

Storytelling with Data

Module 9: Frame the story – consumers and information graphics

Scott Spencer
Faculty and Lecturer
Columbia University

Agenda

Upcoming deliverable

Today's objectives

Considering uncertainty

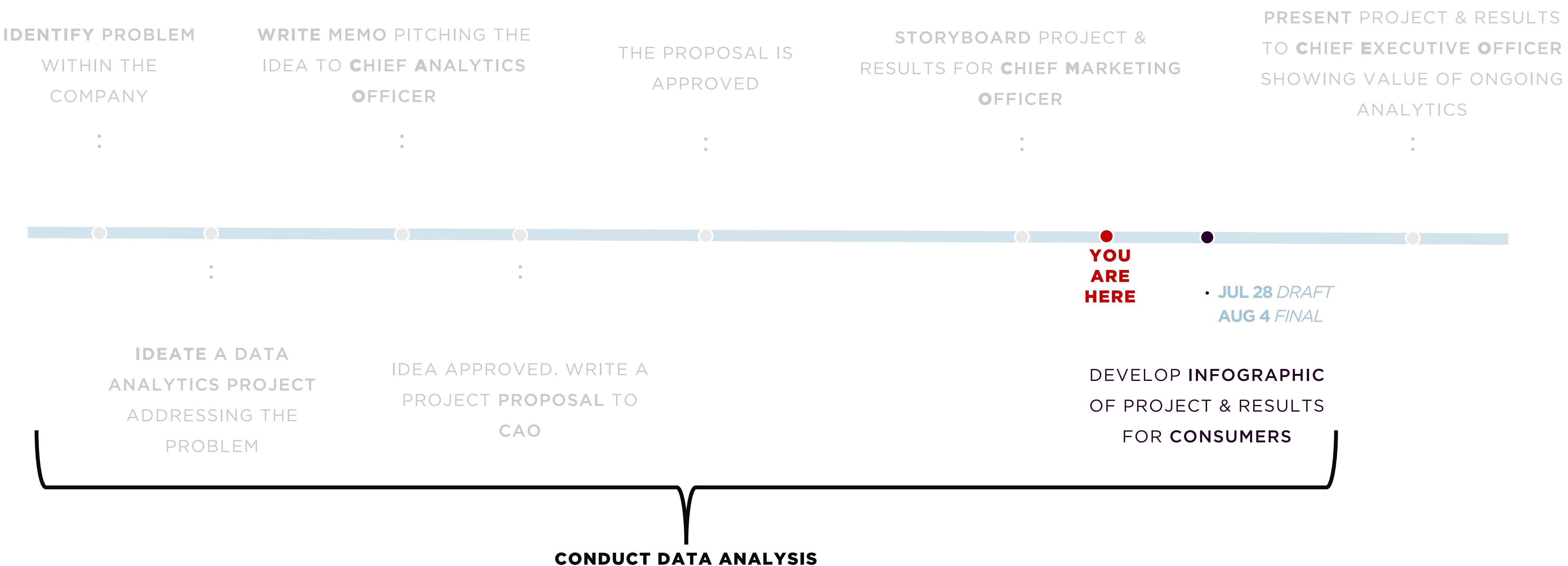
Information graphics

Questions or suggestions?

Upcoming deliverables

Upcoming deliverables

Information graphic – reframe your story, this time building off the messages you built for the marketing team in order to craft an infographic that displays the results of the analytic work in a way that is accessible, engaging, and exciting for a **general or consumer audience**.



