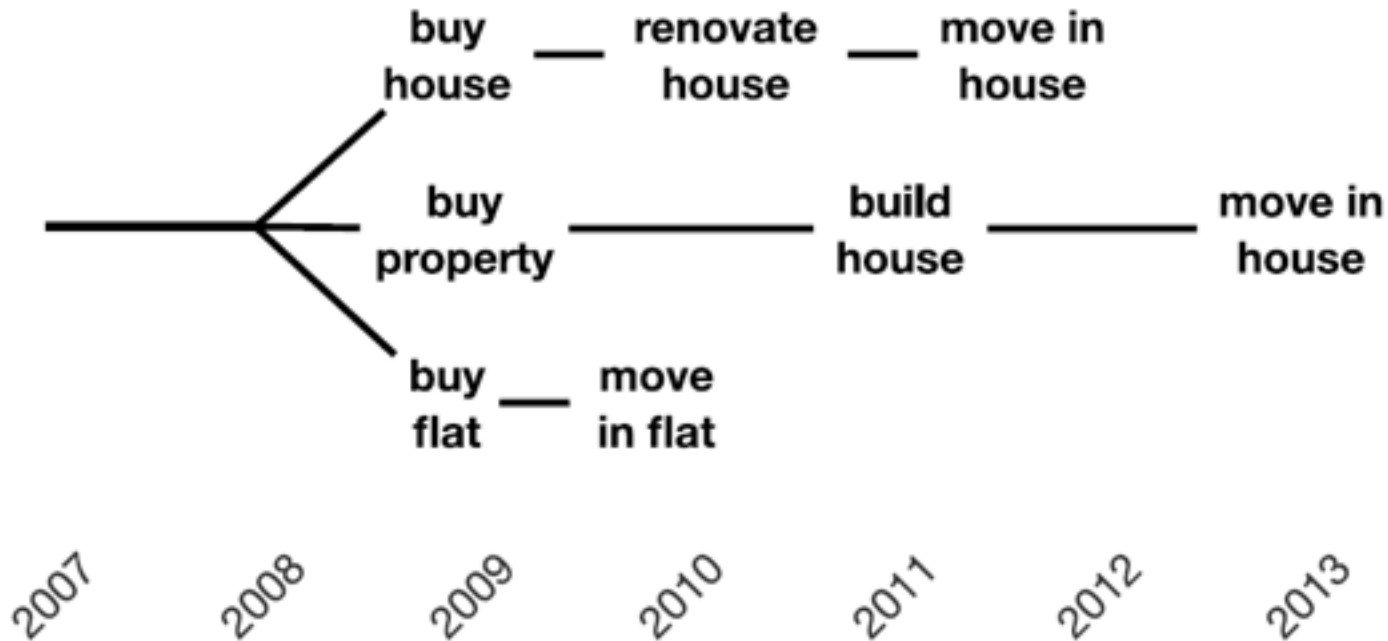
Phylogenetic Tree



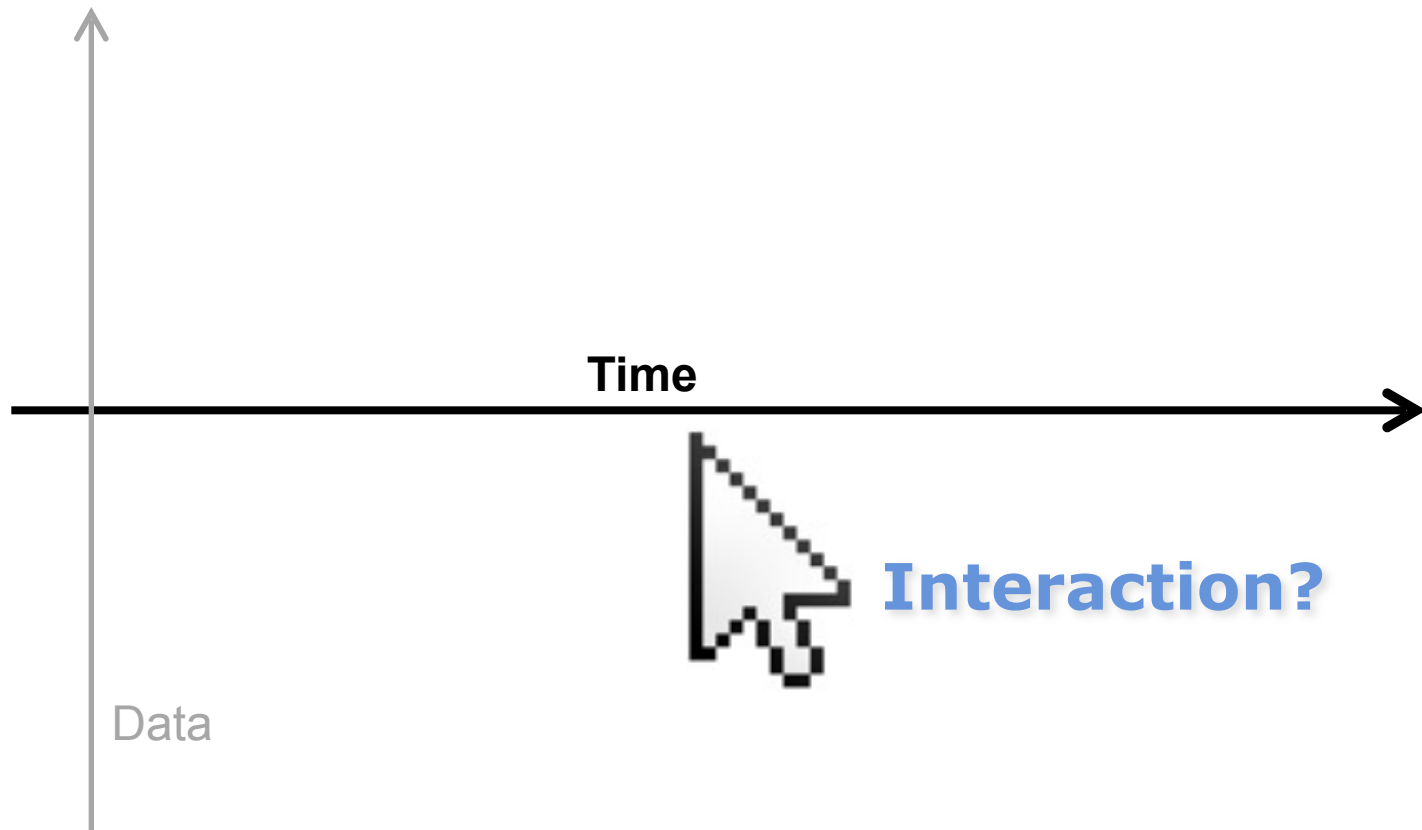
evogeneao.com – based on Dawkins, The Ancestor's Tale

