



UNIVERSITY OF SAN FRANCISCO
CHANGE THE WORLD FROM HERE

Time Series Visualization

TEMPORAL DATA



Time Series

- Series of values that change over time
- Values usually sampled at regular time intervals
- Examples include temperature, stock market, heart beat monitor, system logs, version history



BASIC TECHNIQUES

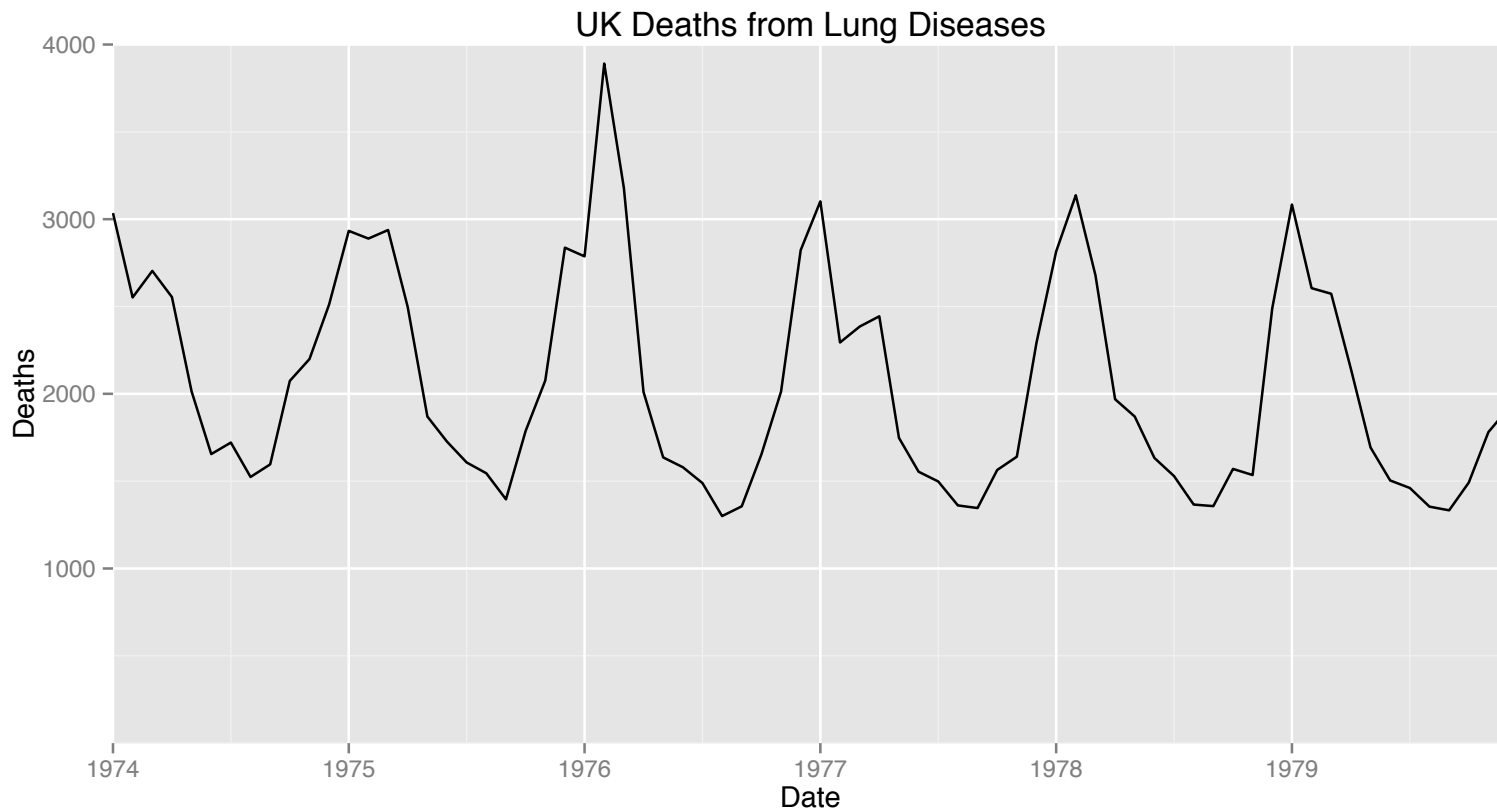
Illustrated in R, ggplot2, and shiny



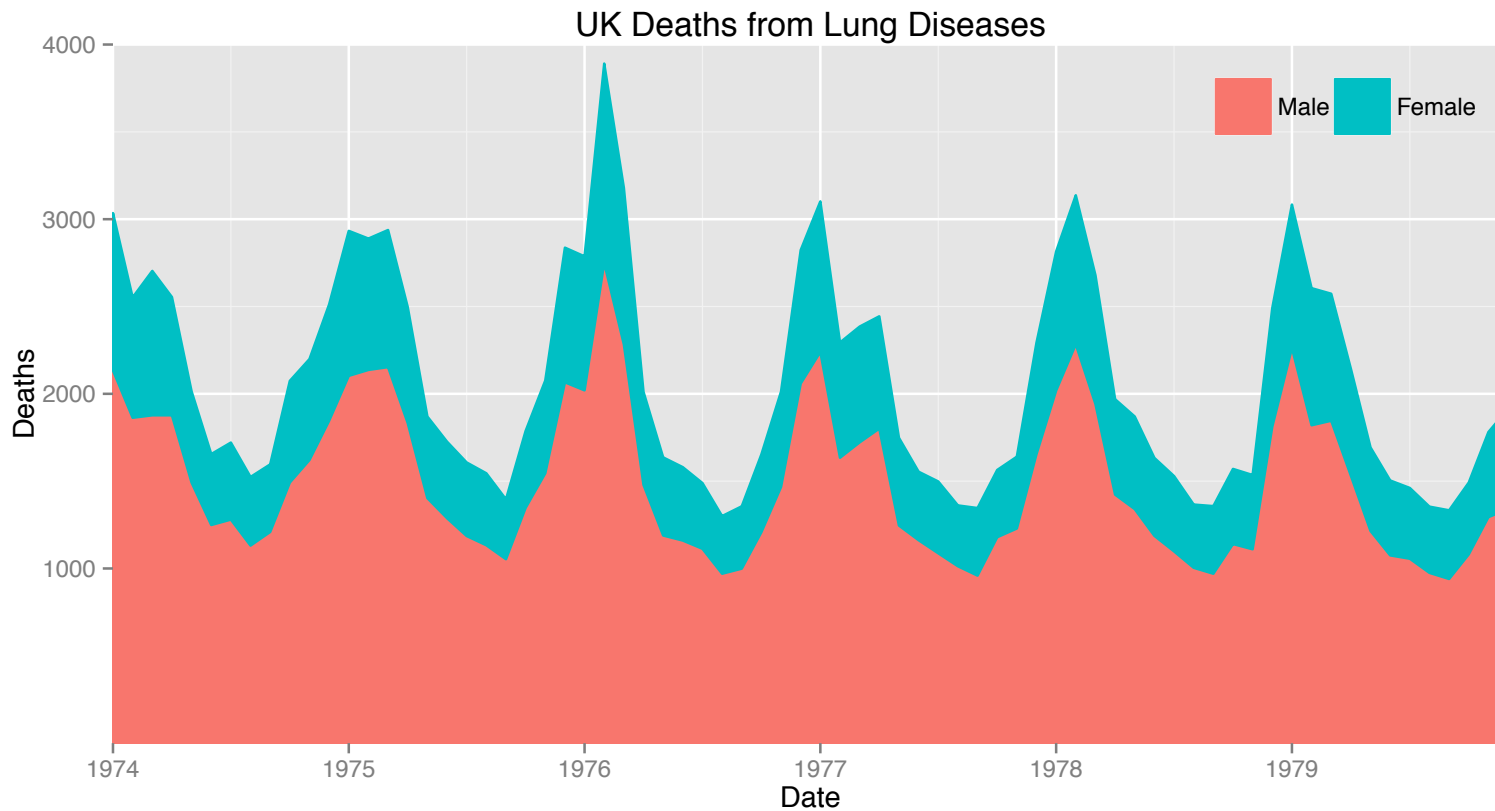
Basic Techniques

- Plot time on x-axis, value on y-axis
 - *e.g. line, bar, area plots*
- Plot two variables on x-axis and y-axis, show time via motion by animating changes over time
 - *e.g. animated bubble plot, geospatial visualizations, linked views*