Today's Objectives

Objectives

1

Communicating uncertainty
with data visualization

2

Organizing information

3

Use information graphics
to tell a story

Communicating uncertainty

Where's my data? Evaluating Visualizations with Missing Data

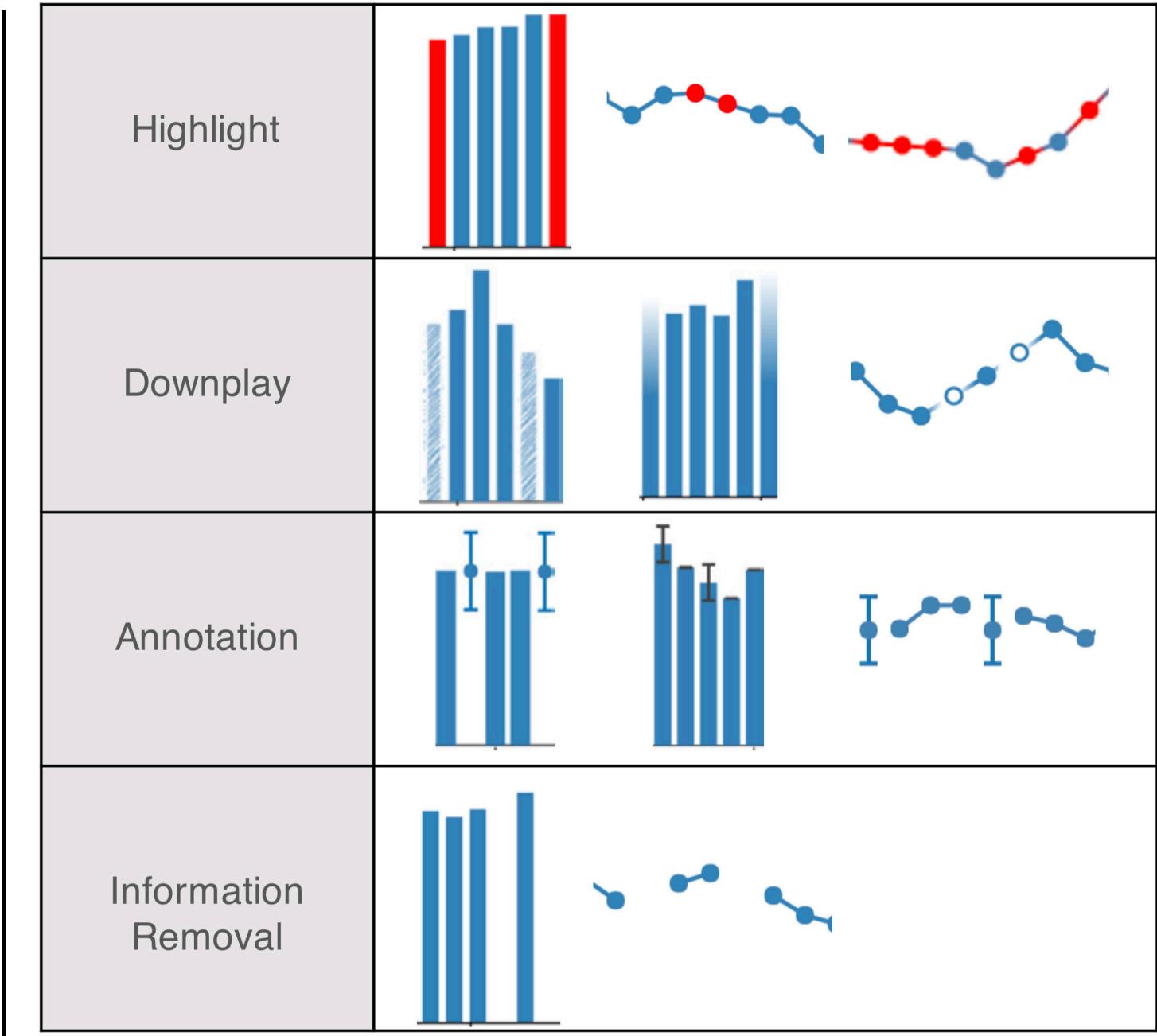
Song & Szafir

The authors were academics at the University of Colorado Boulder.



Visual choices for missing values on perception of data quality

Choice of missing-data visualization alters perceptions of data quality



Perceived data quality and confidence generally degrade as the amount of missing data increases.

Data visualized by **highlighting missing values** tends to be seen as **higher quality than downplay or information removal**.

Information removal can significantly **degrade** perceptions of data quality, and confidence. These methods even lead to incorrect responses if missing values break the visual continuity of a visualization.

Linear interpolation leads to **higher perceptions** of quality and confidence in analysis.

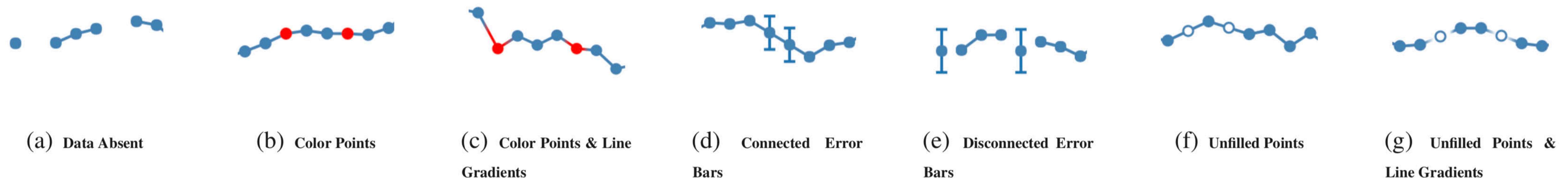


Fig. 4: We tested seven different methods for visualizing missing values in line graphs manipulating both point and line appearance: two highlighting missing values, two downplaying missing values, two annotating missing values, and one removing missing values. .