Non-Linear Time Axes

Trees – Branching time

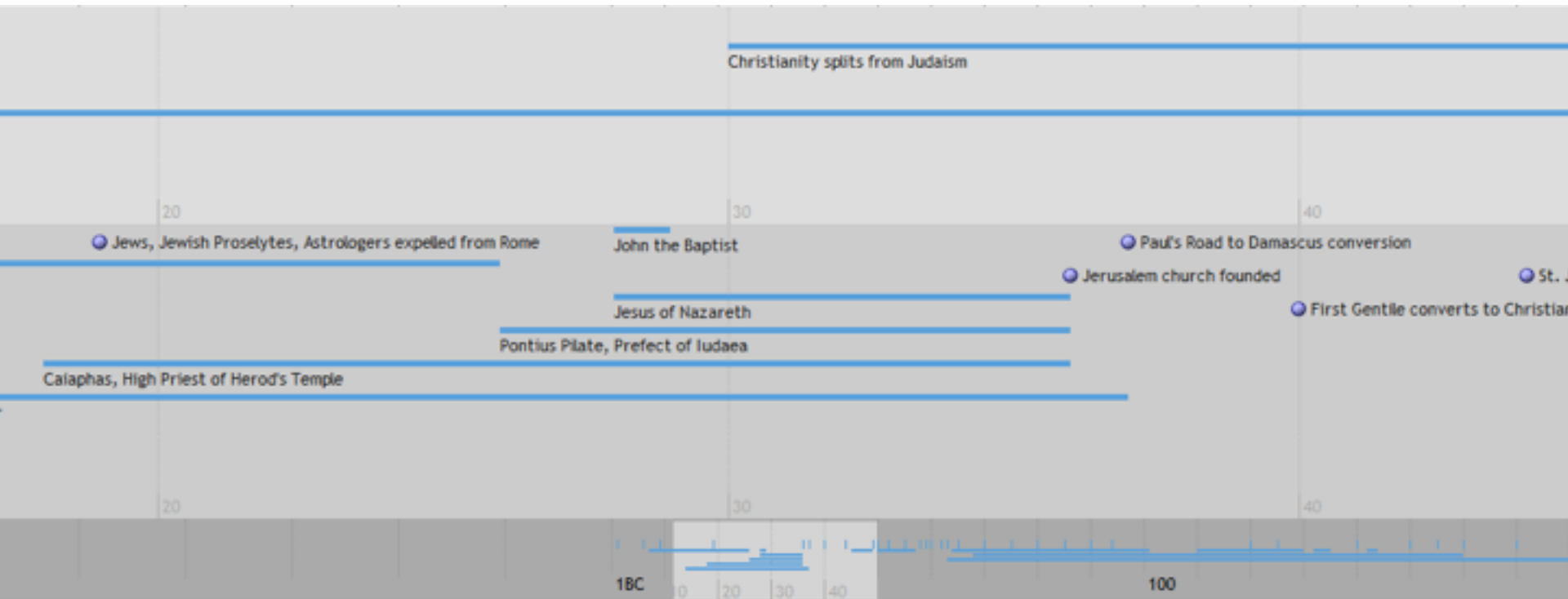


Mapping Time to an Axis



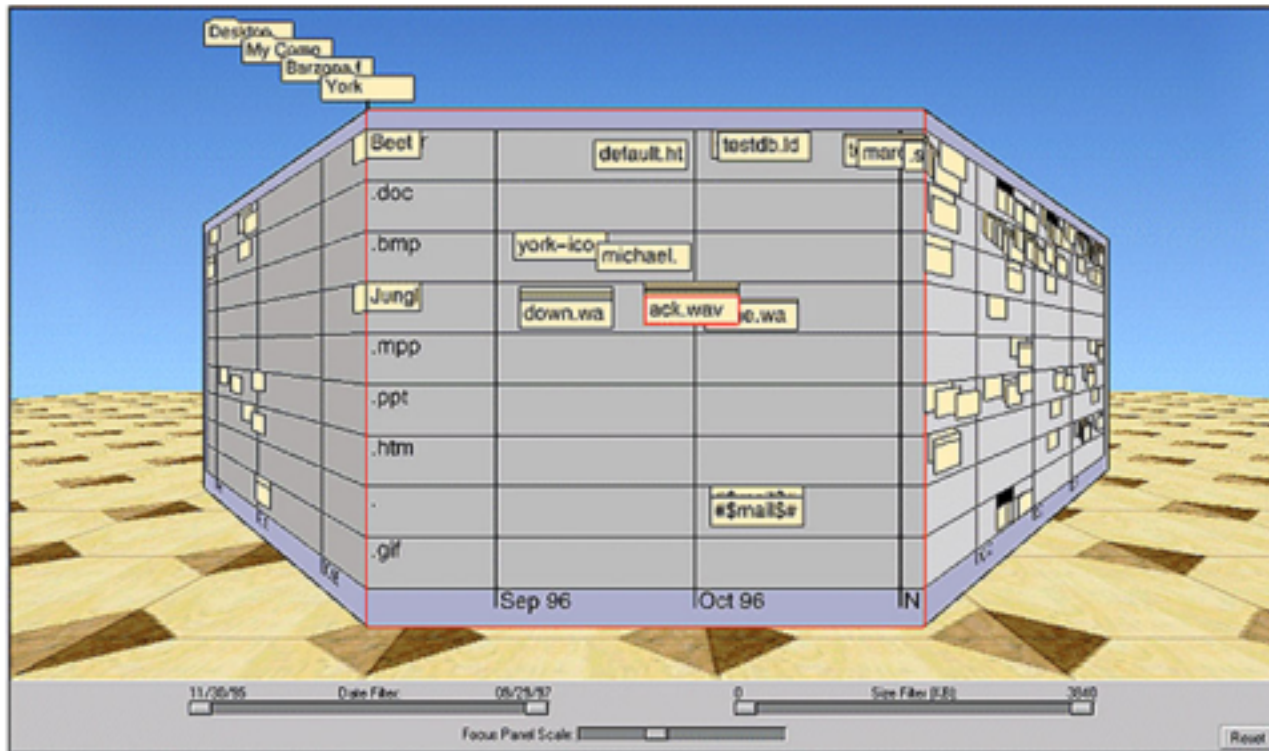
Interaction

Focus+Context - Simile Timeline



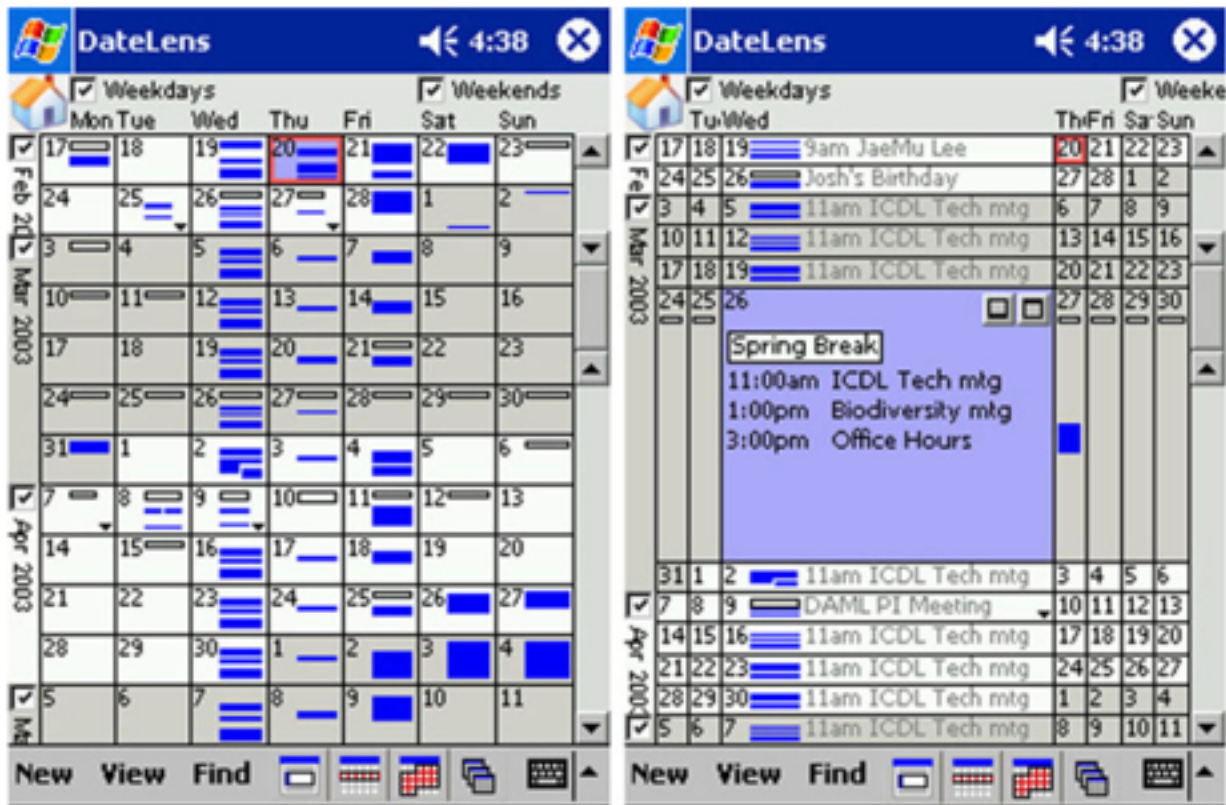
Interaction

Focus+Context - Perspective Wall



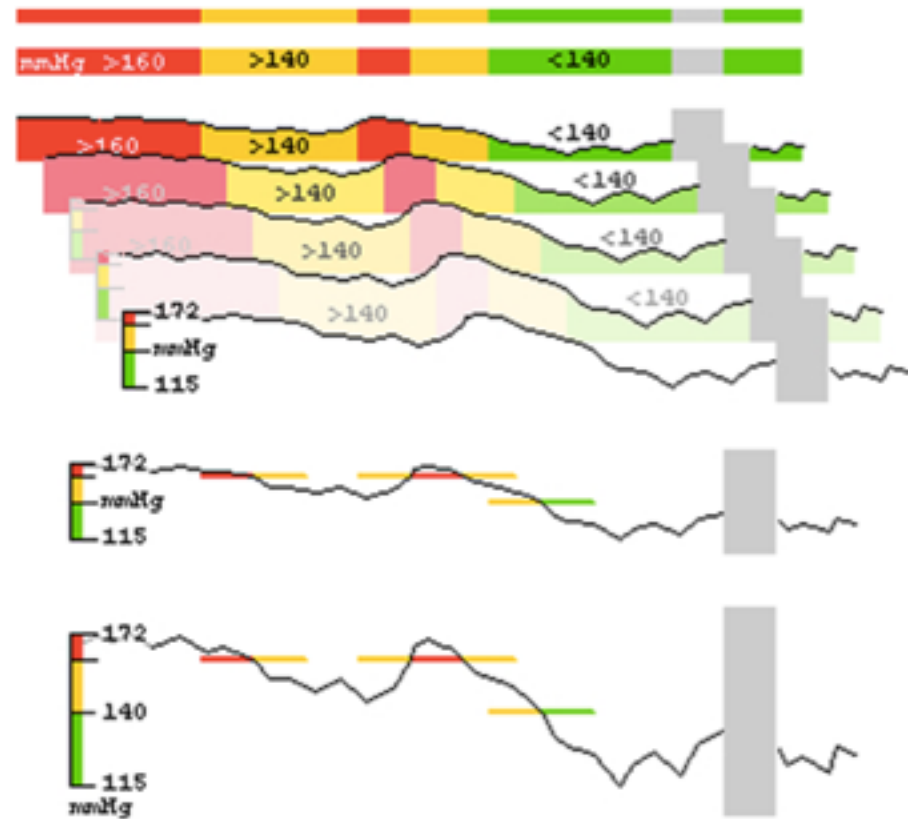
Interaction

Focus+Context - DateLens



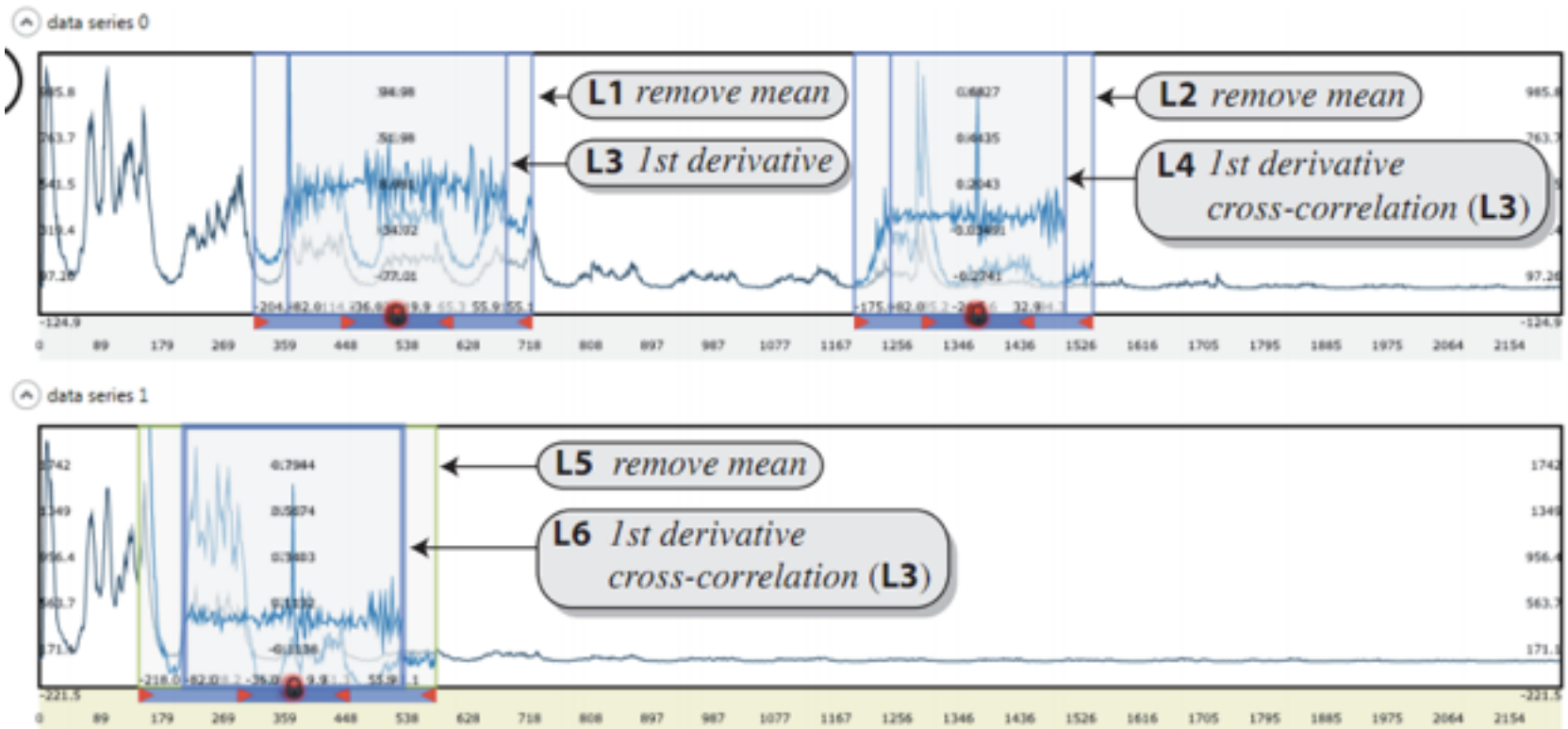
Interaction

Semantic Zooming - Midgaard



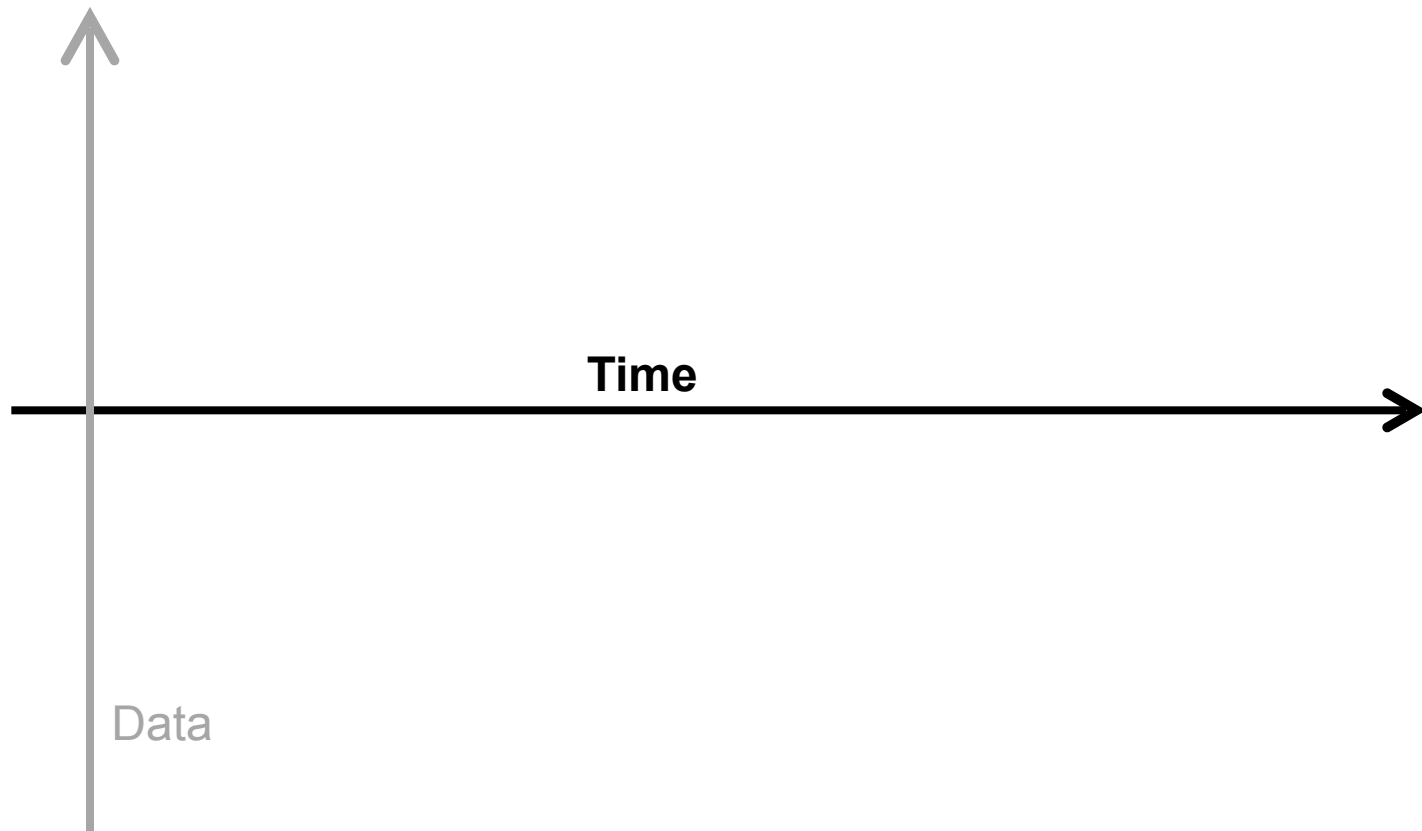
Interaction

Magic Lenses - ChronoLenses

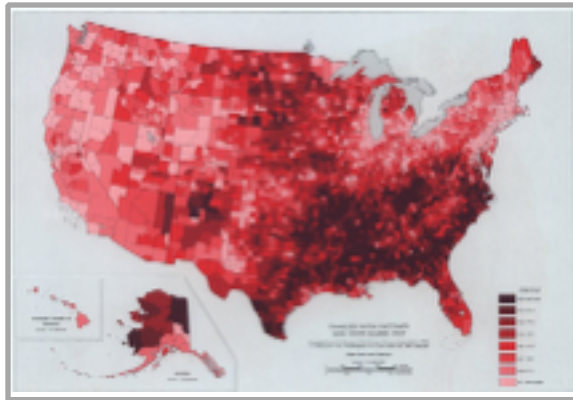


Mapping Time to Space

Mapping Time to an Axis



Mapping Time to an Axis



Data

Time



Mapping Time to an Axis

A Review of Temporal Data Visualizations Based on Space-Time Cube Operations

B. Bach¹, P. Dragicevic¹, D. Archambault², C. Hurter³ and S. Carpendale⁴

¹INRIA, France

²Swansea University, UK

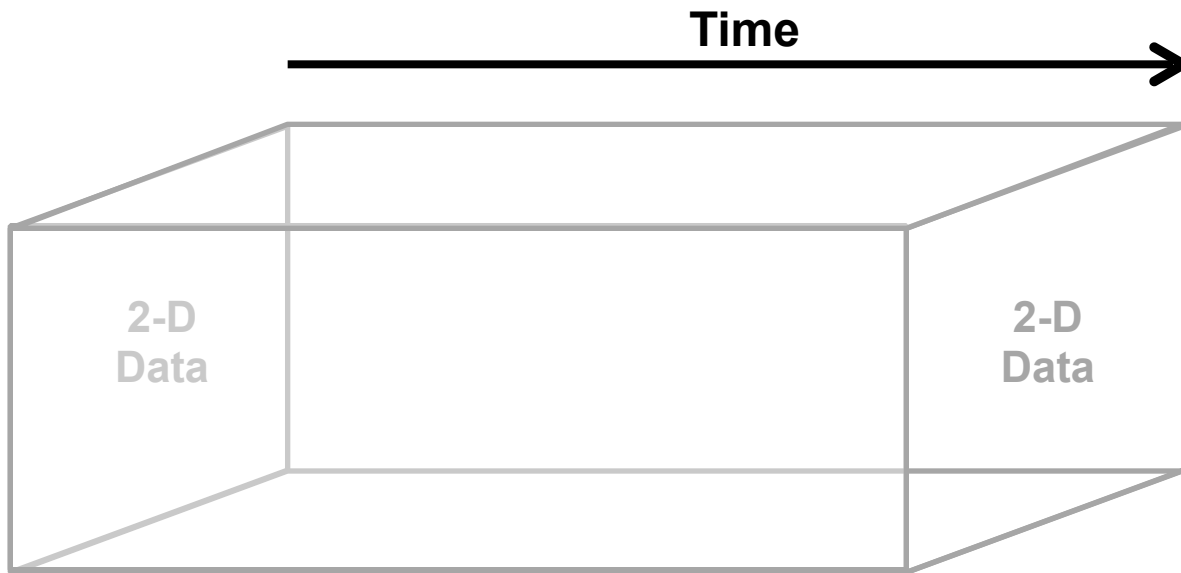
³ENAC, France

⁴University of Calgary, Canada

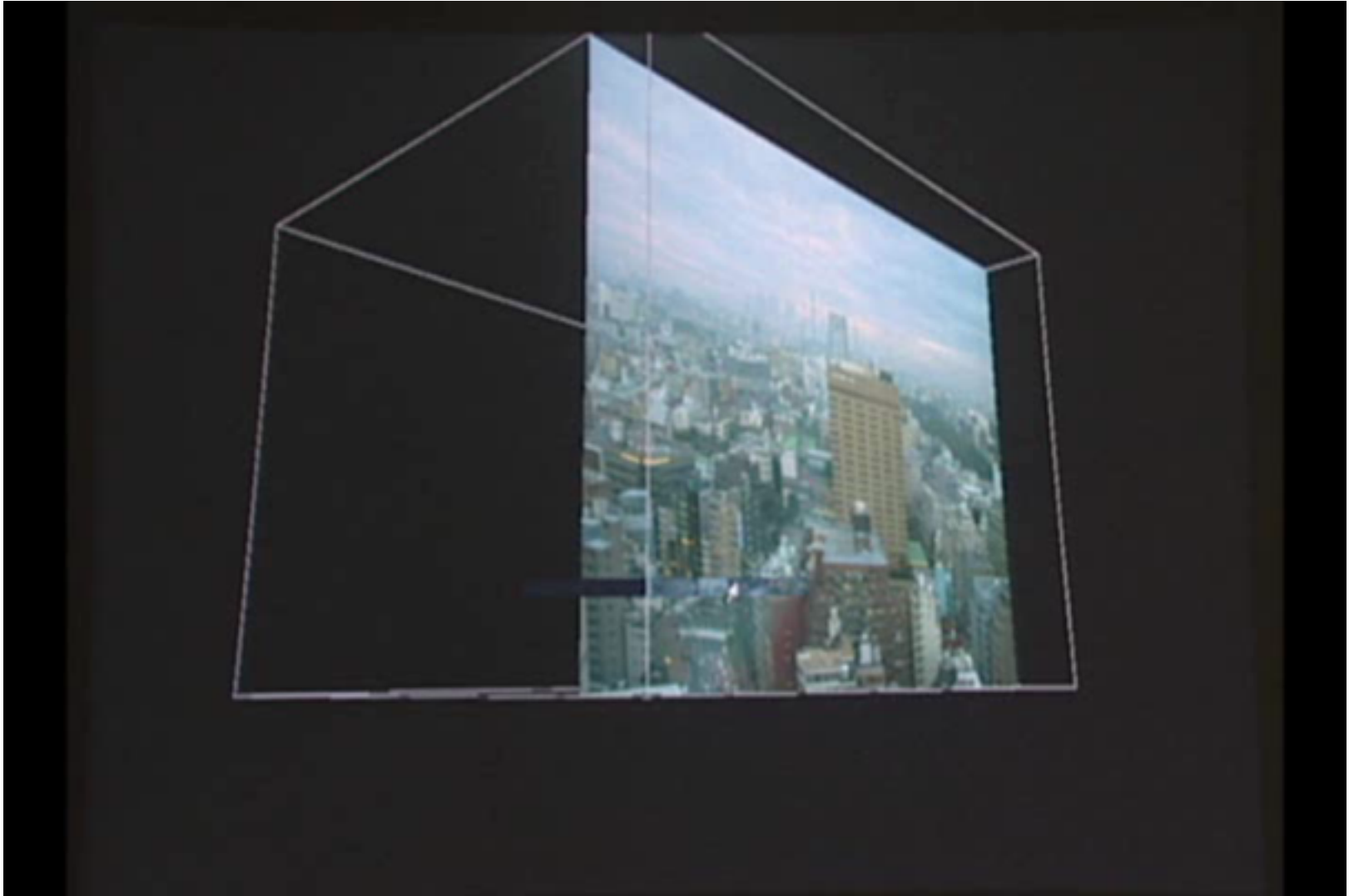
tinyurl.com/spacetime-bach

2D + Time

Space-Time Cube Model



2D + Time



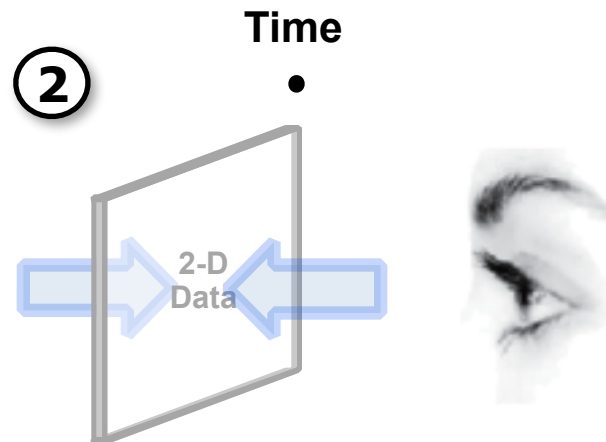
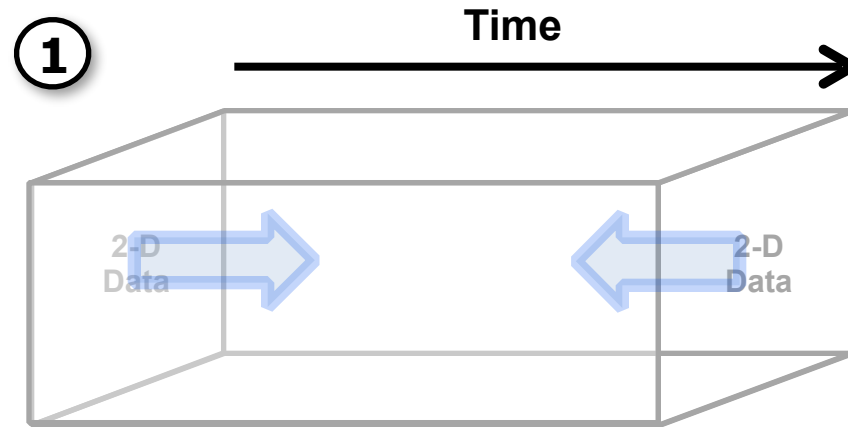
2D + Time

a



2D + Time

Time Flattening



2D + Time

Long exposure photography



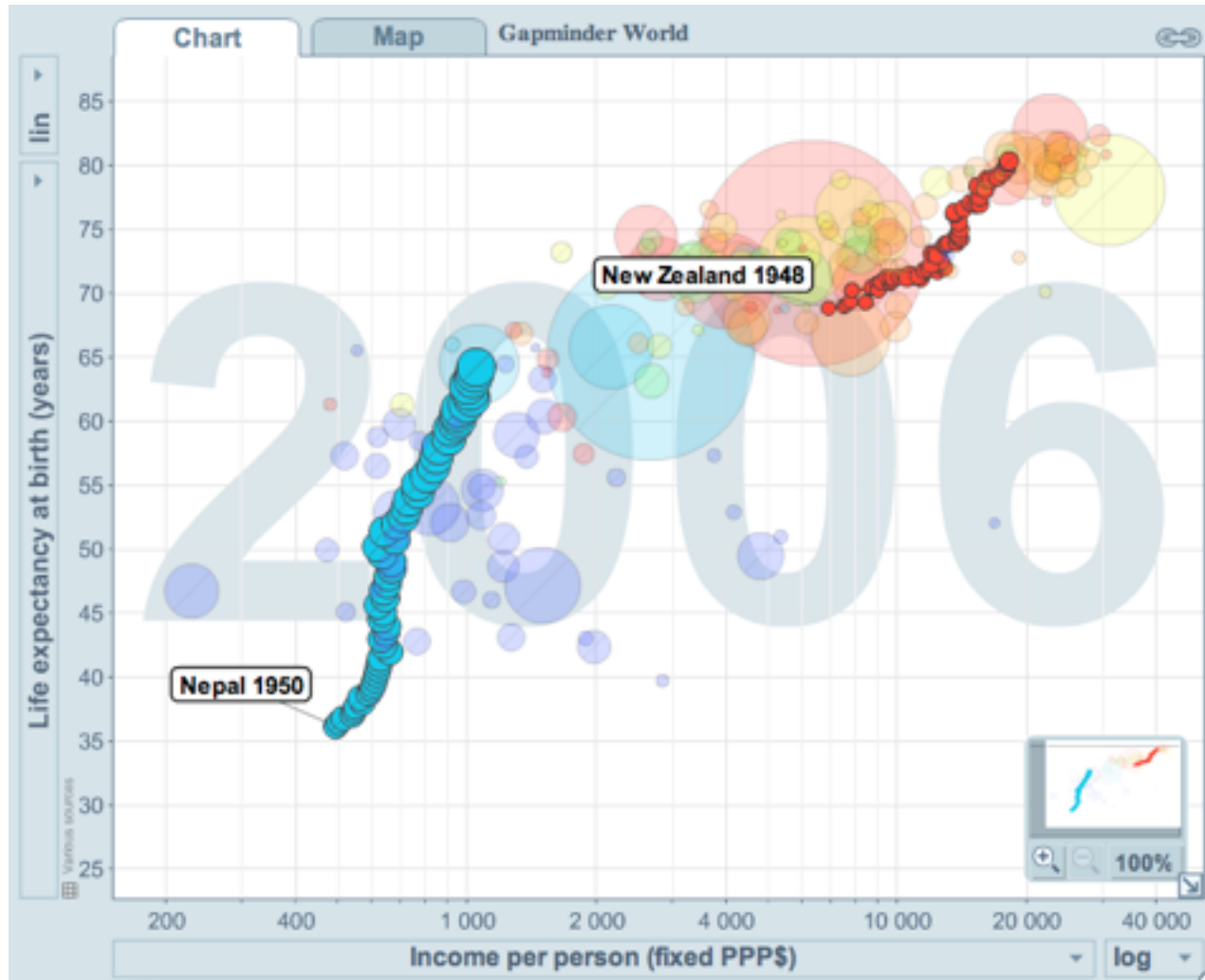
2D + Time

Phillips Curve



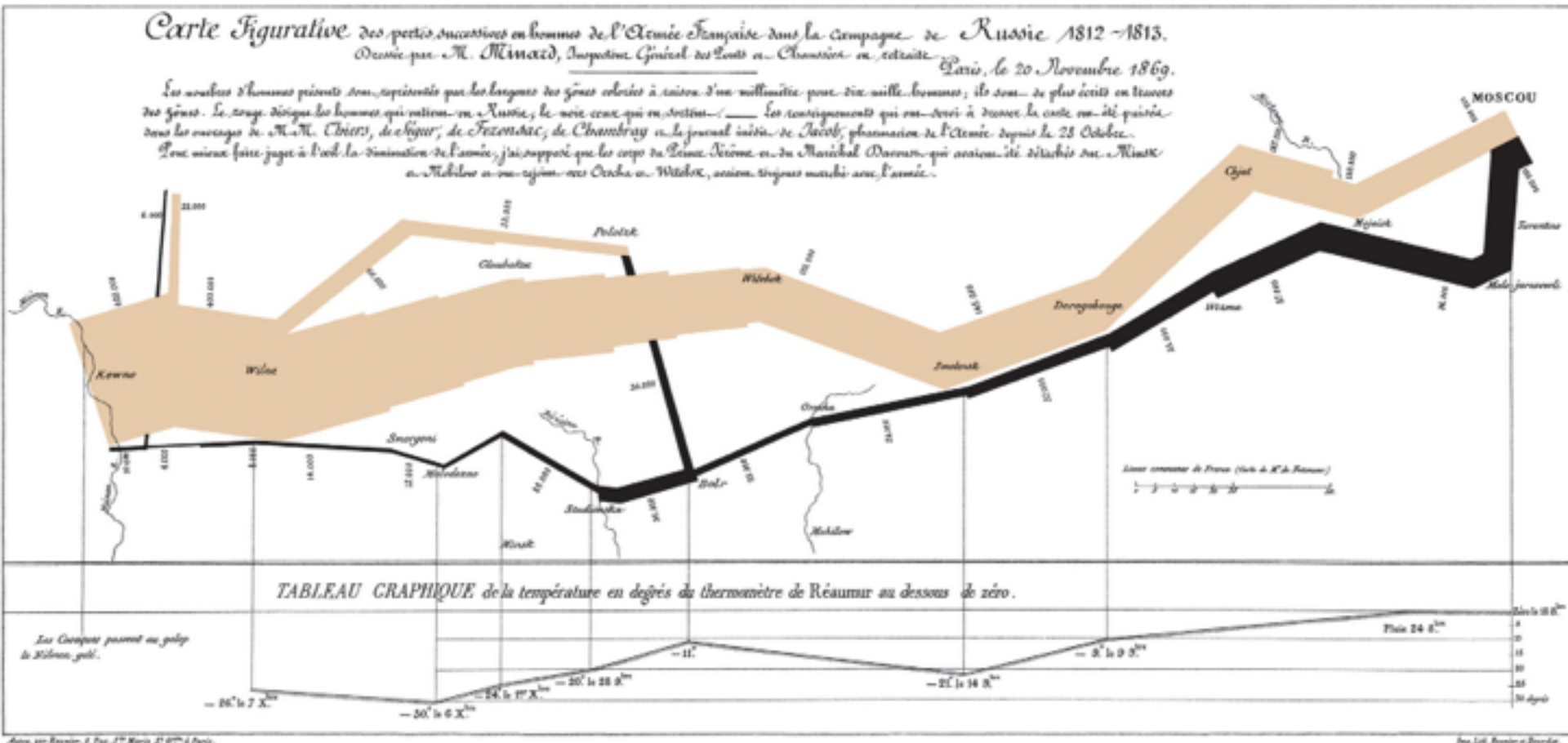
2D + Time

Trails



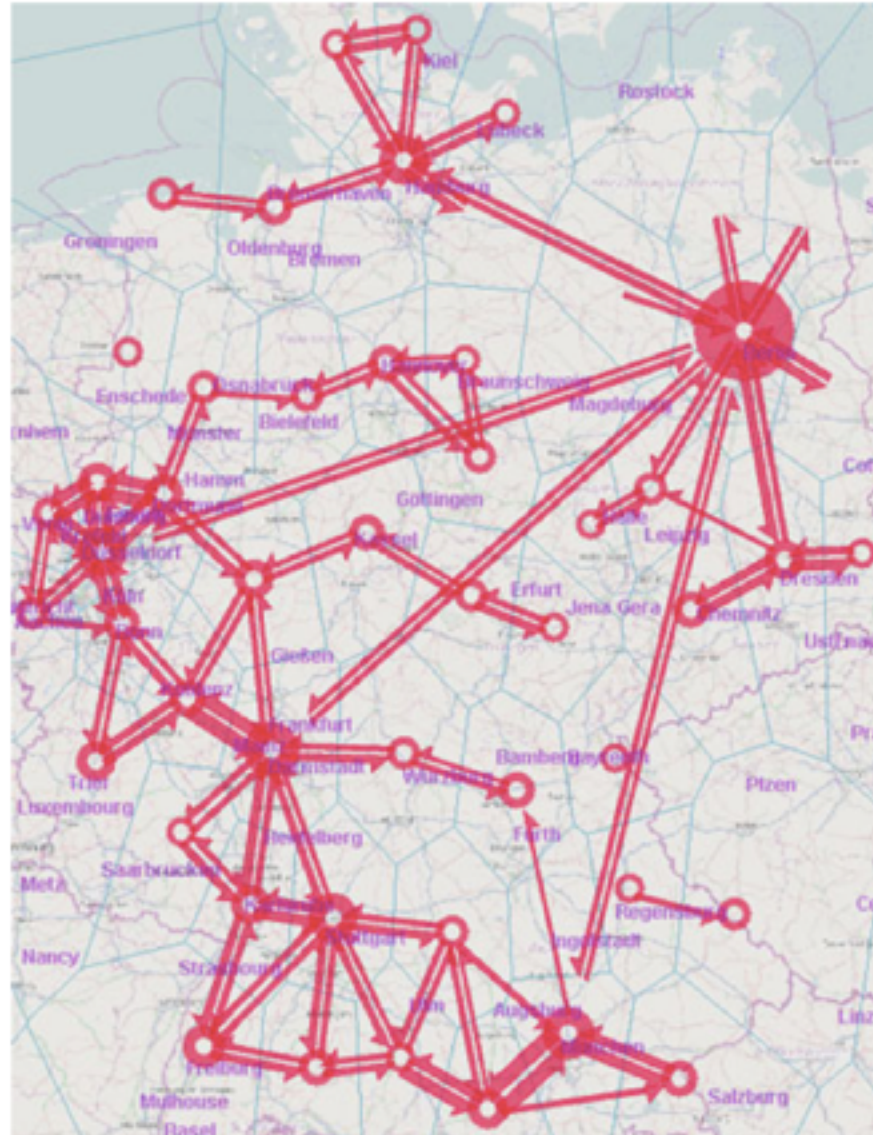
2D + Time

Napoleon's Russian Campaign of 1812



2D + Time

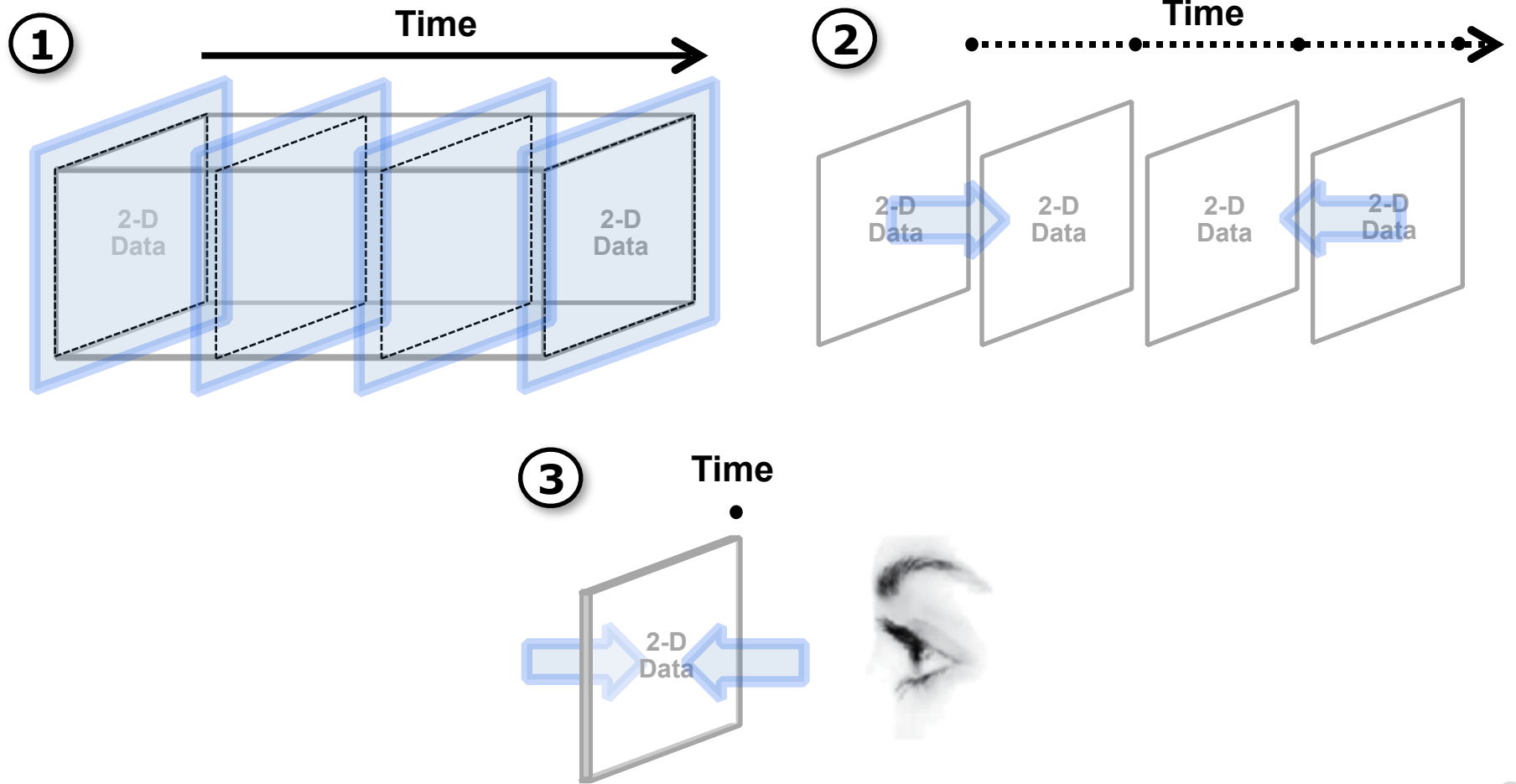
Flow Maps



Tobler, 1987
Adrienko, 2011

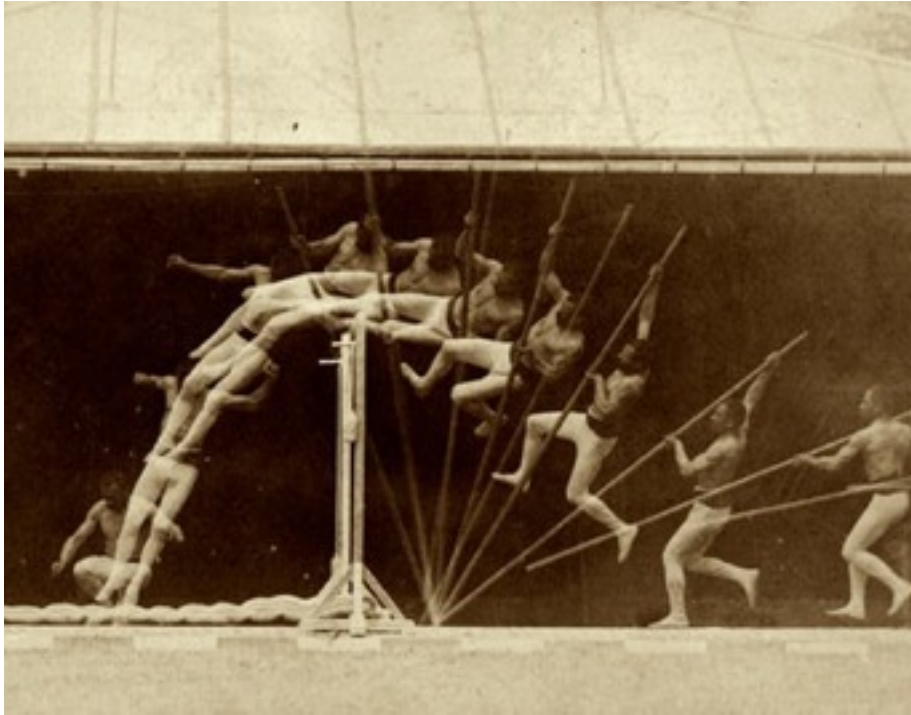
2D + Time

Discrete Time Flattening



2D + Time

Marey's Chronophotography Technique

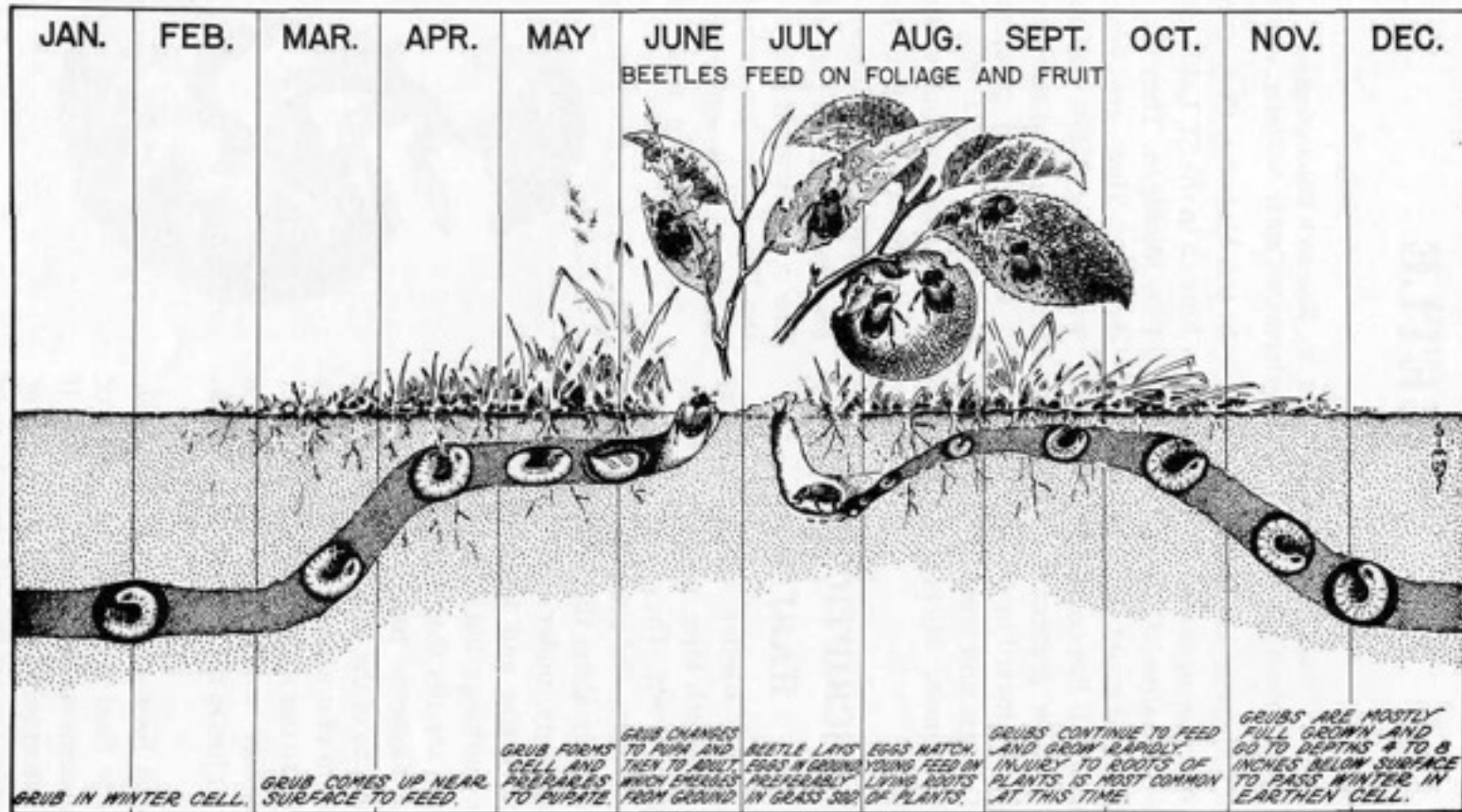


[\(image source\)](#)

Étienne-Jules Marey, 1880s ([source](#))

2D + Time

Sequences



Seasonal life cycle of the Japanese beetle in the vicinity of Philadelphia.

