

ASA WORKSHOP ON DATA VISUALIZATION TECHNIQUES

STORYTELLING WITH DATA

january 31, 2014

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Outline

- Model and Characterization
- Simple Examples
- Elements of a Data Story
- Summary

- **Model and Characterization**
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Story Definition and Model

- Story
 - ordered sequence of steps (<- order is key)
each step contains text, images, visualizations, video, etc
 - defined path (or paths) through the steps
- Journalism Model
 - journalists collect information through research, interviews, etc to assemble the **key facts**
 - tie together the key facts (raw material) to produce a story
- Data Analyst Model
 - use visualization for exploration and analysis
 - use visualization for presentation (storytelling) using the results from the analysis
 - tools used for analysis may not work for presentation

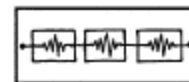
Characterizing the Area –Narrative Visualization

Edward Segel and Jeffrey Heer, Narrative Visualization: Telling Stories with Data, IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 16, NO. 6, NOVEMBER/DECEMBER 2010

- **Narrative framework**
 - visual structure (genre): support the story
 - interactivity: engage the story
 - messaging: tell the story
- **Approaches**
 - author driven: strong ordering, heavy messaging, limited interactivity
 - reader driven: weak ordering, light messaging, free interactivity
- **Common schemas**
 - martini glass structure: prioritizes author-driven approach
 - drill-down story: prioritizes reader-driven approach
 - interactive slide-show: promotes dialog between above approaches

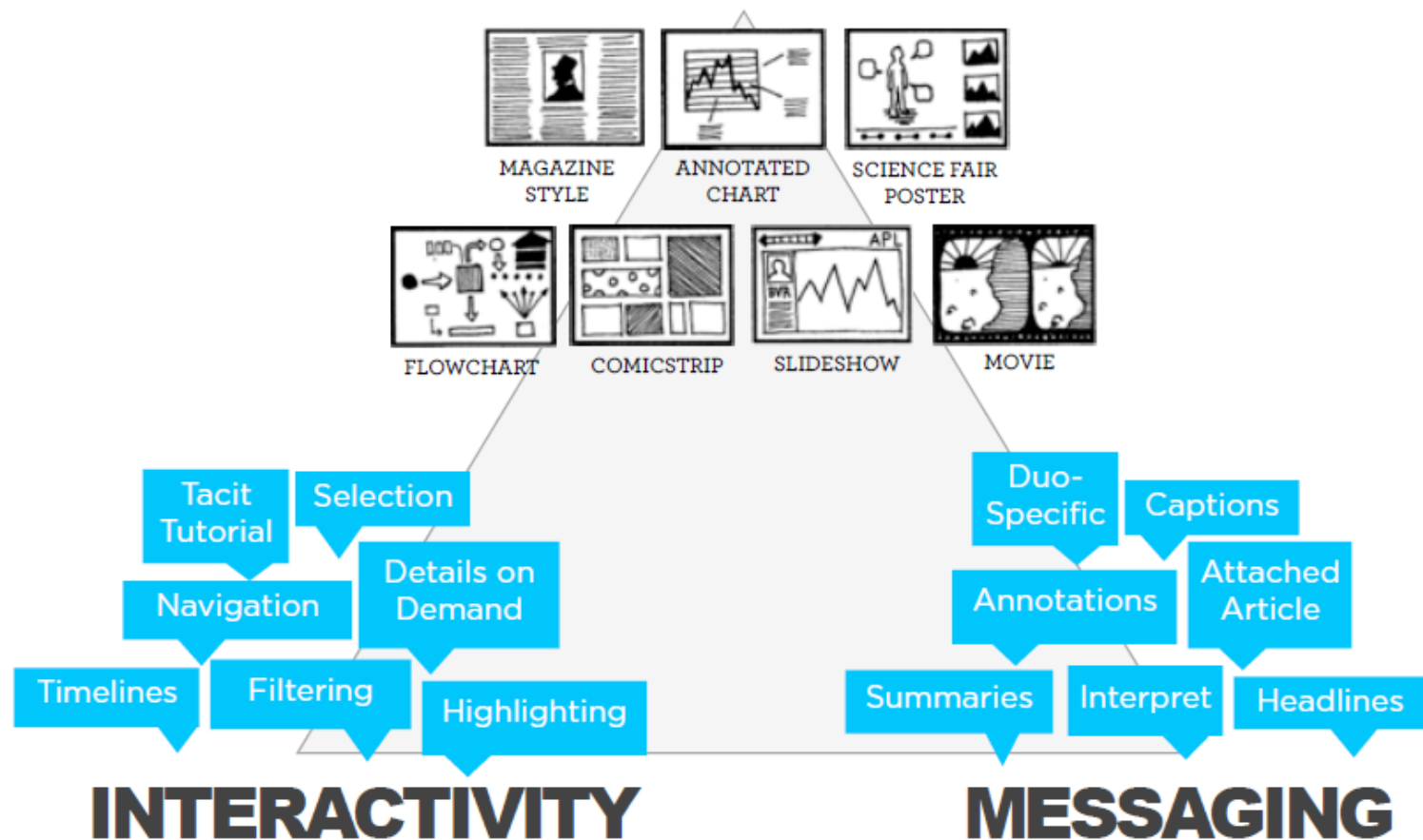
Genres

magazine style
annotated chart
partitioned poster
flow chart
comic strip
slide show
film, video, animation



Narrative Framework

VISUAL STRUCTURE



Edward Segel and Jeffrey Heer, Narrative Visualization: Telling Stories with Data, IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 16, NO. 6, NOVEMBER/DECEMBER 2010

https://multimedia.journalism.berkeley.edu/media/upload/presentations/2012/01/13/InteractiveJournalism_Berkeley.pdf

Design Space

... genres + interactivity + messaging

Author Driven

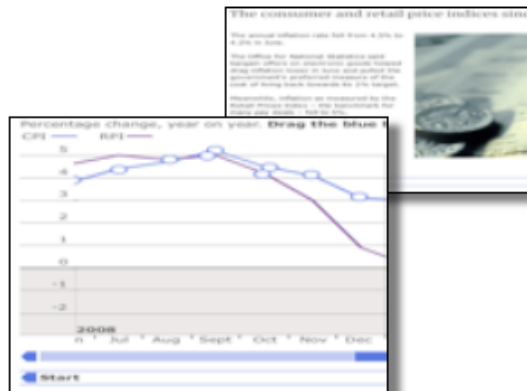
- strong order
- heavy messaging
- minimal interactivity

