

Information Visualization

Storytelling with Data

Cave Paintings, Uluru, ca. 10000 years ago



... 2018

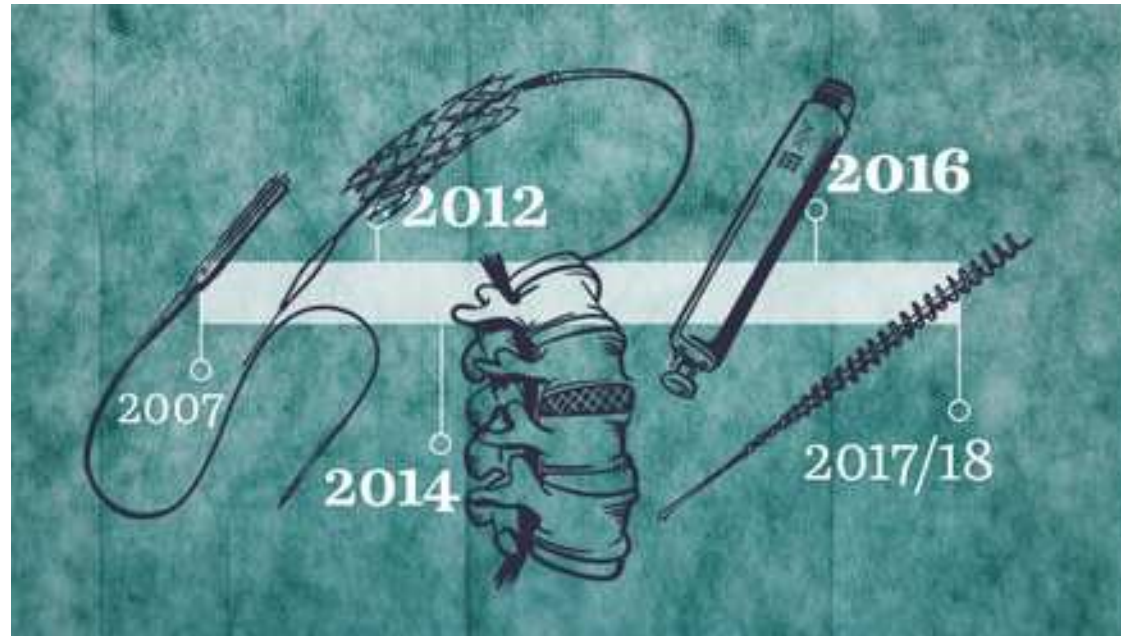


Illustration: Lisa Bucher, SZ 2018,
Implant Files

Data Journalism

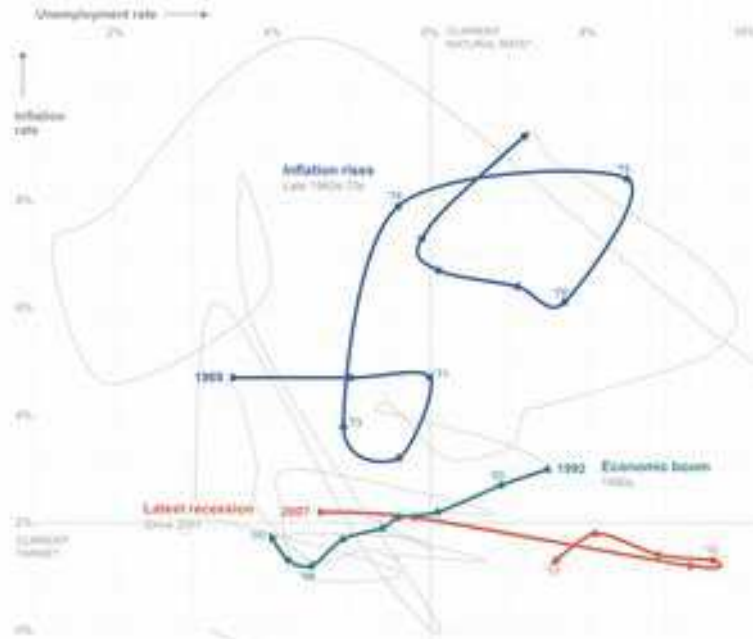
Janet L. Yellen, on the Economy's Twists and Turns

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Inflation and unemployment

The Federal Reserve is said to have a "dual mandate": keeping inflation in check and the unemployment rate low. These measures, which tend to change cyclically and in concert with each other, are charted for every year since the Great Depression.

In speeches and in meetings, Ms. Yellen, the nominee for the next Fed leader, has commented on the Fed's actions during significant periods, providing a window into her views and priorities.