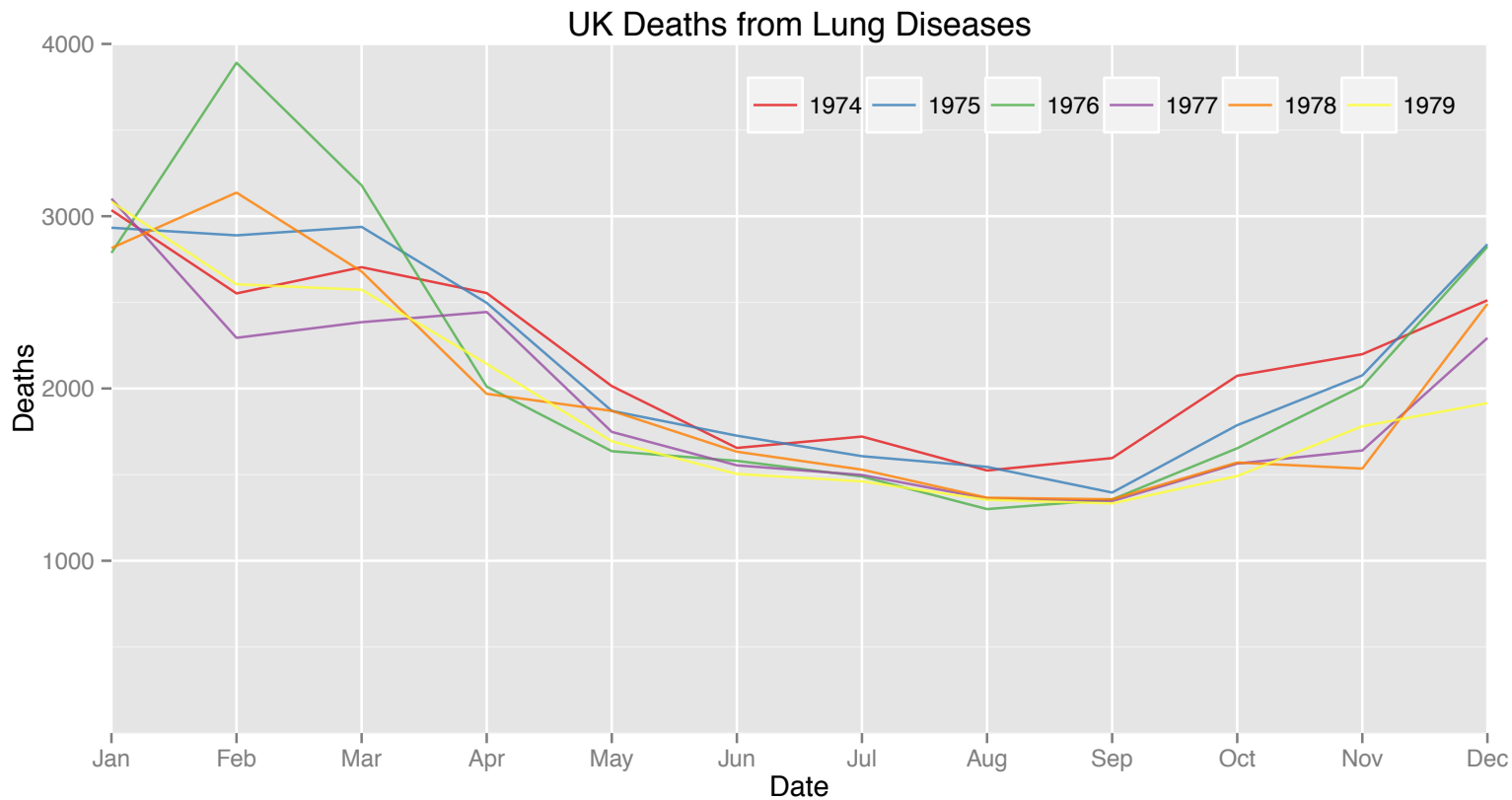




Line Plot

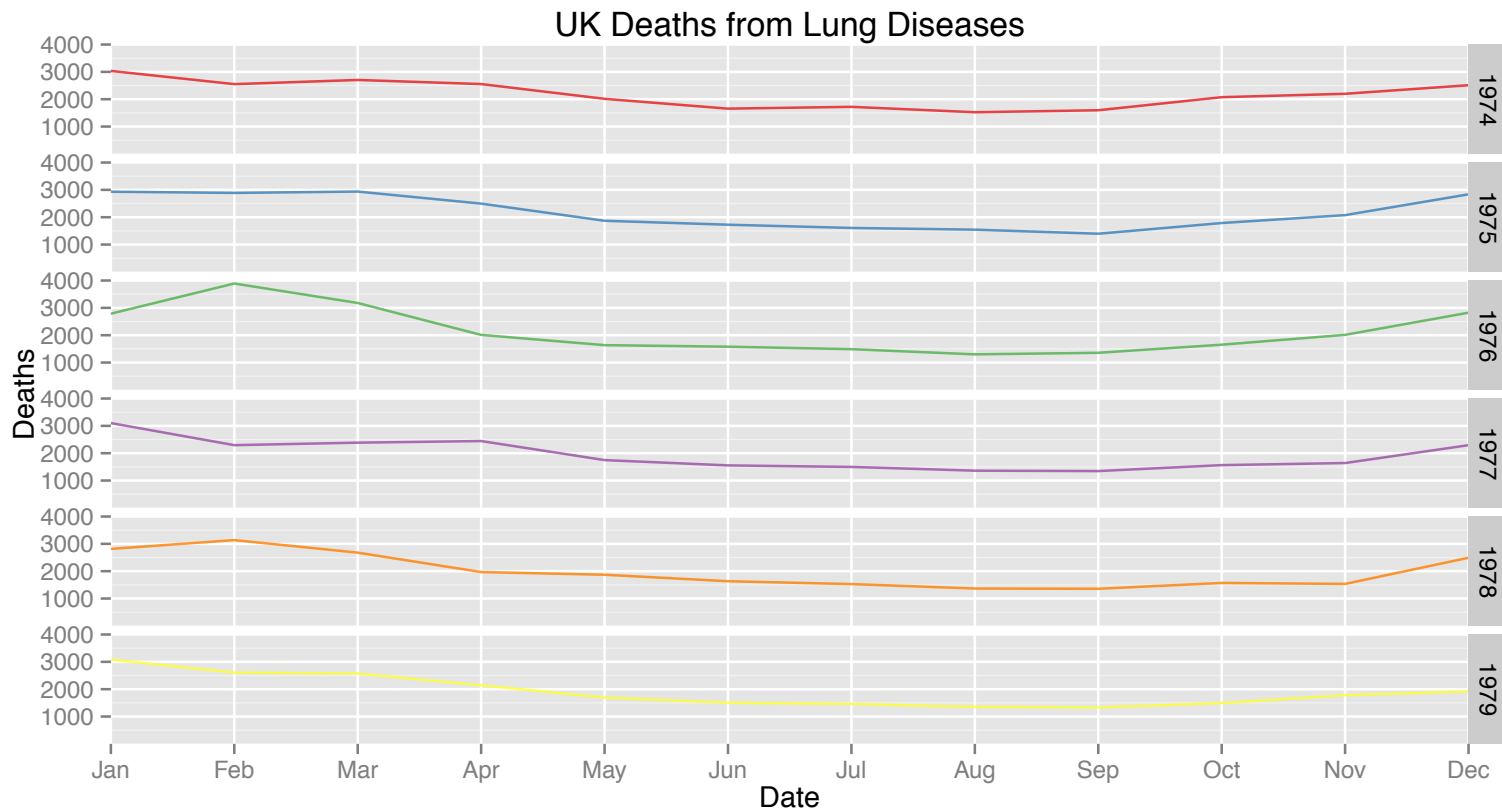


Stacked Area Plot



Multi-Line Plot

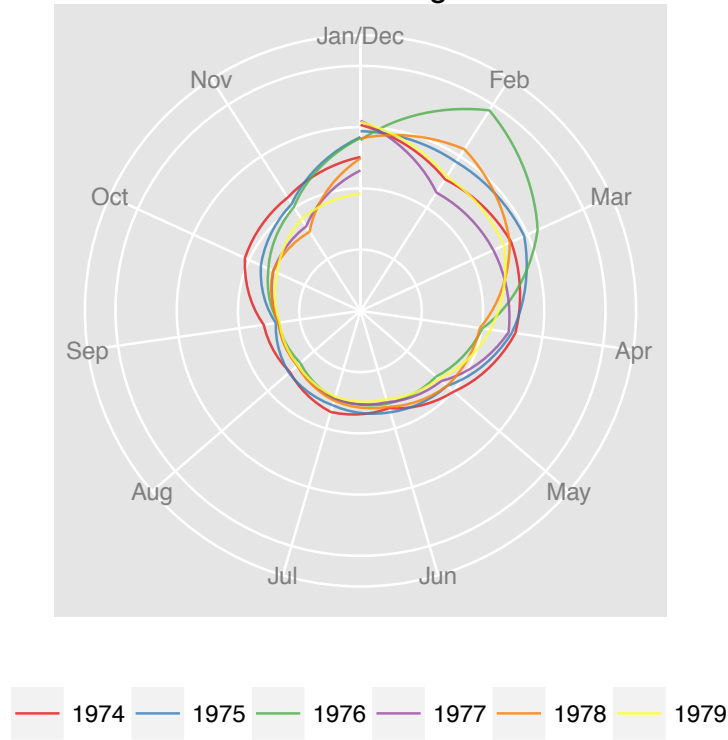




Small Multiples Plot

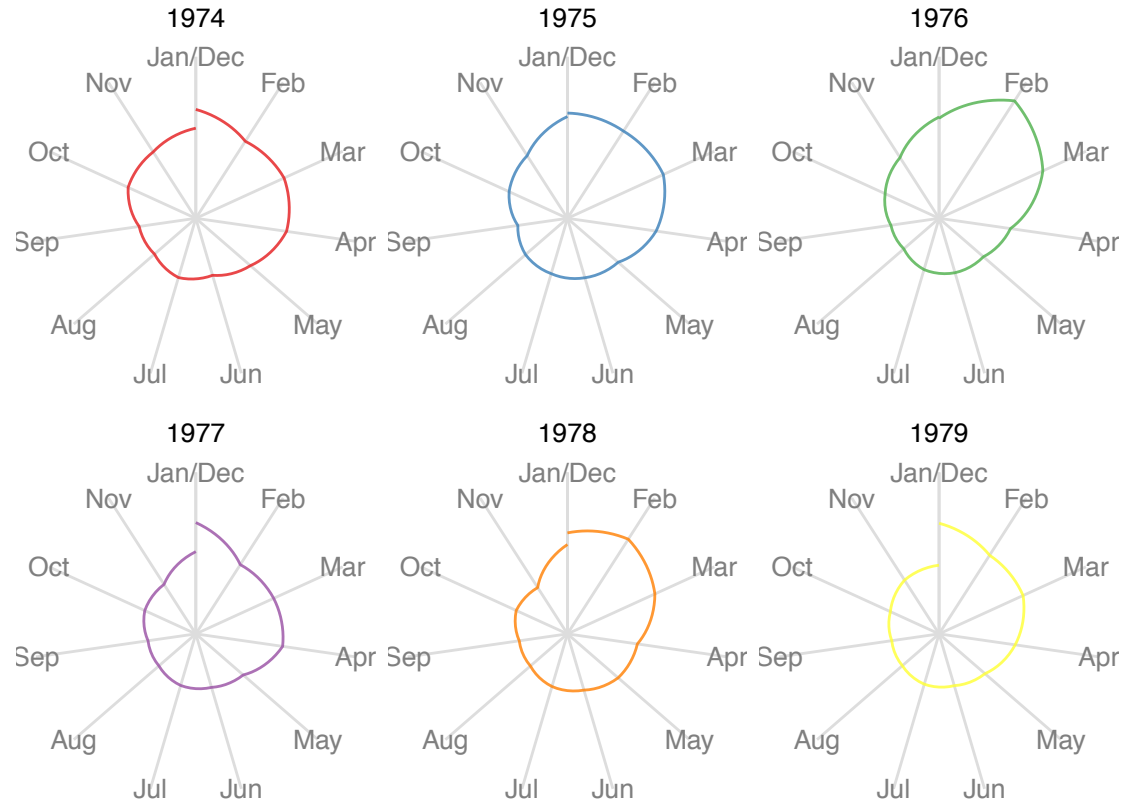


UK Deaths from Lung Diseases

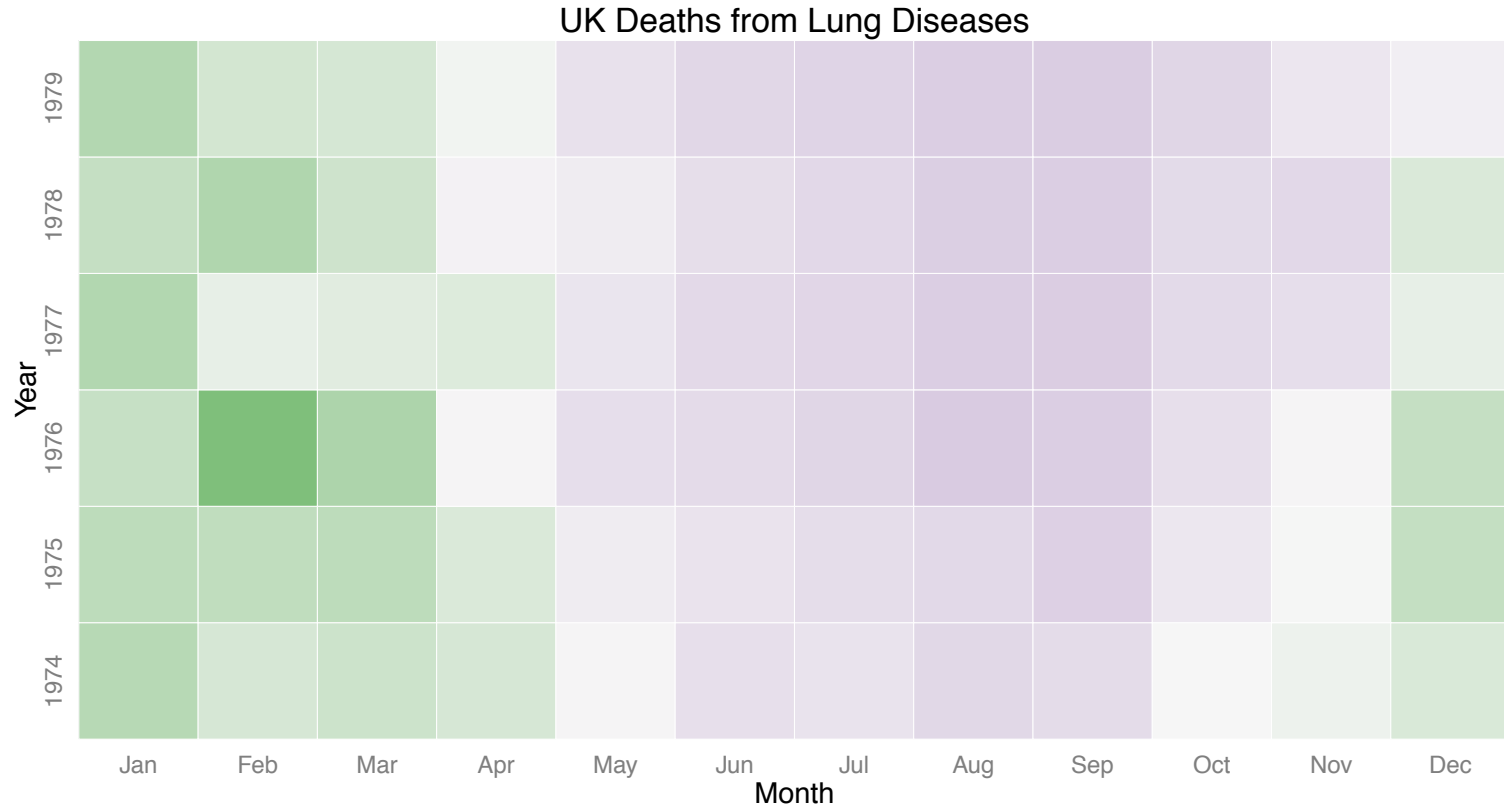


Star Plot*

UK Deaths from Lung Diseases

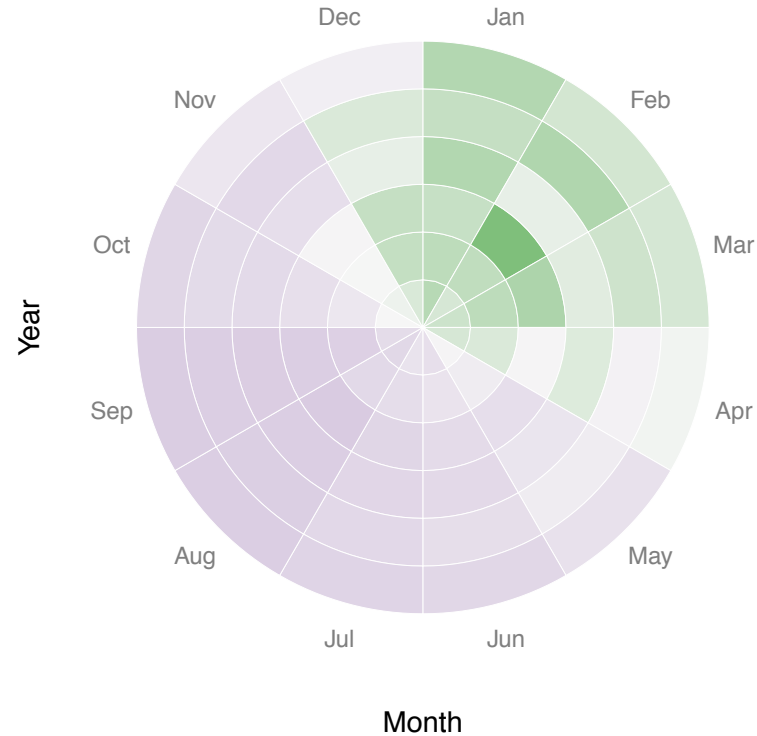


Small Multiple Star Plots*



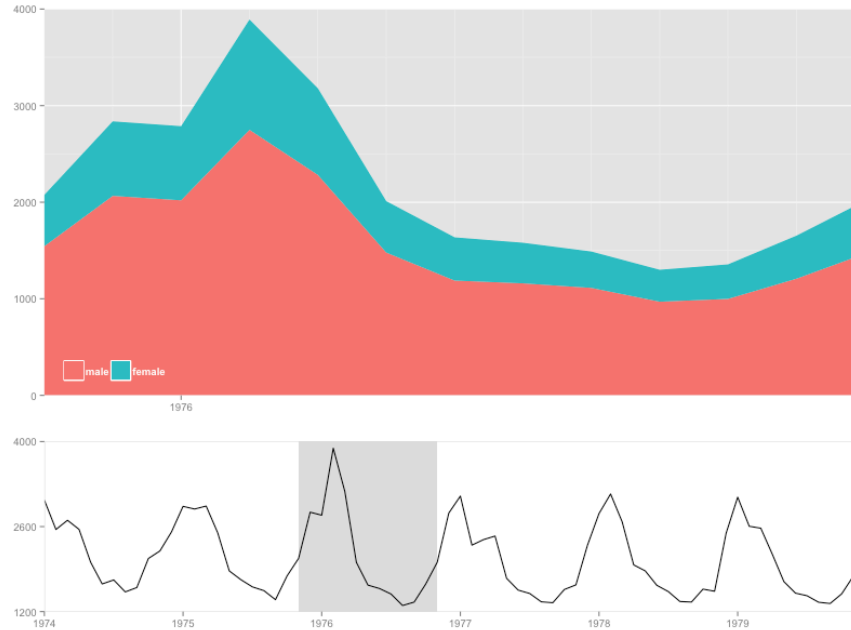
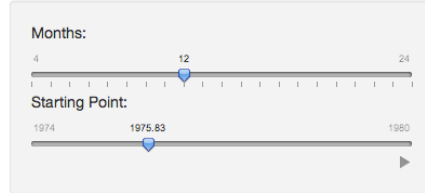
Heatmap