- clear story
- fast delivery
- ➔ author's message

Reader Driven

- weak order
- light messaging
- free interactivity

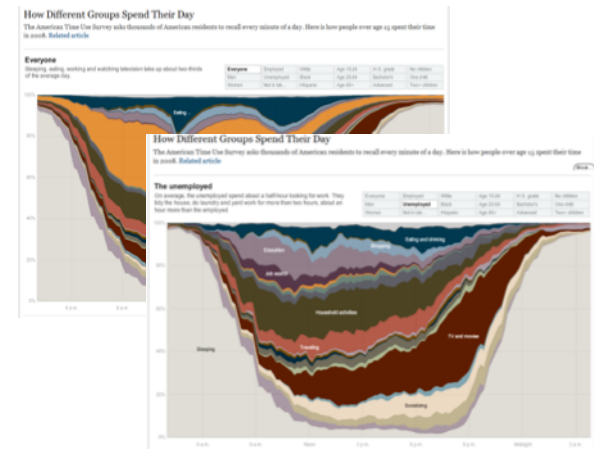
- query
- explore
- ➔ reader driven



martini glass



interactive
slide-show



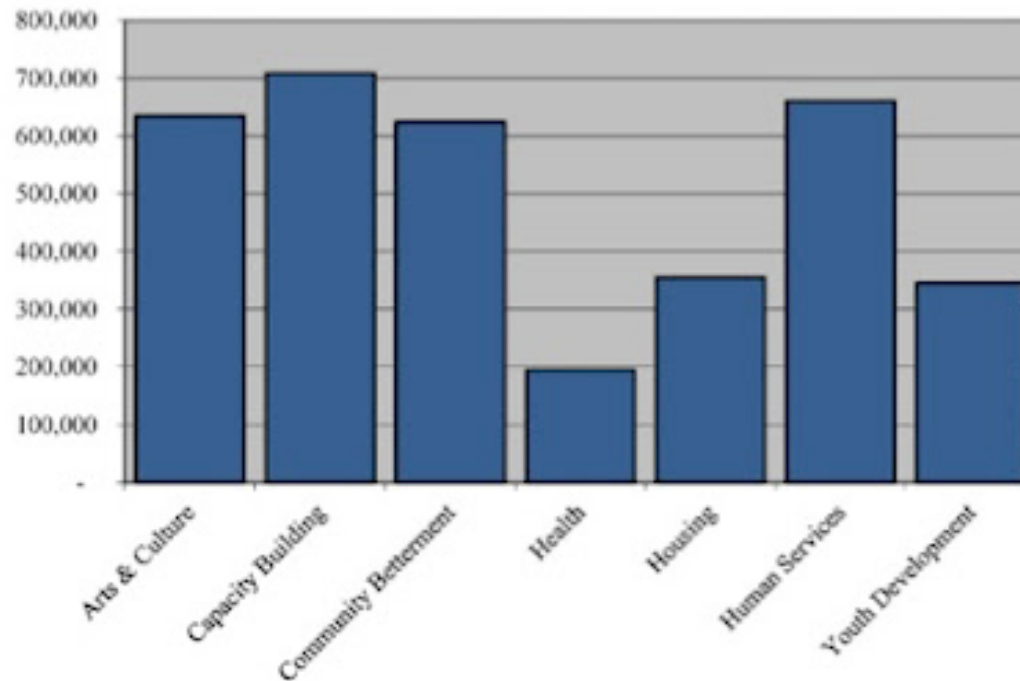
drill-down
story

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Simple story example

Investment by area of impact

2006 - Present



<http://www.storytellingwithdata.com/2012/10/my-penchant-for-horizontal-bar-graphs.html>

... this tells a better story

We invest primarily in four areas

Since we began investing in 2006, **four areas** have received **more than \$600K each**, accounting for 75% of total grantmaking activity

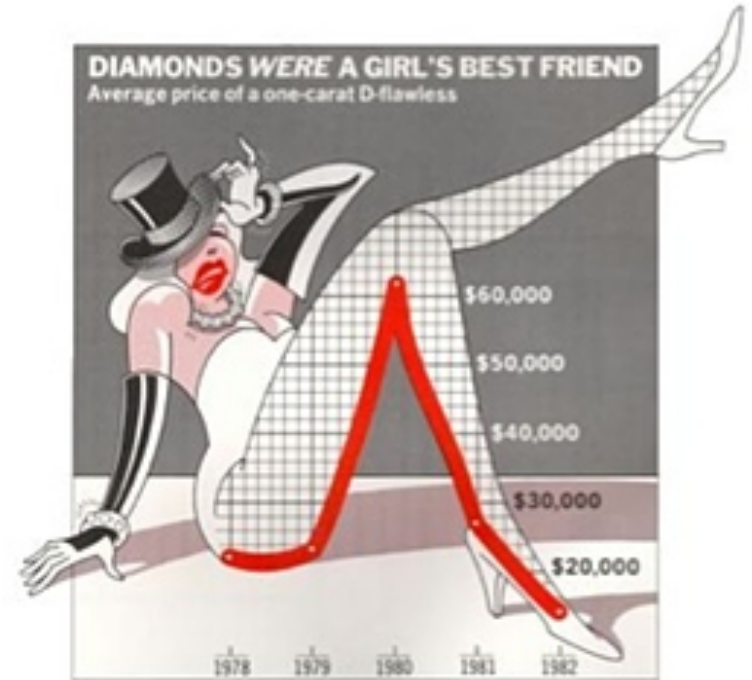
Investment by Area of Impact

2006 - Present



Chart Junk ...

... when is it helpful for a story?



better recall in the long-term – elements, trend, message

Scott Bateman, Regan L. Mandryk, Carl Gutwin, Aaron Genest, David McDine, Christopher Brooks,
[Useful Junk? The Effects of Visual Embellishment on Comprehension and Memorability of Charts](#). *ACM Conference on Human Factors in Computing Systems (CHI)*, 2010.