FR.12789

2D + Time

Sequences

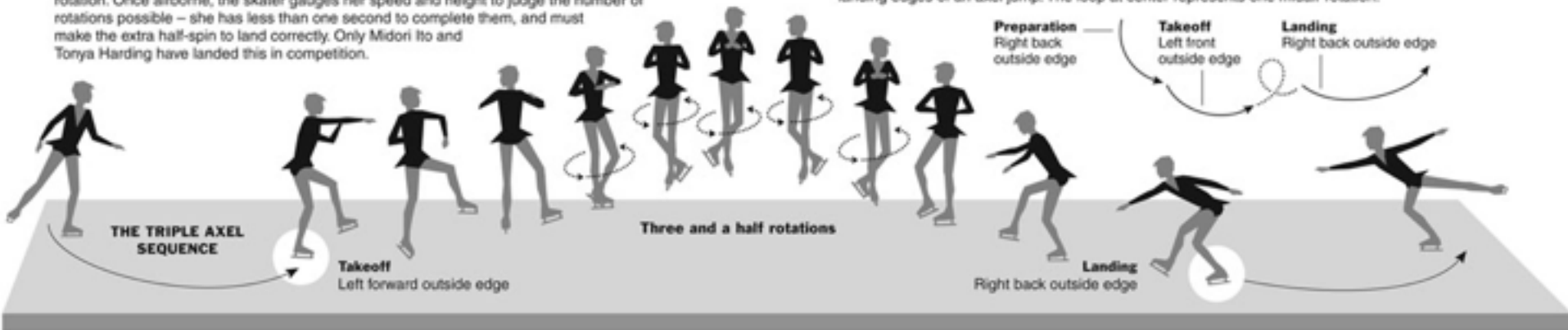
The Jumping Off Points: Moves That Will Be Made in the Free Skating Programs

TRIPLE AXEL: Add an extra half-spin

The axel's forward takeoff and backward landing positions add an extra half-rotation to the jump, so skaters need maximum power on takeoff, and precise upper body control during rotation. Once airborne, the skater gauges her speed and height to judge the number of rotations possible – she has less than one second to complete them, and must make the extra half-spin to land correctly. Only Midori Ito and Tonya Harding have landed this in competition.

SKATING THE EDGES: An overhead view of the axel

In skating terminology, the path of a jump is described as a series of edges – semicircular arcs that follow the path of the skate blade. The diagram shows the preparatory, takeoff and landing edges of an axel jump. The loop at center represents one midair rotation.



Megan Jaegerman. Cited in [Tufte, 2007](#)

2D + Time

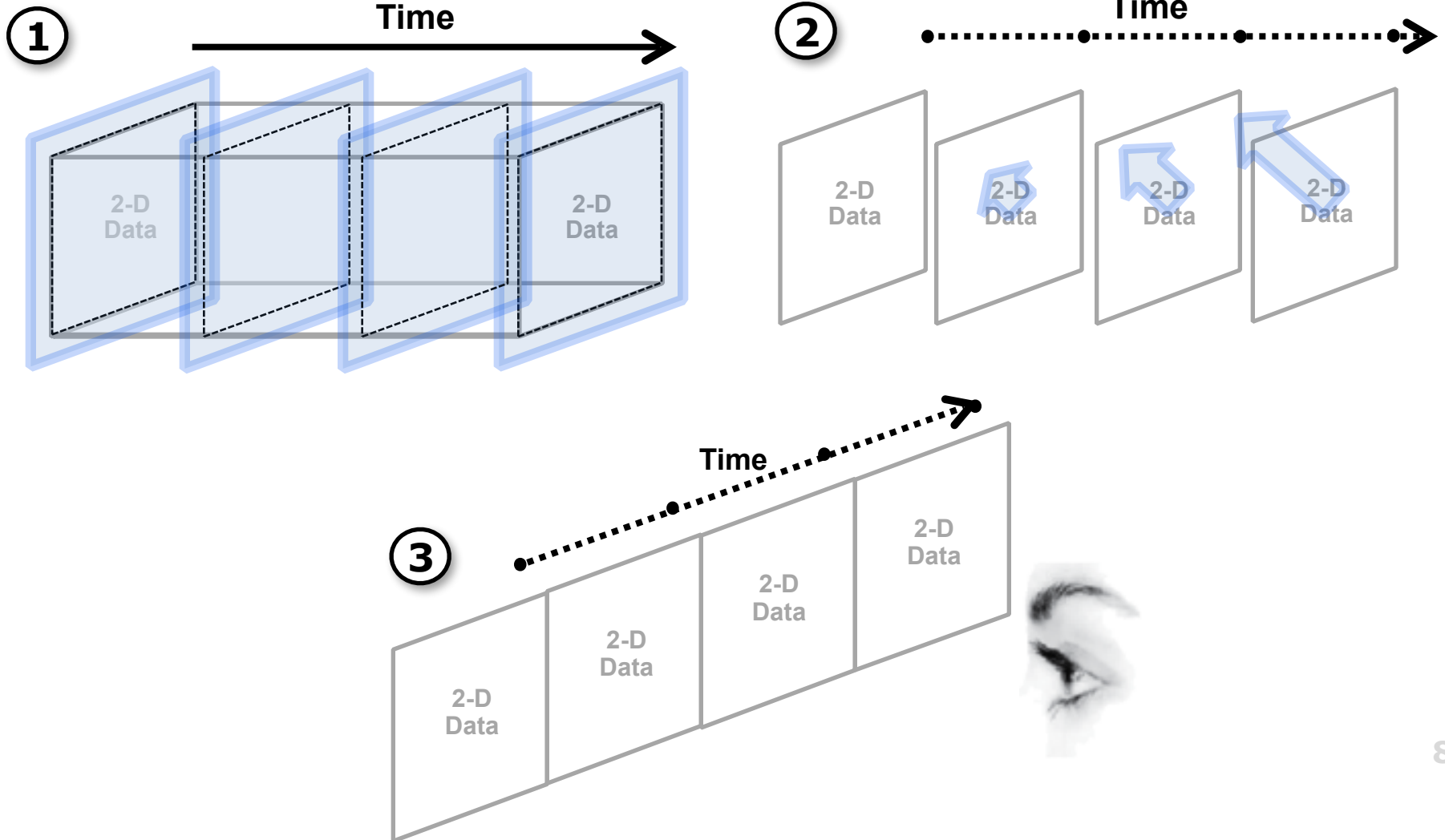
What about this?



[\(image source\)](#)

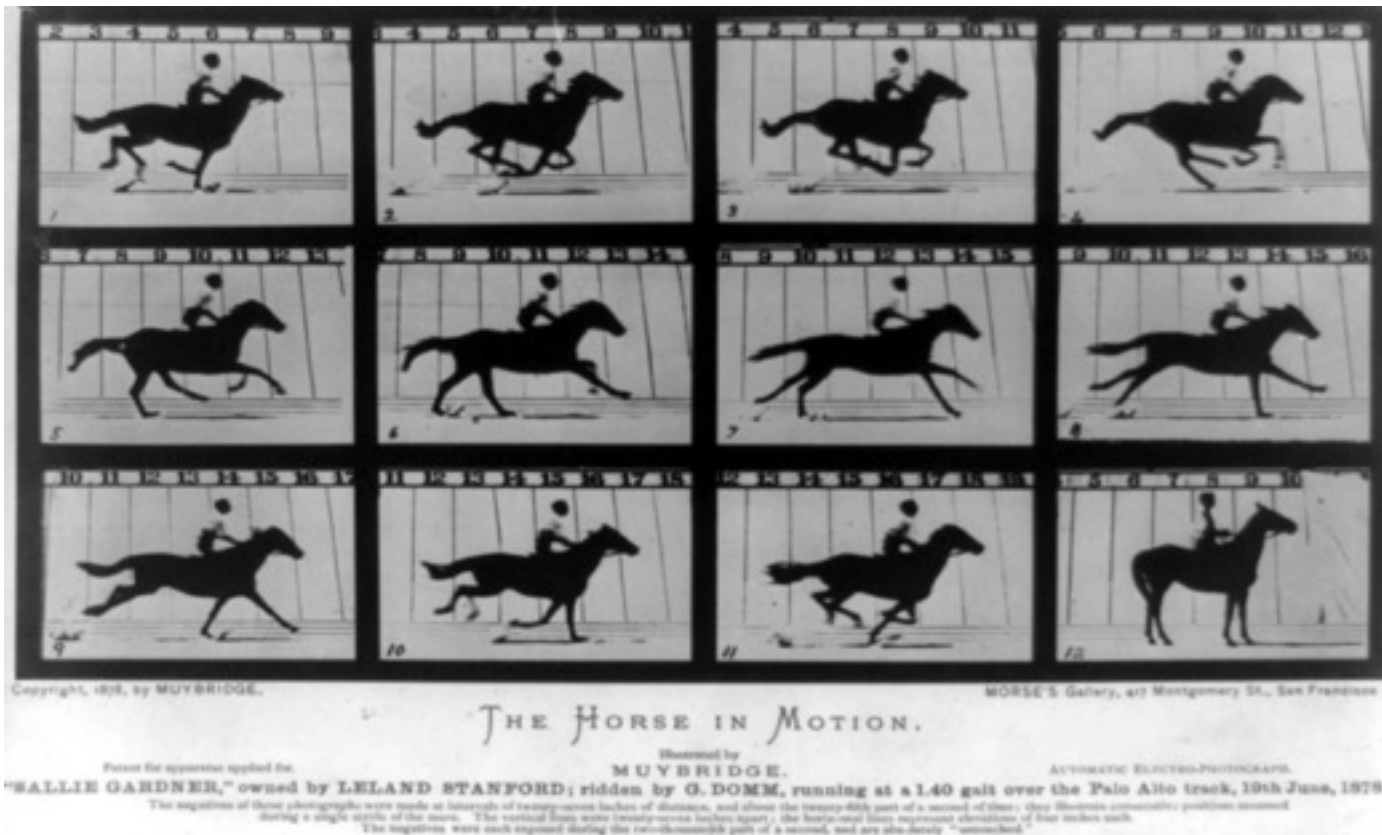
2D + Time

Time Juxtaposing



2D + Time

Muybridge's Chronophotography Technique



Eadweard J. Muybridge, 1878 ([source](#))

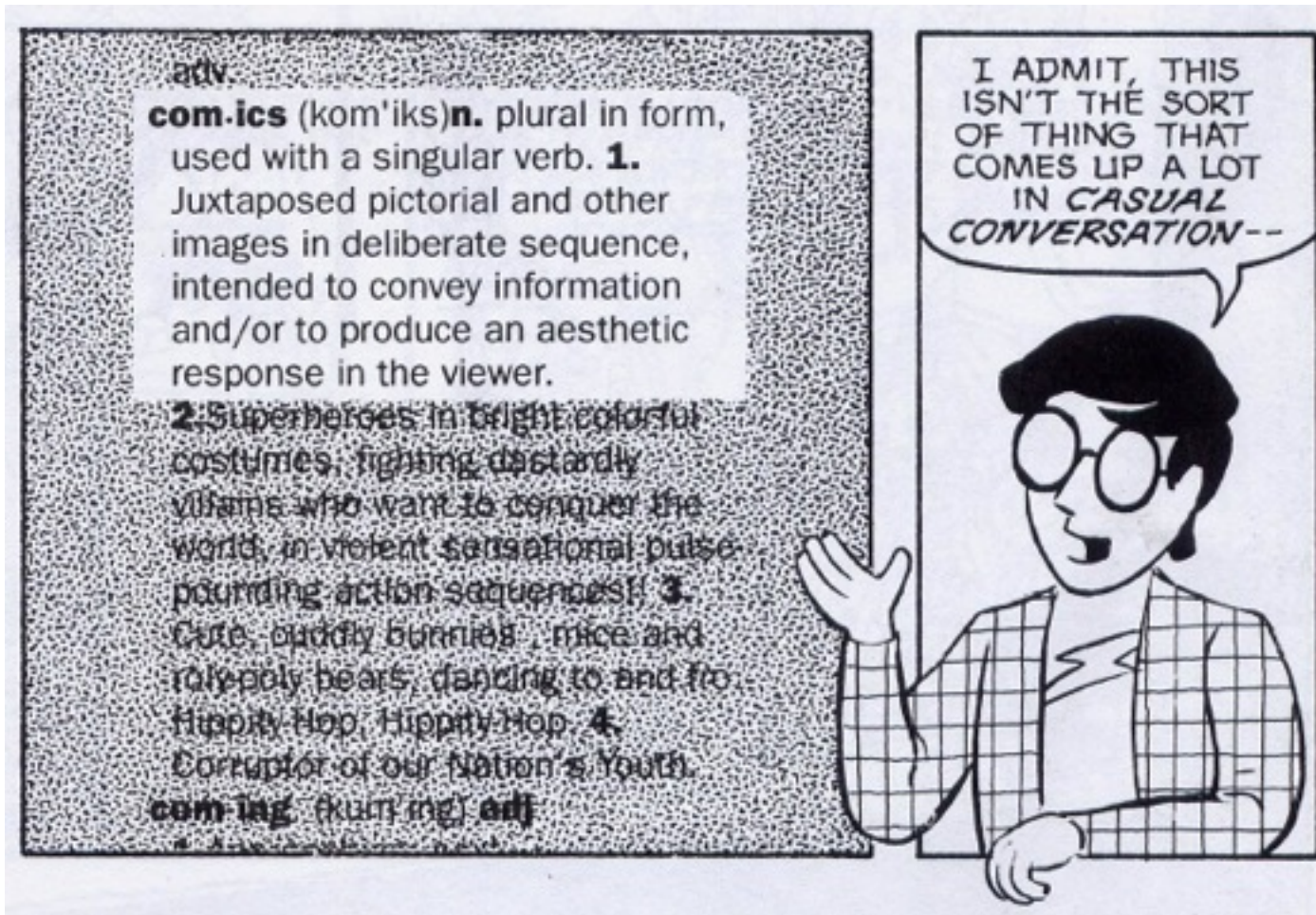
2D + Time

Comics



2D + Time

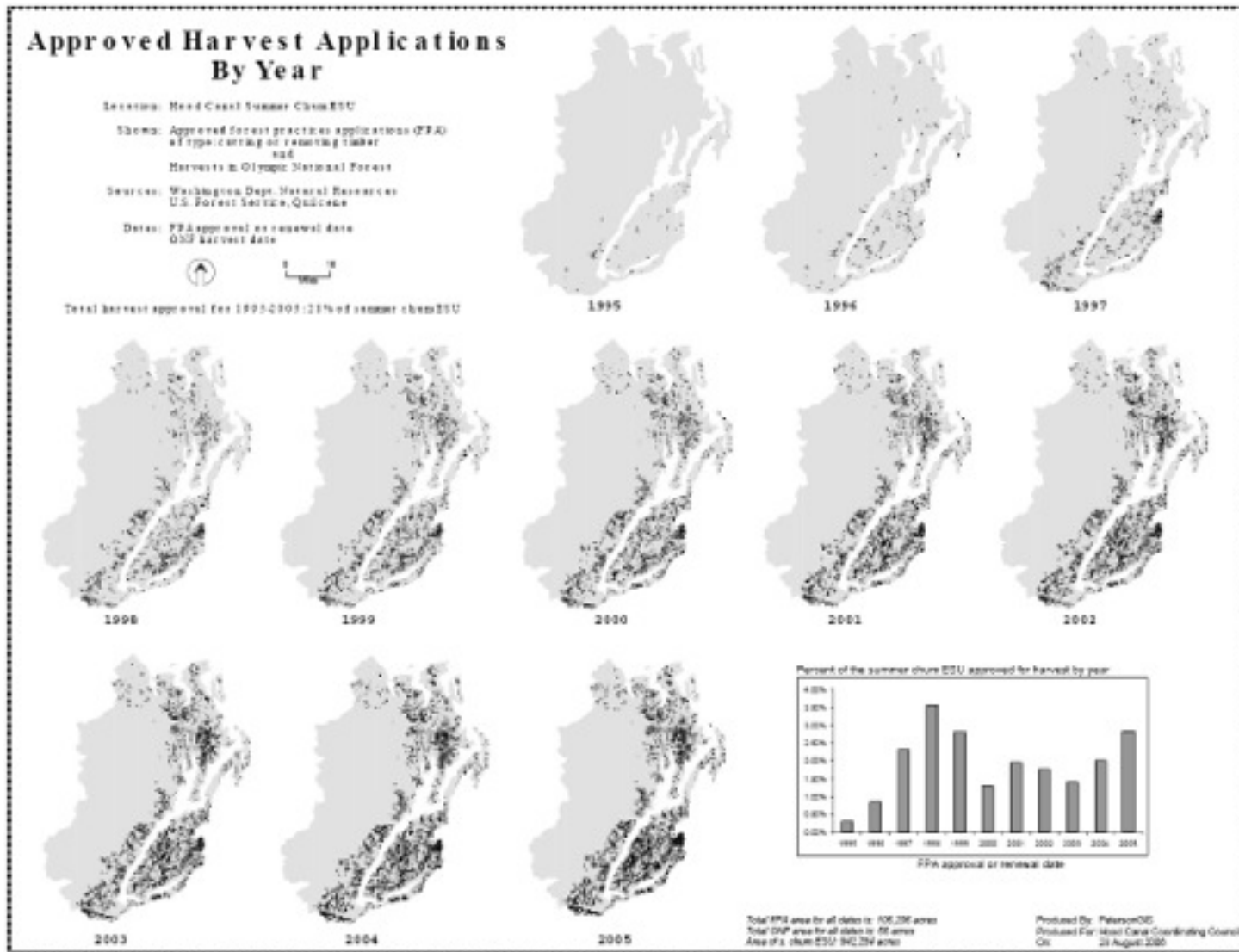
Comics



Understanding Comics: The invisible Art
[Scott McCloud, 1993](#)

2D + Time

Small Multiples

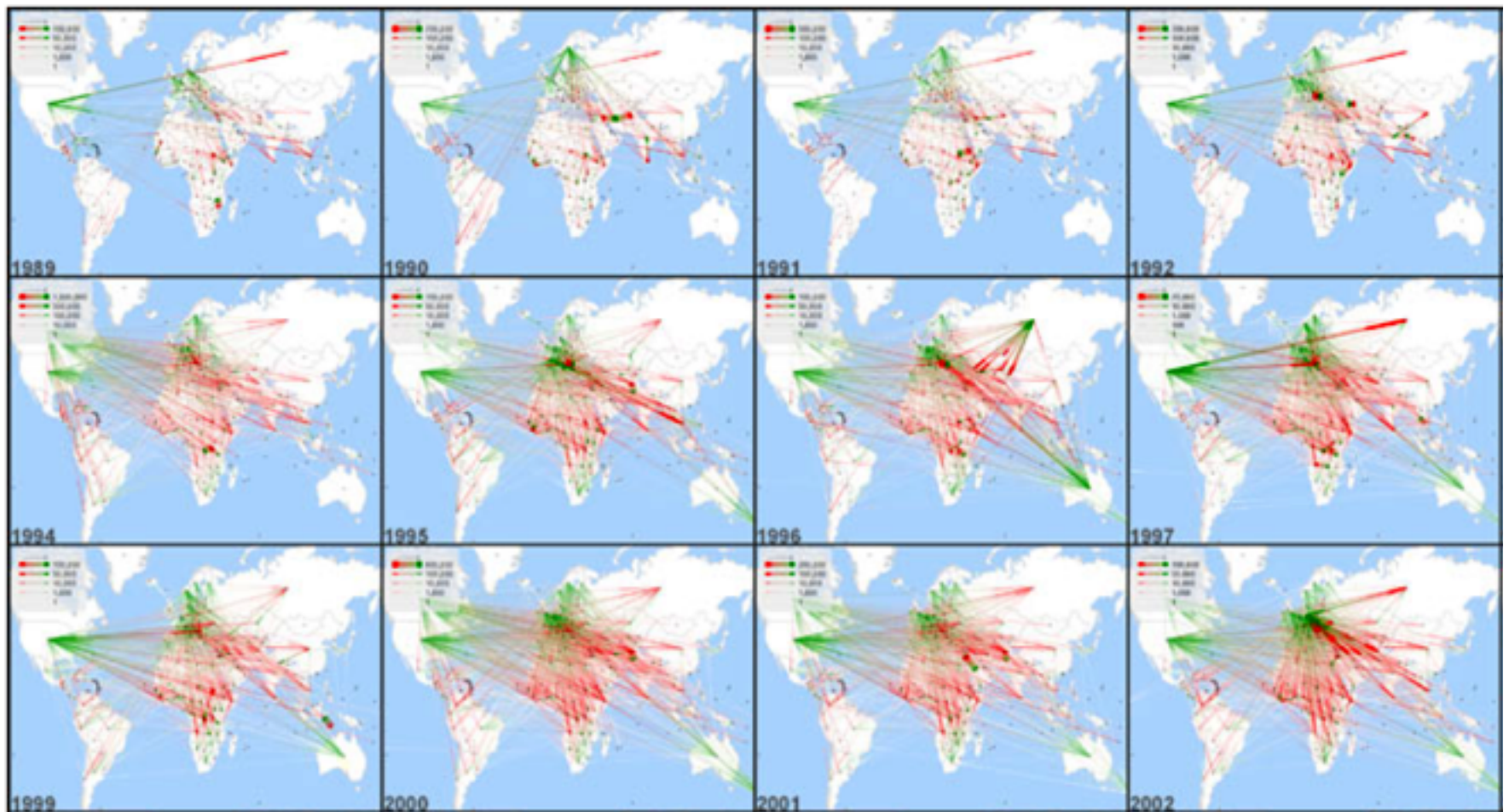


[Tuft](#),
[1983](#)

(image source)