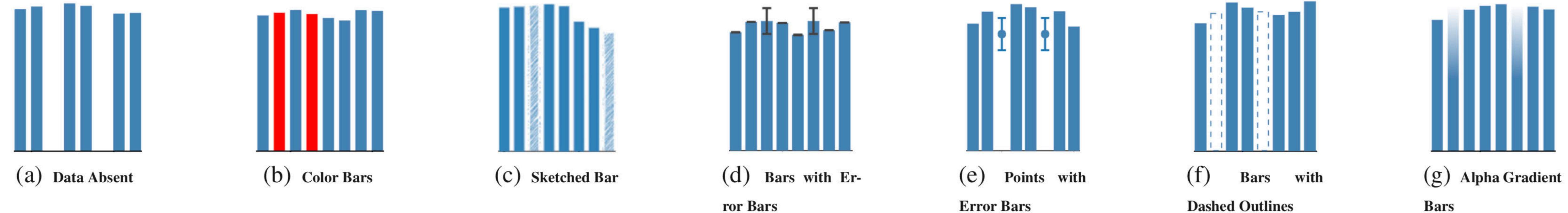
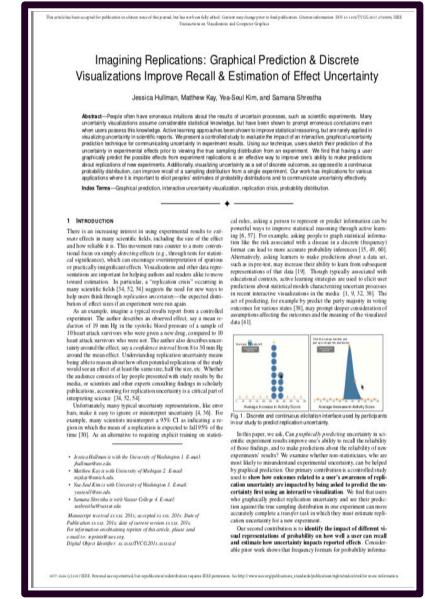


Fig. 6: We tested seven different methods for visualizing missing values in bar charts: one highlighting missing values, three downplaying missing values, two annotating missing values, and one removing missing values.

Imagining Replications

Hullman & co-authors

The authors are part of an academic group formally studying the perception of uncertainty, among other things.



Sketching perception of uncertainty before seeing results improves accuracy

Visualizing uncertainty as set of discrete outcomes improved recall

Crowd-sourced study that evaluated the impact of an interactive, graphical uncertainty prediction technique for communicating uncertainty in results. Users sketched their prediction of the uncertainty in experimental effects prior to viewing the true sampling distribution from an experiment.