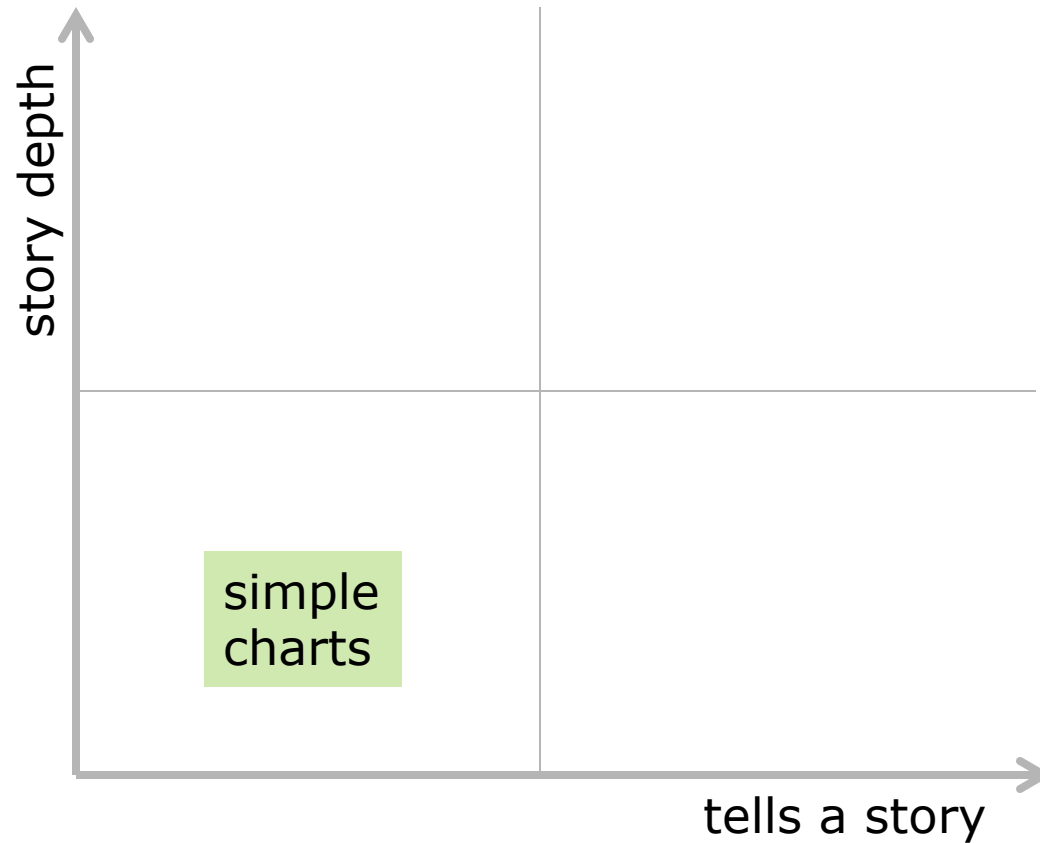
Pictograph (1930)



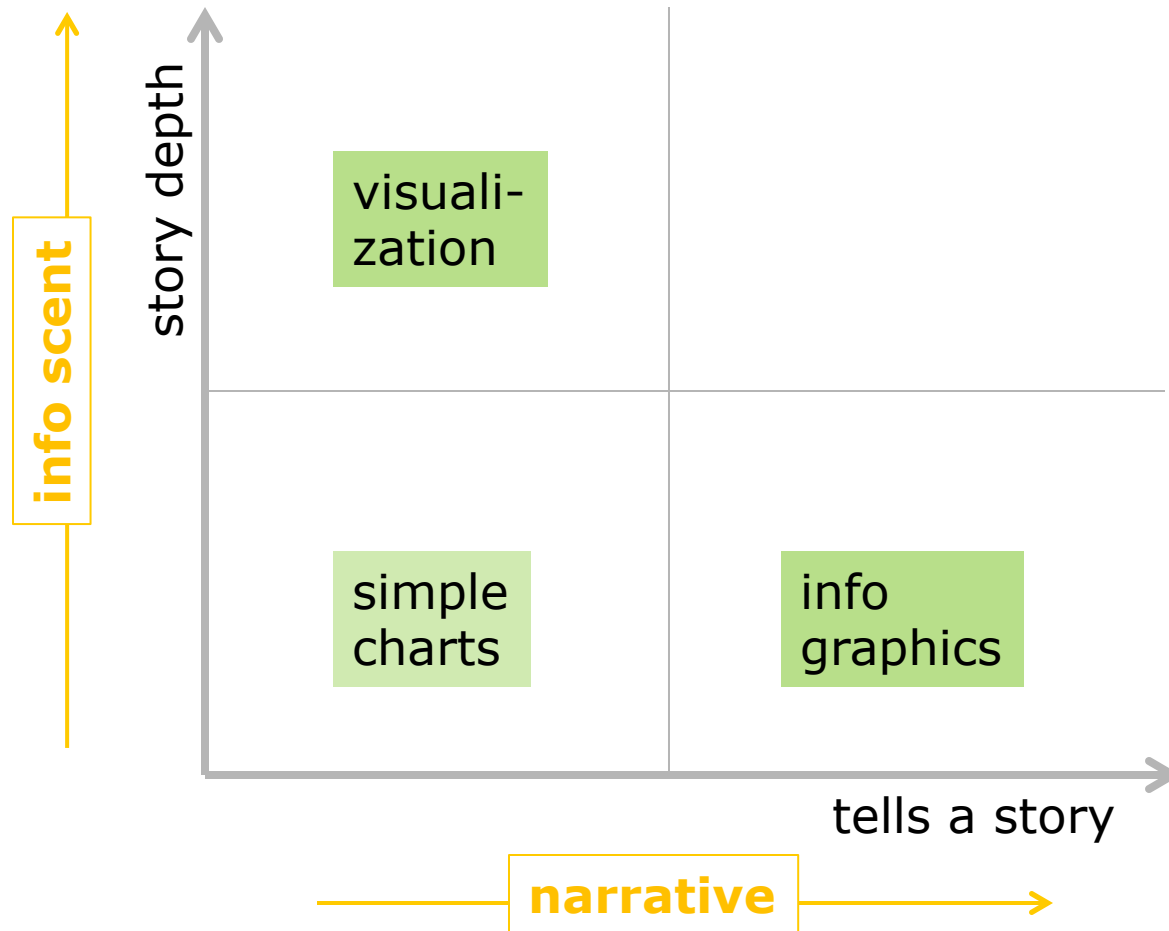
"Home and Factory Weaving in England, 1820-1880" Otto and Marie Neurath Isotype Collection, University of Reading as seen in The Functional Art by Alberto Cairo.