2D + Time

Small Multiples



2D + Time

Side-By-Side Views

FE / trunk
build.xml

Activity Revisions Users Reports Source

107905 107905 Changeset Raw Annotation Highlighting Columns Reviews

```
<import file="eclipse/build.xml"/>
<import file="idea4/build.xml"/>
<import file="idea5/build.xml"/>
<import file="jbuilder/build.xml"/>
<import file="jdeveloper/build.xml"/>

<macrodef name="subtarget">
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  <attribute name="target"/>
  <sequential>
    <subant target="${module}.${target}">
      <dirset dir="." file="${module}"/>
    </subant>
  </sequential>
</macrodef>

<macrodef name="doall">
  <attribute name="target"/>
  <sequential>
    <subtarget module="buildutil" target="${target}"/>
    <subtarget module="cloverantlr" target="${target}"/>
    <subtarget module="core" target="${target}"/>
    <subtarget module="viewer" target="${target}"/>
    <subtarget module="clover-ant" target="${target}"/>
    <subtarget module="plugincore" target="${target}"/>
    <subtarget module="eclipse" target="${target}"/>
    <subtarget module="idea4" target="${target}"/>
    <subtarget module="idea5" target="${target}"/>
    <subtarget module="jbuilder" target="${target}"/>
    <subtarget module="jdeveloper" target="${target}"/>
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<target name="global.build">
  <doall target="build"/>
</target>
```

```
<import file="eclipse/build.xml"/>
<import file="idea7/build.xml"/>
<import file="perfmon/build.xml"/>

<property name="test.results.dir" value="${build.dir}/test/ht

<macrodef name="subtarget">
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    <subant target="${module}.${target}" inheritrefs="true"
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```

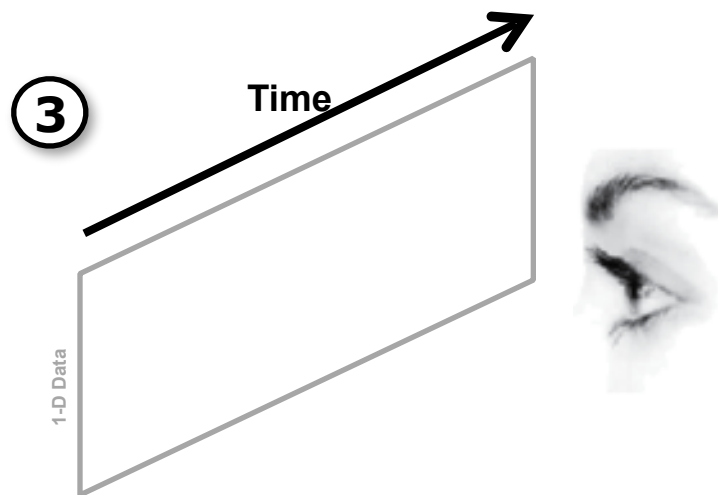
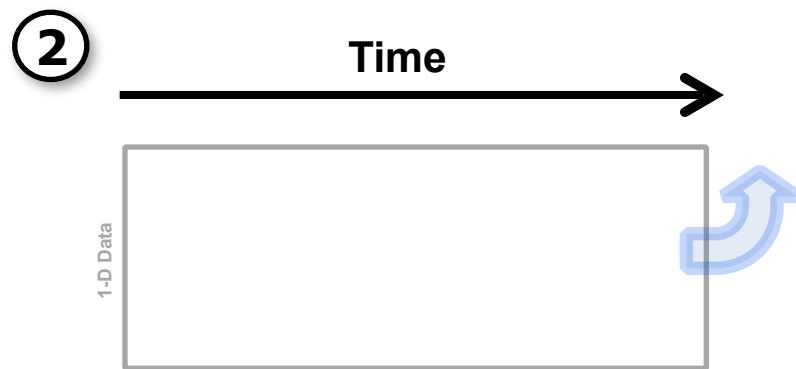
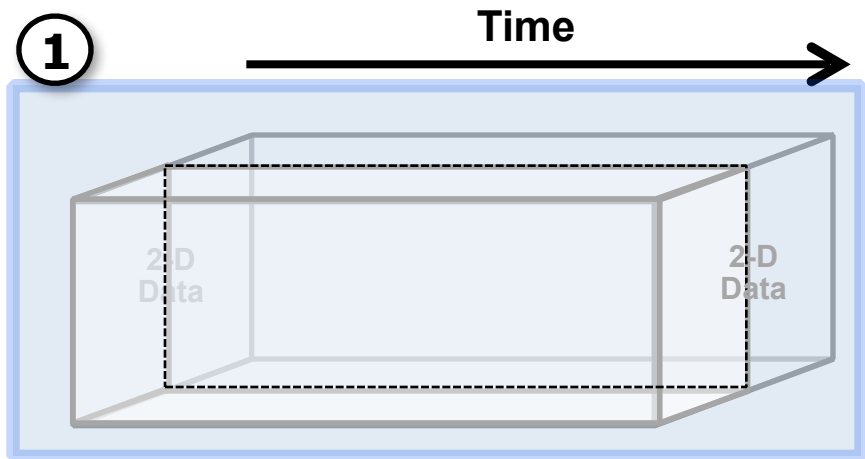
2D + Time

Side-By-Side Views



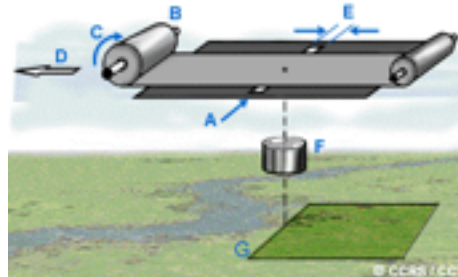
2D + Time

Space Cutting



2D + Time

Slit-Scan Photography

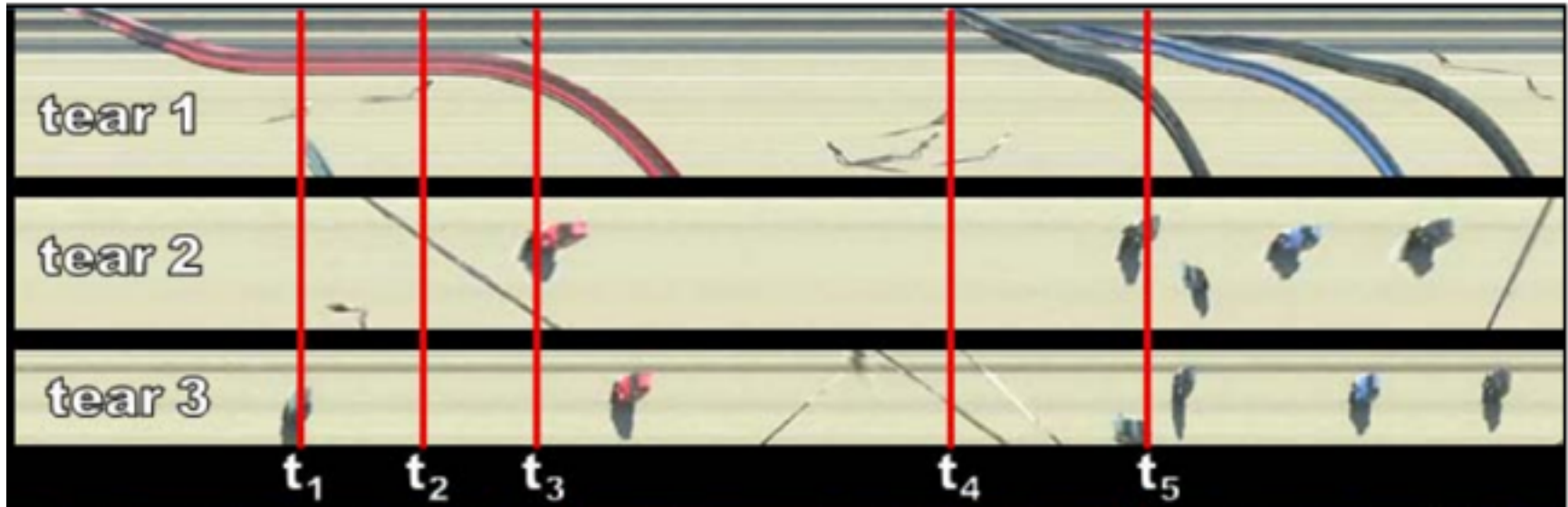


(images source)

Time

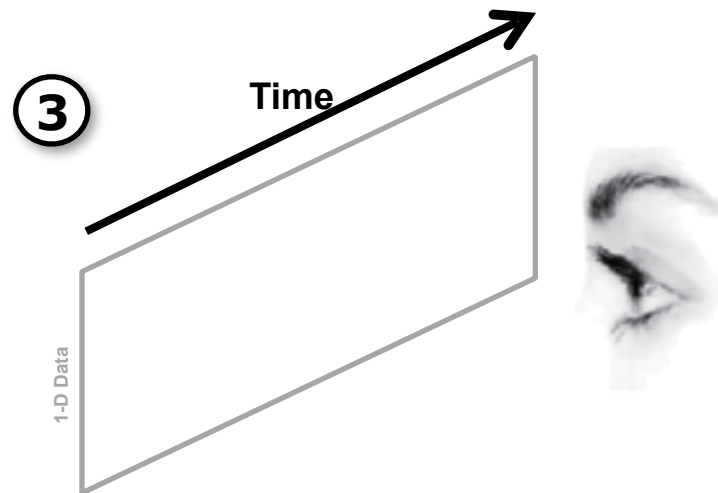
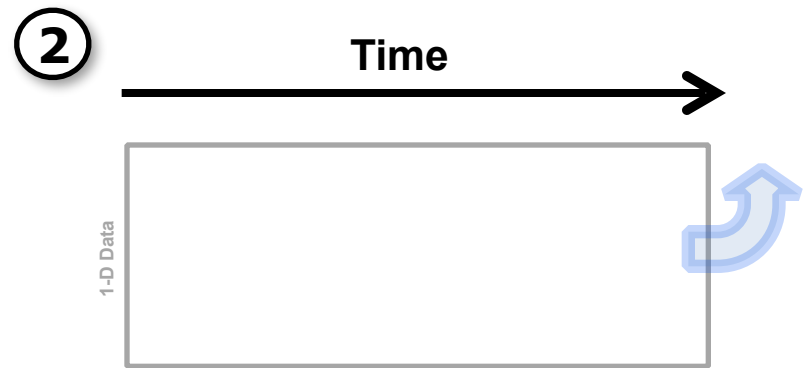
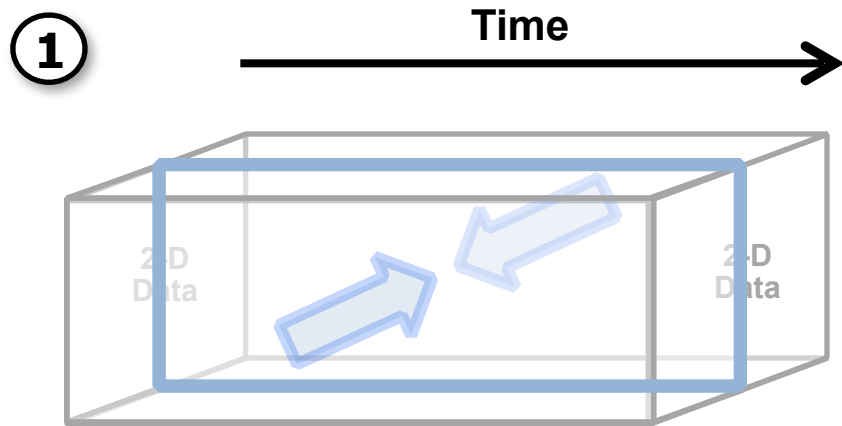
2D + Time

Slit-Tear Exploration of Videos



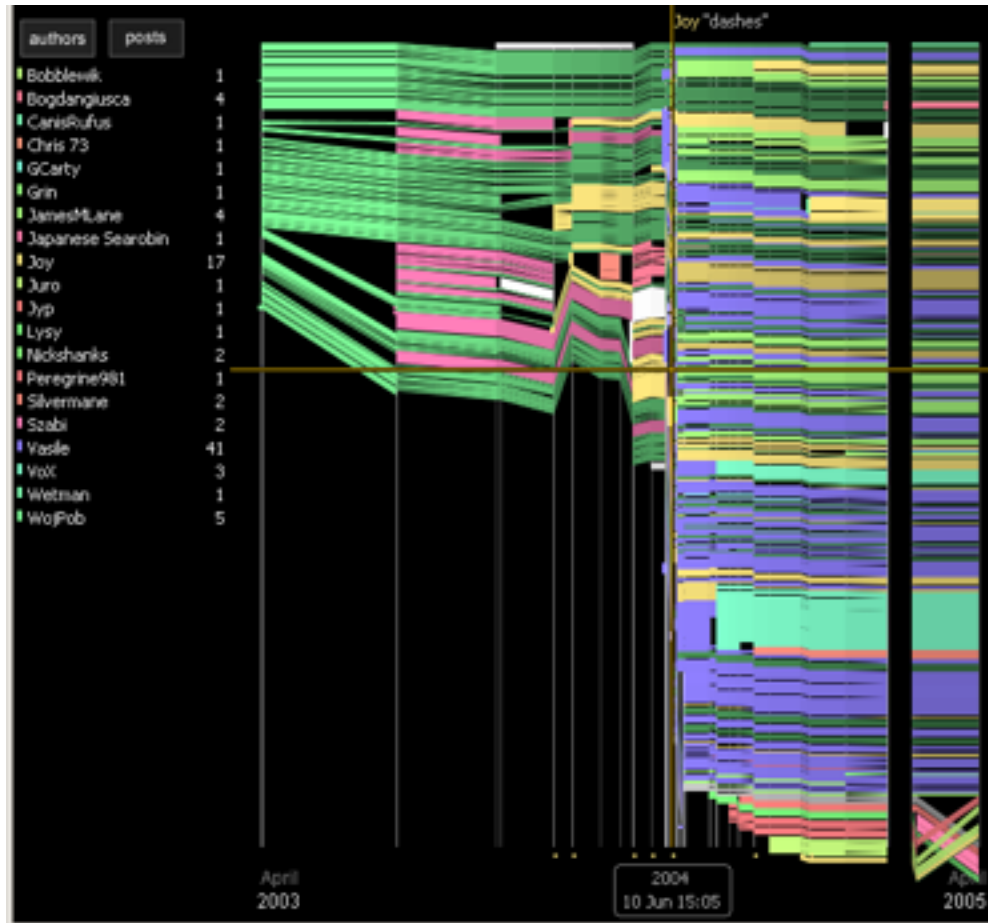
2D + Time

Space Flattening



2D + Time

History Flow



of Hungary was about 45% of the entire population. The provinces Hungary lost in the treaty had significant population of non-Magyars, but also a significant Magyar minority, which can still be found in these countries.

The number of Hungarians in the provinces started decreasing after the treaty. Comparing the Magyar population based on census data before and after the treaty:

* In Slovakia:

** 1910: 884,000 - 30%

** 1930: 592,000 - 18%

* In Transylvania (now in Romania):

** 1910: 1,662,000 - 32%

** 1930: 1,353,000 - 24%

* In Volvodina (now in Serbia and Montenegro):

** 1910: 420,000 - 28%

** 1931: 376,000 - 23%

* In Transcarpathia (now in Ukraine):

** 1910: 183,000 - 30%

** 1930: 123,000 - 17%

* In Croatia:

** 1910: 121,000 - 3.5%

** 1921: 76,000 - 2.2%

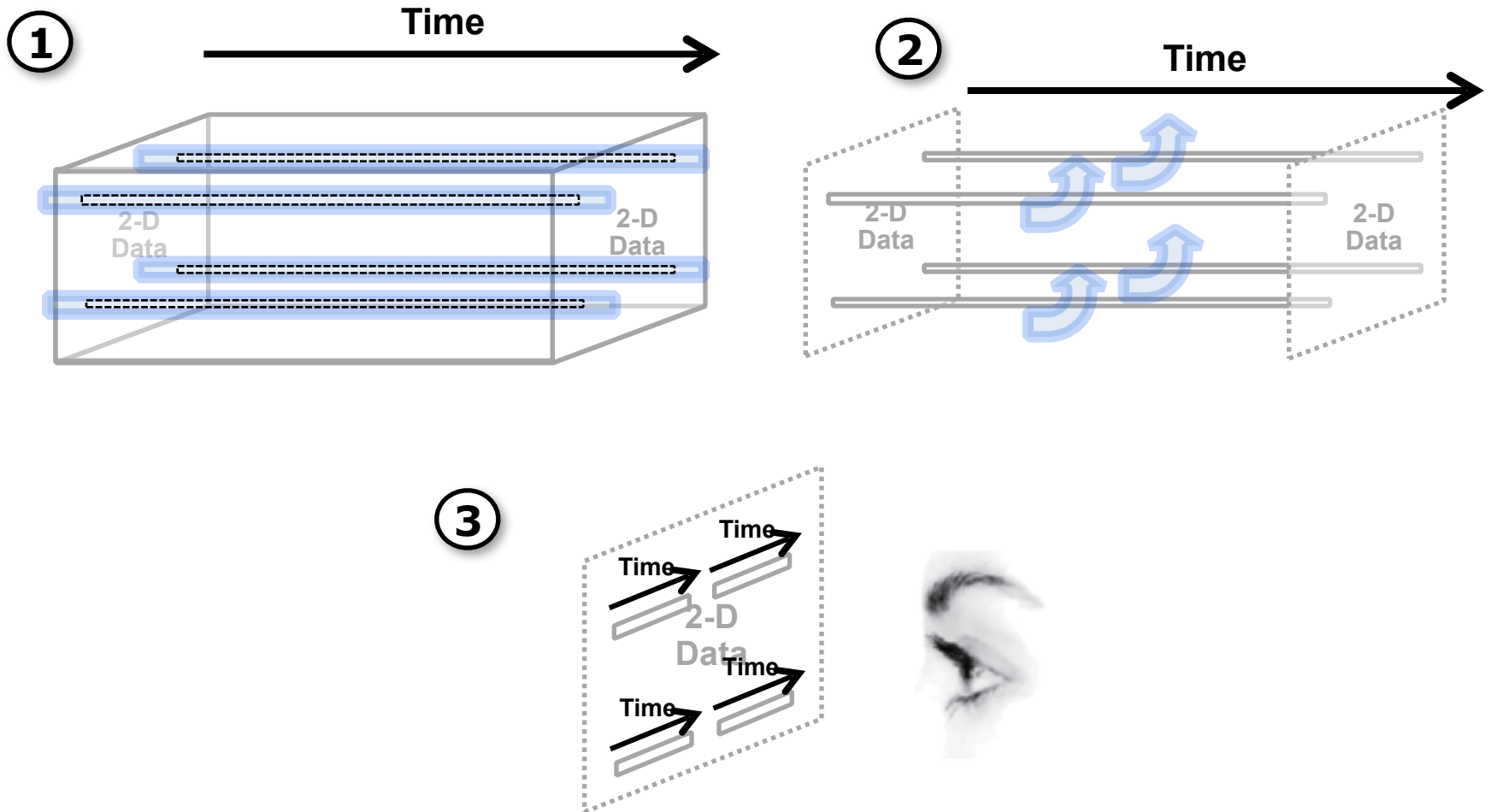
* In Slovenia:

** 1910: 20,800 - 1.6%

** 1921: 15,000 - 1.1%

2D + Time

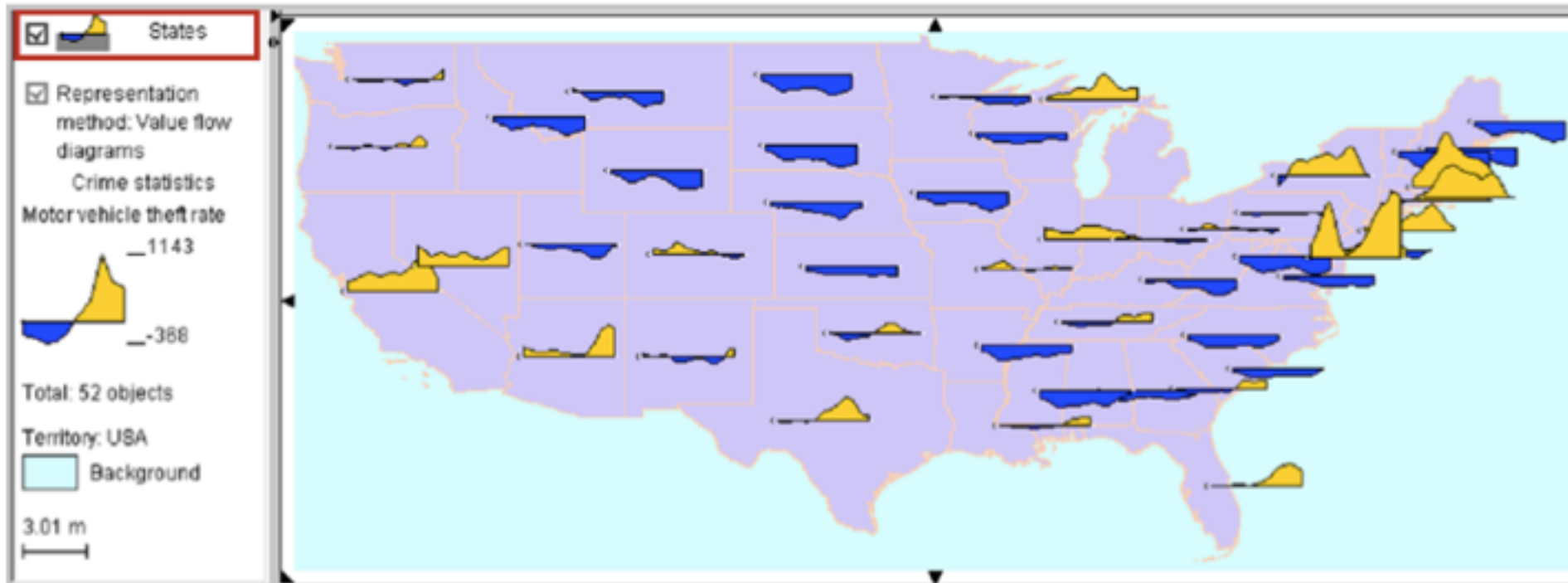
Sampling



2D + Time

Skipped slide

Multiple Silhouette Graphs



2D + Time

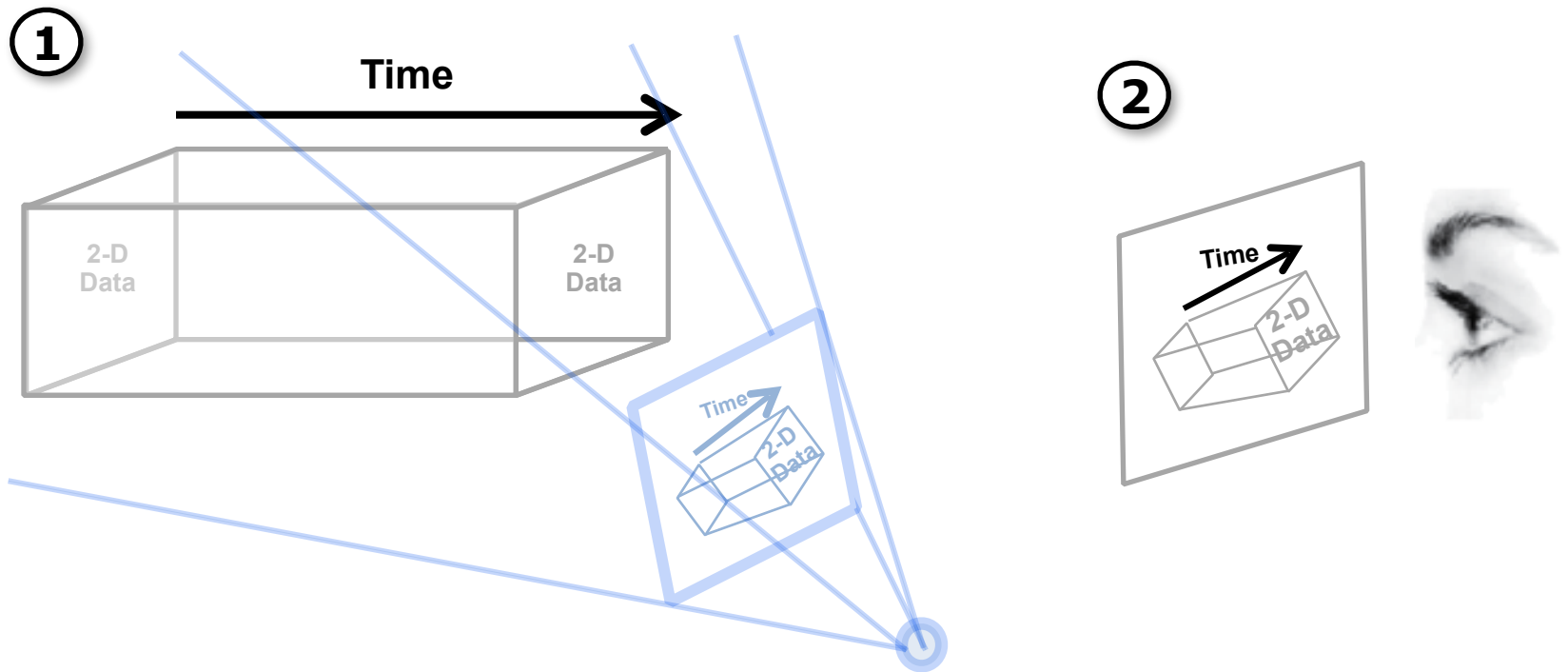
Skipped slide

Planning Polygons



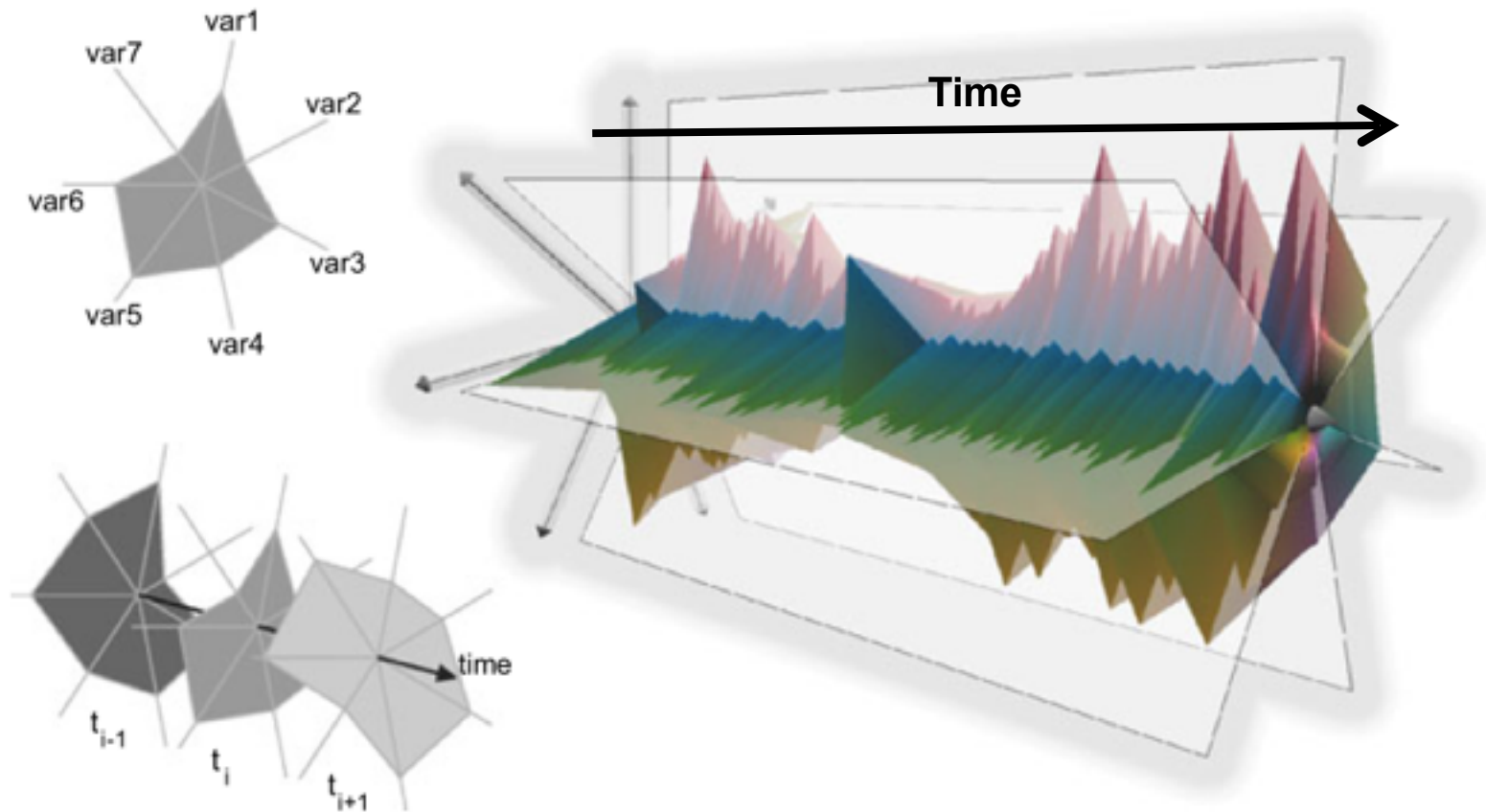
2D + Time

3D Rendering



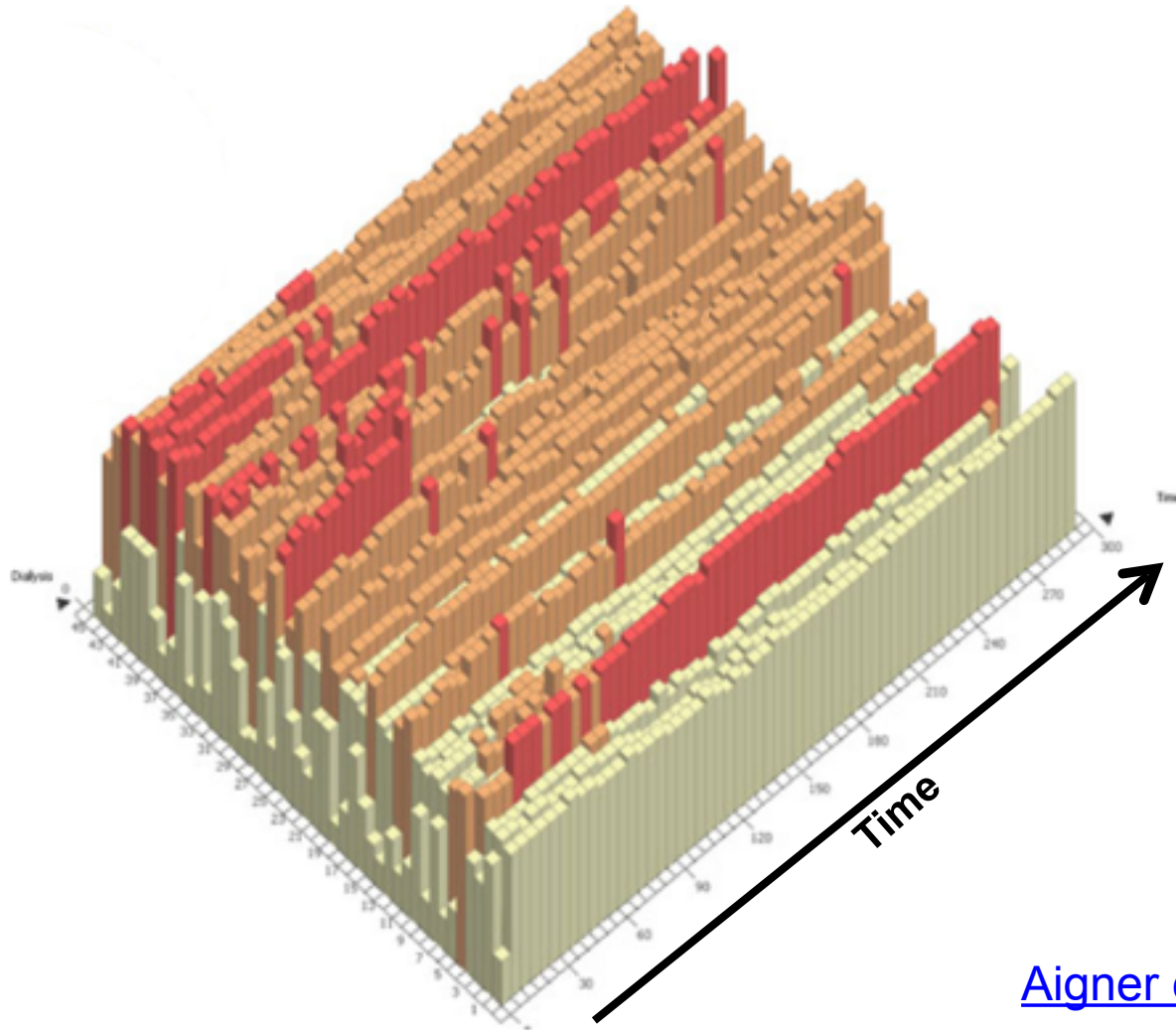
2D + Time

3D visualizations - Kiviat Tube



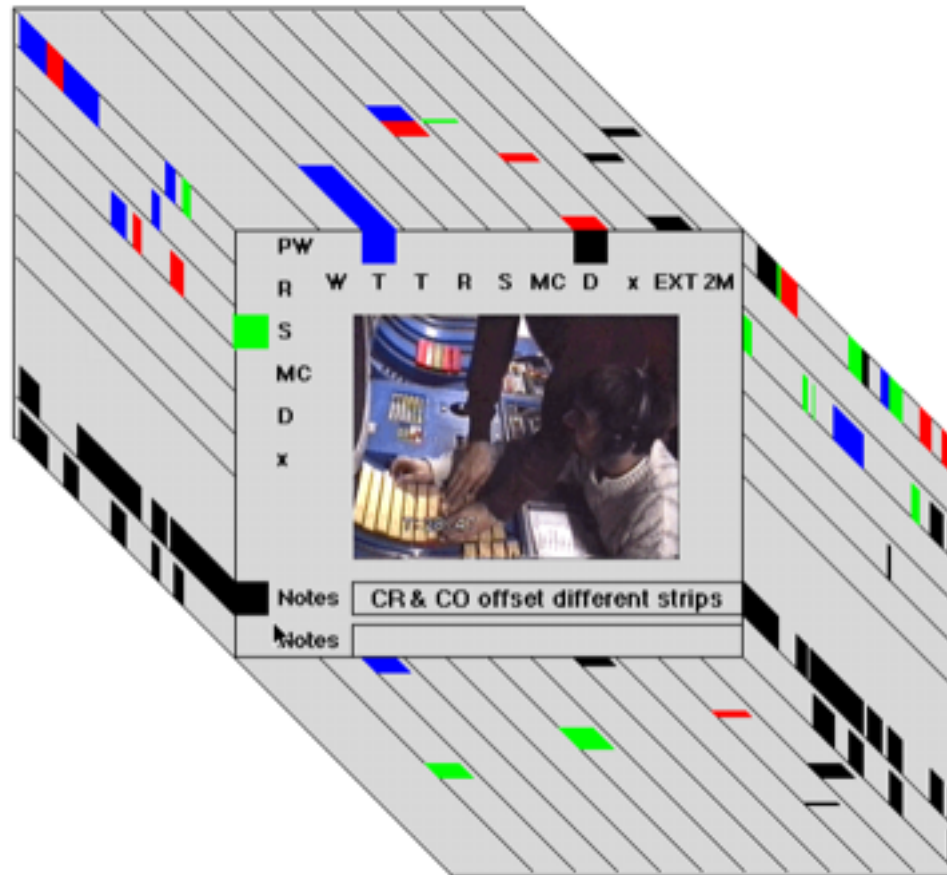
2D + Time

3D visualizations – 3D bar chart



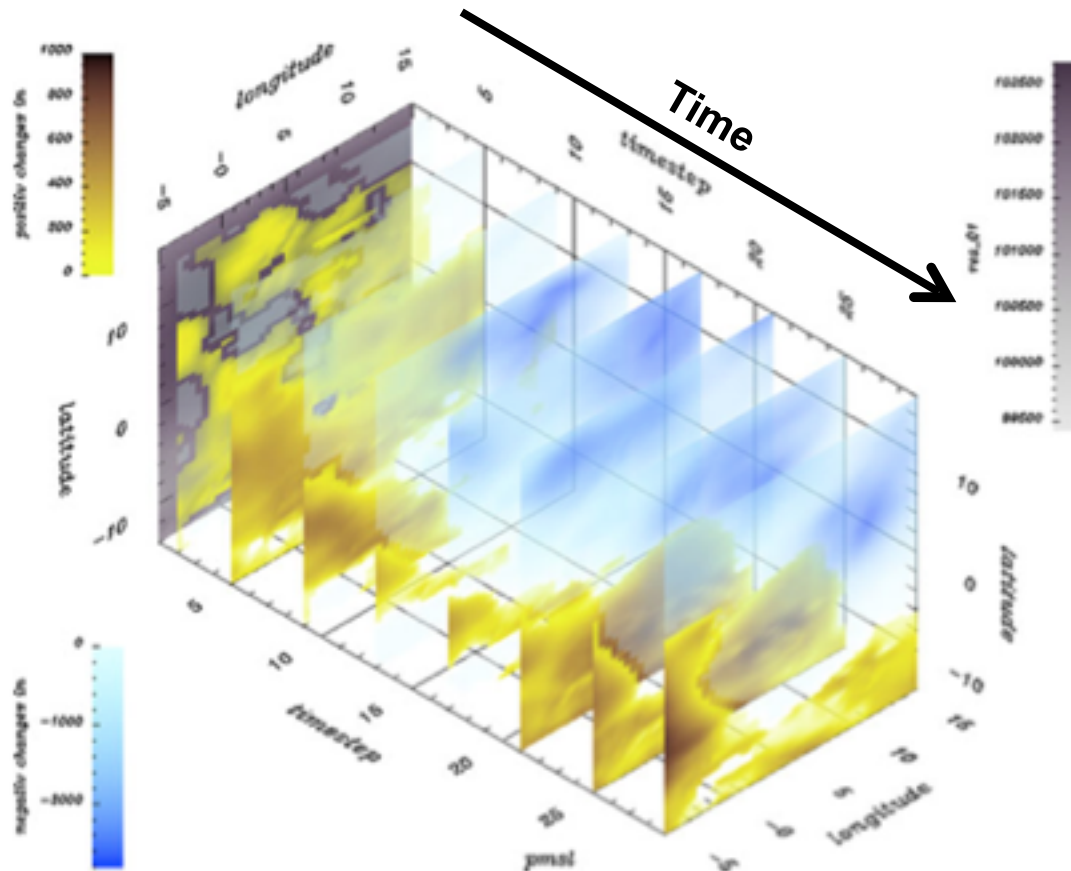
2D + Time

3D visualizations – DIVA



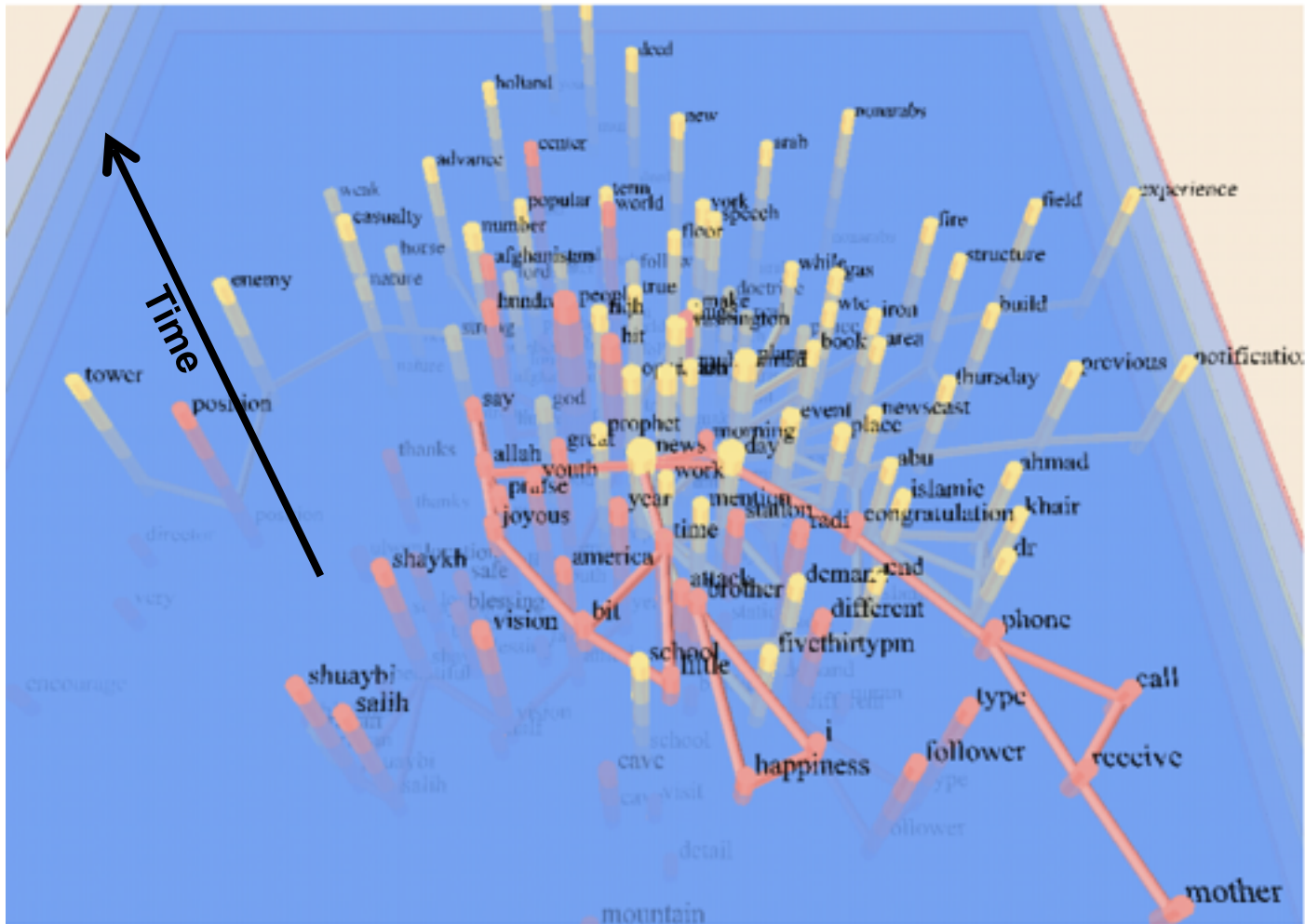
2D + Time

3D visualizations – Climate data



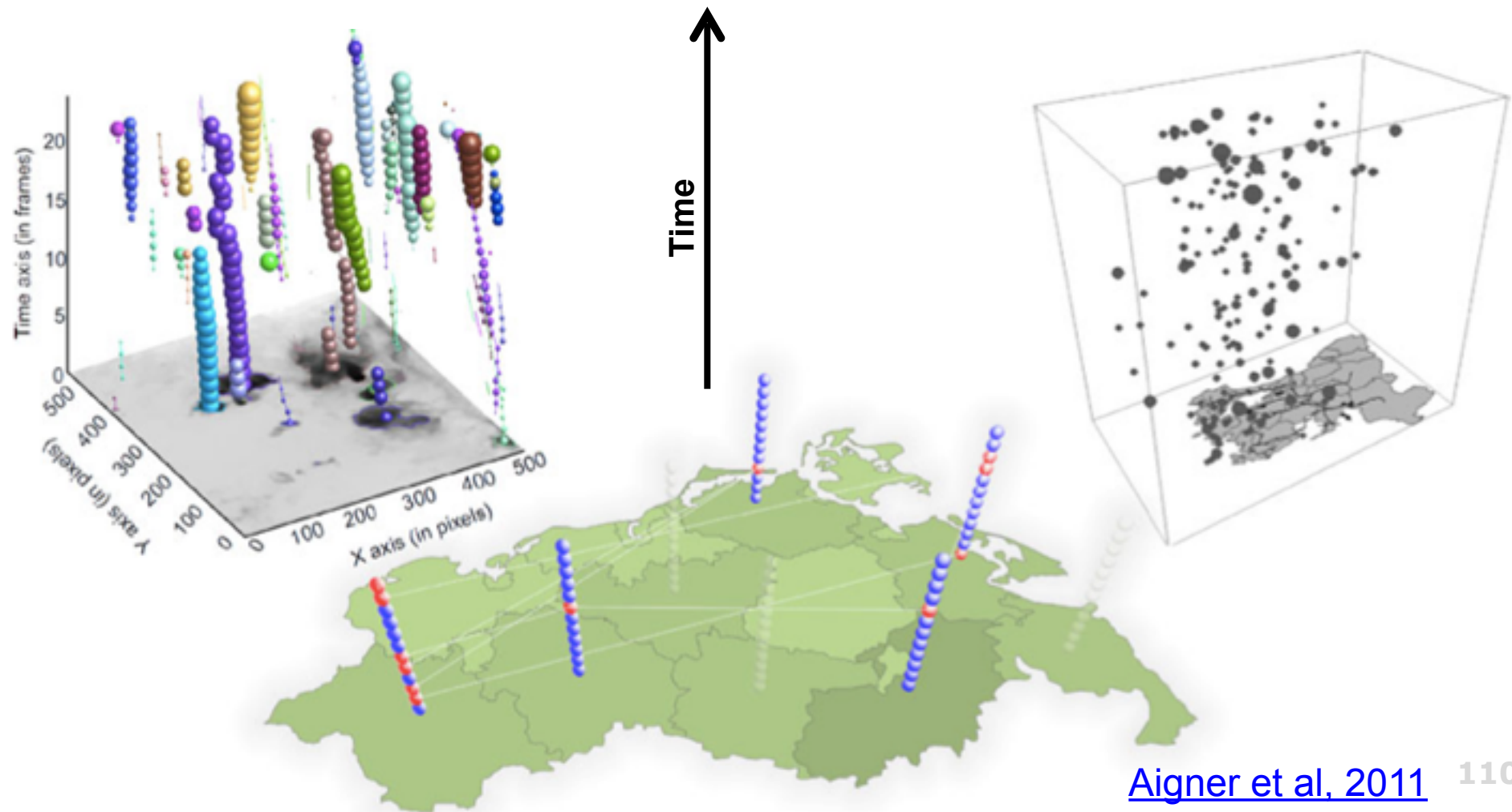
2D + Time

3D visualizations – Time-evolving graphs



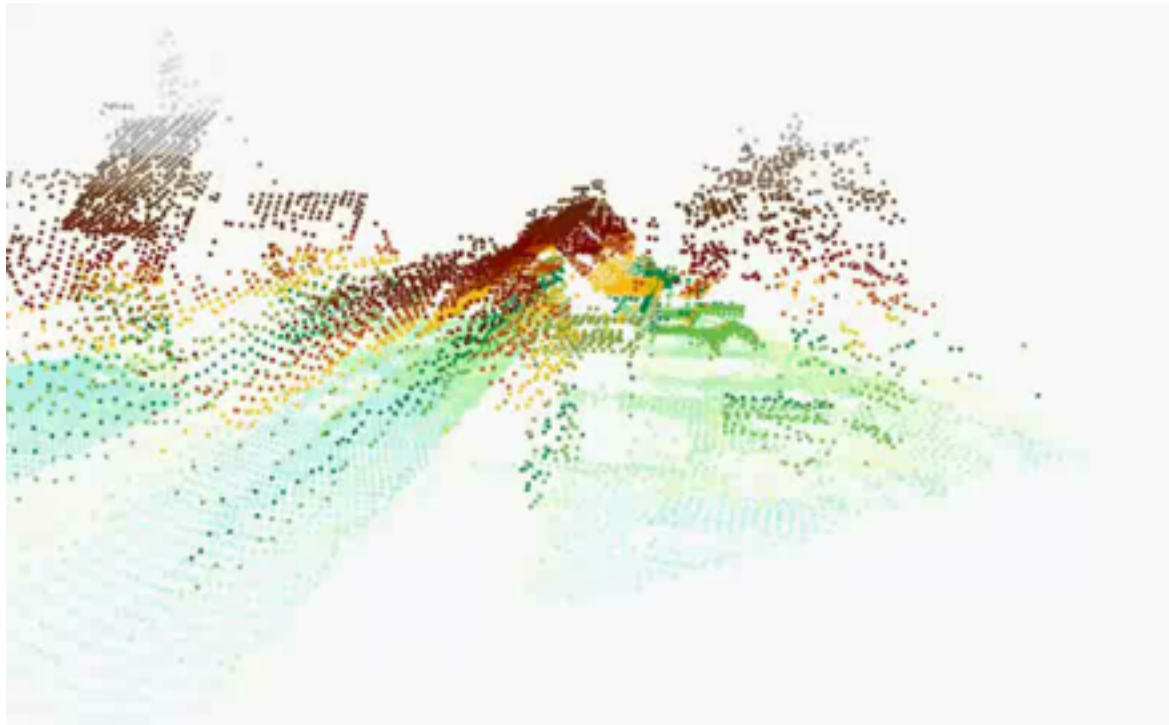
2D + Time

3D visualizations - Points



2D + Time

3D visualizations - Points

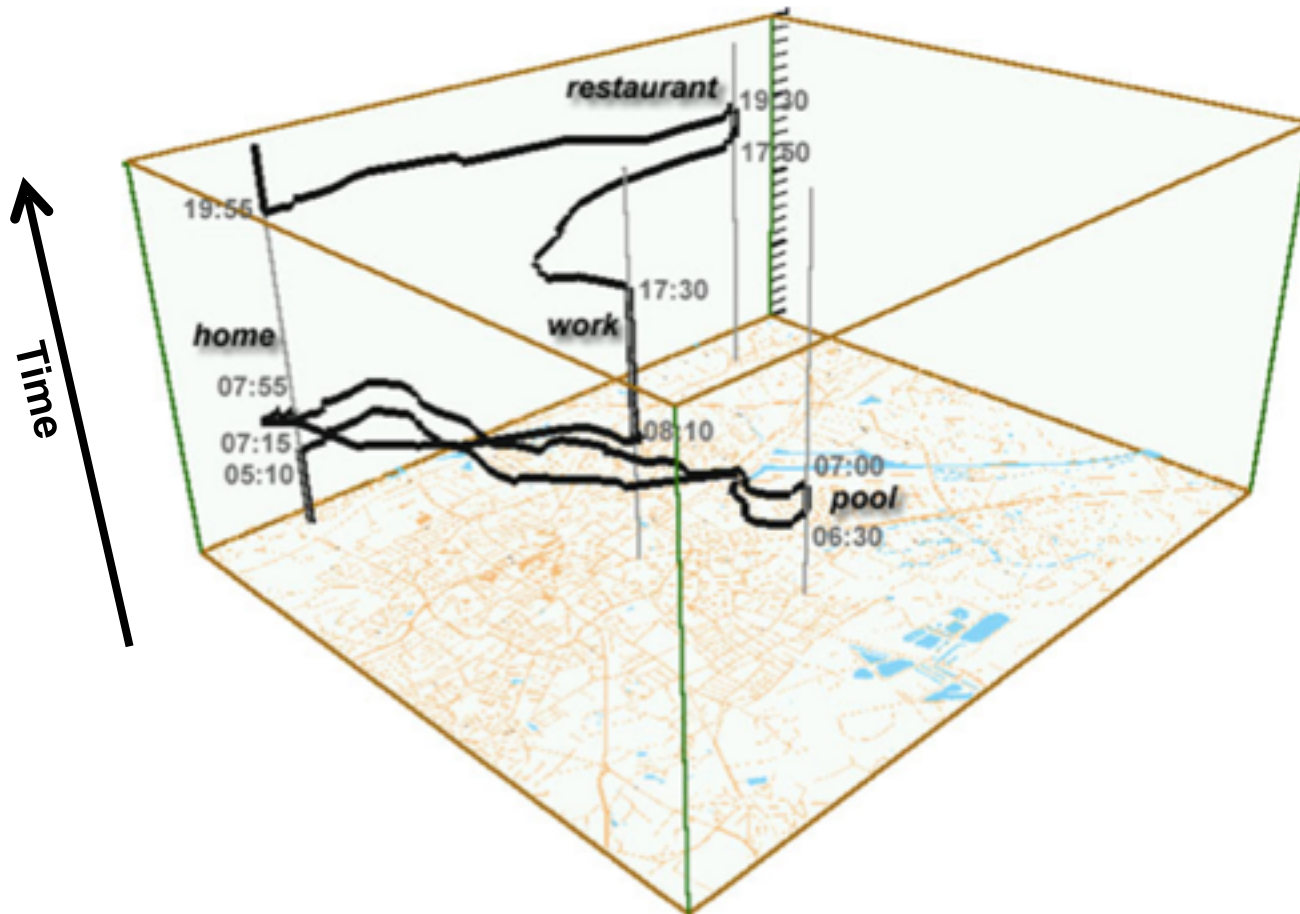


[\(video source\)](#)

2D + Time

Skipped slide

3D visualizations - Paths

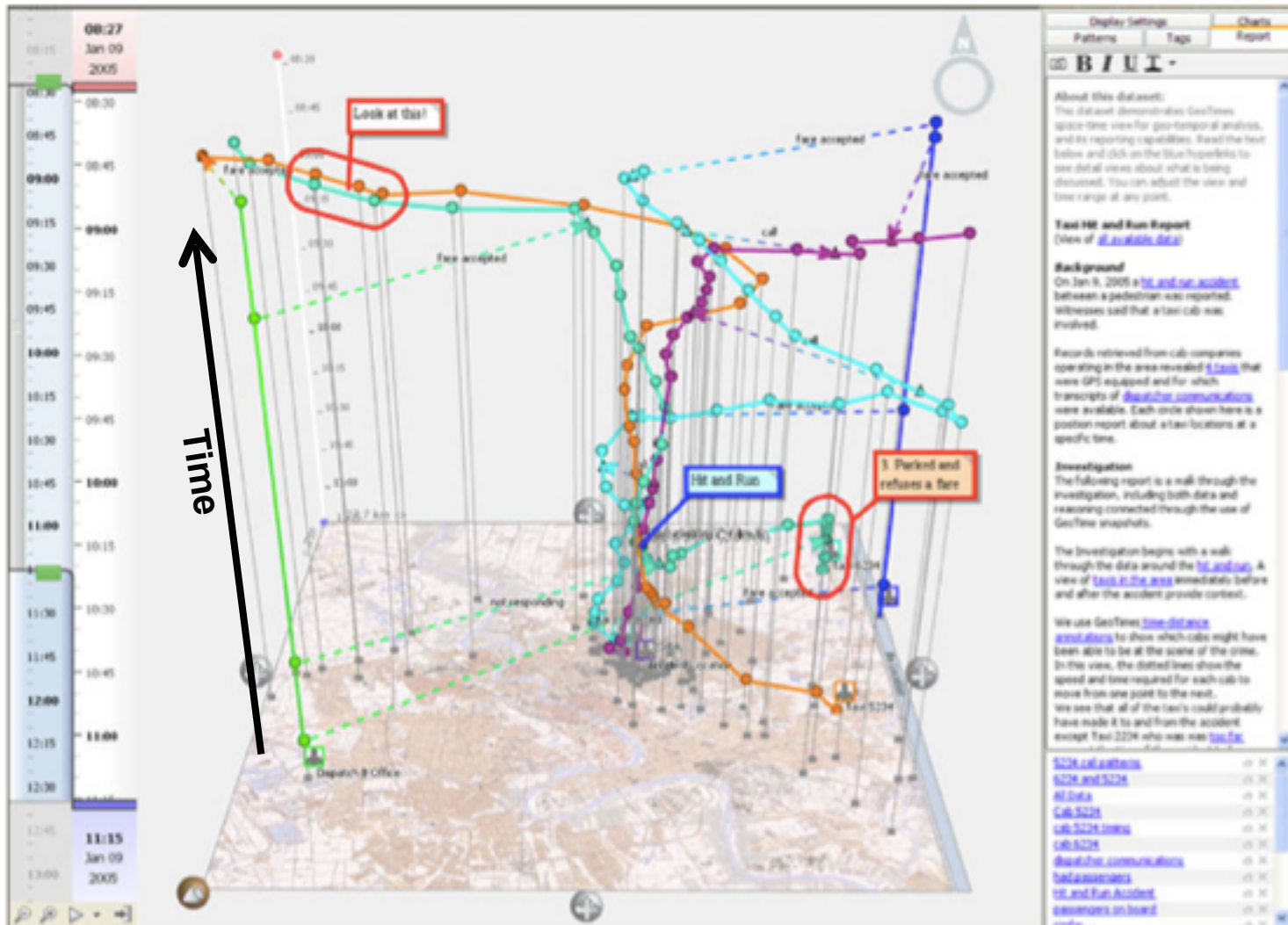


2D + Time

Skipped slide

3D visualizations - GeoTime

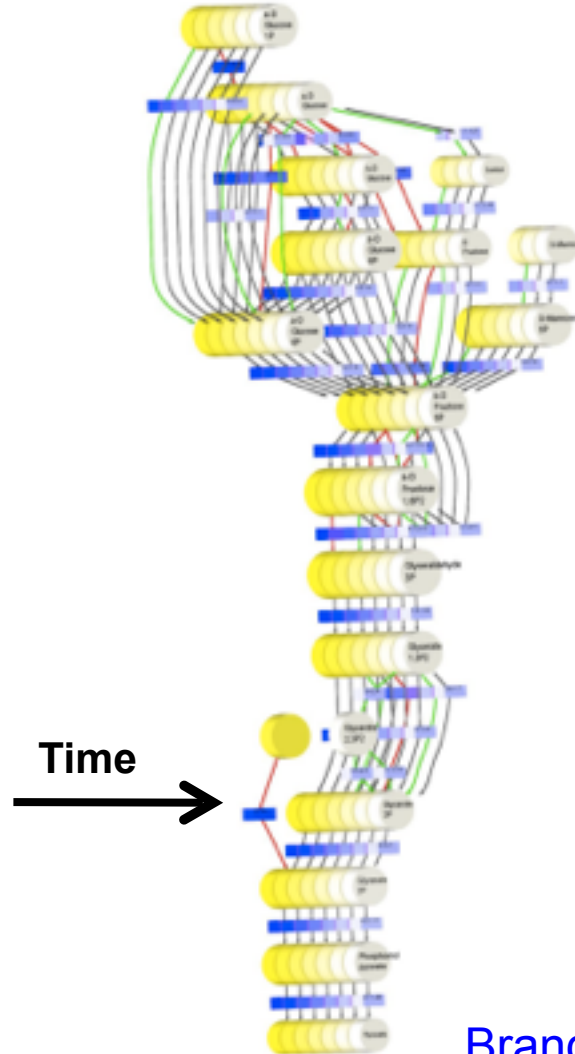
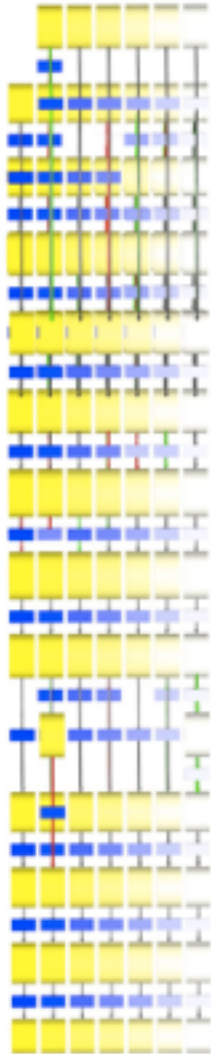
geotime.com



2D + Time

Skipped slide

3D visualizations – Time-evolving graphs

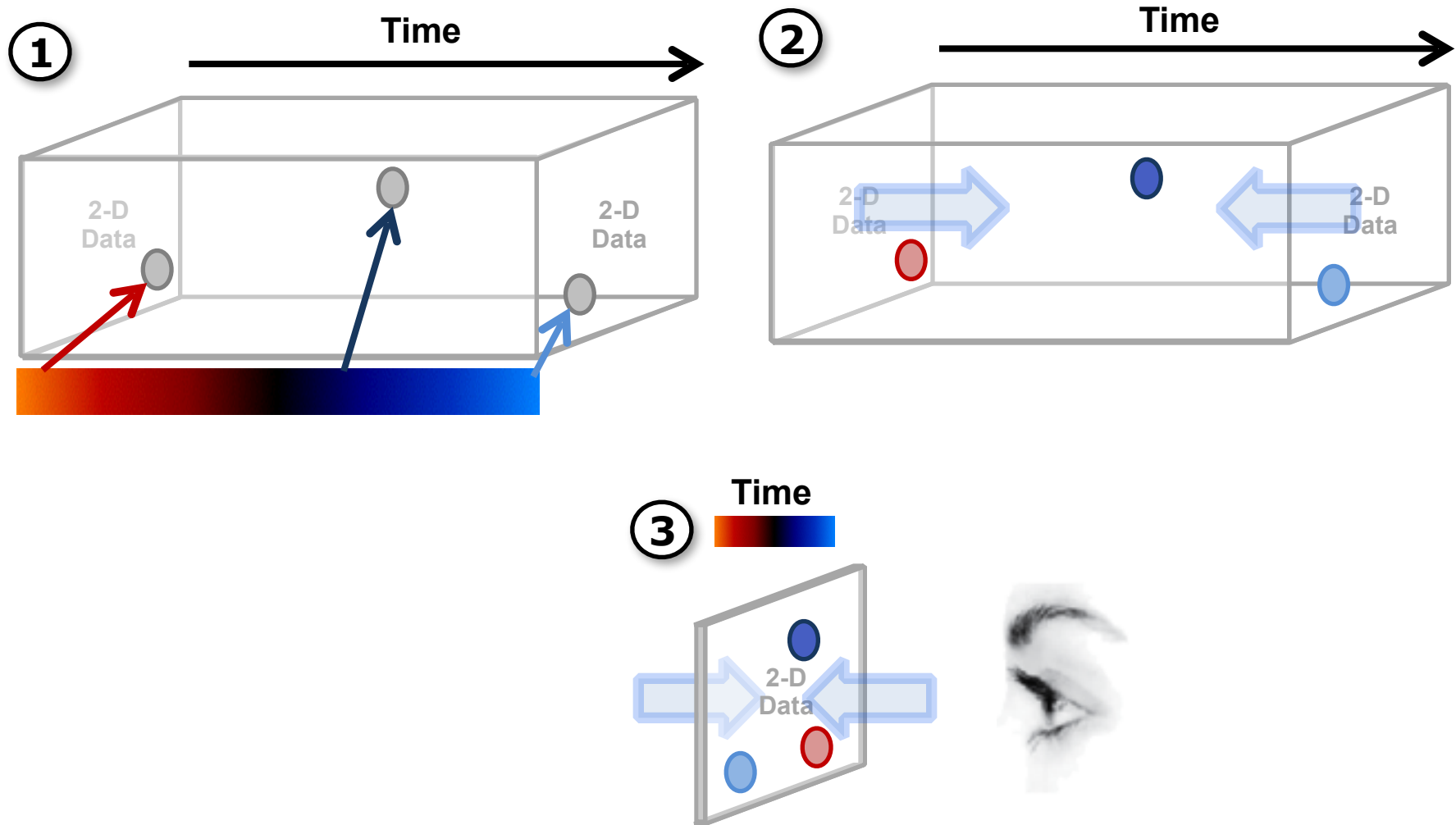


[Brandes et al, 2004](#)

Mapping Time to Space

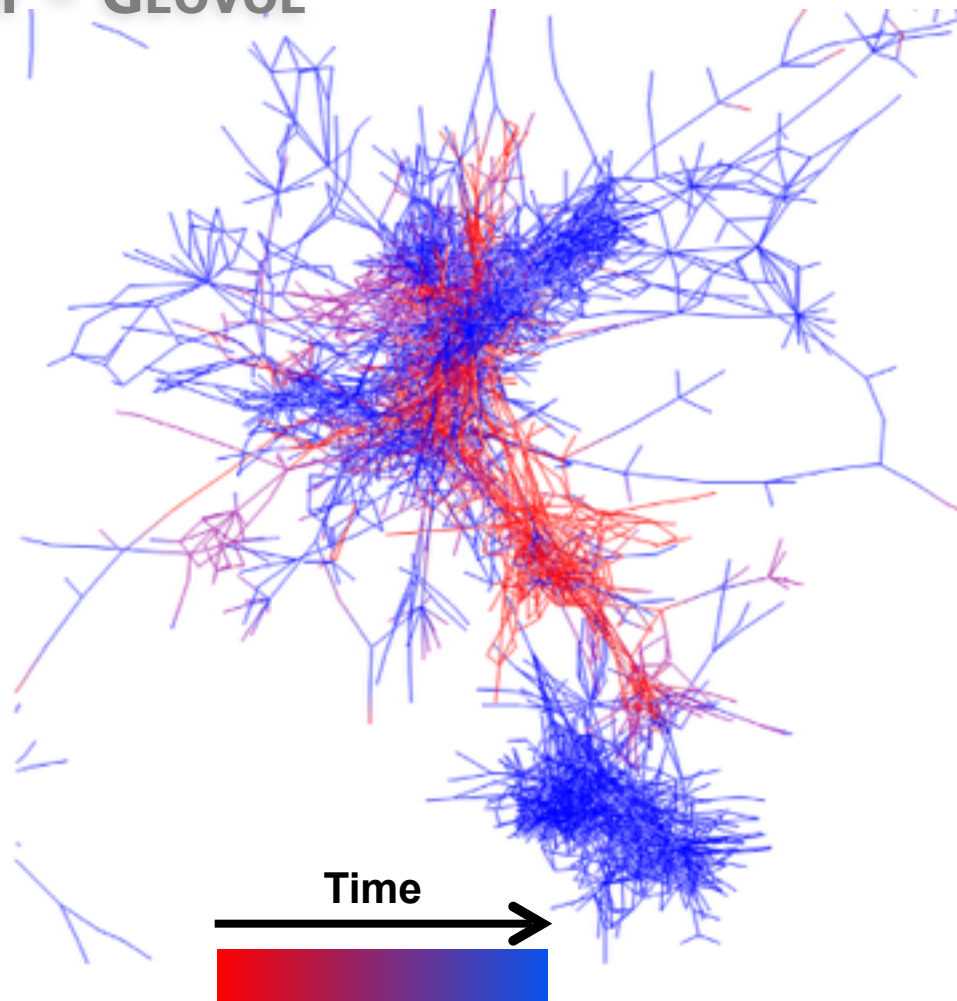
2D + Time

Colored Time Flattening



2D + Time

Using Color – GEOVOL

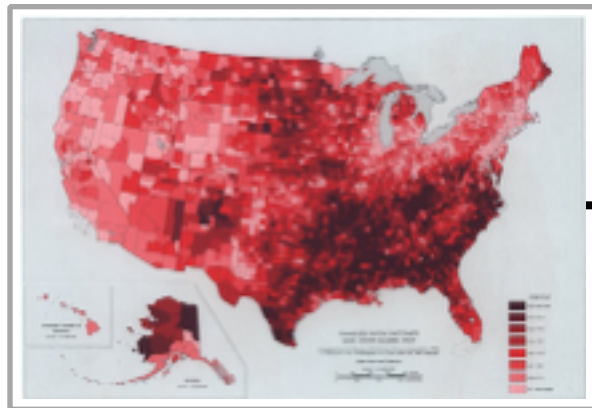


2D + Time

Using Color – Stroke Order



Mapping Time to an Axis

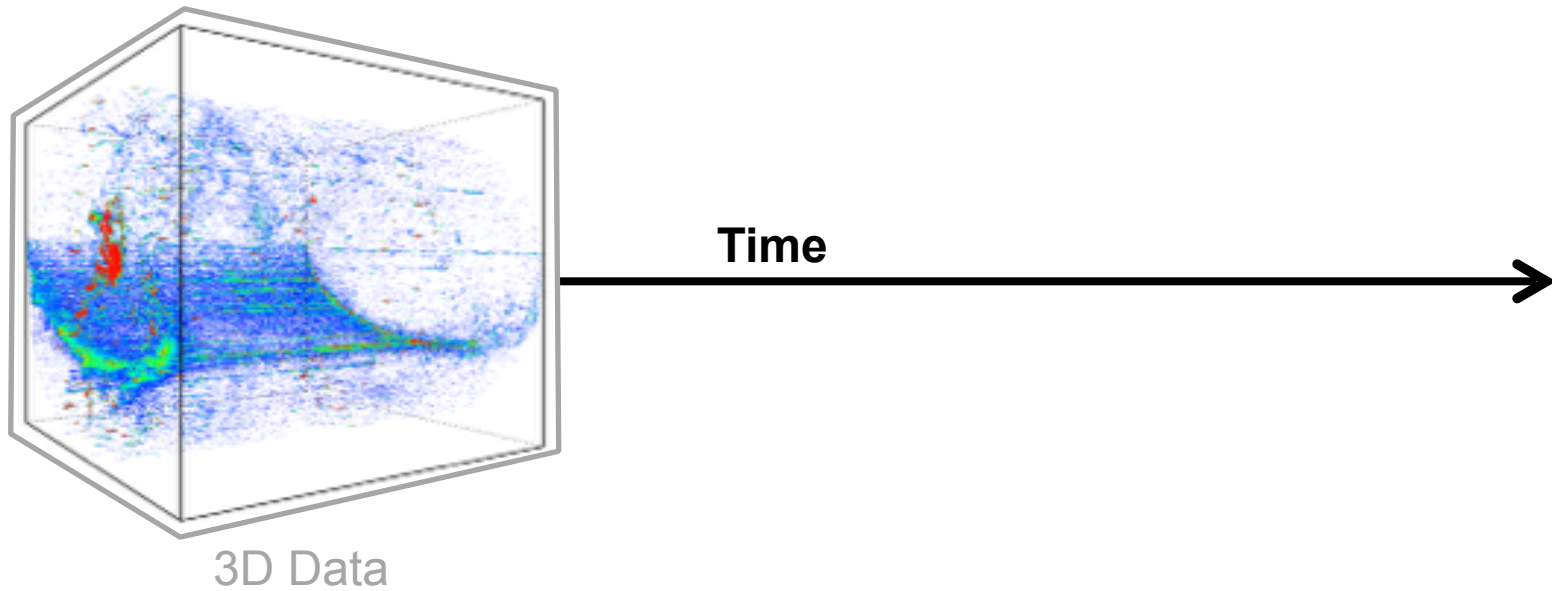


2D Data

Time

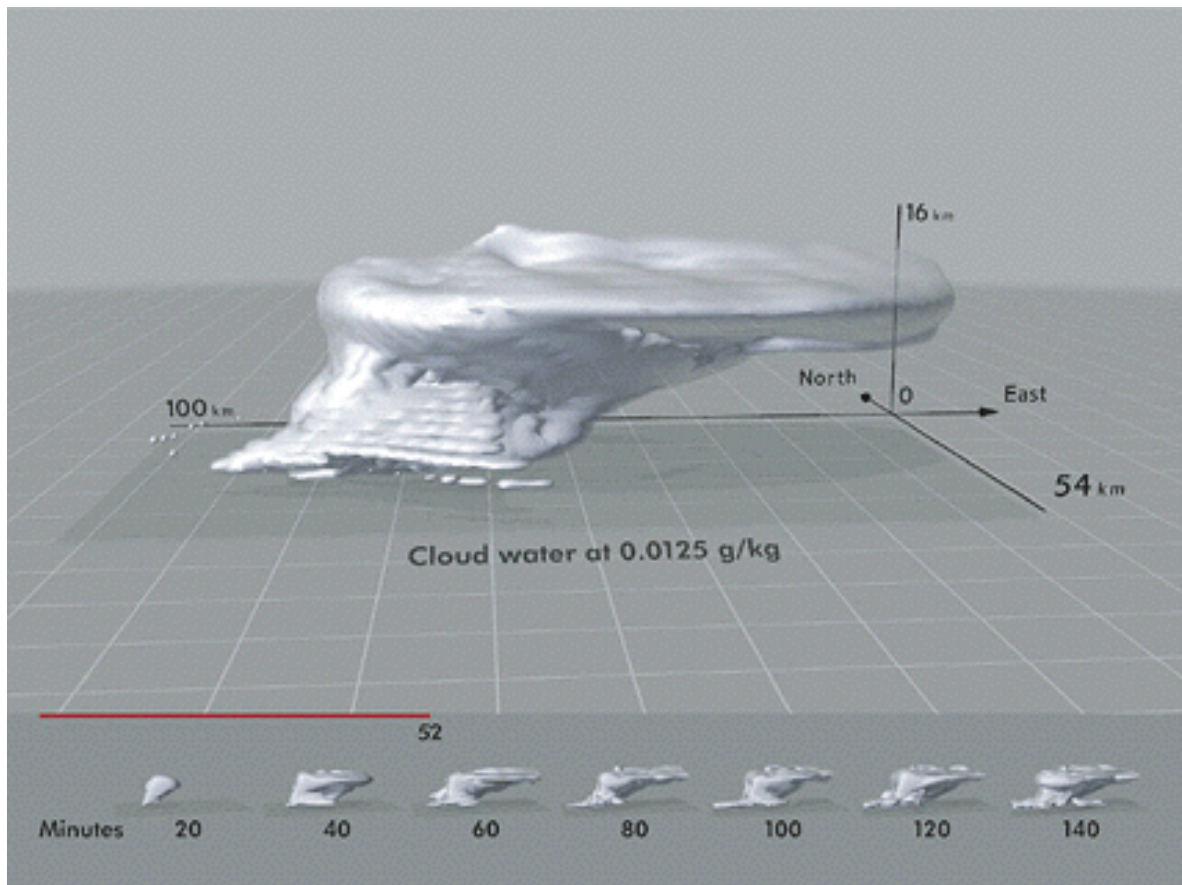


Mapping Time to an Axis



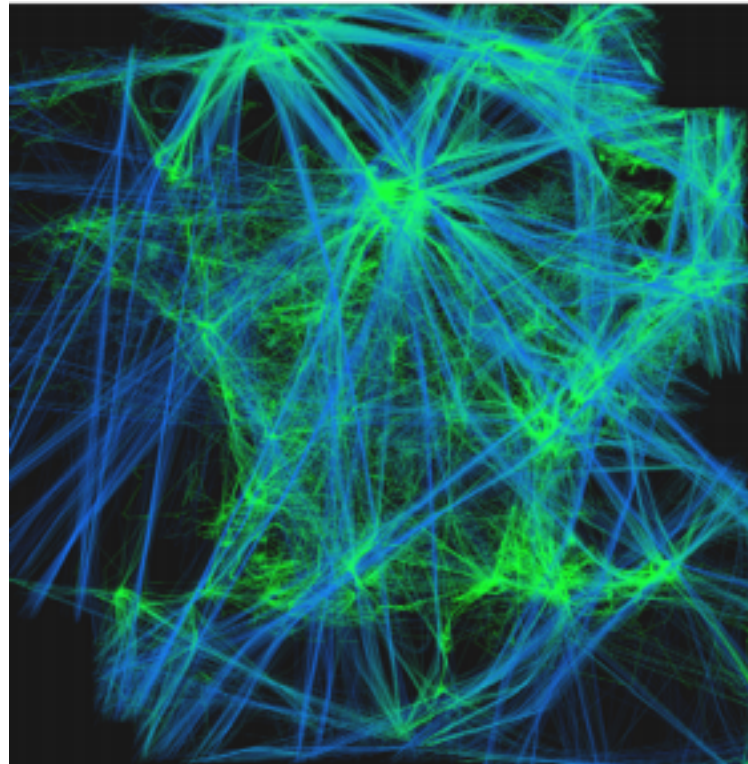
3D + Time

Slicing + Juxtaposing – 3D Small Multiples

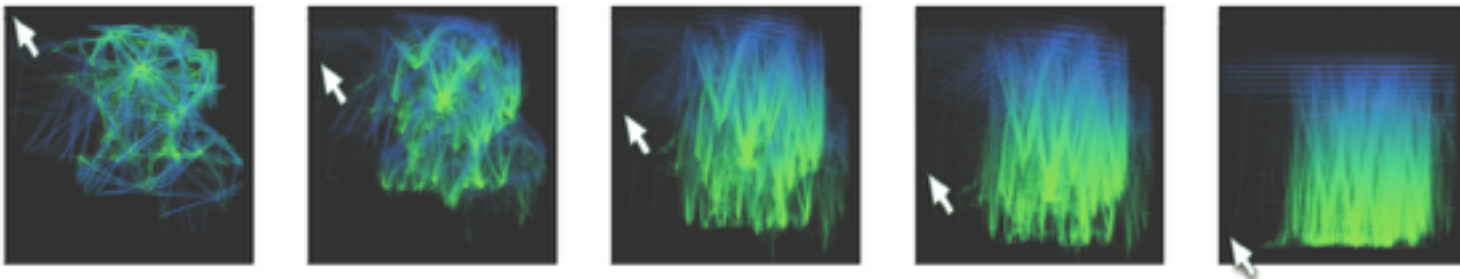


3D + Time

Flattening - FromDaDy



[Hurter et al, 2009](#)



3D + Time

Slicing & Flattening - Peter Jansen's Sculptures



Time Visualization

What's Missing?

Animations

Animation

Animation

- **Static Visual Content**
 - **Visual content that is fixed over time**

Animation

- **Static Visual Content**
 - **Visual content that is fixed over time**
- **Dynamic Visual Content**
 - **Visual content that changes over time**

Animation

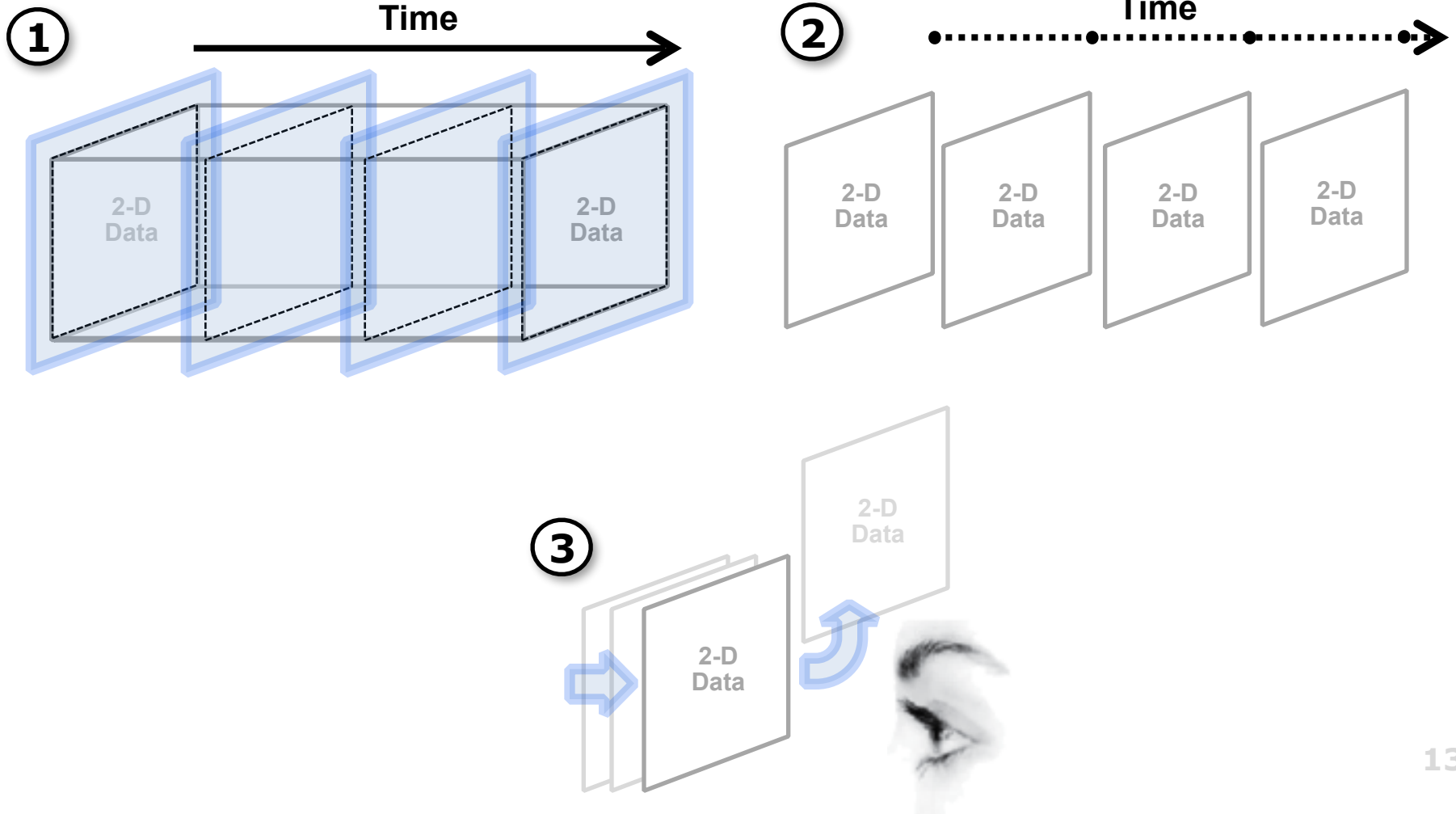
- **Static Visual Content**
 - Visual content that is fixed over time