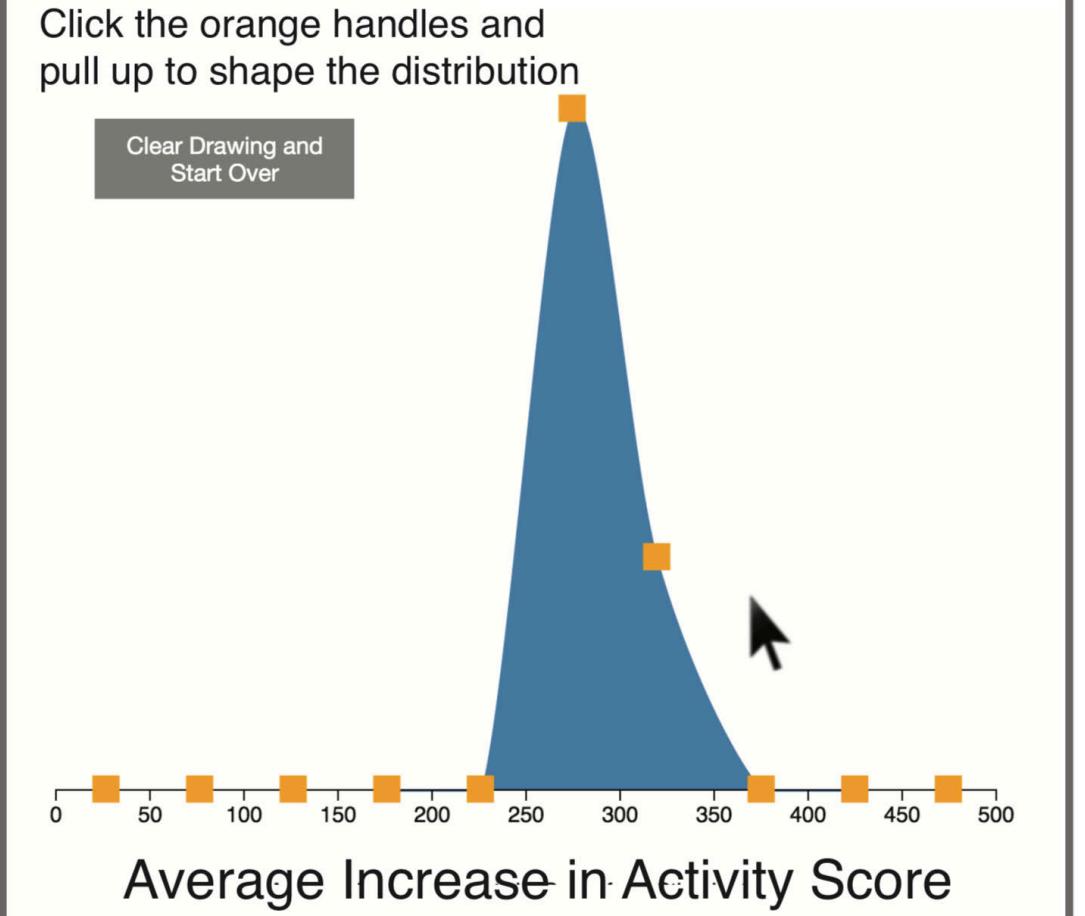


Fig. 1. Discrete and continuous elicitation interface used by participants in our study to predict replication uncertainty.