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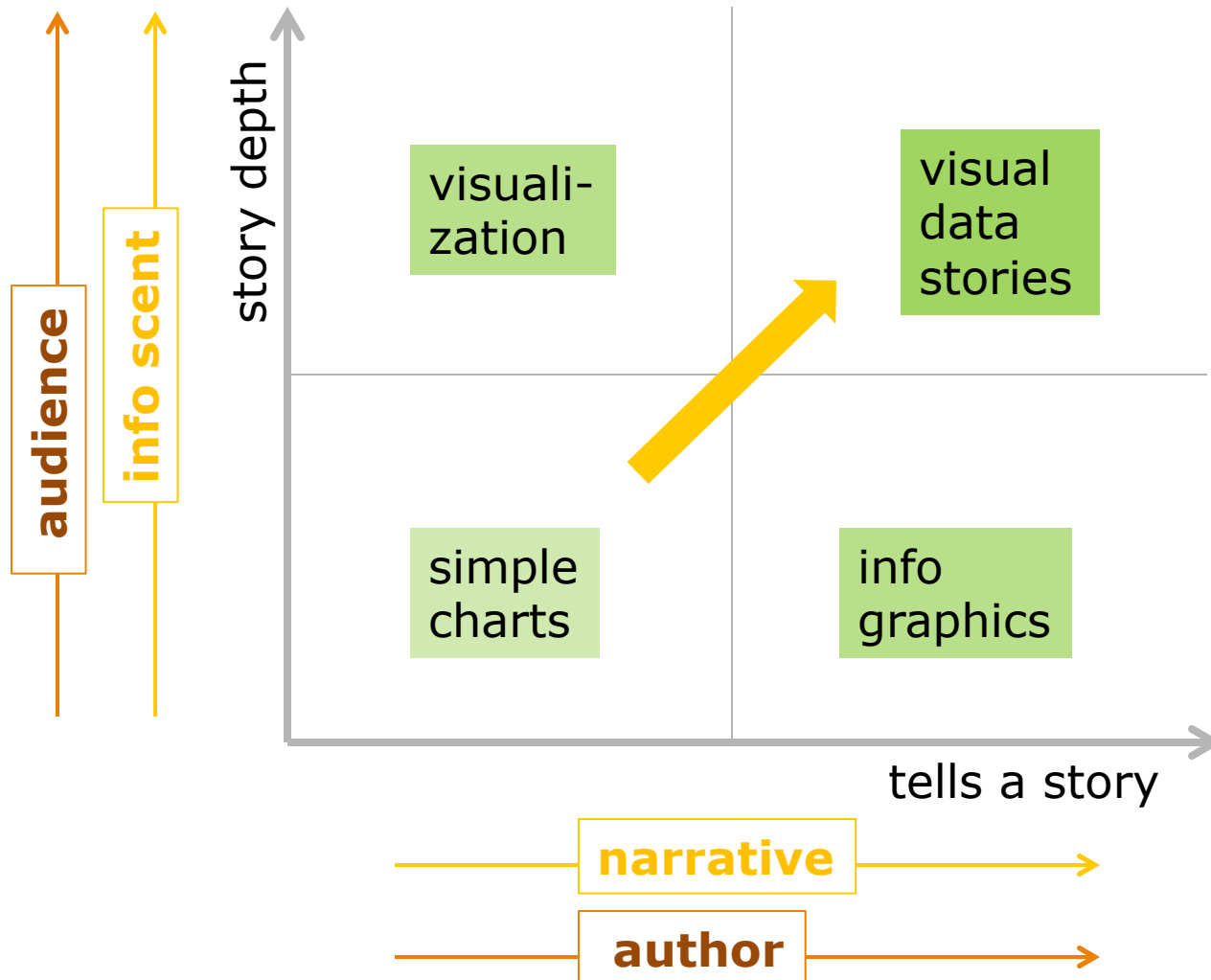
Storytelling elements



Storytelling elements



Storytelling elements



Building Narrative

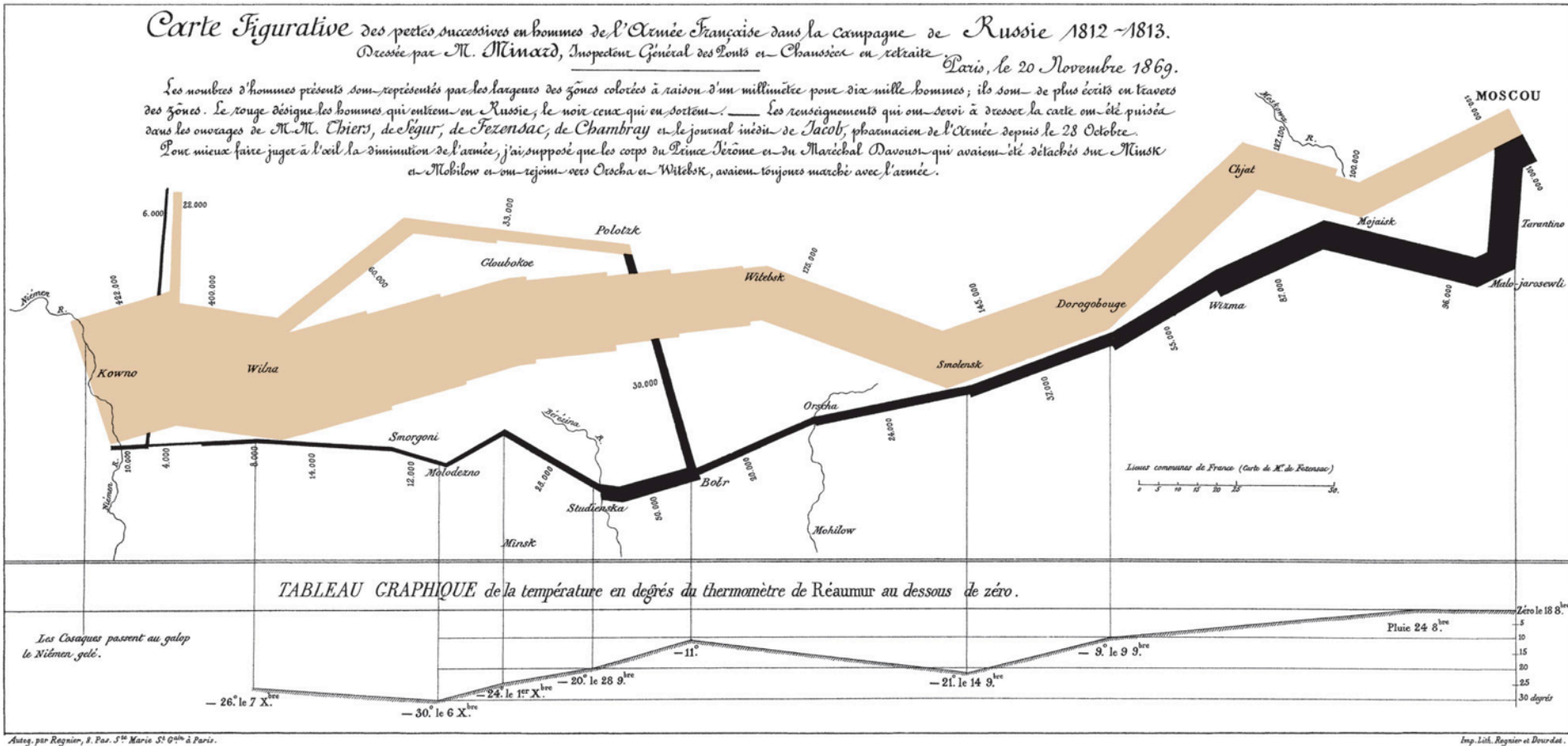
Napoleon's March 1812-1813 flowmap

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. MINARD, Inspecteur Général des Ponts et Chaussées en retraite. Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Ligny, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout, qui avaient été détachés sur Minsk et Mohilow et qui rejoignent vers Orscha et Witebsk, avaient toujours marché avec l'armée.