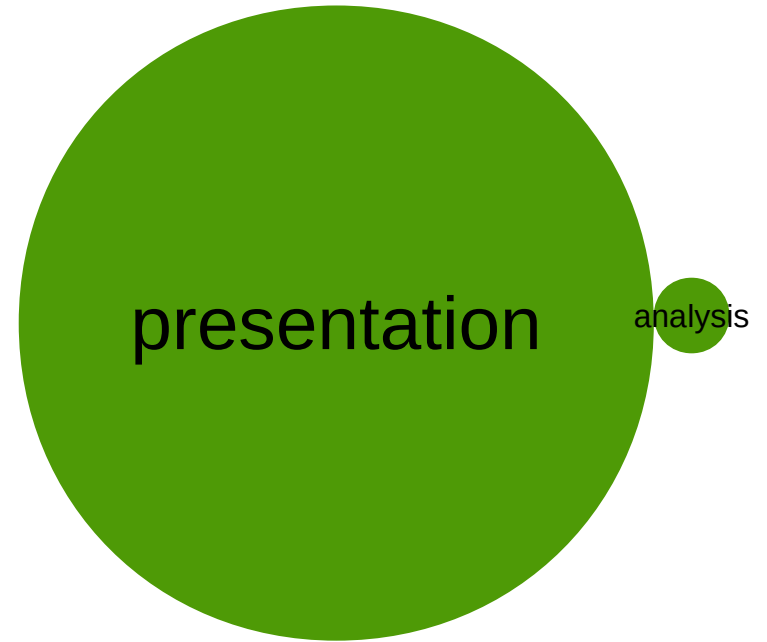
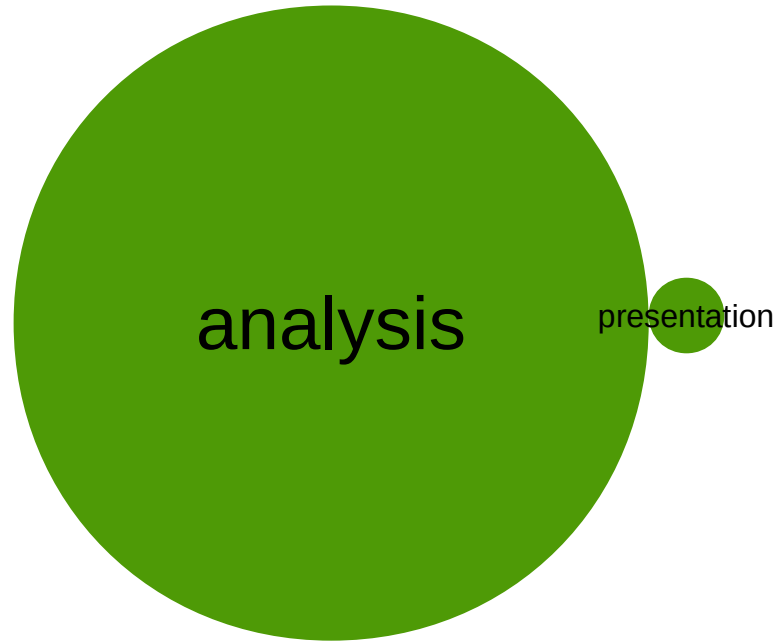


*This national rate of unemployment is defined as the broadest available level of unemployment over the long term. If the rate is seasonal, it is based on the seasonal level, except when it is not.

By TOM SWARTZMAN and ALICE HANSHAW

Sources: Federal Reserve Bank of St. Louis inflation (measured by annual change in core consumer-price index); Bureau of Labor Statistics unemployment rate (average monthly); National Bureau of Economic Research unemployment rate (1947).

<https://archive.nytimes.com/www.nytimes.com/interactive/2013/10/09/us/yellen-fed-chart.html>



What Storytelling Can Do for Information Visualization (Gershon and Page)





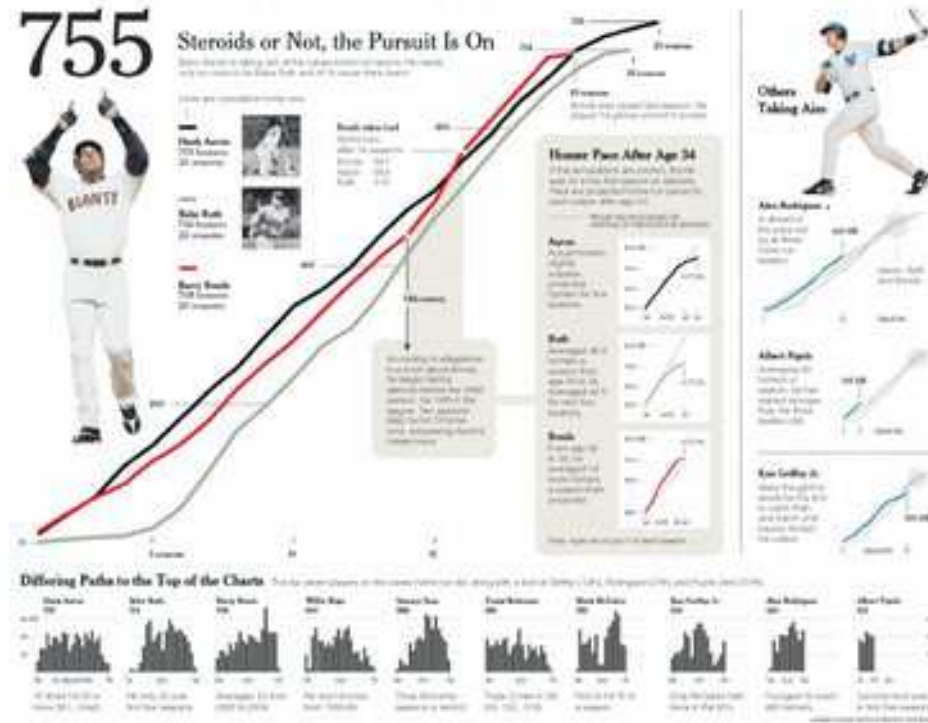
What Storytelling Can Do for Information Visualization (Gershon and Page)