- **Dynamic Visual Content**
 - Visual content that changes over time
- **Interactive Visual Content**
 - Visual content that changes over time
 - Under the user's influence

Animation

- **Static Visual Content**
 - Visual content that is fixed over time
- **Dynamic Visual Content**
 - Visual content that changes over time
- **Interactive Visual Content**
 - Visual content that changes over time
 - Under the user's influence
- **Animation**
 - Visual content that changes over time
 - Outside the user's influence

2D + Time

Animated Time Cutting



2D + Time

Movies and Cartoons



Eadweard J. Muybridge, 1879

2D + Time

Zoopraxiscope



[\(image source\)](#)



[\(image source\)](#)

Eadweard J. Muybridge, 1879

2D + Time

Animation – Gap Minder



[\(image source\)](#)

2D + Time

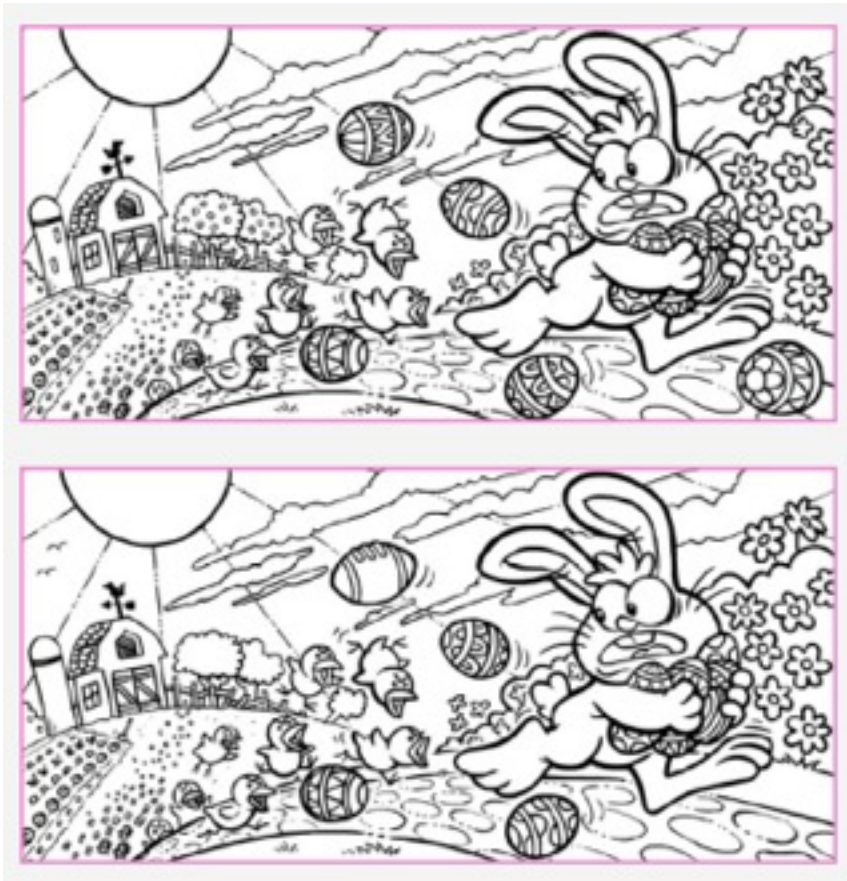
Animation – Gap Minder



[\(video source\)](#)

2D + Time

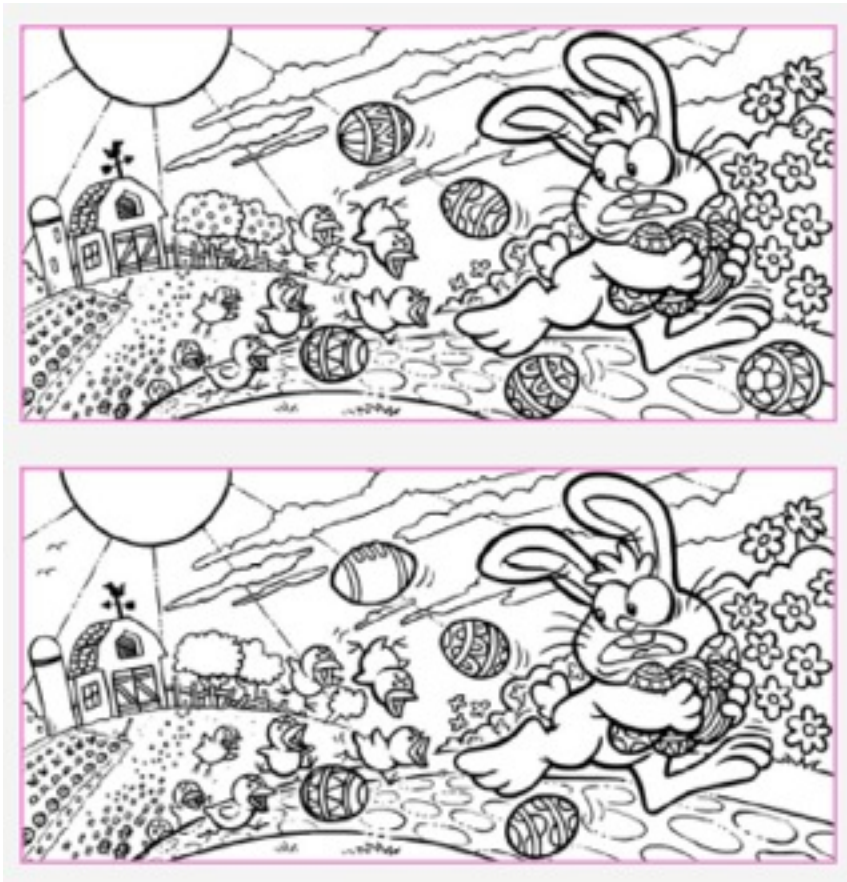
Animation vs. Other Approaches



[\(image source\)](#)

2D + Time

Animation vs. Other Approaches

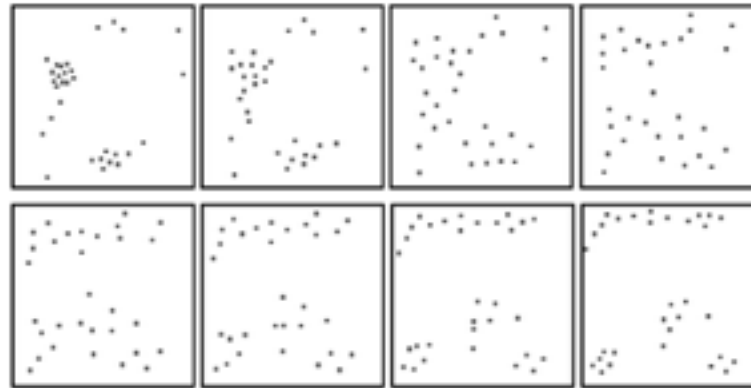


[\(image source\)](#)

2D + Time

Animation vs. Other Approaches

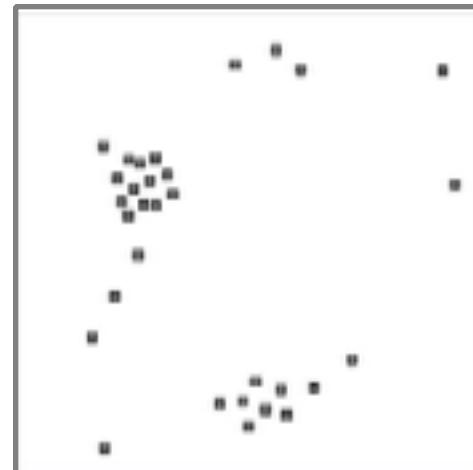
Small Multiples



Trails (Coloring + Flattening)

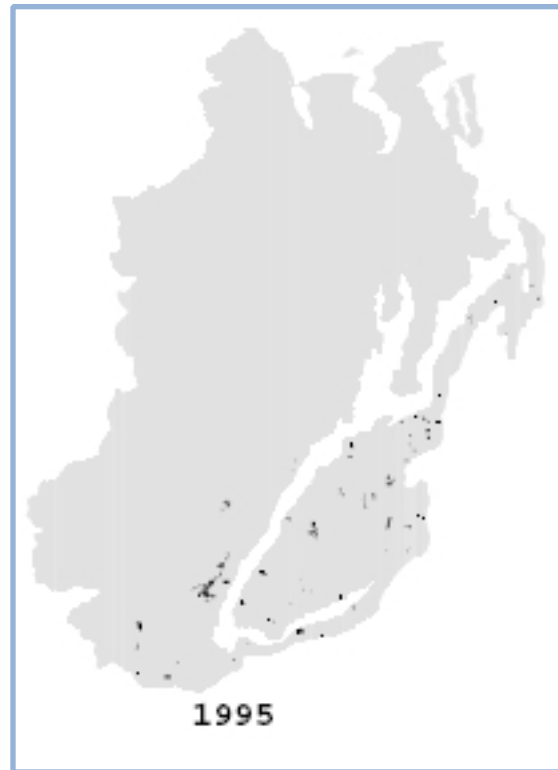


Animation



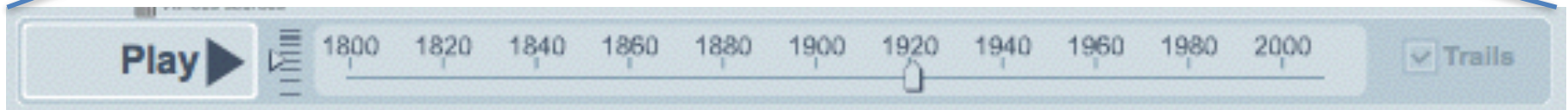
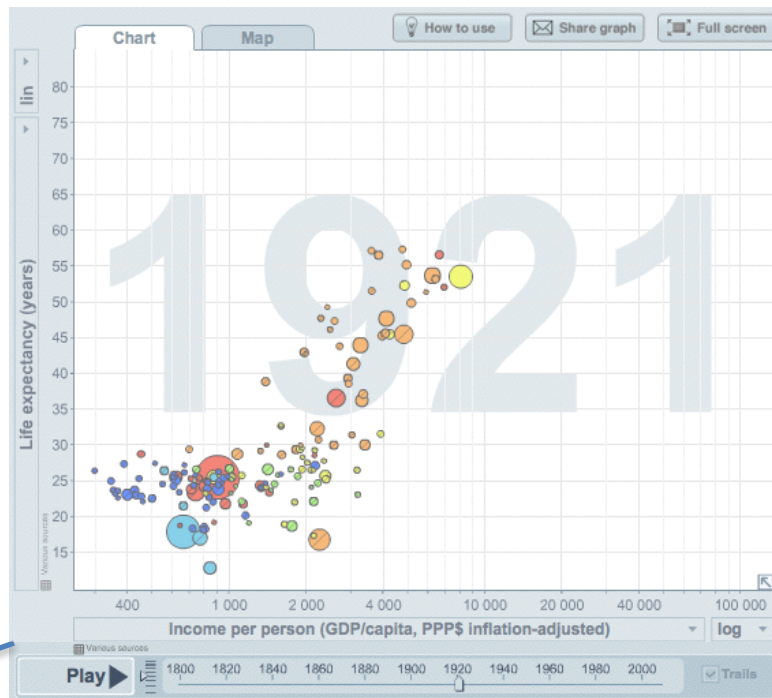
2D + Time

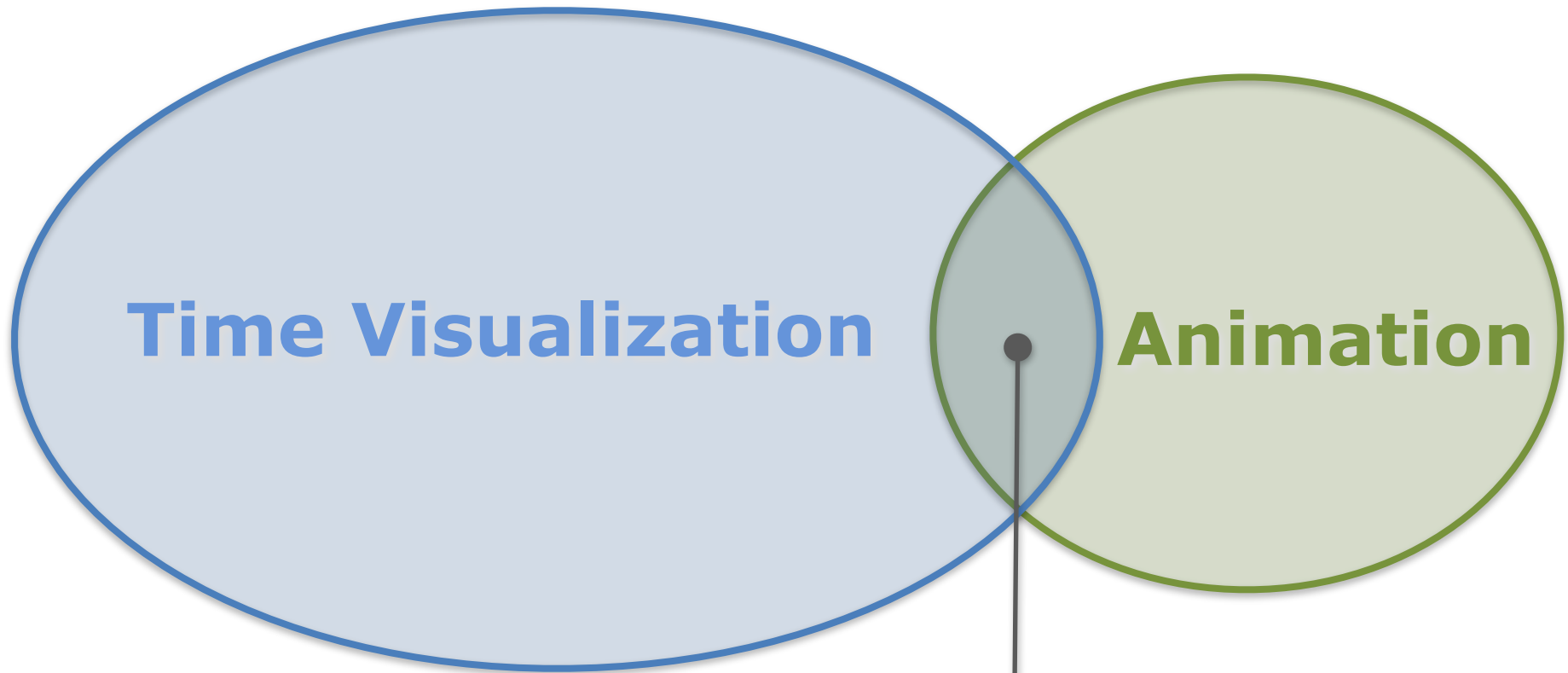
Animation vs. Other Approaches



2D + Time

Time Slider – GapMinder





Time Visualization

Animation

**Animations for
conveying time-
evolving data**

Animations

- **For conveying time-evolving data**

Animations

- **For conveying time-evolving data**
- **For capturing users' attention**
- **As an information channel**
- **For explaining transitions**

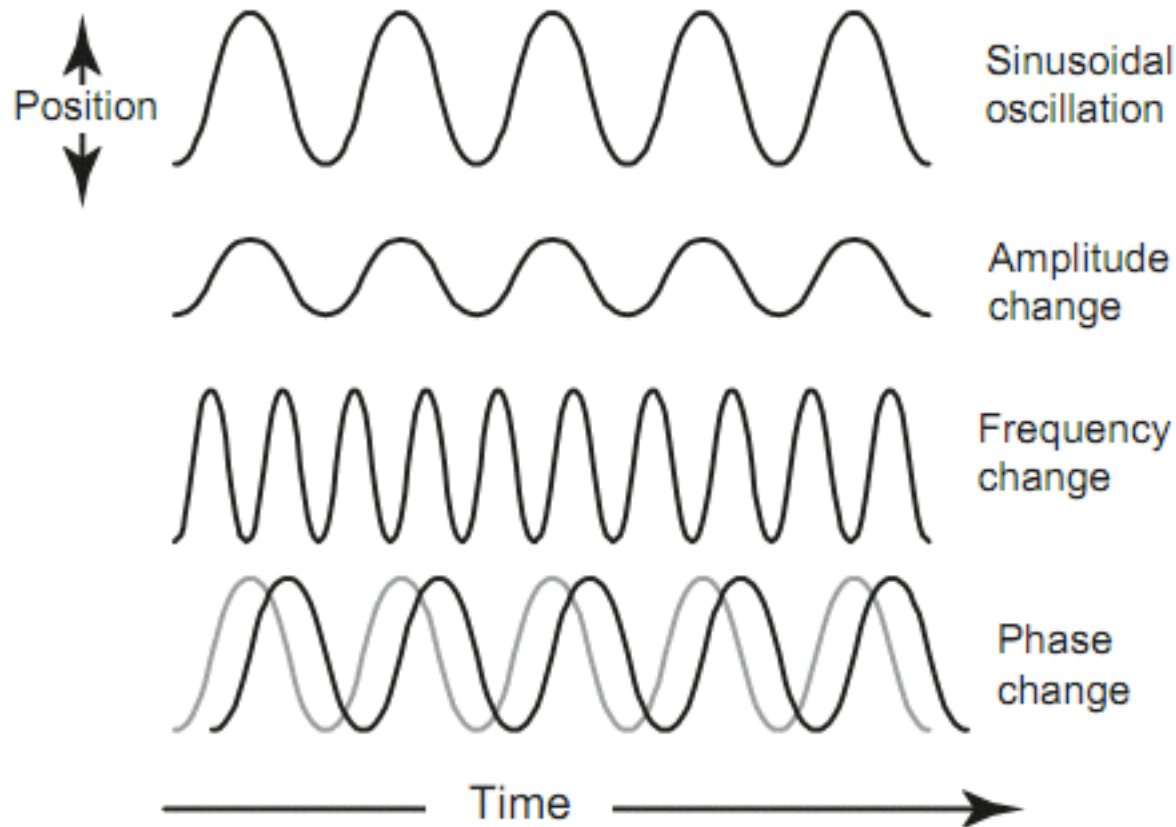
Stopped here.

Animations

- For conveying time-evolving data
- For capturing users' attention
- As an information channel
- For explaining transitions

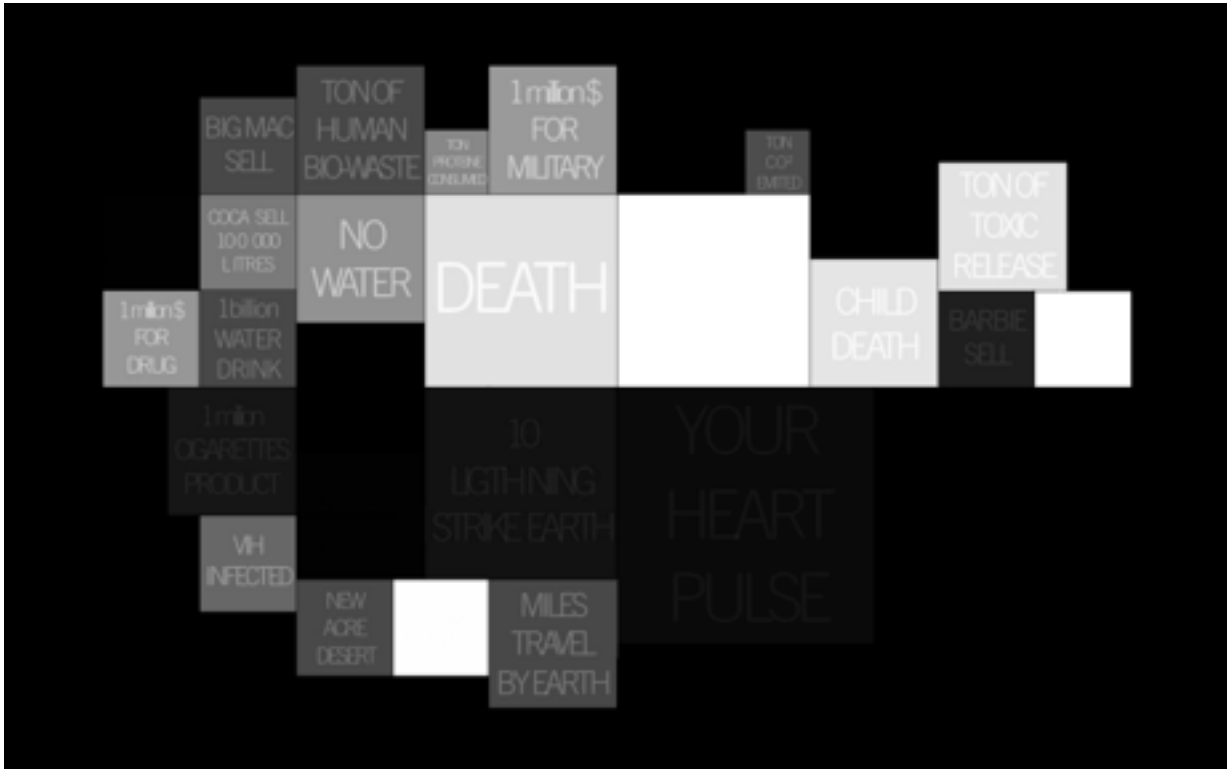
Animations

Motion primitives as visual variables



Animations

Rhythm as a visual variable



[LINK](#)

Animations

- For conveying time-evolving data
- For capturing users' attention
- As an information channel
- For explaining transitions

Animated Transitions

Change Blindness Demo



Animated Transitions

Change Blindness Demo



Animated Transitions

Change Blindness Demo – Try again



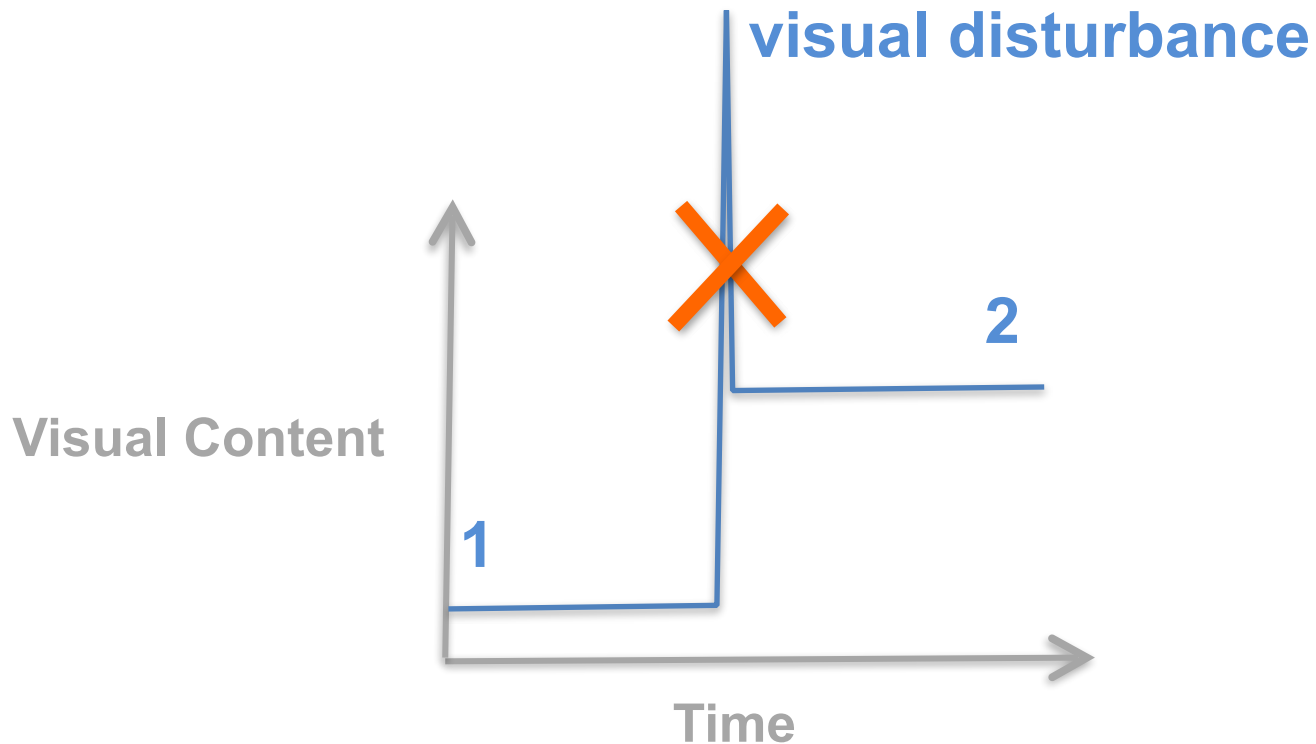
Animated Transitions

Change Blindness Demo – Try again



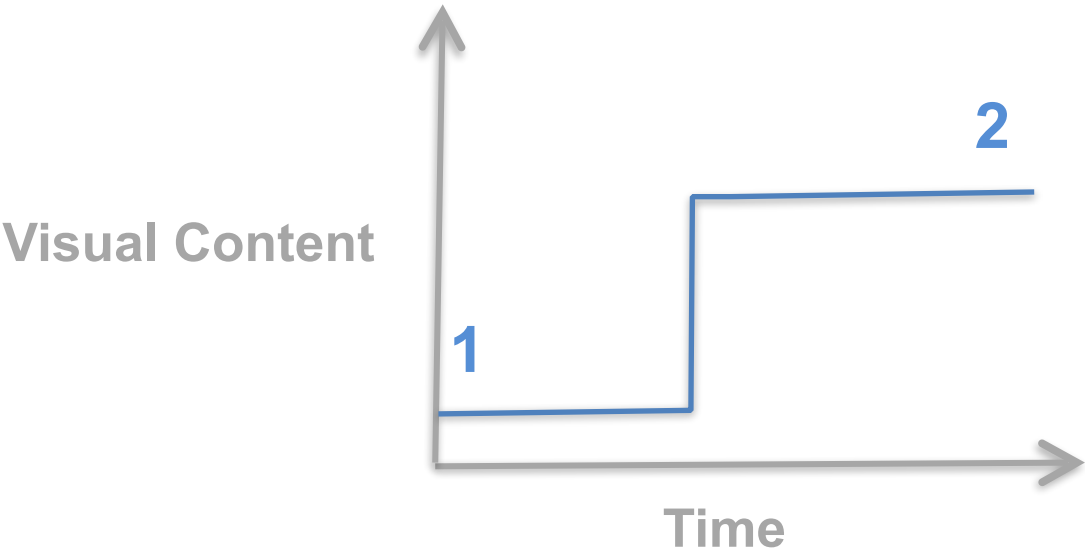
Animated Transitions

Understanding Visual Transitions



Animated Transitions

Understanding Visual Transitions



Animated Transitions

How many words were inserted?