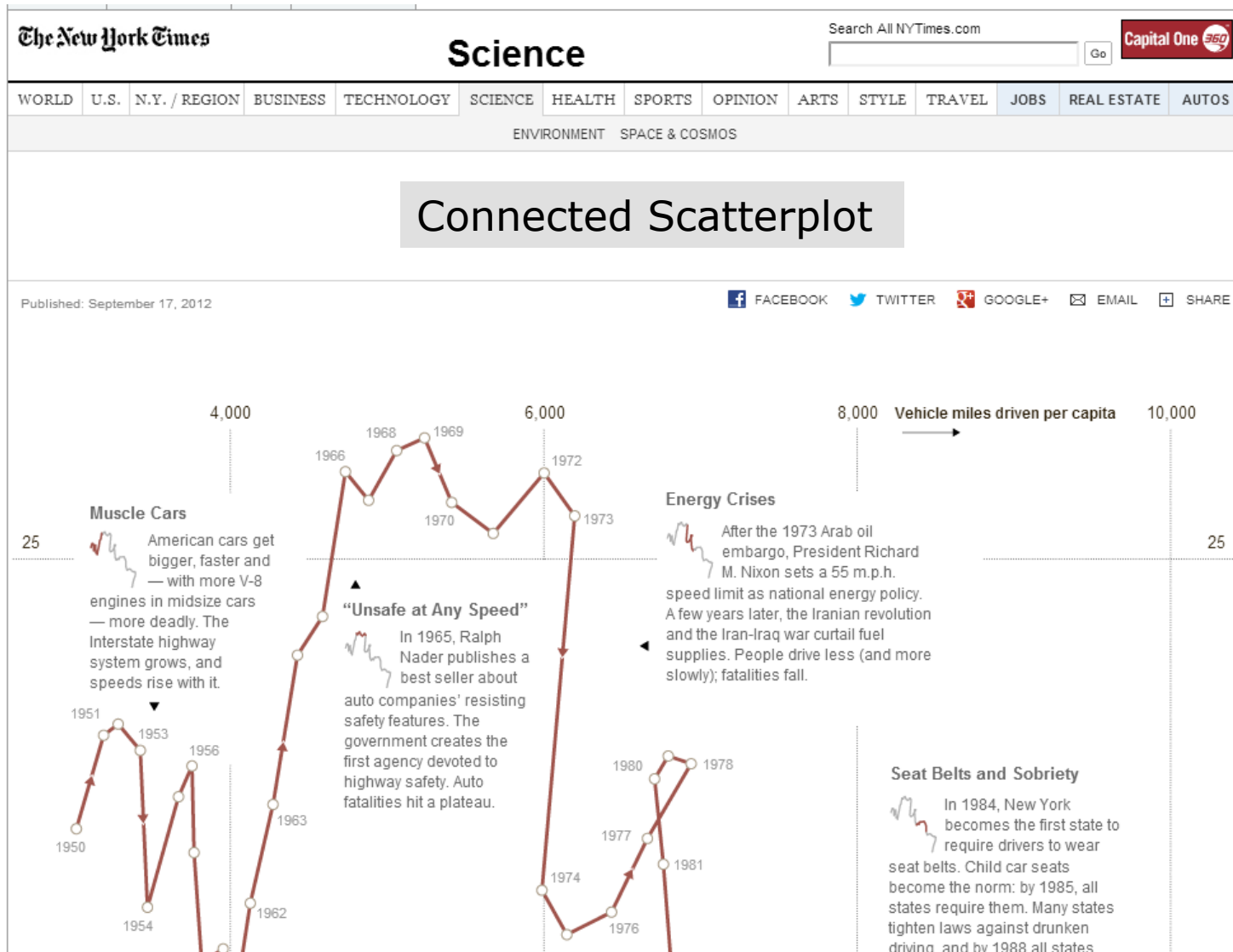


“ ... a means of telling the story of the soldiers' plight ...”

Building Narrative

Driving Safety in Fits and Starts

<http://www.nytimes.com/interactive/2012/09/17/science/driving-safety-in-fits-and-starts.html>



Why is Her Paycheck Smaller

Adding Depth

http://www.nytimes.com/interactive/2009/03/01/business/20090301_WageGap.html? r=0