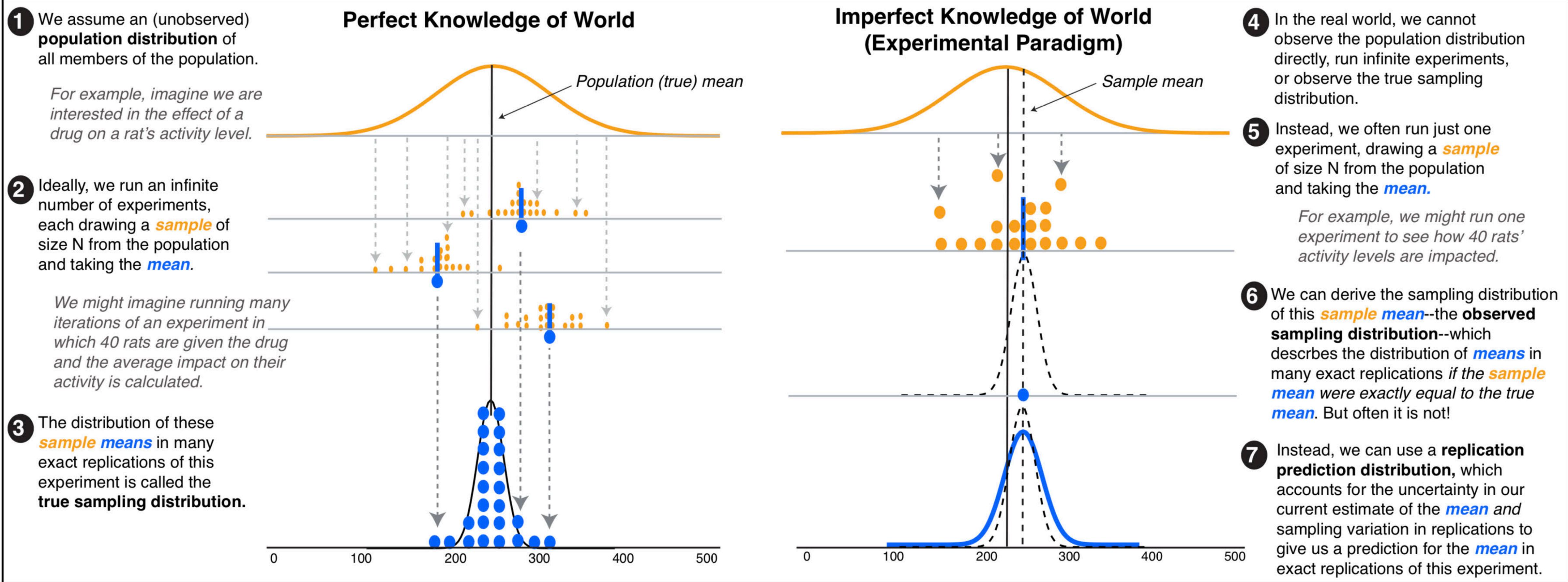


Fig. 2. A depiction of distributions relevant to replication uncertainty, including those based on perfect knowledge of the world (left) and those derived from samples obtained in experimentation (right).

Information graphics

Too broad, generic

infographic n. a visual image such as a chart or diagram used to represent information or data in an easily understandable form.



All

Images

News

Videos

Books

More

Settings

Tools



education



timeline



social media



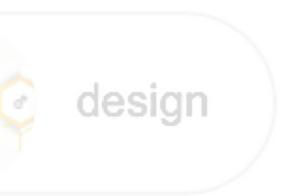
health



food



design



water



technology



business



process

Want bad examples? Just google.



What is an Infographic? Infograp...
venngage.com



Reports & Charts Online ...
visme.co



What is an Infographic? Infograp...
venngage.com

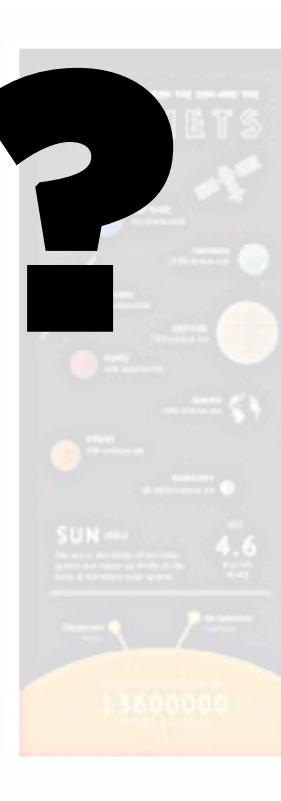


Free Online Infographic Mak...
canva.com



Reports & Charts Online ...
visme.co

Visual.ly
visual.ly



Free Online Infographic Mak...
canva.com



Most collect trivia. They lack:
change, complexity, story, design.



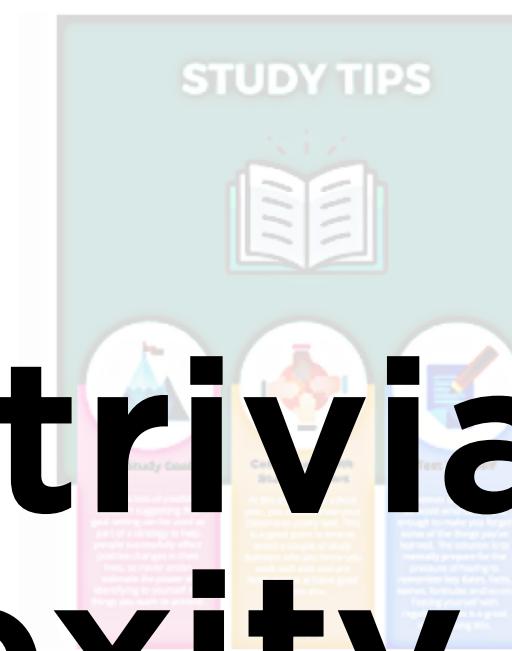
Creating Beautiful Infographic...
blog.hubspot.com