UK Deaths from Lung Diseases



Circle View • <http://dl.acm.org/citation.cfm?doid=989863.989891>

UK Deaths from Lung Diseases



Animated Linked Views

SHOWCASE

Non-Animated Visualizations



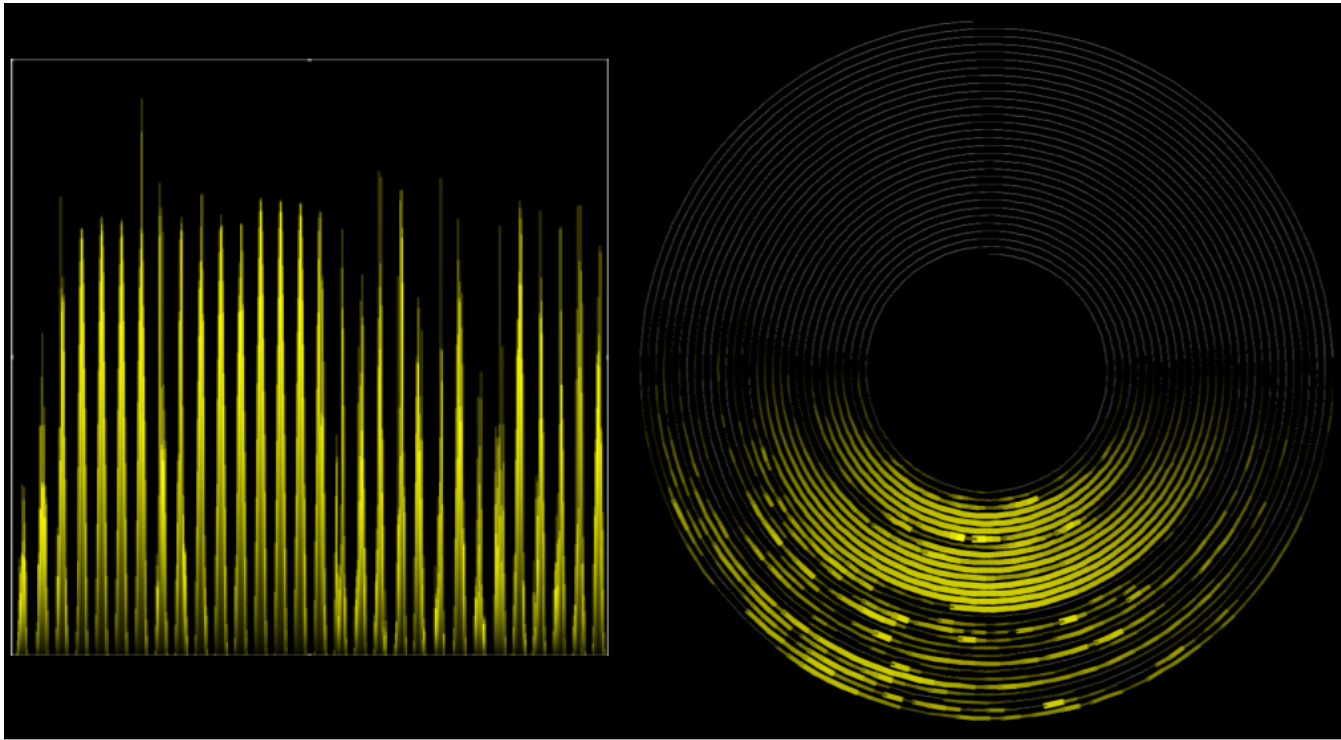


Figure 1: Two visualizations of sunshine intensity using about the same screen real estate and the same color coding scheme. In the spiral visualization it is much easier to compare days, to spot cloudy time periods, or to see events like sunrise and sunset.