Figure 2. Two-part script for the visual representation of information (sorted by location); visual operations are in red.

Time	Image	Voice	Time
	Begin Part 1: Show overview (map)	It is now early in the morning. The time is 10:05.	
	<i>Zoom in to show the school building. Show the school building make it transparent and superimpose a picture of children.</i>	Our schoolhouse is in the center.	
	<i>Zoom-out. Highlight NWSE arrows.</i>	Enemy is strongest in NWSE direction. Enemy (SE) becomes active between H+2 to H+4.	
	<i>Zoom in the G-shaped building. Add lines of fire to the G-shaped building.</i>	G-shape building not as strong as enemy in SE.	
	<i>Highlight the line of fire of the G-shape building.</i>	Direction of fire toward the schoolhouse and other directions (SWV). G-shape building, weak fire, thinner lines.	
	<i>Zoom-out.</i>	G-shape building, active between H to H+2, H+2 to H+4.	
	<i>Zoom in to NW enemy position. Add lines of fire while zooming out.</i>	NWV enemy position, direction of fire SW/SE. NWV enemy has been active between H to H+4.	
	<i>Zoom-out. Show overview while highlighting two little enemy objects.</i>	Two little enemy activities in the corner (SWV reported yesterday).	
	Begin Part 2: <i>Review</i> the overview from the beginning (time 1) to show time dependence.		
	Show overview	Commander's Perceptions Enemy is oriented toward the center. Has shifts in the ranks of my magnitude. One relatively strong rank (SE-NW). Maybe we made too much of a mistake (SE), too early to tell. It is now early in the morning. Maybe enemy (SE) is not unlike you.	

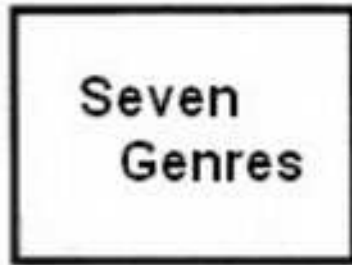
- Taken
 - Picture
 - Continuity
 - Animation for events
 - Increasing attention
 - Redundancy

Narrative Visualization (Segel and Heer, 2010)

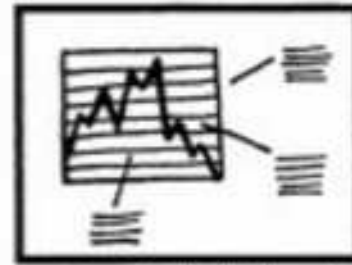


- Studied 58 examples, characterized design space
- News media, blogs, instructional videos, research
- Reading time ...

Style for Visualization: Genre (by Segel and Heer, 2010)