Hervey de Saint Denys has recently started to be known for his introspective studies on dreams. He wrote down his dreams on a daily basis from the age of 13. In 1867, he anonymously published *Les rêves et les moyens de les diriger* (Dreams and the Ways to Direct Them). In this book, he proposed techniques to control dreams, and he described dreams in which the "dreamer is perfectly aware he is dreaming". This particular state of consciousness later came to be called lucid dreaming.

Animated Transitions

How many words were inserted? Try Again

Hervey de Saint Denys has recently started to be known for his introspective studies on dreams. He wrote down his dreams on a daily basis from the age of 13. In 1867, he anonymously published *Les rêves et les moyens de les diriger* (Dreams and the Ways to Direct Them). In this book, he proposed techniques to control dreams, and he described dreams in which the "dreamer is perfectly aware he is dreaming". This particular state of consciousness later came to be called lucid dreaming.

Animated Transitions

What has changed?

Hervey de Saint Denys devoted himself to the study of Chinese, and in 1851 published his *Recherches sur l'agriculture et l'horticulture des Chinois*, in which he dealt with the plants and animals that might be acclimatized in the West. He translated Chinese texts as well as some Chinese stories not of classical interest but valuable for the light they throw on oriental custom. He also translated some works from the Spanish, and wrote a history of the Spanish drama.

Hervey de Saint Denys has recently started to be known for his introspective studies on dreams. He wrote down his dreams on a daily basis from the age of 13. In 1867, he anonymously published *Les rêves et les moyens de les diriger; observations pratiques* (Dreams and the Ways to Direct Them: Practical Observations). In

Animated Transitions

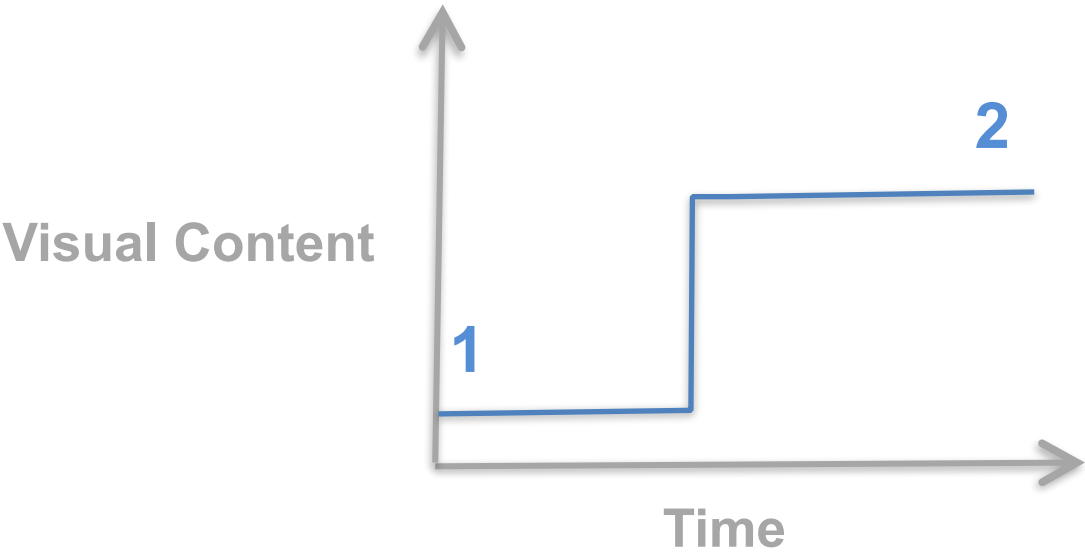
What has changed? Try Again

Hervey de Saint Denys devoted himself to the study of Chinese, and in 1851 published his *Recherches sur l'agriculture et l'horticulture des Chinois*, in which he dealt with the plants and animals that might be acclimatized in the West. He translated Chinese texts as well as some Chinese stories not of classical interest but valuable for the light they throw on oriental custom. He also translated some works from the Spanish, and wrote a history of the Spanish drama.

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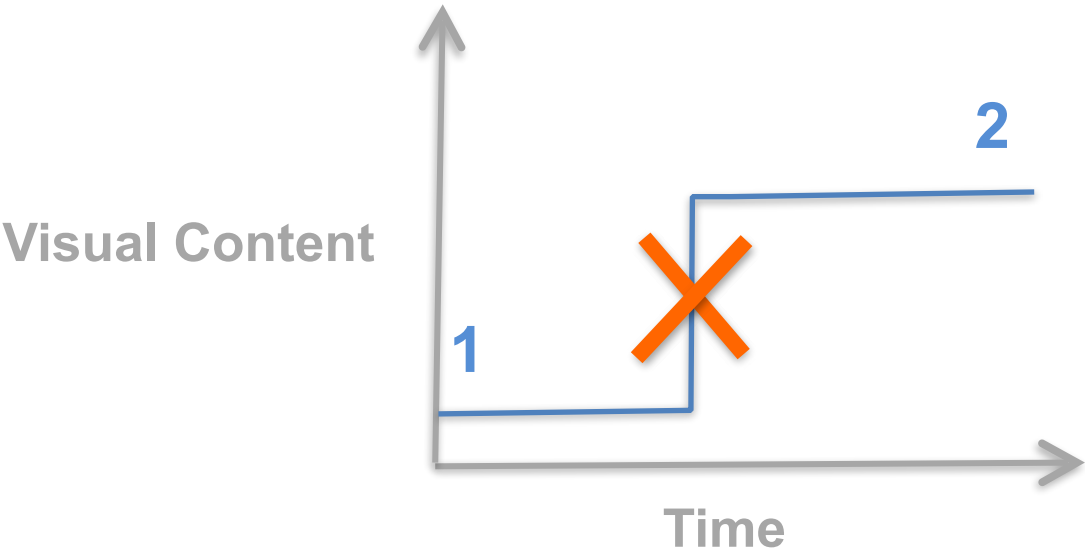
Animated Transitions

Understanding Visual Transitions



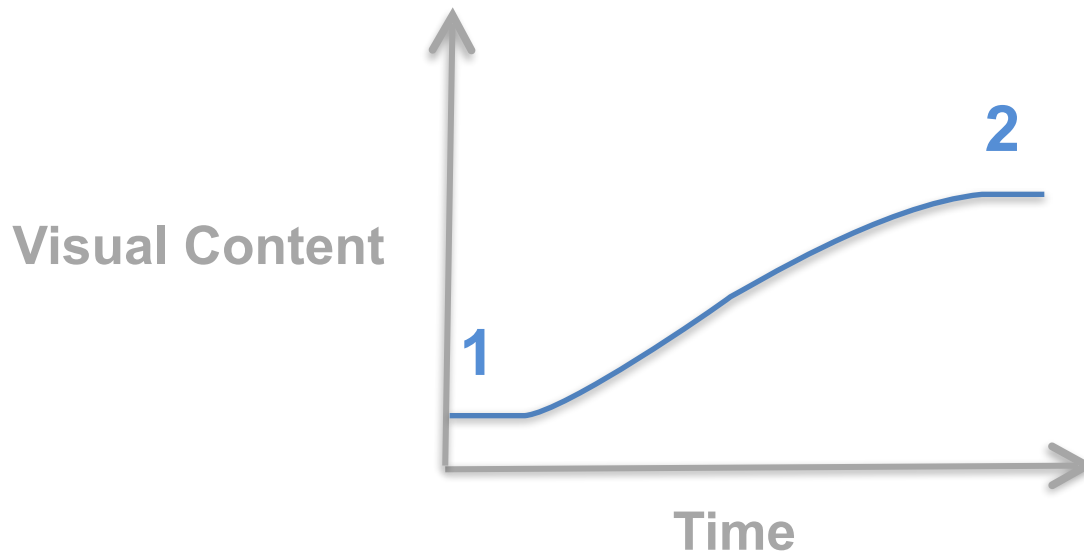
Animated Transitions

Understanding Visual Transitions



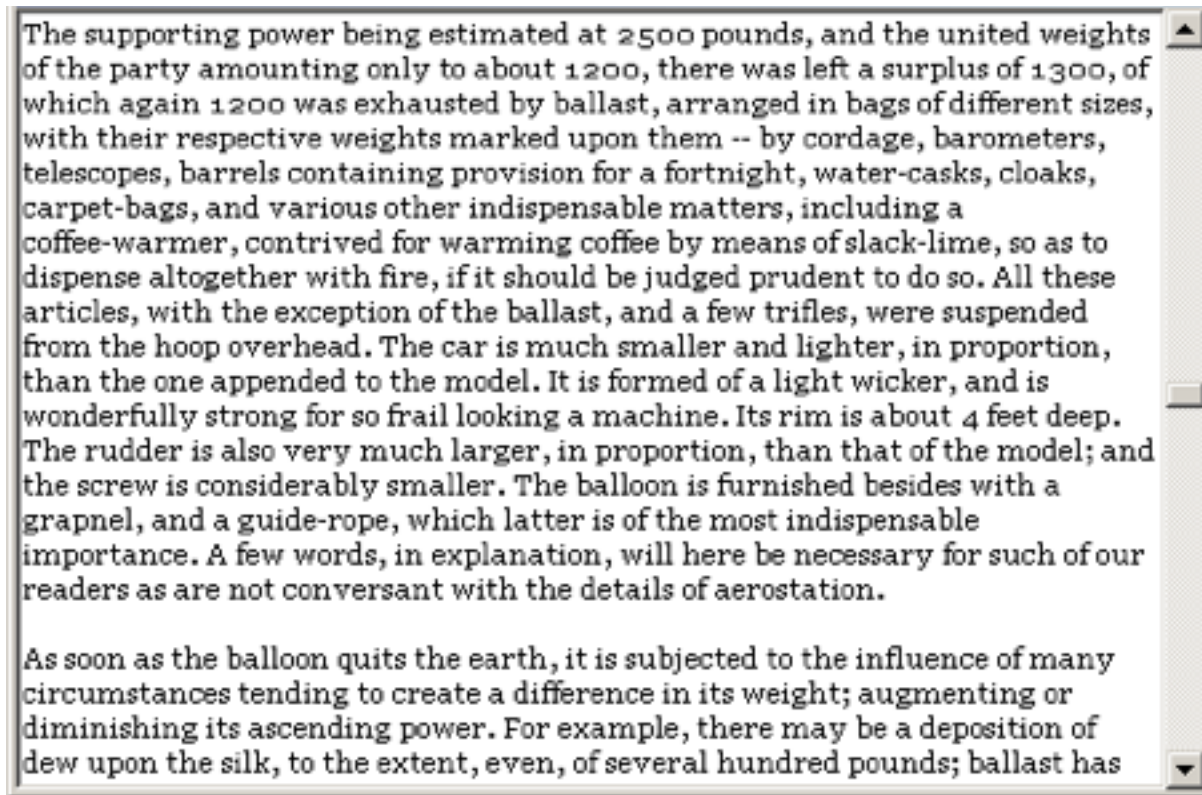
Animated Transitions

Understanding Visual Transitions



Animated Transitions

Help when scrolling documents