Sunshine Intensity • <http://dx.doi.org/10.1109/INFVIS.2001.963273>



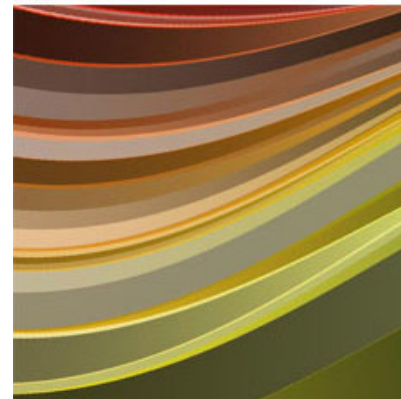
WINTER



SPRING



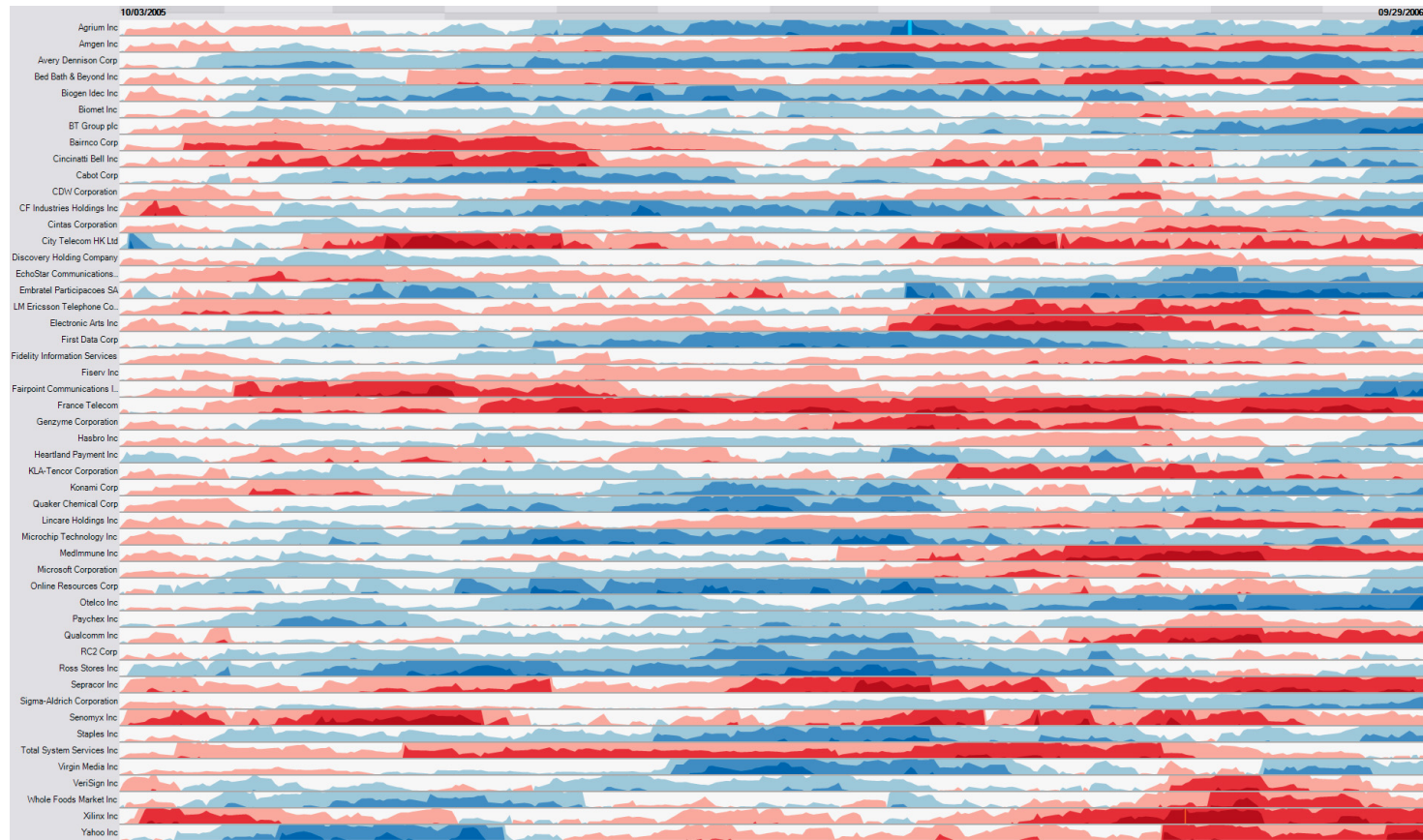
FALL



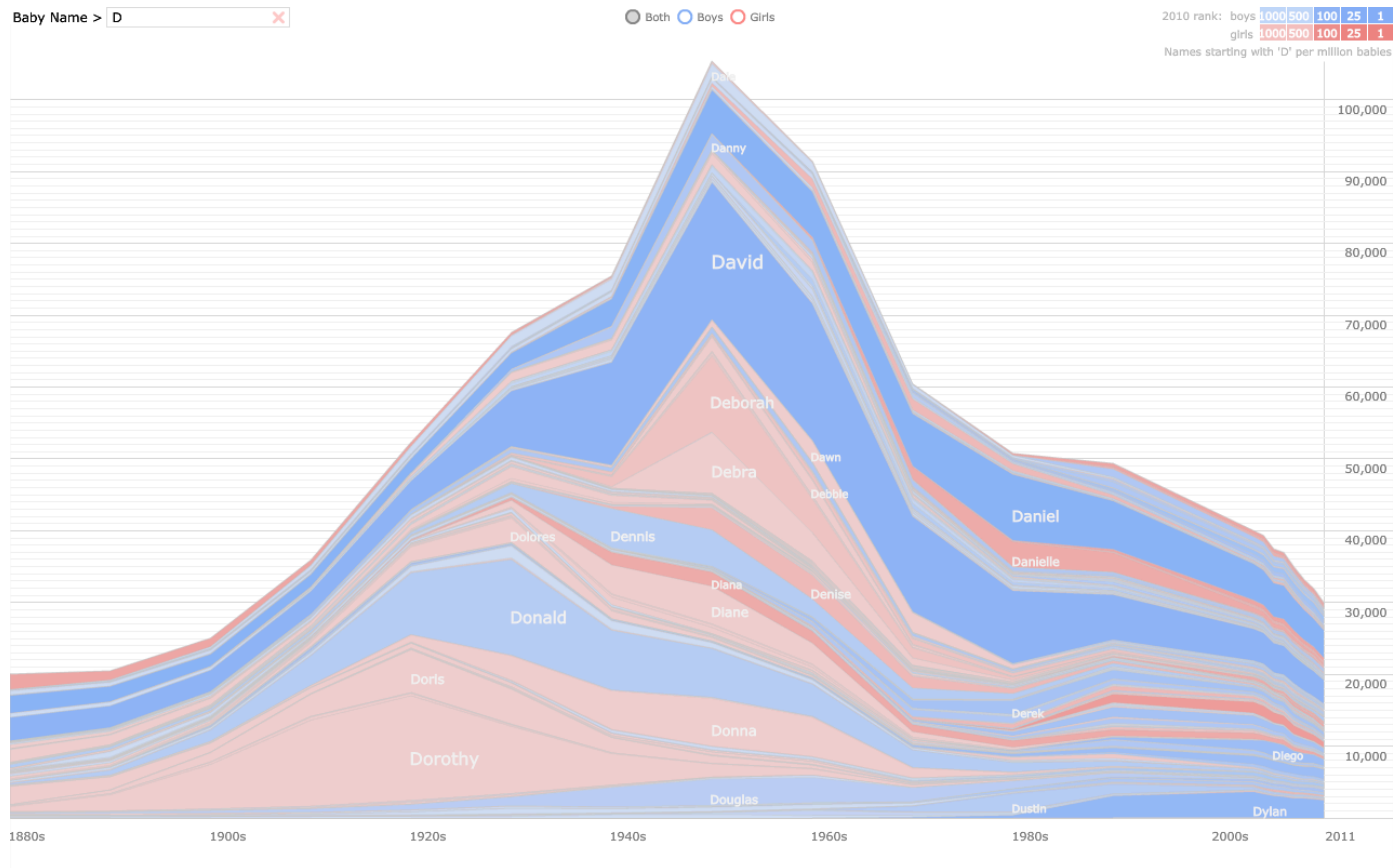
SUMMER



Flickr Flow • <http://hint.fm/projects/flickr/>



Horizon Graph • <http://www.perceptualedge.com/blog/?p=390>

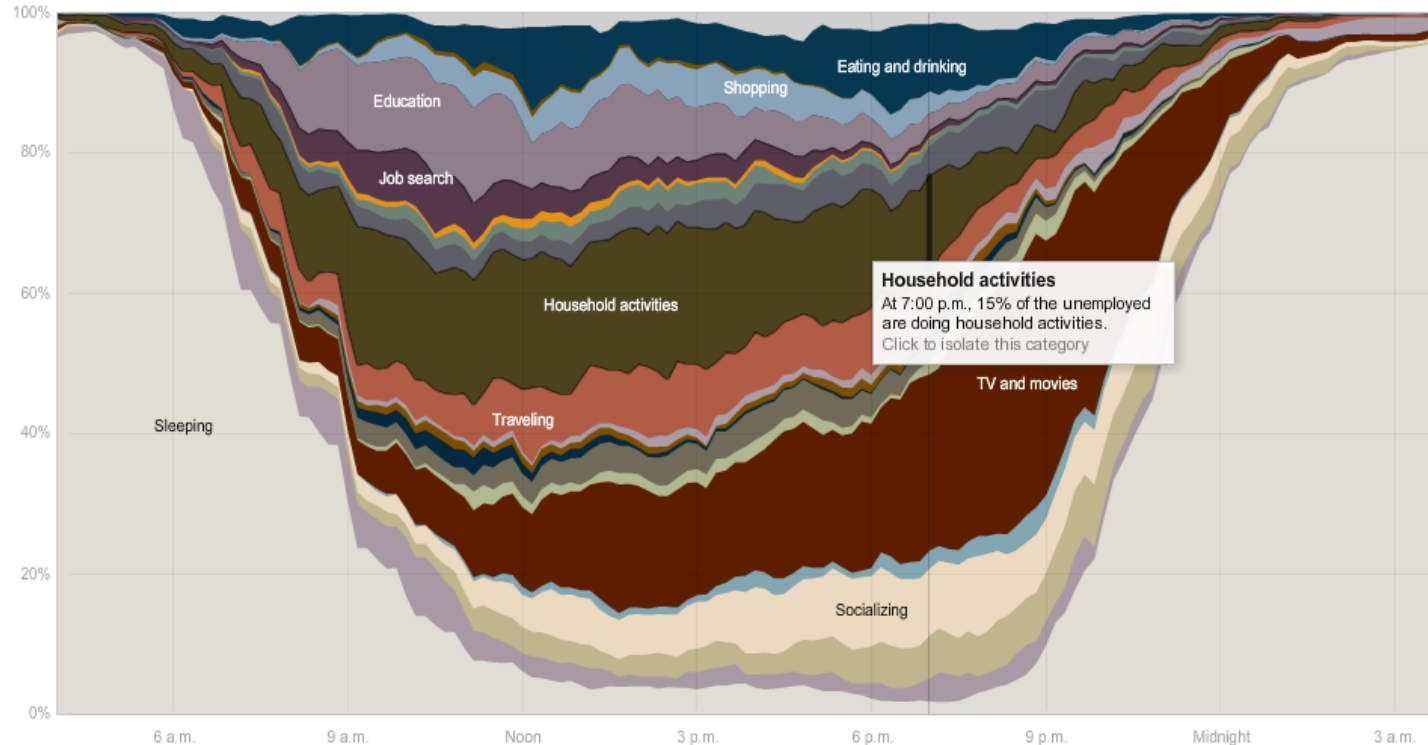


Baby Name Voyager • <http://www.babynamewizard.com/voyager>

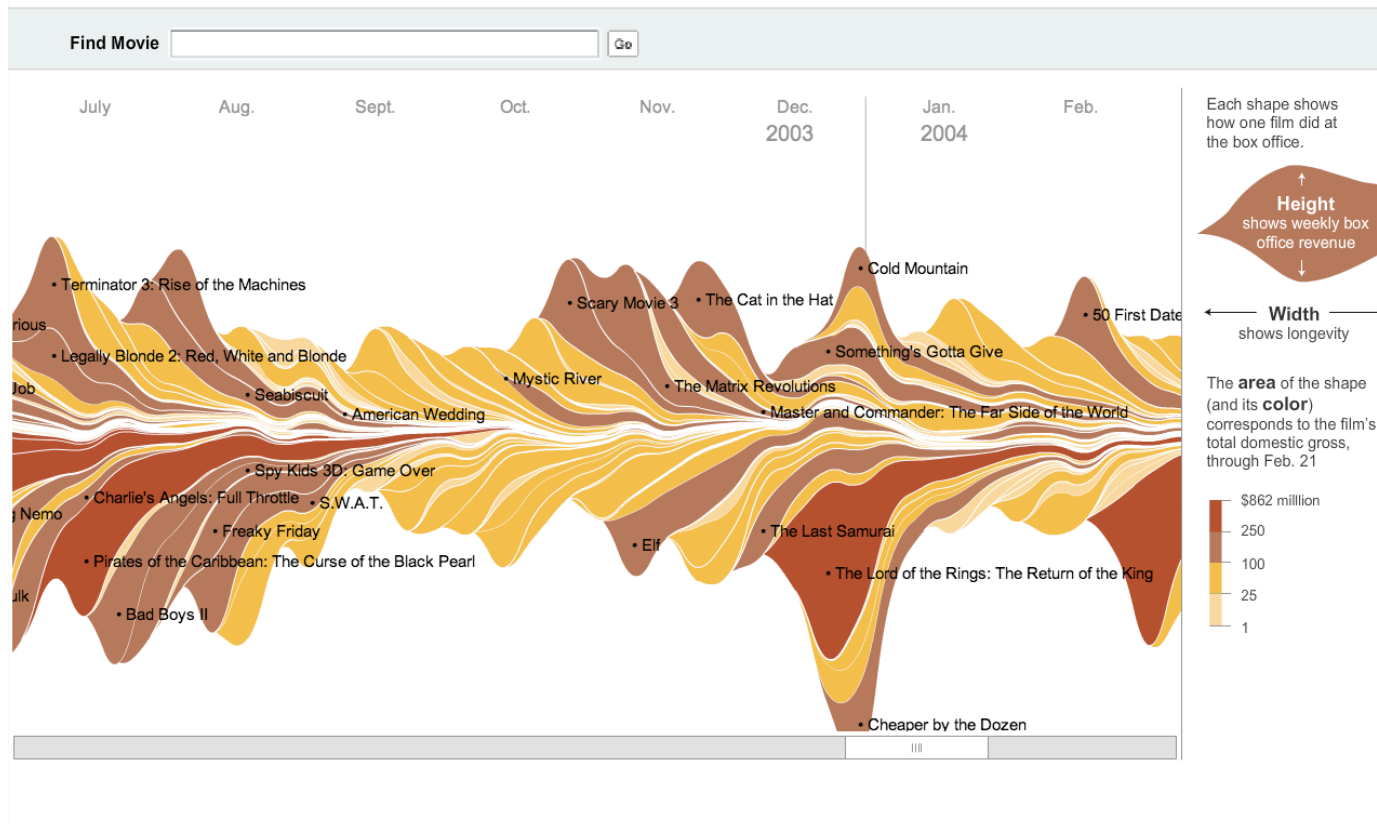
The unemployed

On average, the unemployed spend about a half-hour looking for work. They tidy the house, do laundry and yard work for more than two hours, about an hour more than the employed.

Everyone	Employed	White	Age 15-24	H.S. grads	No children
Men	Unemployed	Black	Age 25-64	Bachelor's	One child
Women	Not in lab...	Hispanic	Age 65+	Advanced	Two+ children

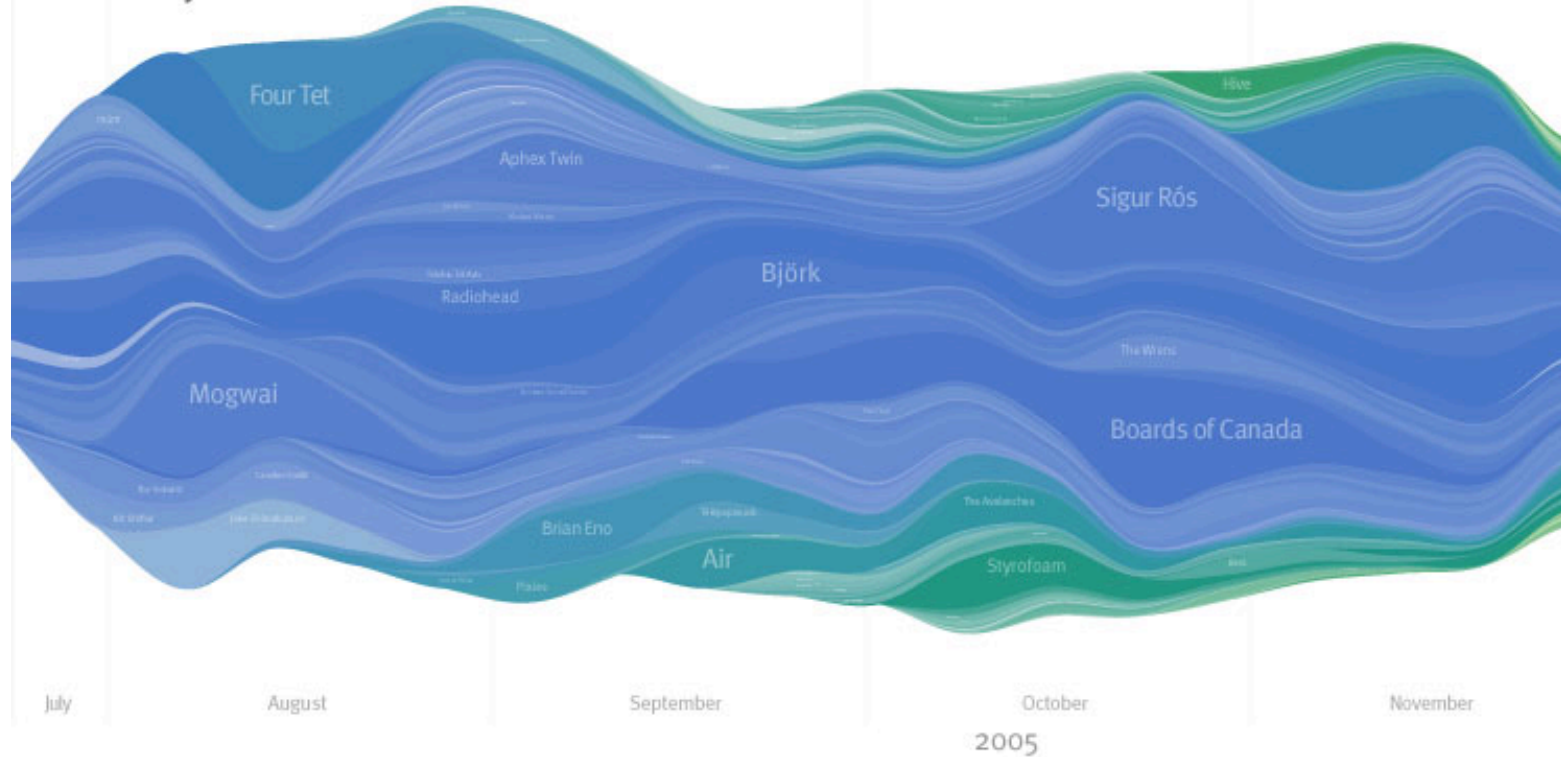


<http://www.nytimes.com/interactive/2009/07/31/business/20080801-metrics-graphic.html>