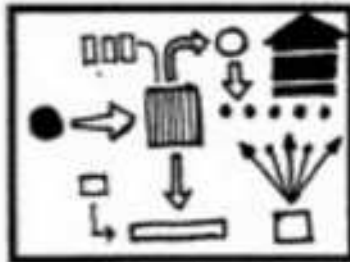
Magazine Style



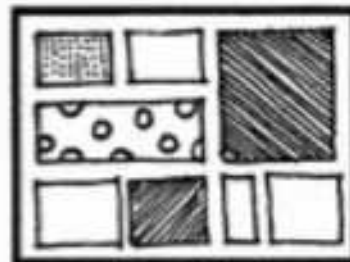
Annotated Chart



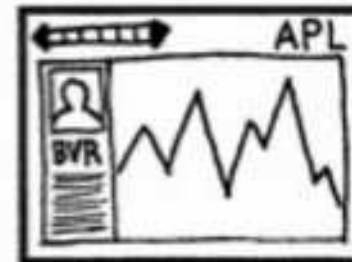
Partitioned Poster



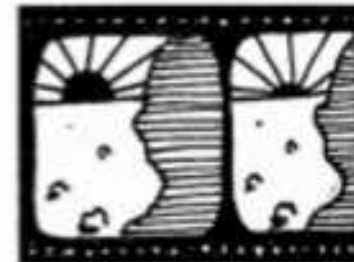
Flow Chart



Comic Strip

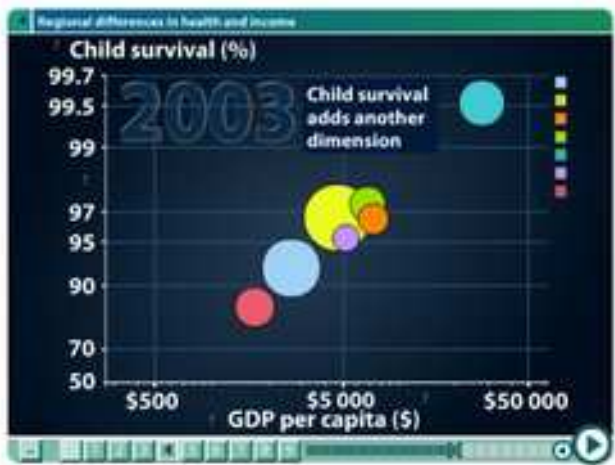


Slide Show



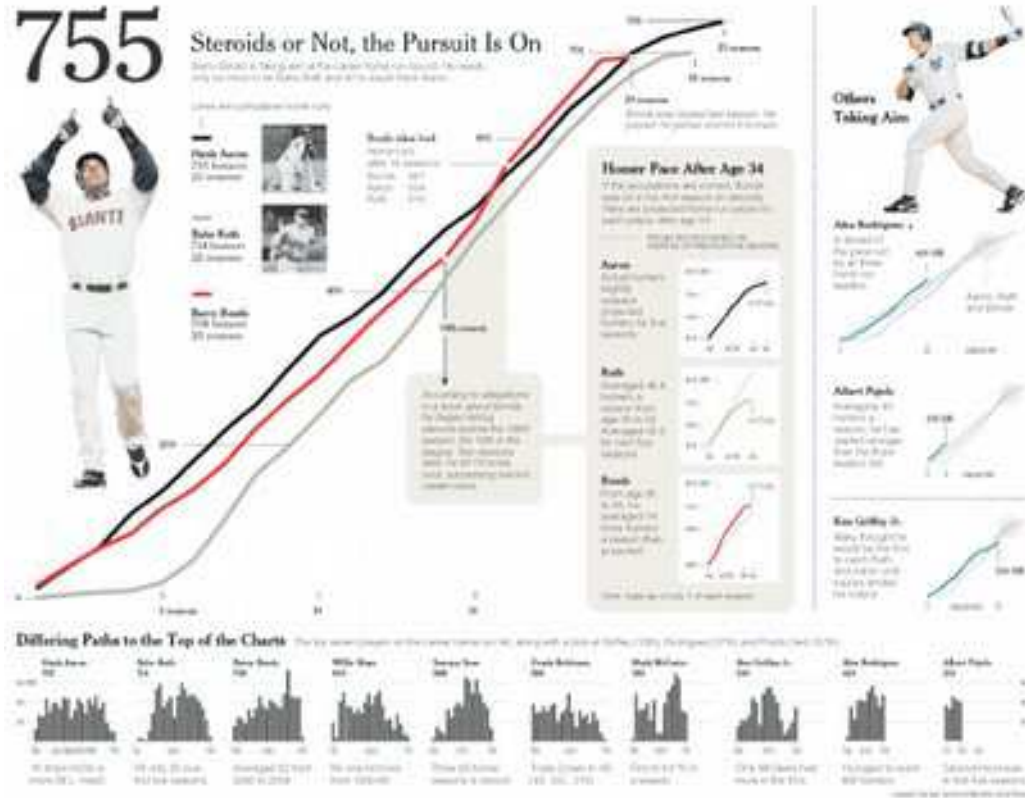
Film/Video/Animation

Visual Narrative Tactics - Transition Guidance



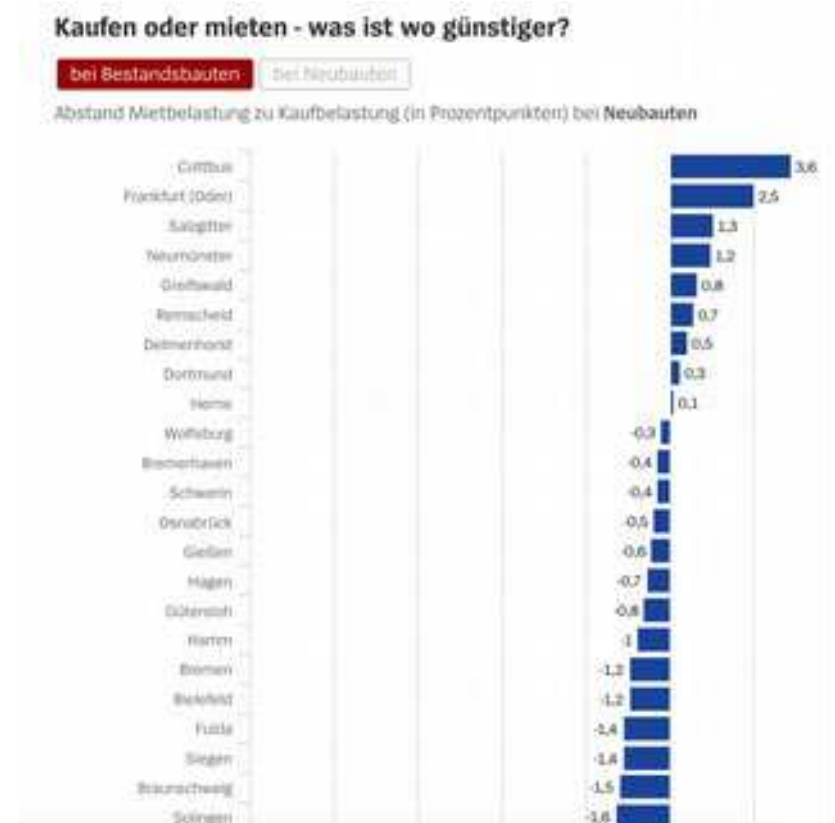
Visual Narrative Tactics - Highlighting

755?



Narrative Structure Tactics

- Ordering
- Messaging
- Interactivity



<http://www.spiegel.de/wirtschaft/unternehmen/kaufen-oder-mieten-was-ist-wo-guenstiger-a-1231213.html>

Author or Reader Driven?

- Author driven
 - Prescribed ordering
 - Stronger messaging
 - Limited interactivity
- Reader driven
 - Multiple orderings
 - Less messaging