The New York Times

Business Day

Search All NYTimes.com

Go

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION ARTS STYLE TRAVEL JOBS REAL ESTATE AUTOS

Search

Global

DealBook

Markets

Economy

Energy

Media

Personal Tech

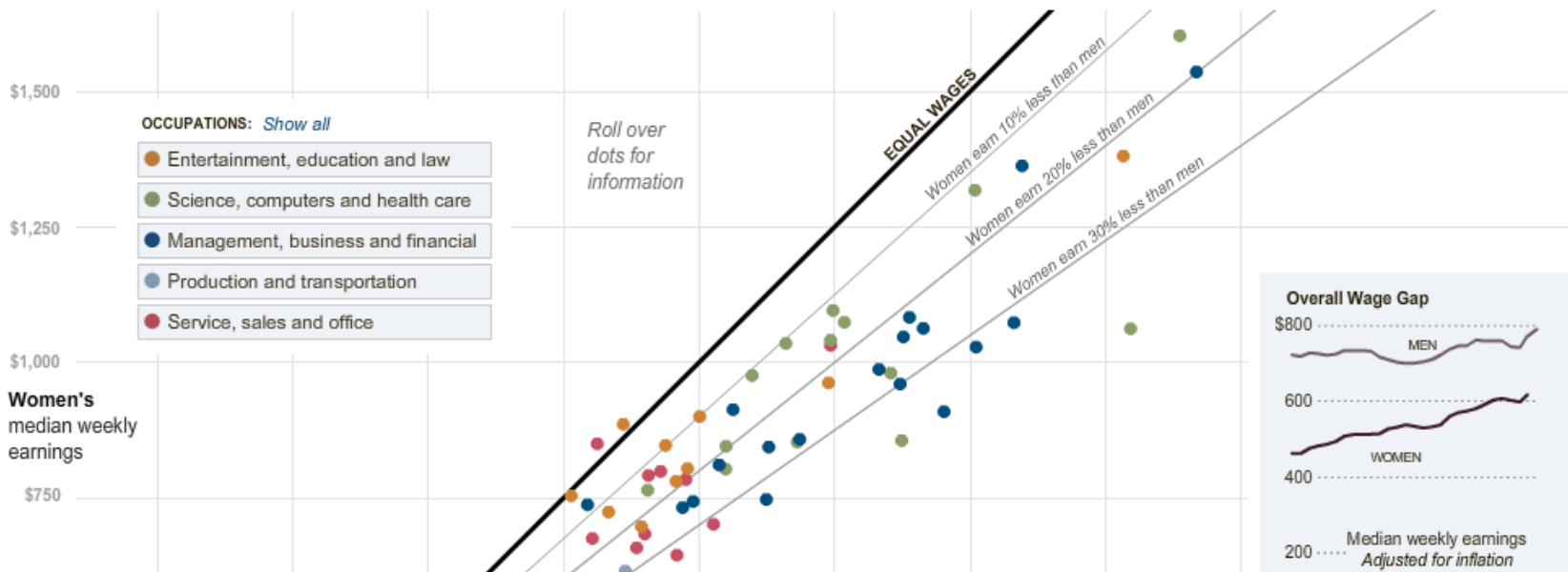
Small Business

Your Money

Published: May 18, 2010

Why Is Her Paycheck Smaller?

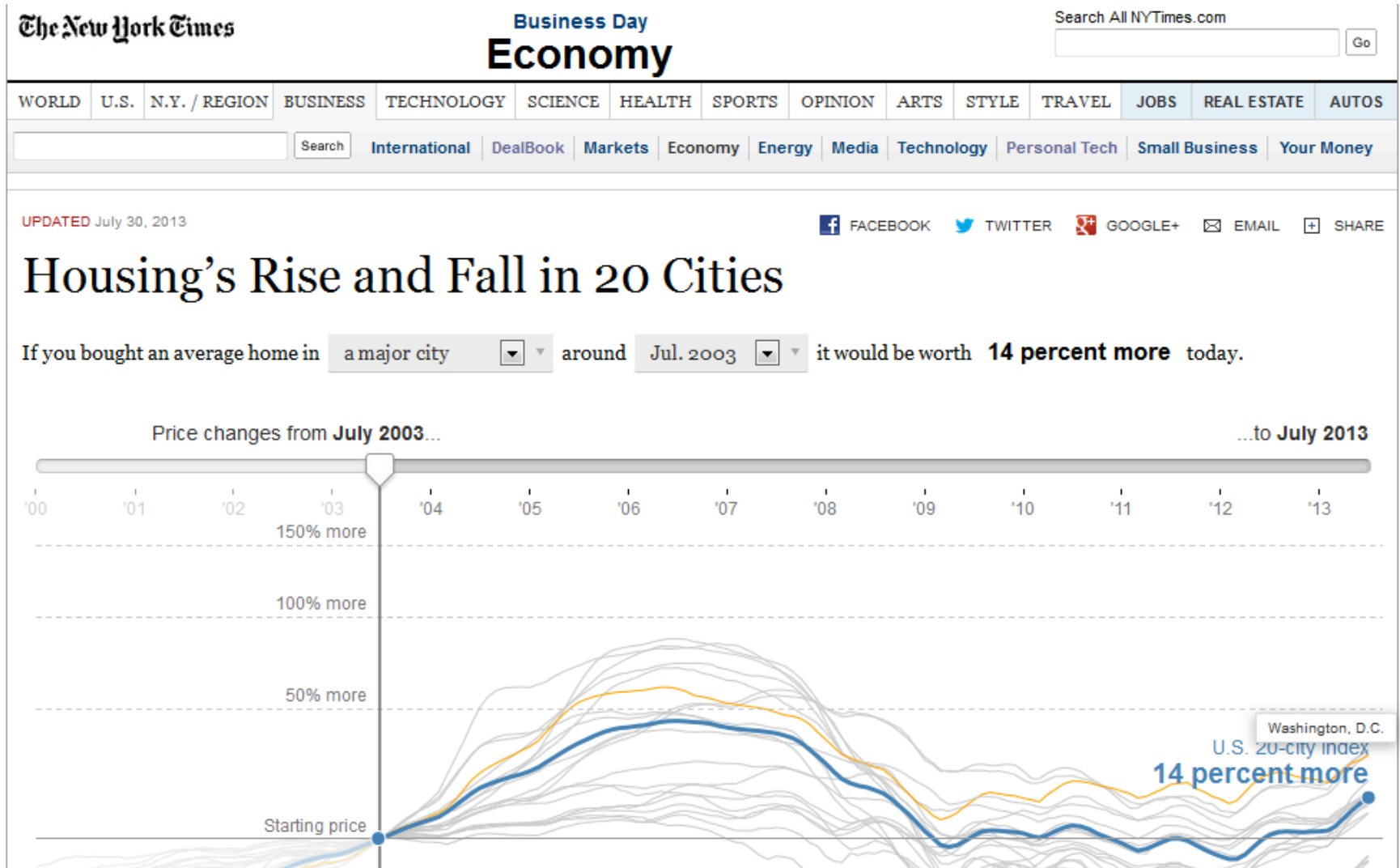
Nearly every occupation has the gap — the seemingly unbridgeable chasm between the size of the paycheck brought home by a woman and the larger one earned by a man doing the same job. Economists cite a few reasons: discrimination as well as personal choices within occupations are two major factors, and part of the gap can be attributed to men having more years of experience and logging more hours.