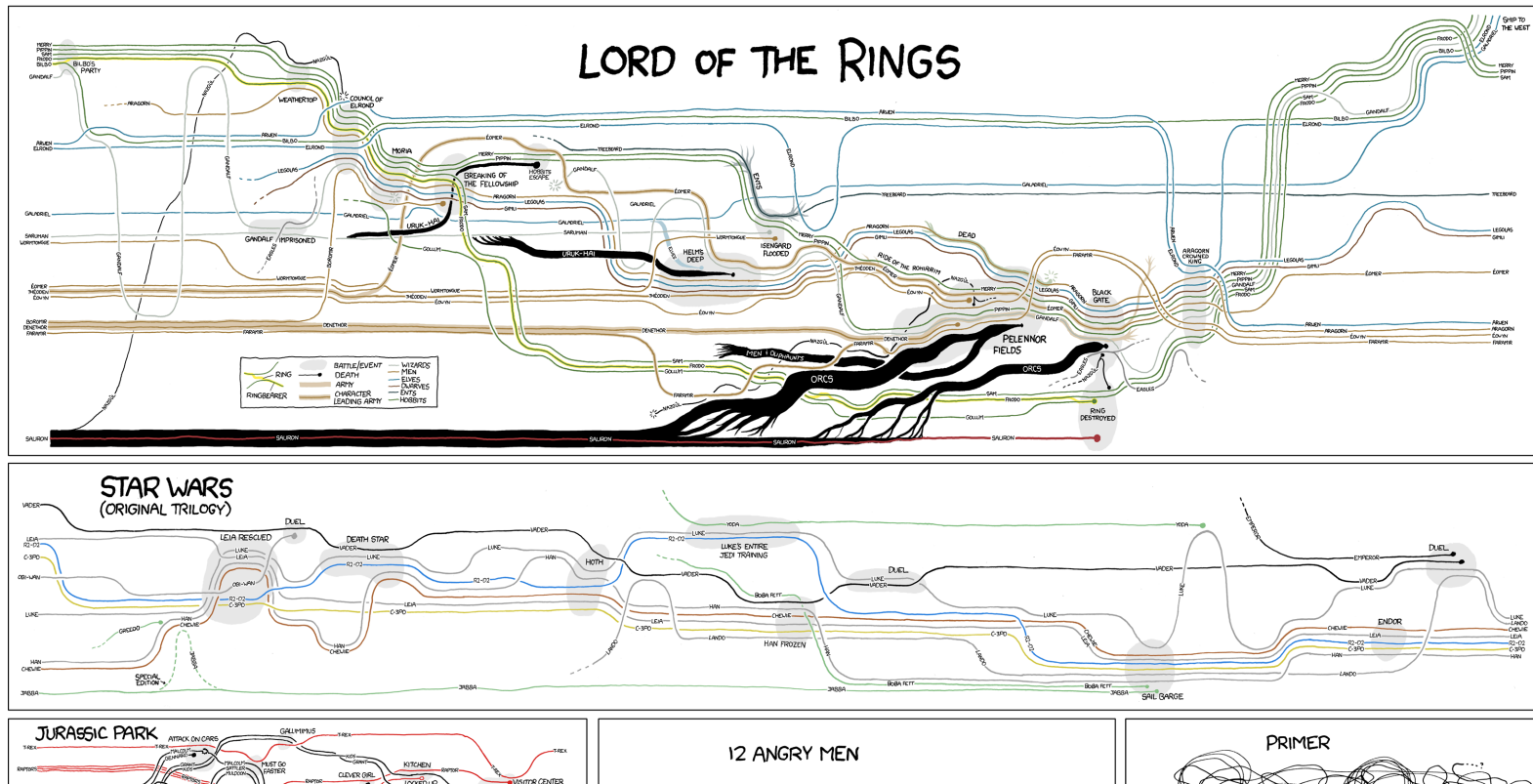
http://www.nytimes.com/interactive/2008/02/23/movies/20080223_REVENUE_GRAPHIC.html

Lee Byron

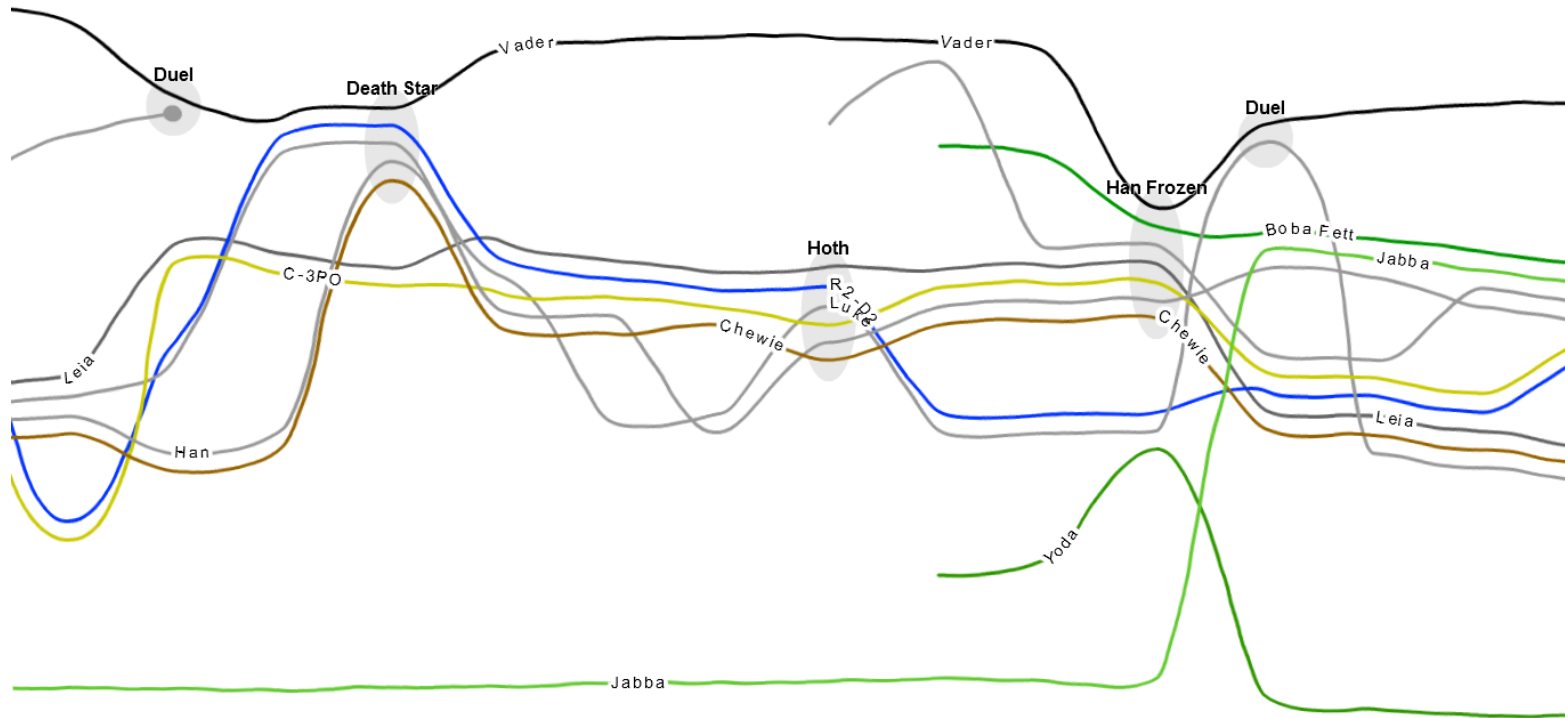


<http://www.leebyron.com/what/lastfm/>

THE HORIZONTAL AXIS IS TIME. THE VERTICAL GROUPING OF THE LINES INDICATES WHICH CHARACTERS ARE TOGETHER AT A GIVEN TIME.



<http://xkcd.com/657/>



Plot Weaver • <http://ogievetsky.com/PlotWeaver/>

SHOWCASE

Animated Visualizations



wind map

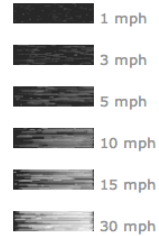
February 17, 2013

11:59 pm EST

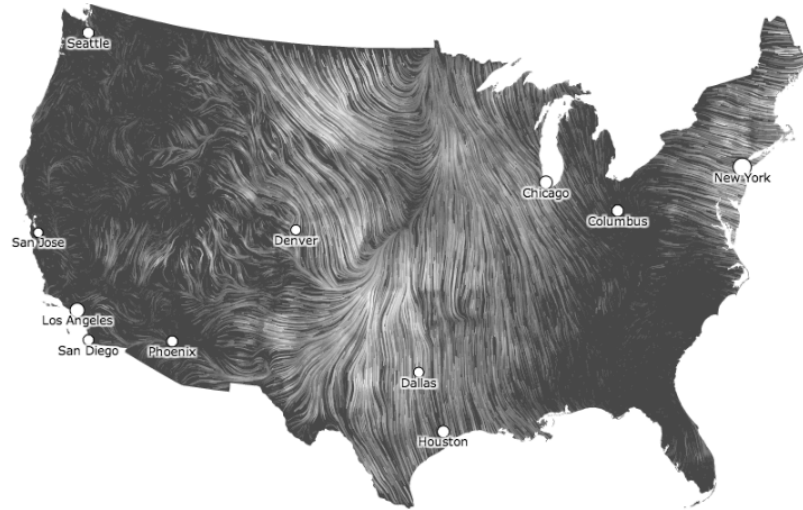
(time of forecast download)

top speed: **39.4 mph**

average: **8.8 mph**



Gallery

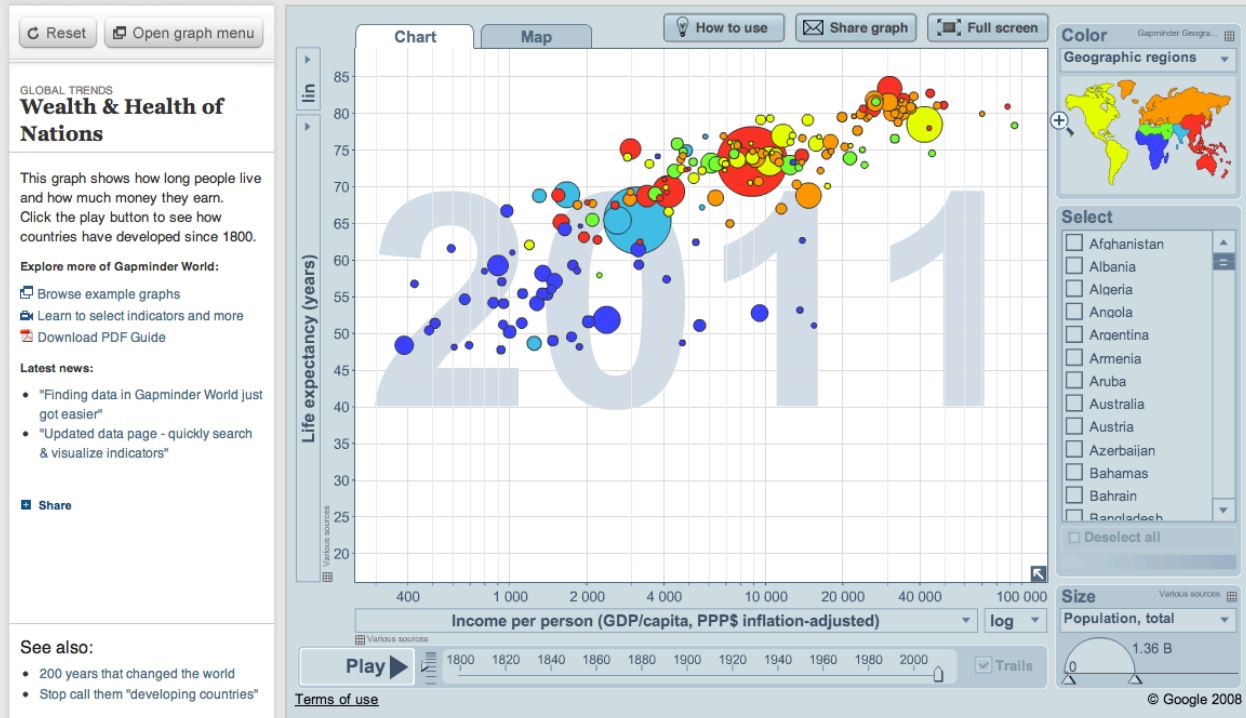


An invisible, ancient source of energy surrounds us—energy that powered the first explorations of the world, and that may be a key to the future. This map shows you the delicate tracery of wind flowing over the US.

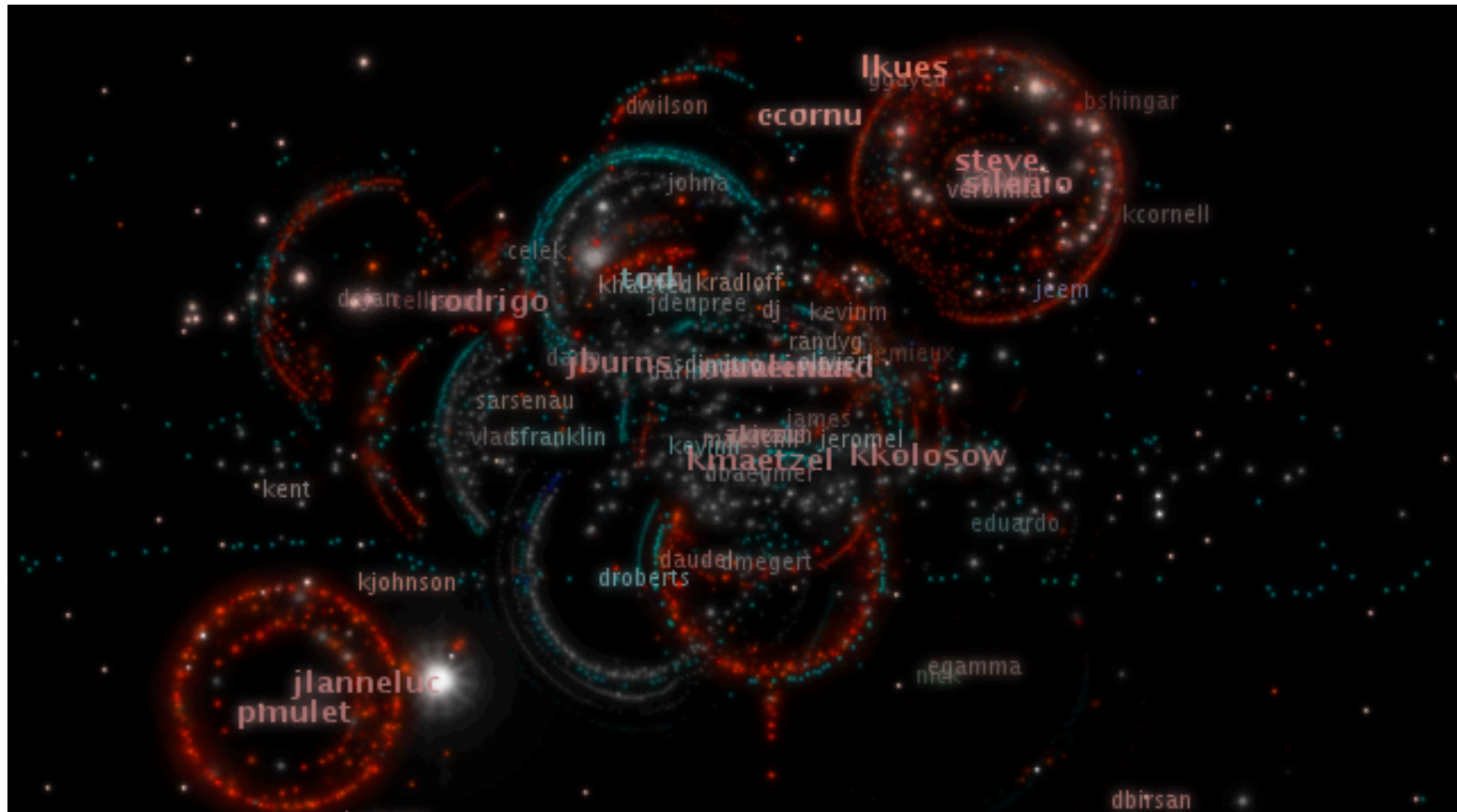
[Donate to Hurricane Sandy relief efforts here.](#)