 - More open interactivity

Visual Rhetoric (Hullman & Diakopoulos 2011)

- Using data and visualization to persuade users to adopt certain interpretations (explicitly or implicitly)
- Framing effects: small changes in presentation of an issue result in significant changes in opinion
- Method
 - 51 professional produced narrative visualizations
 - NYT, BBC, Economist, local news, political outlets
 - Iterative qualitative coding, seeded scheme with semiotics, persuasion concepts



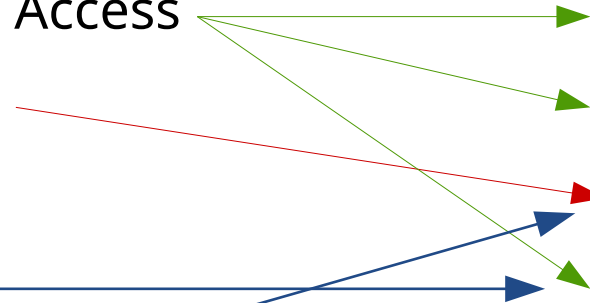
Taxonomy of rhetorical strategies

- Rhetorical Categories

- Information Access
- Provenance
- Mapping
- Procedural
- Linguistic

- Editorial Layers

- Data
- Visual Representation
- Annotation
- Interactivity

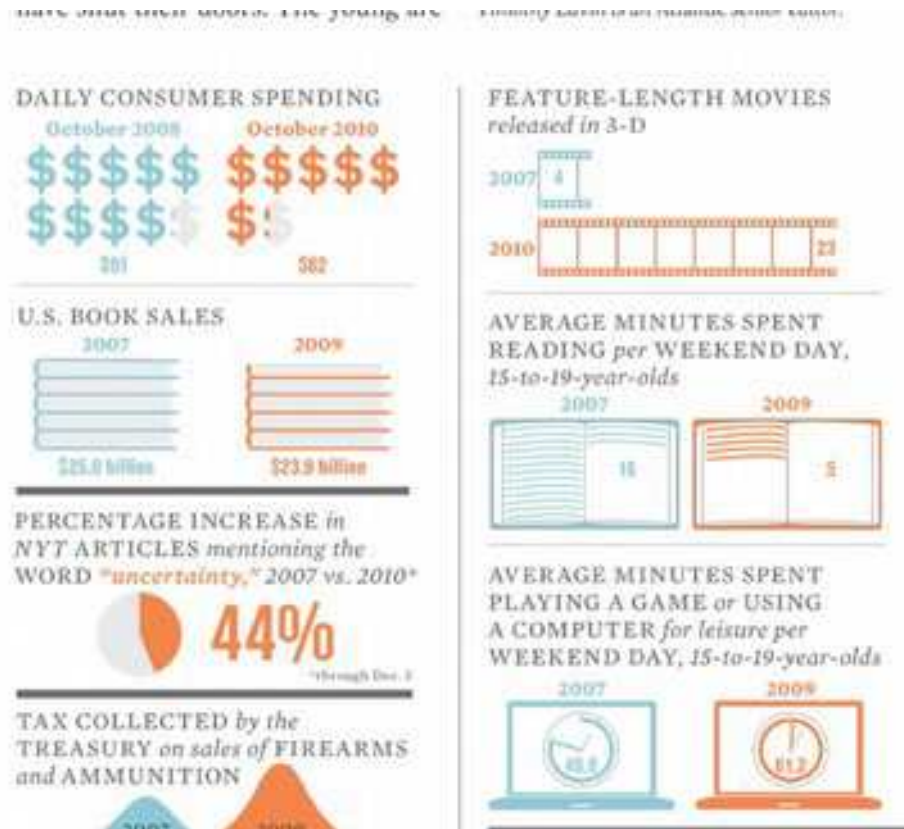


- Omission (variable selection)
- Metonymy (aggregation, categorization)