Adding Depth

Housing's Rise and Fall in 20 Cities

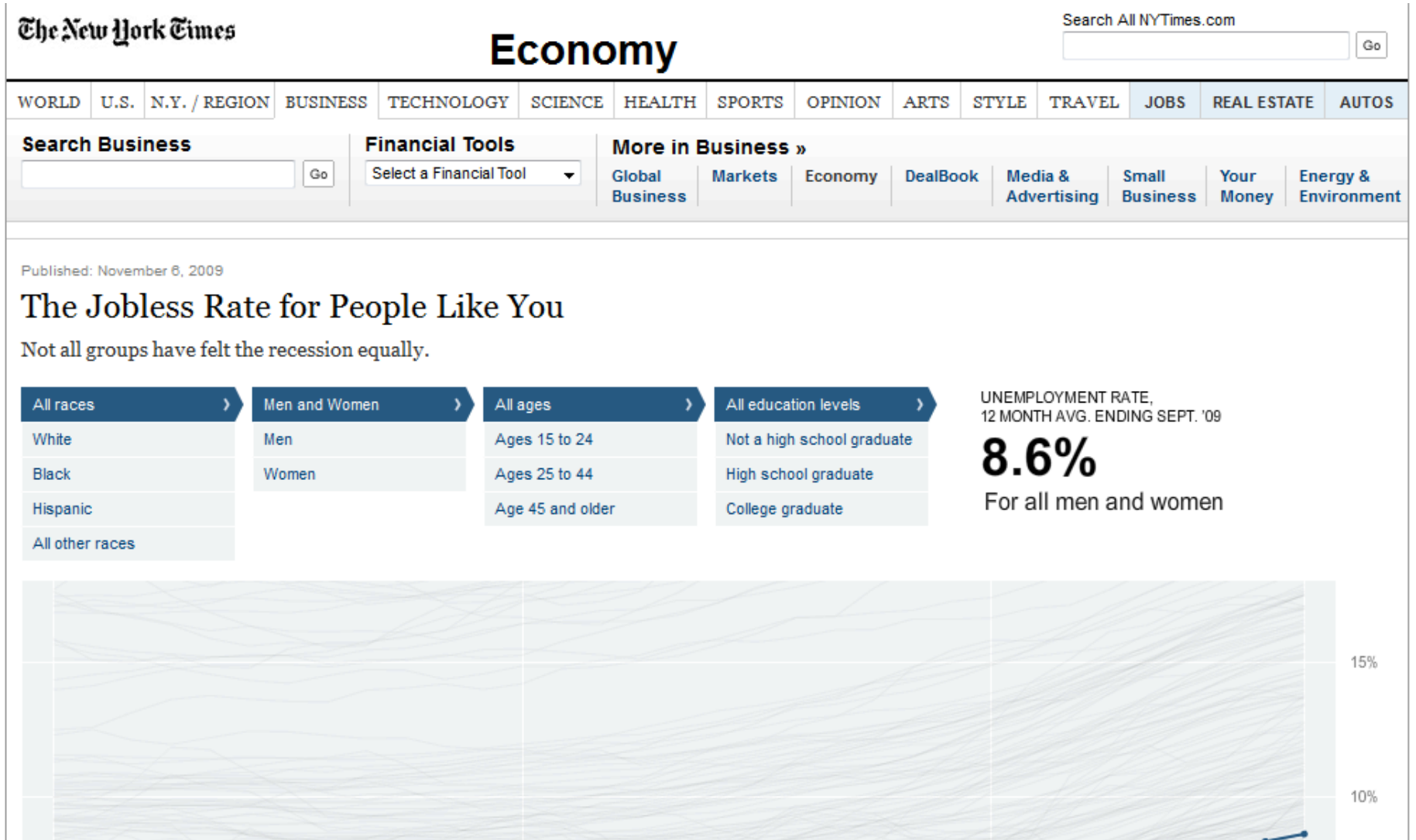
<http://www.nytimes.com/interactive/2011/05/31/business/economy/case-shiller-index.html?ref=economy>



Adding Depth

Jobless Rate for People Like You

<http://www.nytimes.com/interactive/2009/11/06/business/economy/unemployment-lines.html>



Adding Interaction

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

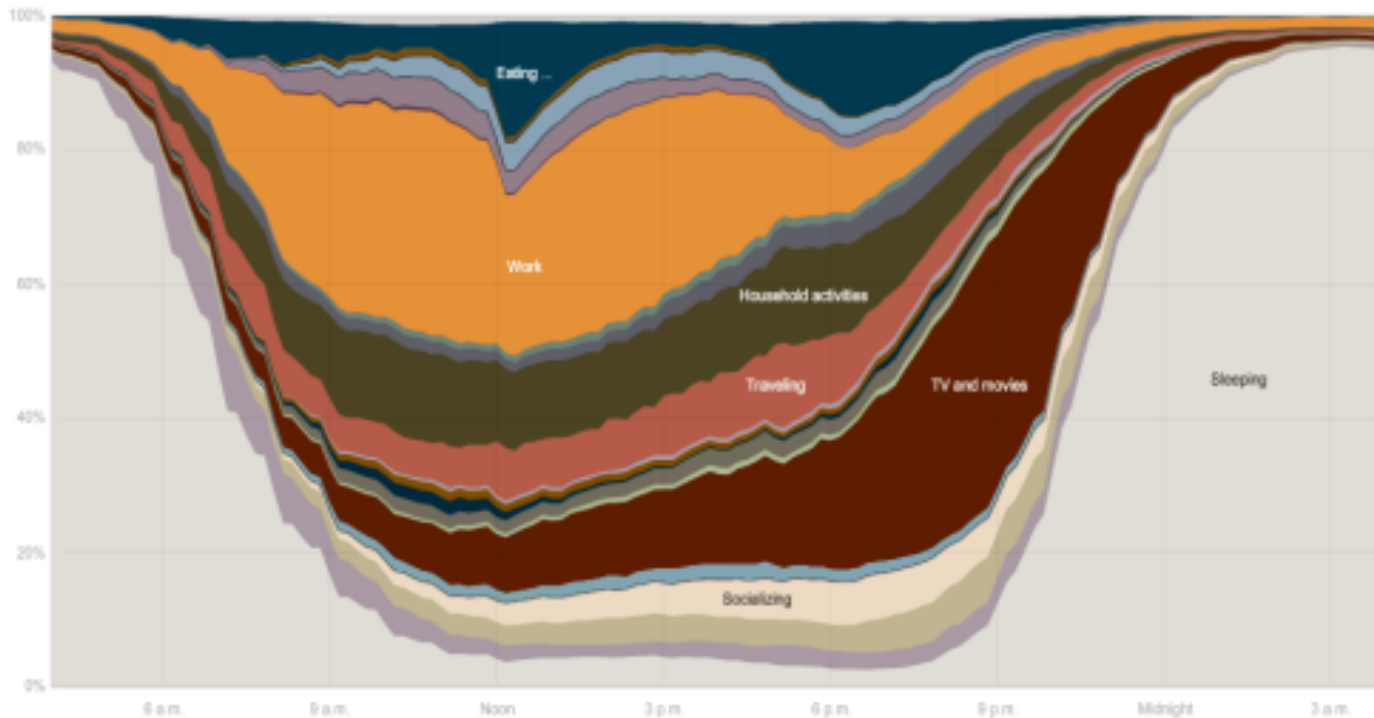
How Different Groups Spend Their Day

The American Time Use Survey asks thousands of American residents to recall every minute of a day. Here is how people over age 15 spent their time in 2008. [Related article](#)