NEW: wind map prints are available from [Point.B Studio.](#)

<http://hint.fm/wind/>



<http://www.gapminder.org/>

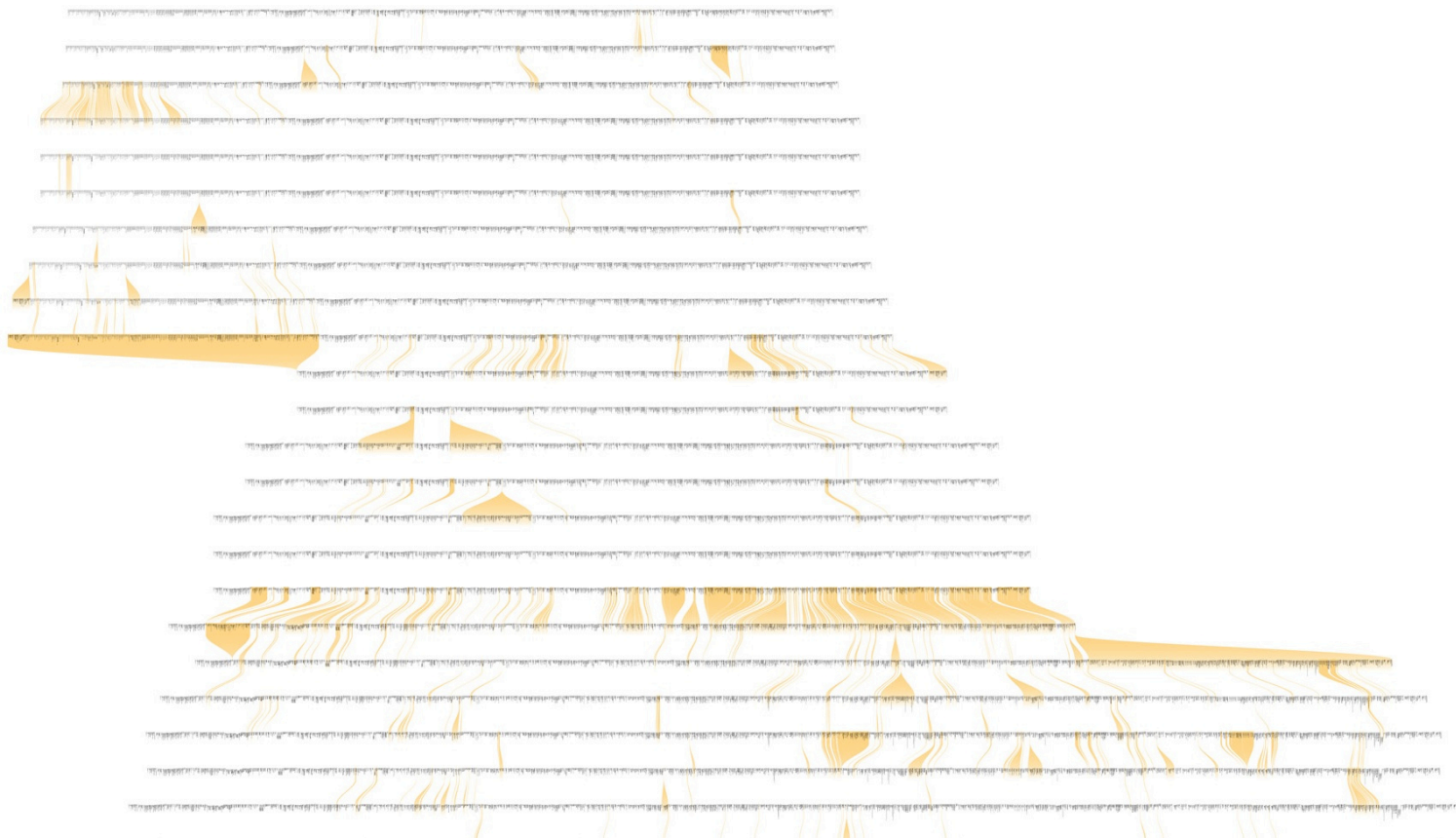


Code Swarm • http://www.michaelogawa.com/code_swarm/

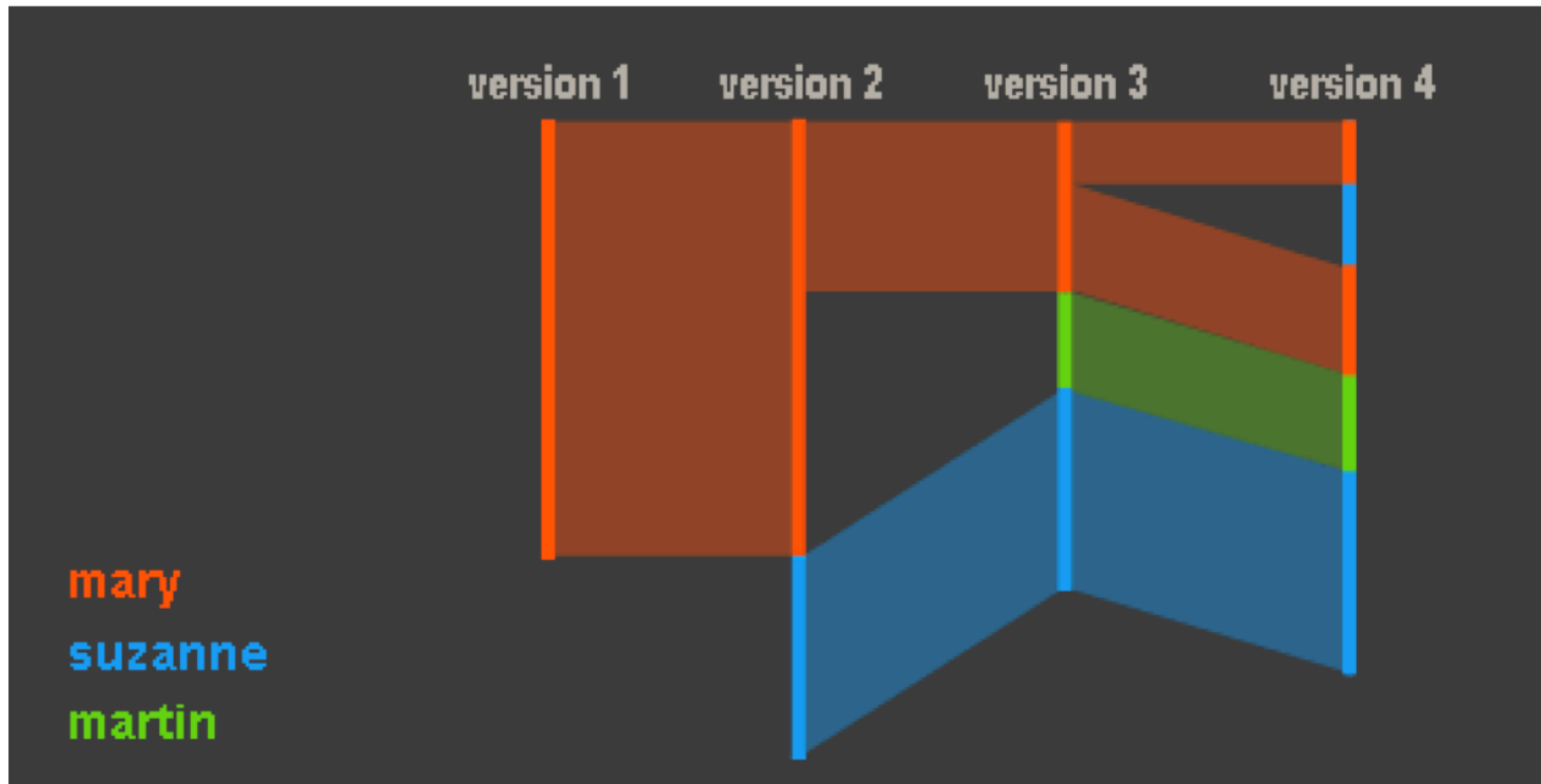
SHOWCASE

Revision Visualization