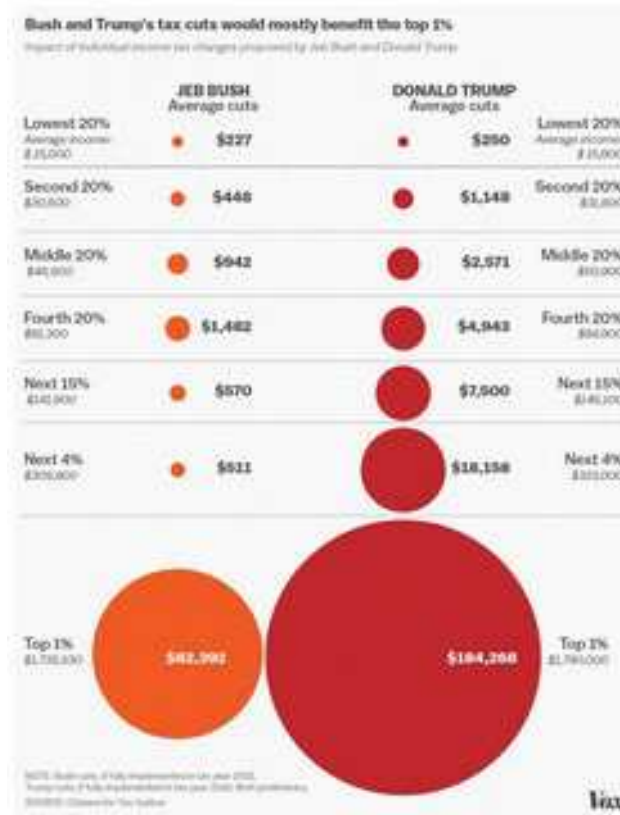
- Citing sources, methodology
- Exceptions, corrections
- Acknowledging uncertainty

- Rhetorical question, "scare quotes"
- Labeling choices
- Analogy, simile, double entendre

Enthymeme (information access)

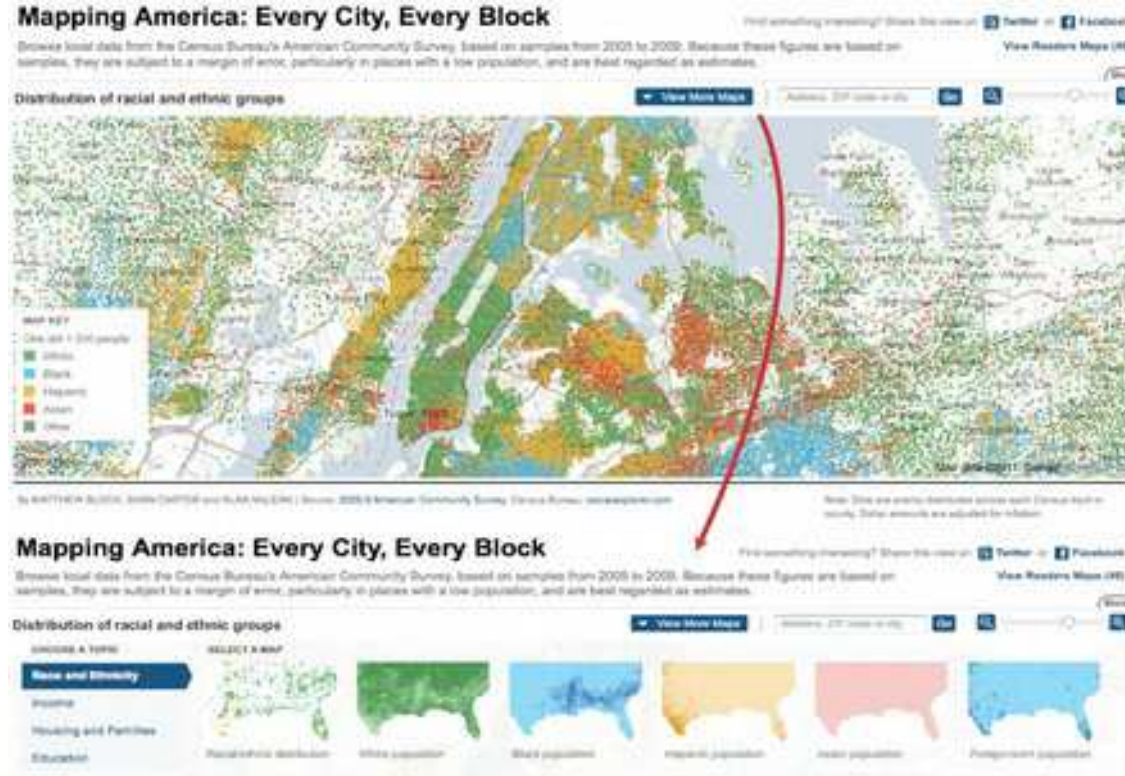


Metonymy (information access)