Everyone

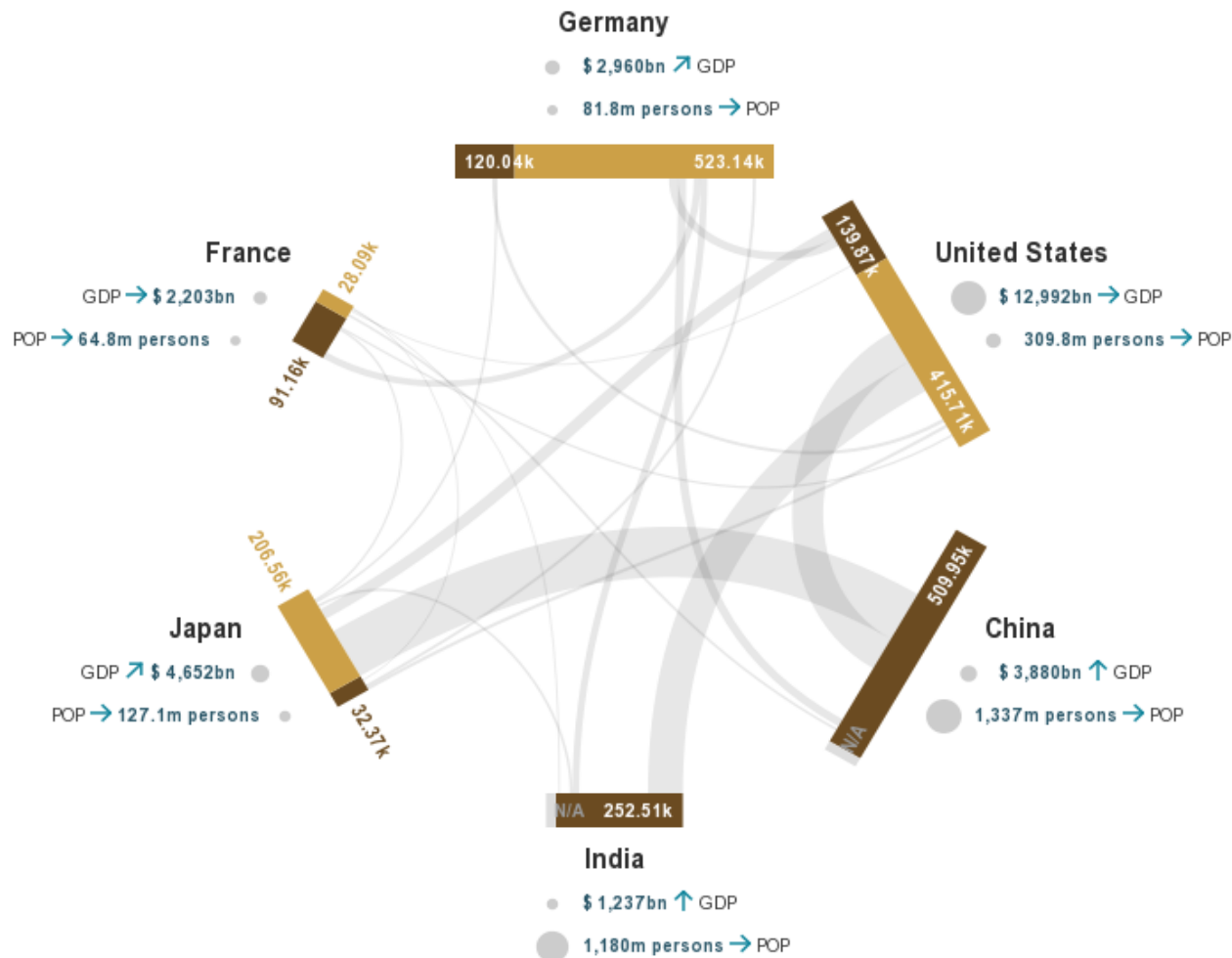
Sleeping, eating, working and watching television take up about two-thirds of the average day.

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



GED Viz ... Data Storytelling Tool

<http://viz.ged-project.de/?lang=en>



Generated with GED VIZ (viz.ged-project.de)

SOURCES

Migration: [OECD Migration Database](#)
GDP, POP: [OECD/European Commission](#)

LEGEND

2010 Emigration/immigration to/from all available countries in thousand persons as reported by immigration countries' statistics (inflows of foreign population by nationality). Bar lengths relative to largest sum of immigrations and emigrations (among displayed countries for all years).

Emigration/immigration in thousand persons

Bubble size relative to largest indicator value.

GDP: Gross Domestic Product, in billion US-\$ (constant prices, base 2005)
max. size \$ 13,225bn

POP: Population, in million persons
max. size 1,344m

↗ Tendency arrows indicate change to previous year's value (i) for absolute values: relative change; (ii) for percentage values: difference in percent points.

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Discovery vs Presentation

Discovery

explore
build views
test hypothesis
lots of data

Presentation

how much narrative to provide?
... depends
is there a presenter?
or is the graphic provided?

Presentation

- ➔ focus!
- common mistake – lack of focus, too much data
- present only what is relevant for the story
- minimum amount of information needed to make the story work

Summary

- Understand the context – audience, data, takeaway/outcome
- Choose right display type – text, scatterplots, line charts, bar charts, ...
- Eliminate clutter – use Gestalt principles to cut if no information value
- Draw attention where you want to – preattentive attributes of color, size, ...
- Linear is better for storytelling
- Guide readers through the story –where to start, how to get back, reset
- Limit complexity initially, reveal as needed
- Cool and readability maybe at odds – recognize tradeoffs, tailor to audience

STRUCTURE

- Text good for storytelling
- State the point you want to make – don't leave the reader wondering
- Start with an interesting view
- Put numbers and facts in context
- Connect relevant text and graphics, e.g., see Figure 1
- Add summary/conclusions/"so what?"
- Labels and significant digits suggest what deserves attention

MESSAGING

- Show how the interactivity works, make it intuitive
- Limit interactivity to key elements – too much can distract from story

INTERACTIVITY

Building Narrative

... extra virgin suicide ...

<http://nyti.ms/MbTzYz>