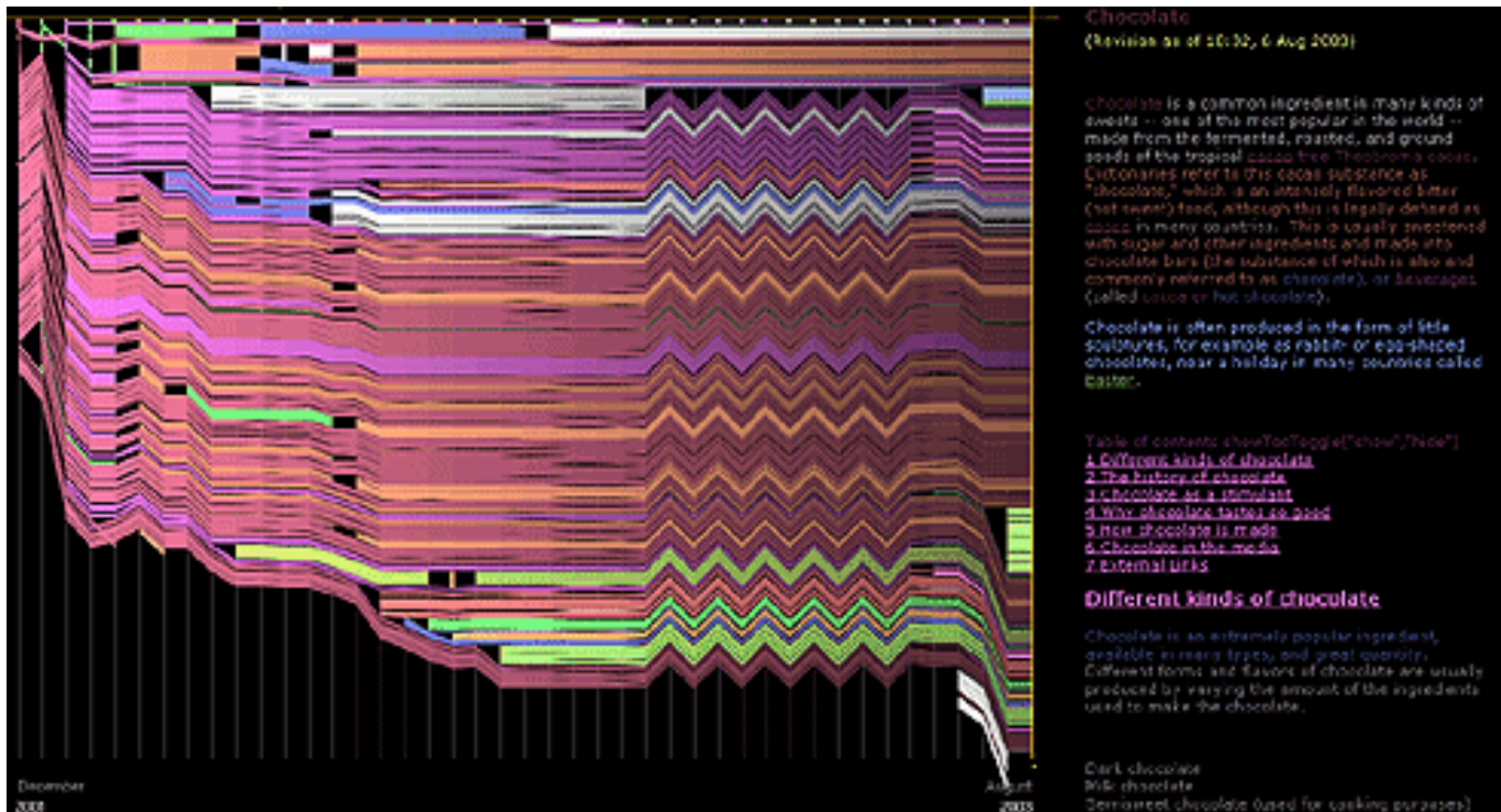




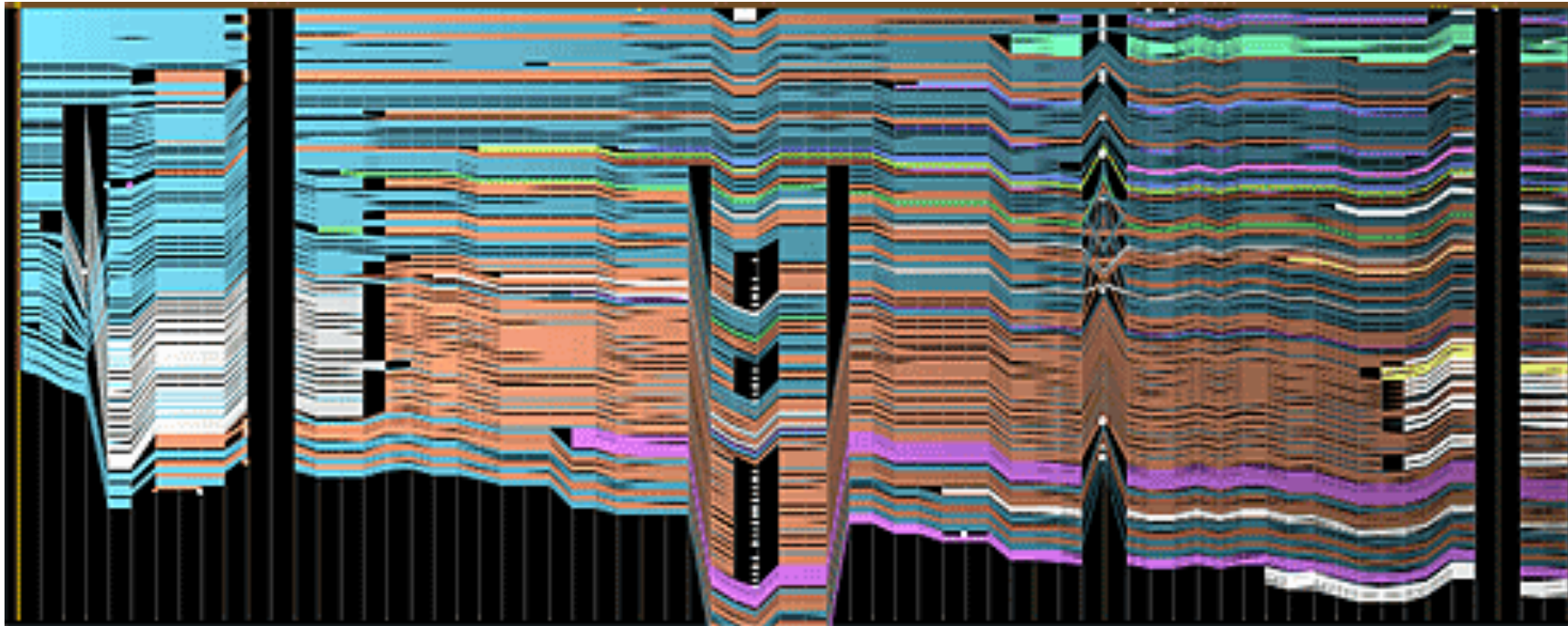
Revisionist • <http://benfry.com/revisionist/>



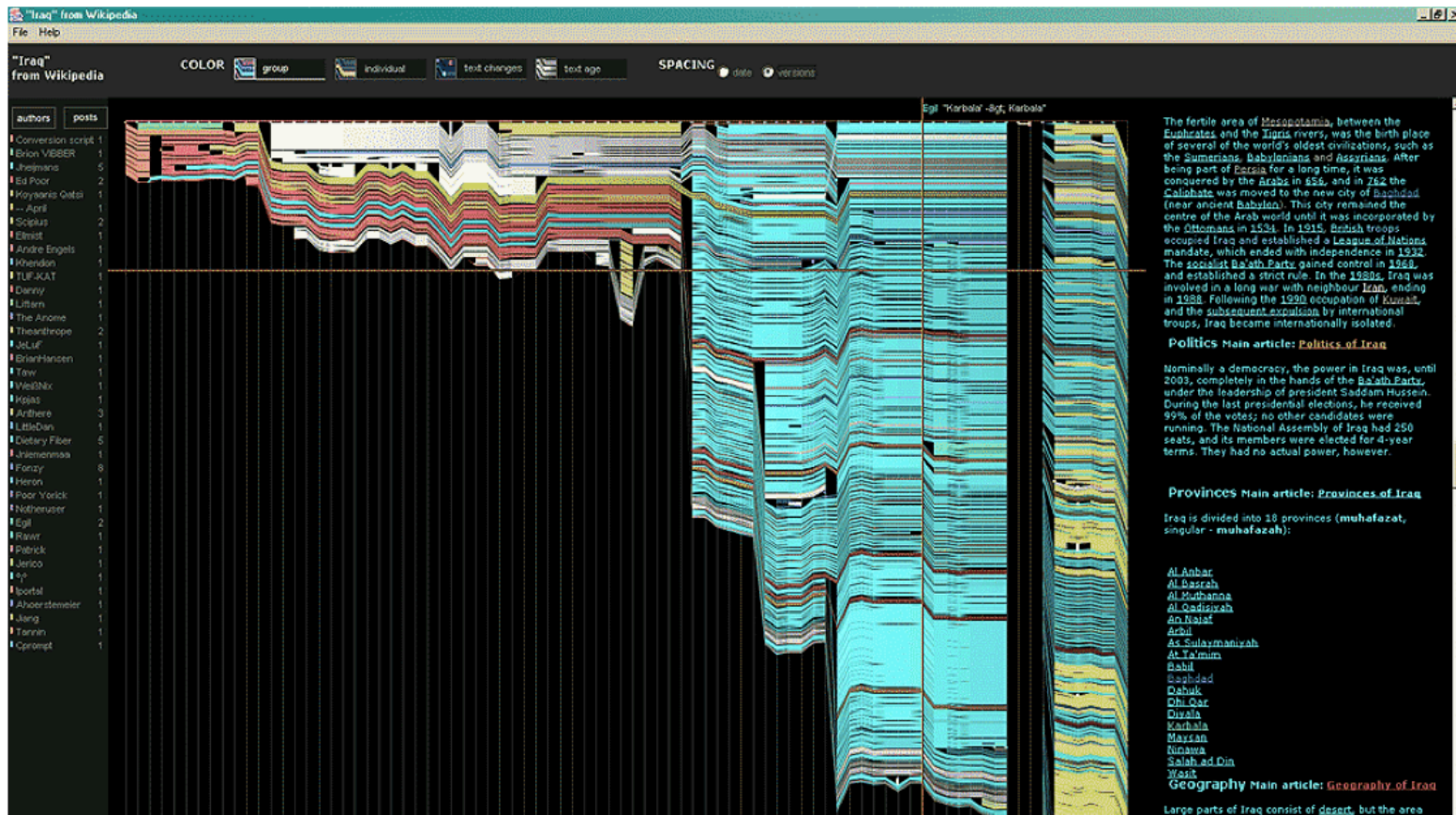
History Flow • <http://hint.fm/projects/historyflow/>



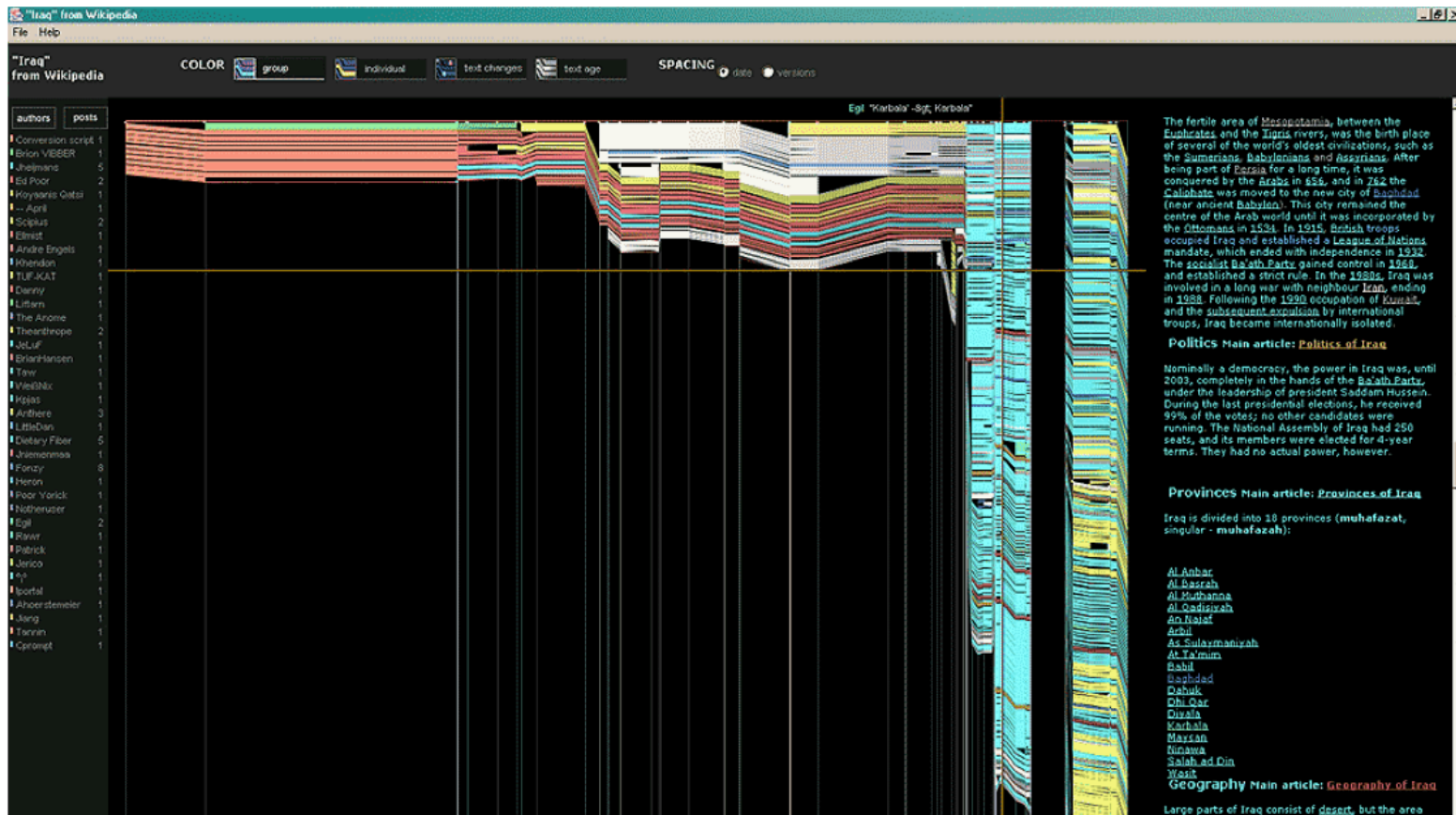
History Flow • <http://hint.fm/projects/historyflow/>