Donald Trump wants massive tax cuts for the rich [Vox 2015]

Citing sources /methods (provenance)



Bloch, Carter, and McLean 2010

Narrative theory applied

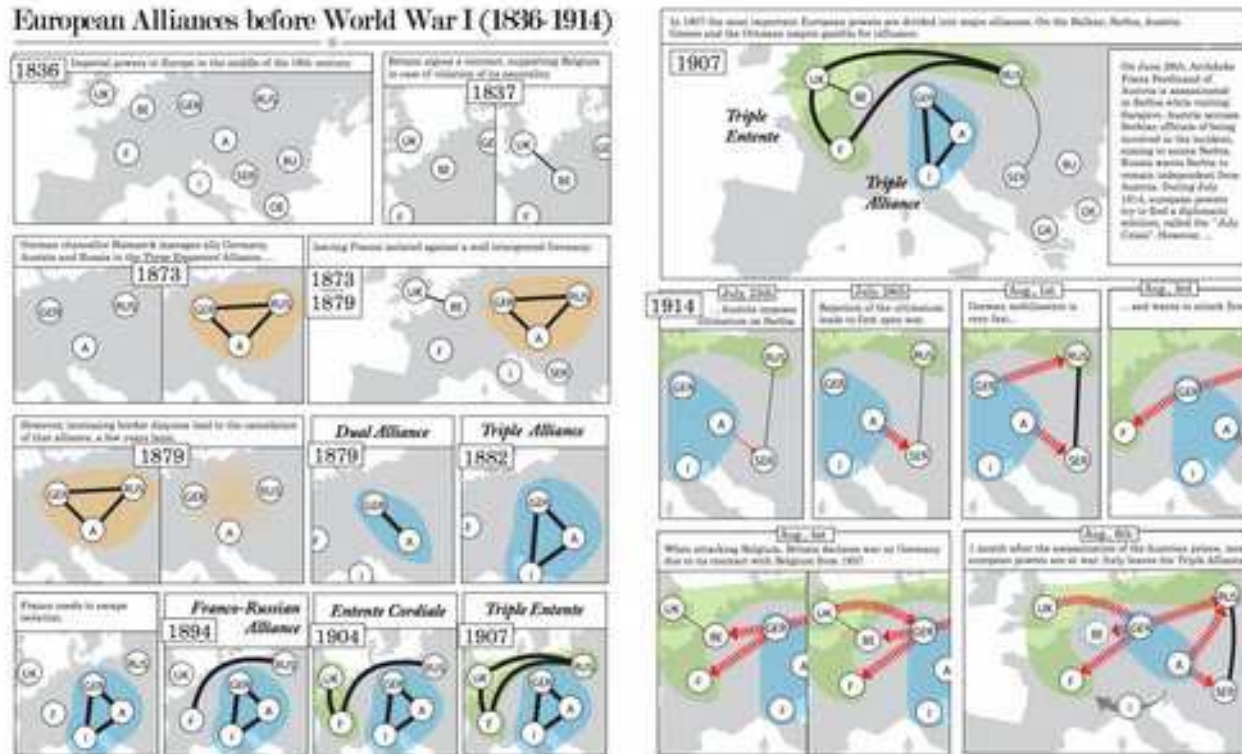


Figure 3. Graph comic example illustrating historical events preceding WWI, targeted to a general audience.

Graph Comics [Bach et al. 2016]