[Klein & Bederson, 2005](#)

Animated Transitions

Help when panning and zooming



[Shanmugasundaram & Irani, 2008](#)

Animated Transitions

Help when navigating document revisions

Revision history of User interface

From Wikipedia, the free encyclopedia

[View logs for this page](#)

Browse history

From year (and earlier): From month (and earlier): Tag filter:

For any version listed below, click on its date to view it. For more help, see [Help:Page history](#) and [Help:Edit summary](#).

External tools: [Revision history statistics](#) • [Revision history search](#) • [Number of watchers](#) • [Page view statistics](#)

(cur) = difference from current version, (prev) = difference from preceding version,

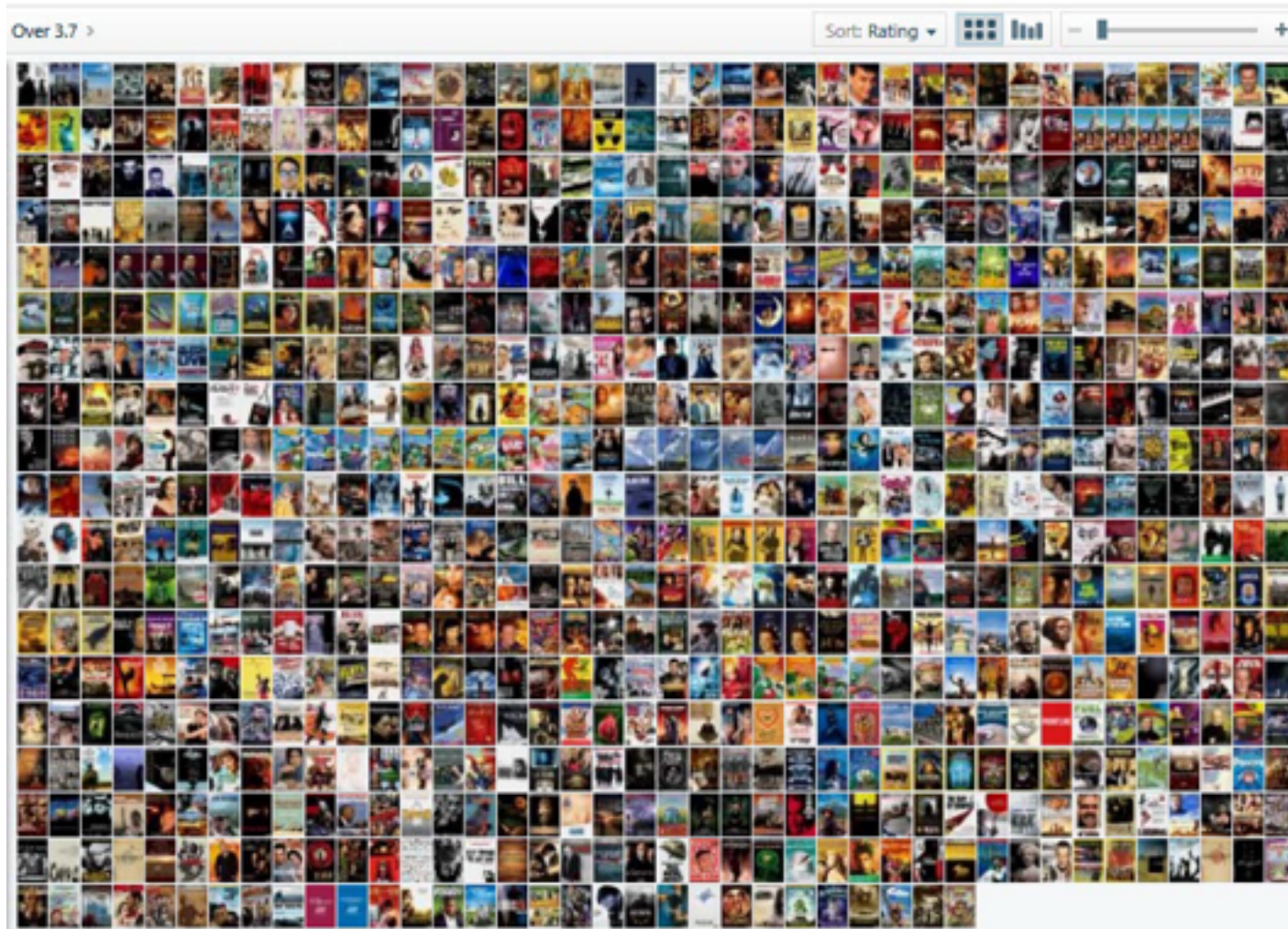
m = minor edit, **→** = section edit, **←** = automatic edit summary

(latest | earliest) View (newer 50 | older 50) (20 | 50 | 100 | 250 | 500)

- (cur) (prev) 21:05, 6 December 2009 94.74.138.66 (talk) (16,058 bytes) (undo)
- (cur) (prev) 19:15, 17 November 2009 72.48.156.2 (talk) (16,056 bytes) (→Introduction) (undo)
- (cur) (prev) 11:33, 17 November 2009 192.248.16.90 (talk) (15,551 bytes) (→See also) (undo)
- (cur) (prev) 22:06, 9 November 2009 The Thing That Should Not Be (talk | contribs) **m** (15,522 bytes) (Reverted edits by 189.72.213.11 (talk) to last revision by ClueBot (Report Mistake) (HG)) (undo)
- (cur) (prev) 22:06, 9 November 2009 189.72.213.11 (talk) (15,764 bytes) (→Usability) (undo)
- (cur) (prev) 11:24, 9 November 2009 ClueBot (talk | contribs) **m** (15,522 bytes) (Reverting possible vandalism by 41.220.224.134 to version by Lester. False positive? Report it. Thanks, ClueBot. (819644) (Bot)) (undo)
- (cur) (prev) 11:24, 9 November 2009 41.220.224.134 (talk) (15,405 bytes) (←) (undo)

Animated Transitions

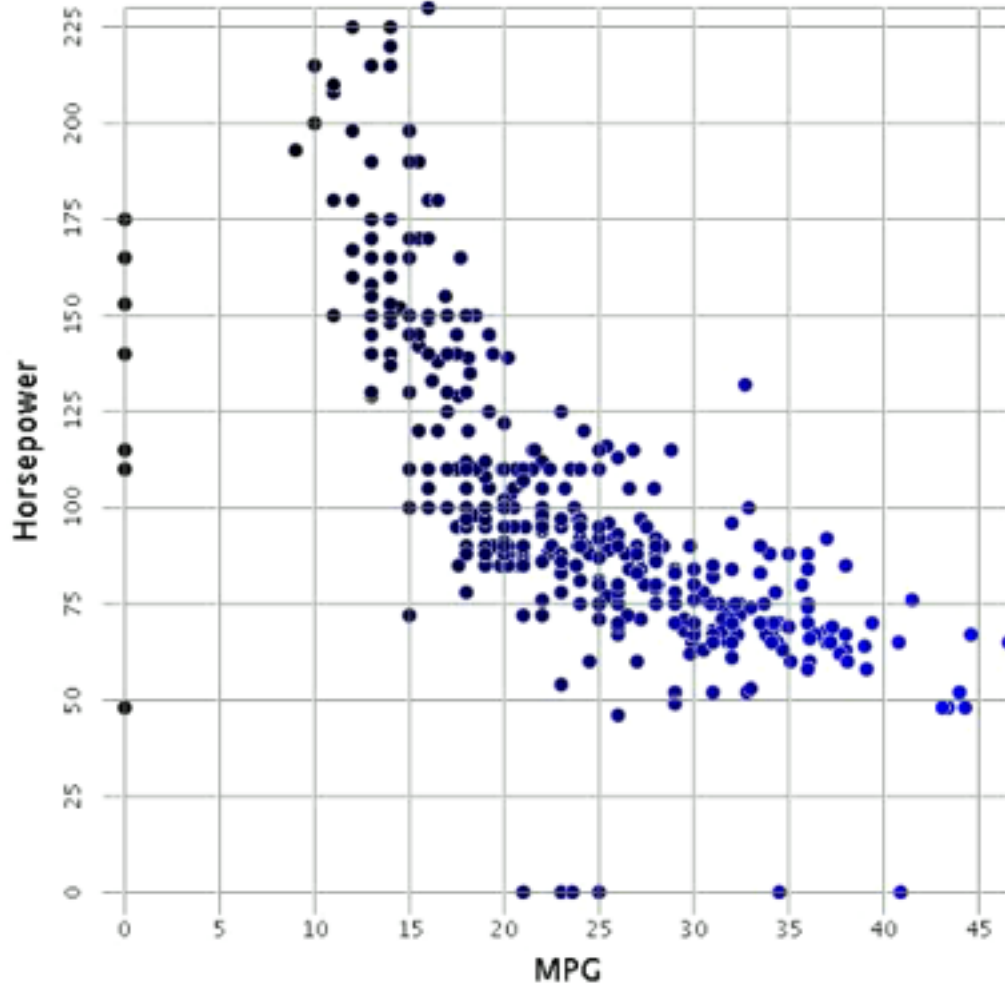
In faceted browsing - Pivot



[Microsoft
Pivot](#)

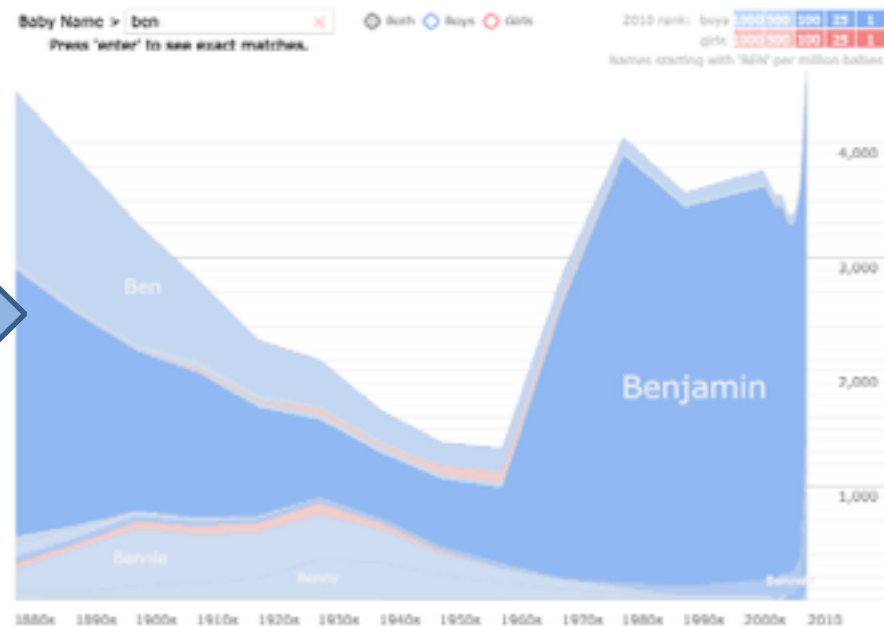
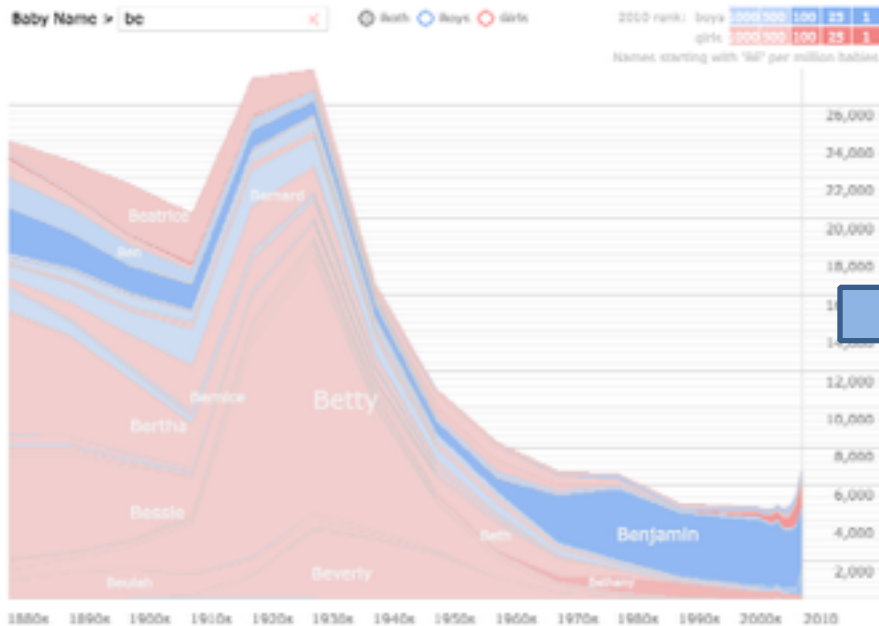
Animated Transitions

In multidimensional exploration - ScatterDice



Animated Transitions

In charts – Baby Name Voyager



Animated Transitions

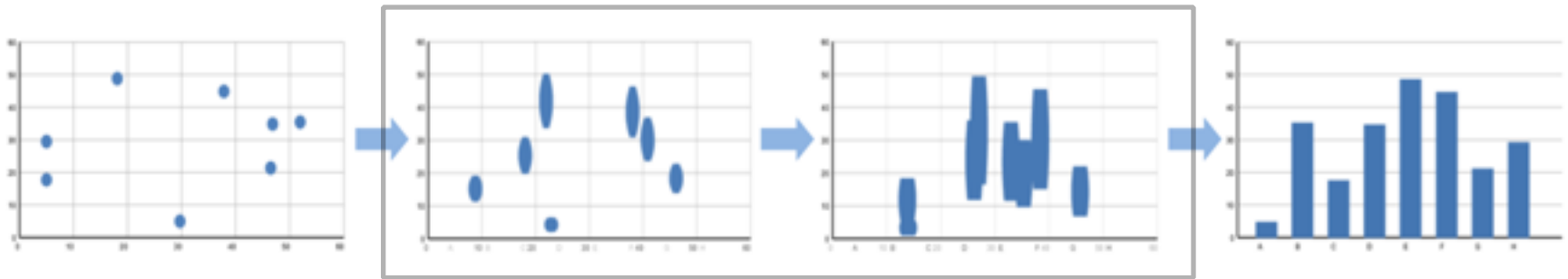
How to design them?

1. **Interpolation problem:** what to show in-between
2. **Pacing problem:** when to show the frames

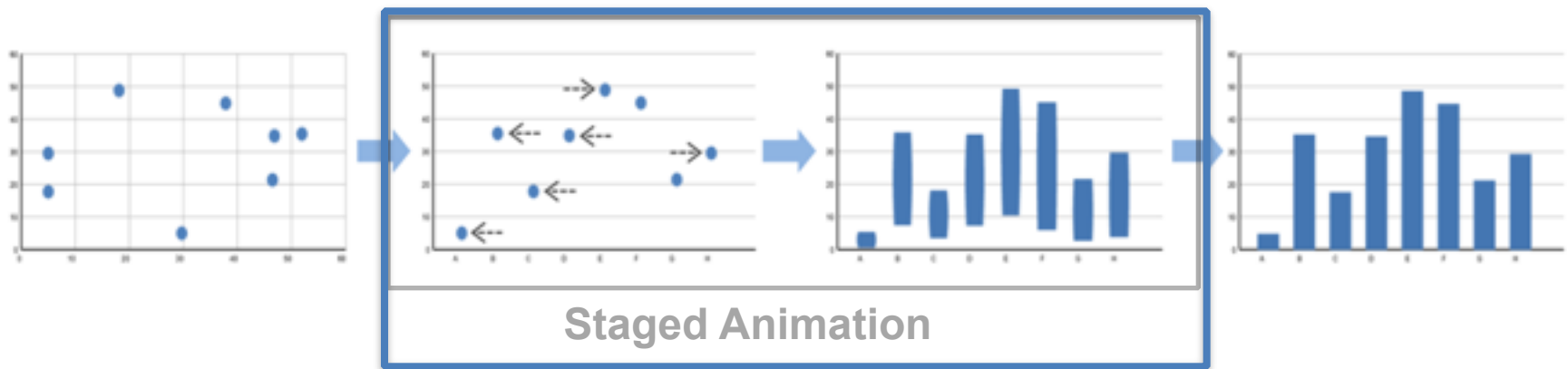


Animated Transitions

How to design them?



Direct Interpolation

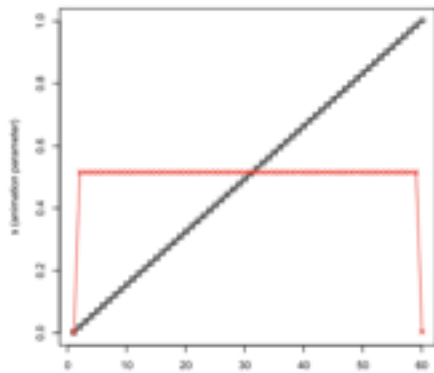


Staged Animation

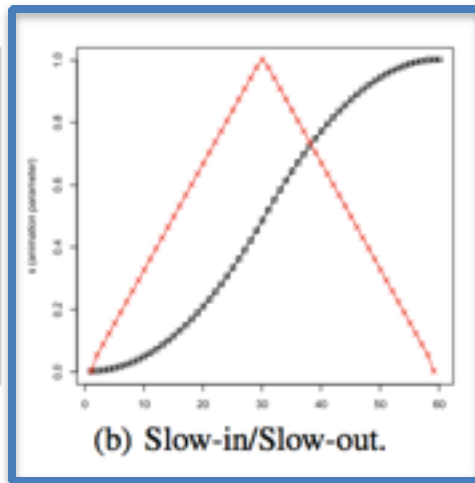
Animated Transitions

How to design them?

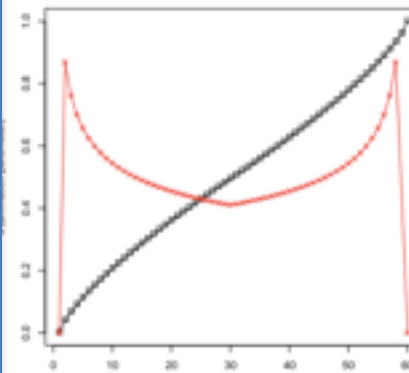
Duration: ~ 1 second



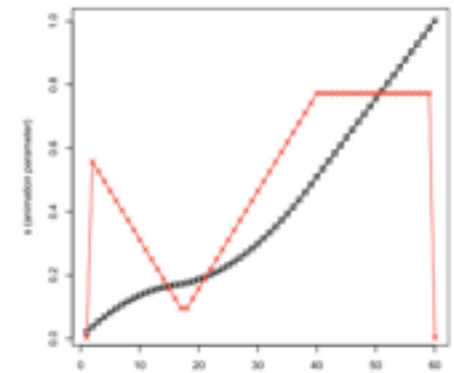
(a) Constant rate.



(b) Slow-in/Slow-out.



(c) Fast-in/Fast-out.



(d) Adaptive rate (frame 18).

Animated Transitions

Use them!

The End.