History Flow • <http://hint.fm/projects/historyflow/>

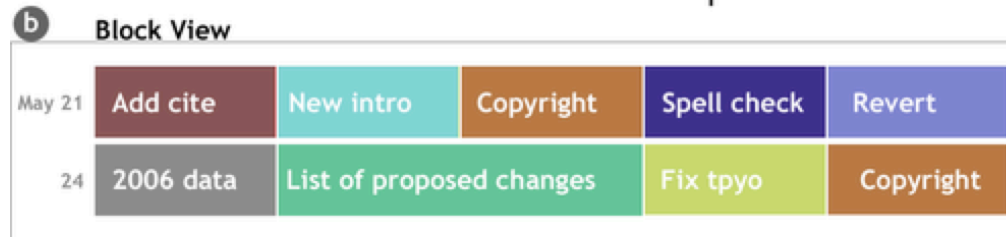


History Flow • <http://hint.fm/projects/historyflow/>

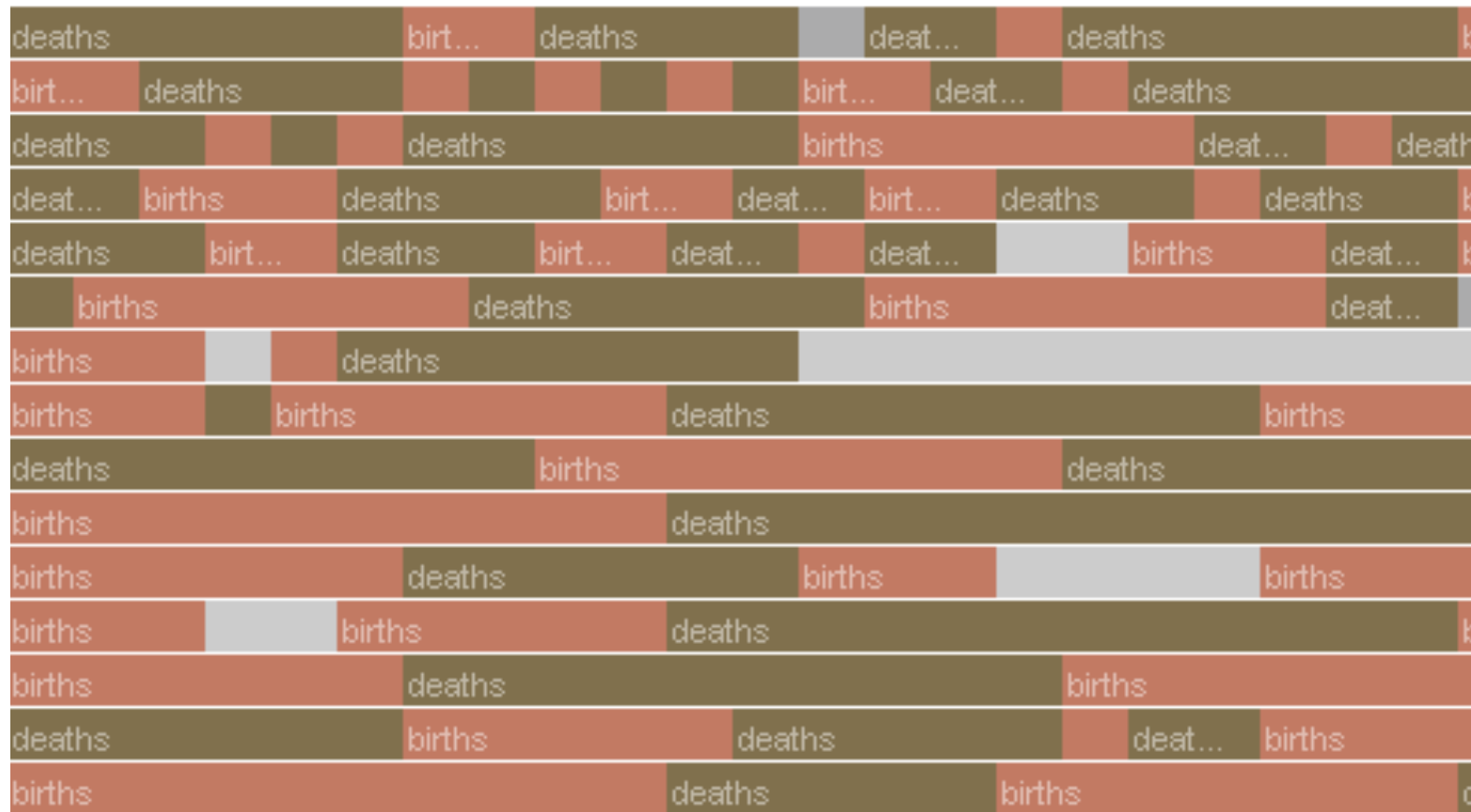


History Flow • <http://hint.fm/projects/historyflow/>

a	Time	Page	Comment
	May 21, 9:32 am	Sphere	Add cite
	May 22, 10:56 am	Sphere	New Intro
	May 22, 1:23 pm	sphere.png	Copyright
	May 22, 2:54 pm	Helix	Spell check
	May 22, 3:00 pm	Mathematics	Revert
	May 24, 11:21 am	Fields Medal	2006 data
	May 24, 11:25 am	Talk:Fractal	List of proposed changes
	May 24, 11:27 am	Talk:Fractal	List of proposed changes
	May 25, 10:13 am	Sphere	Fix typo
	May 25, 10:23 am	mercator.png	Copyright



Chromogram • <http://hint.fm/projects/chromogram/>



Chromogram • <http://hint.fm/projects/chromogram/>

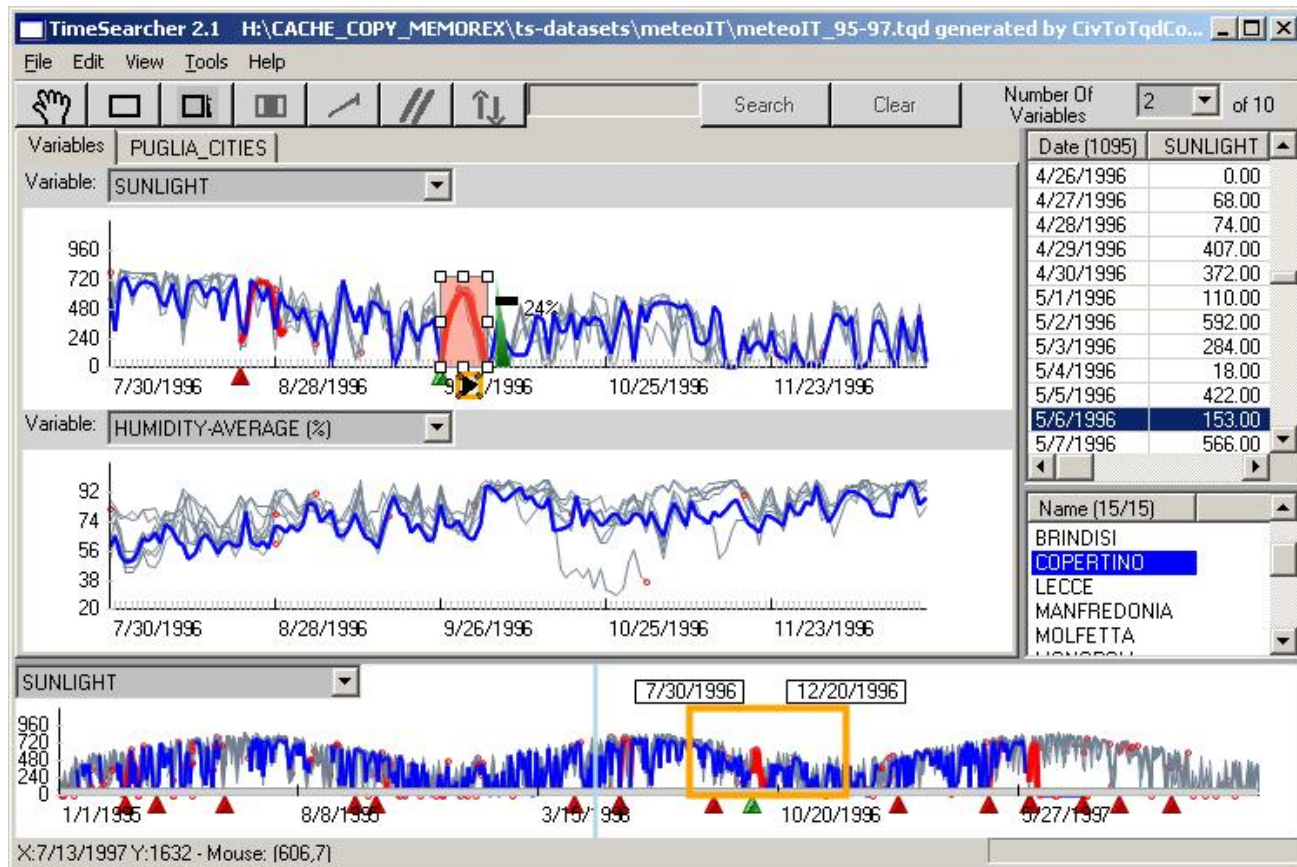


Chromogram • <http://hint.fm/projects/chromogram/>

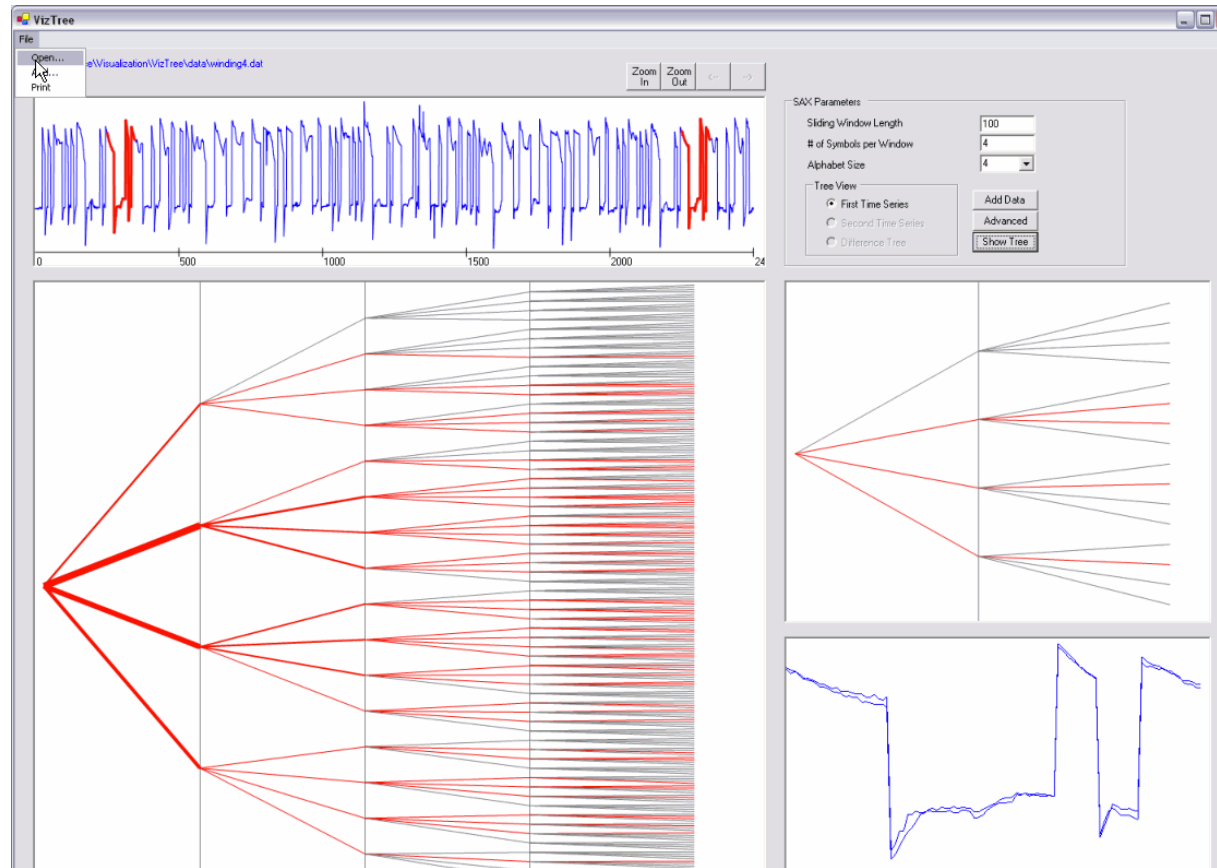
SHOWCASE

Tools for Time Series

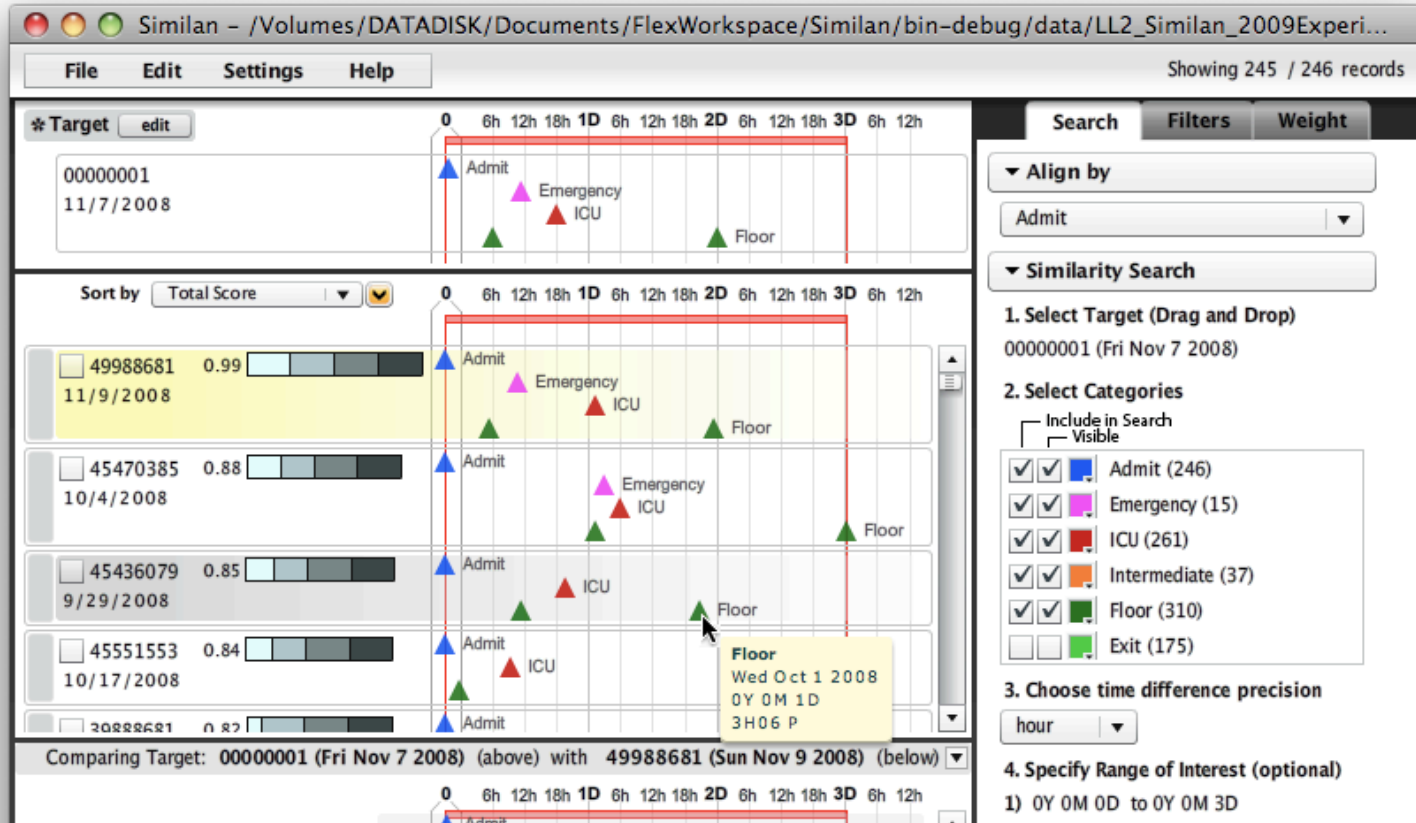




TimeSearcher • <http://www.cs.umd.edu/hcil/timesearcher/>



VizTree • <http://www.cs.gmu.edu/~jessica/viztree.htm>



Similan • <http://www.cs.umd.edu/hcil/similan/>

RESOURCES



TimeViz Browser

The TimeViz Browser

A Visual Survey of Visualization Techniques for Time-Oriented Data



<http://survey.timeviz.net/>

QUESTIONS

<http://sjengle.cs.usfca.edu/>