Narrative theory

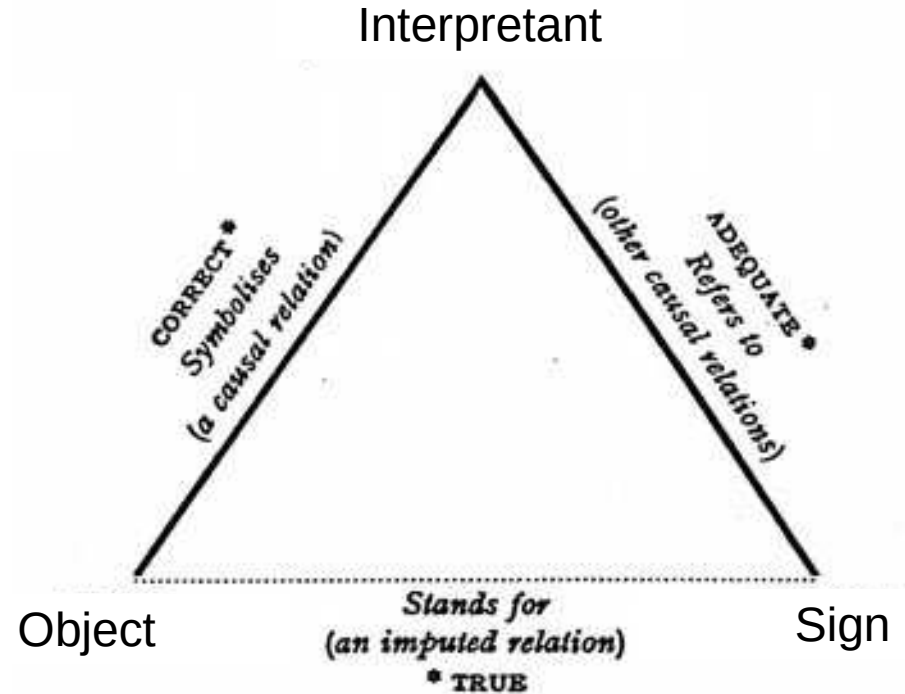
- Story grammars:
 - Models of narrative cognition based on systematic studies of what impacts peoples' ability to recall parts of a story
- Reader mentally indexes events by time, space, protagonist, causality, intention [Zwaan 1995]

SUMMARY OF REWRITE RULES FOR A SIMPLE STORY GRAMMAR*	
FABLE	→ STORY AND MORAL
STORY	→ SETTING AND EVENT STRUCTURE
SETTING	→ $\left[\begin{array}{l} \text{STATE}^* \text{ (AND EVENT}^*) \\ \text{EVENT}^* \end{array} \right]$
STATE*	→ STATE ((AND STATE))
EVENT*	→ EVENT ($\left[\begin{array}{l} \text{AND} \\ \text{THEN} \\ \text{CAUSE} \end{array} \right] \text{ EVENT?} \text{ ((AND STATE?))}$
EVENT STRUCTURE	→ EPISODE ((THEN EPISODE?))
EPISODE	→ BEGINNING CAUSE DEVELOPMENT CAUSE ENDING
BEGINNING	→ $\left[\begin{array}{l} \text{EVENT}^* \\ \text{EPISODE} \end{array} \right]$
DEVELOPMENT	→ $\left[\begin{array}{l} \text{SIMPLE REACTION CAUSE ACTION} \\ \text{COMPLEX REACTION CAUSE GOAL PATH} \end{array} \right]$
SIMPLE REACTION	→ INTERNAL EVENT ((CAUSE INTERNAL EVENT?))
ACTION	→ EVENT
COMPLEX REACTION	→ SIMPLE REACTION CAUSE GOAL
GOAL	→ INTERNAL STATE
GOAL PATH	→ $\left[\begin{array}{l} \text{ATTEMPT CAUSE OUTCOME} \\ \text{GOAL PATH (CAUSE GOAL PATH?)} \end{array} \right]$
ATTEMPT	→ EVENT*
OUTCOME	→ $\left[\begin{array}{l} \text{EVENT}^* \\ \text{EPISODE} \end{array} \right]$
ENDING	→ $\left[\begin{array}{l} \text{EVENT}^* \text{ (AND EMPHASIS)} \\ \text{EMPHASIS} \\ \text{EPISODE} \end{array} \right]$
EMPHASIS	→ STATE

Semiotics

- Viewing codes: the perceptual mechanisms, cognitive mechanisms, conventions and other prior knowledge that influence how we interpret signs
- Semantic design decisions
 - Logos
 - Signs
 - Labels
 - Glyphs

- Sign: Signifier | Signified





Tasks for now ...

- Scope of narrative visualization
 - Visualization genres that employ visual and narrative structures to guide attention
- Visualizations that use rhetorical devices to persuade

Bibliography

- Gershon, N., Page, W., 2001. What storytelling can do for information visualization. Communications of the ACM 44, 31–37. <https://doi.org/10.1145/381641.381653>
- Segel, E., Heer, J., 2010. Narrative Visualization: Telling Stories with Data. IEEE Transactions on Visualization and Computer Graphics 16, 1139–1148. <https://doi.org/10.1109/TVCG.2010.179>
- Bach, B., Riche, N.H., Carpendale, S., Pfister, H., 2017. The Emerging Genre of Data Comics. IEEE Computer Graphics and Applications 37, 6–13. <https://doi.org/10.1109/MCG.2017.33>
- Hullman, J., Diakopoulos, N., 2011. Visualization Rhetoric: Framing Effects in Narrative Visualization. IEEE Transactions on Visualization and Computer Graphics 17, 2231–2240. <https://doi.org/10.1109/TVCG.2011.255>
- Tufte, E.R., 2001. The visual display of quantitative information, 2nd ed. ed. Graphics Press, Cheshire, Conn.