for patients—than copay surprise...
advancecardiohealth.org



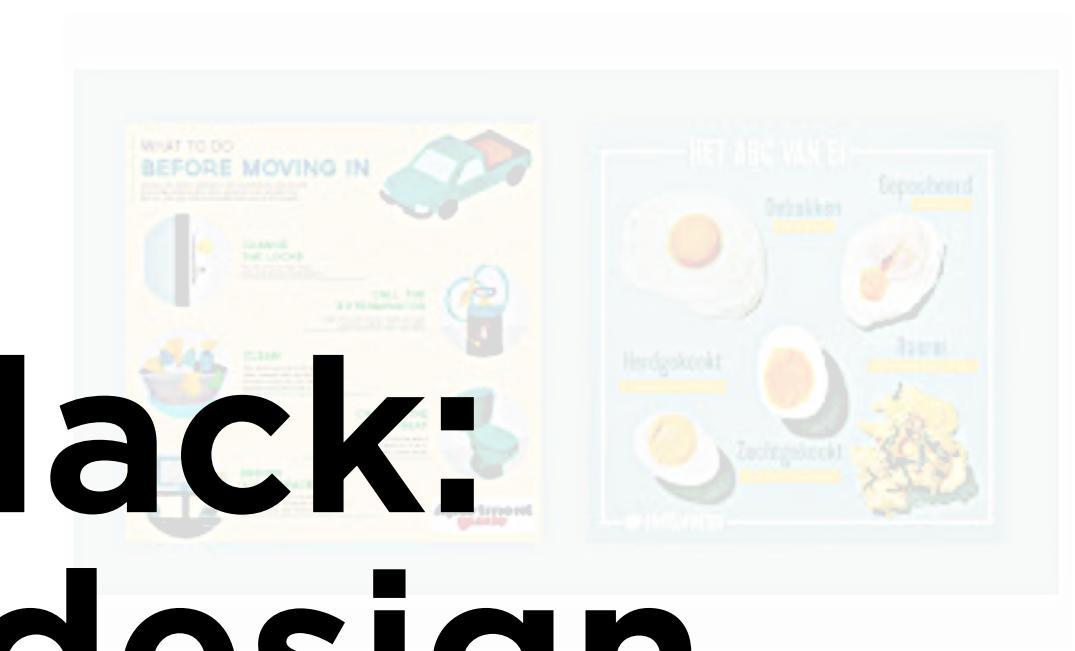
The 4 Most Common Infographic...
columnfivemedia.com



venngage.com



edgeforscholars.org
visme.co



A ru...
pro:





2017 PITCHER HEATMAPS

by Jacob Olsufka

2017 PITCHER HEATMAPS

How to read this heatmap visual: each column is a start, each row is an inning

Runs per game

The bars across the top shows a pitcher's trend of total runs allowed over the season.
A dot represents a quality start (>= 6 innings, <= 3 ER).

Depth into game

Follow the depth of the bars across the bottom to see the trend of how far into a game a pitcher goes.

Runs per inning

See which innings pitchers gave up the most total runs with the bars to the right.

Individual innings

The heatmap shows each inning during a pitcher's season, and when they gave up their runs colored by intensity.

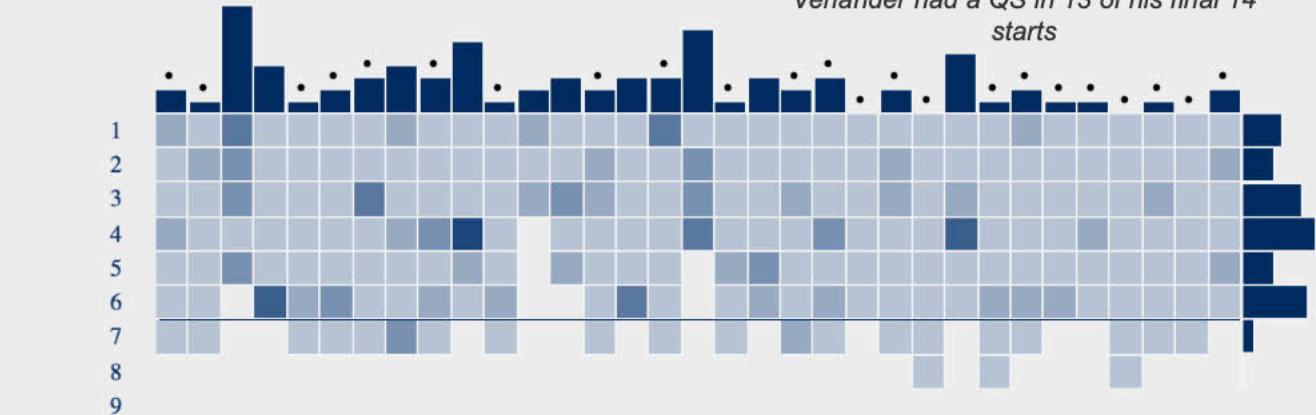
INDICATES LEAGUE
LEADER



JUSTIN VERLANDER

15-8 3.36 ERA 1.17 WHIP 219 SO 23 QS

Verlander had a QS in 13 of his final 14 starts



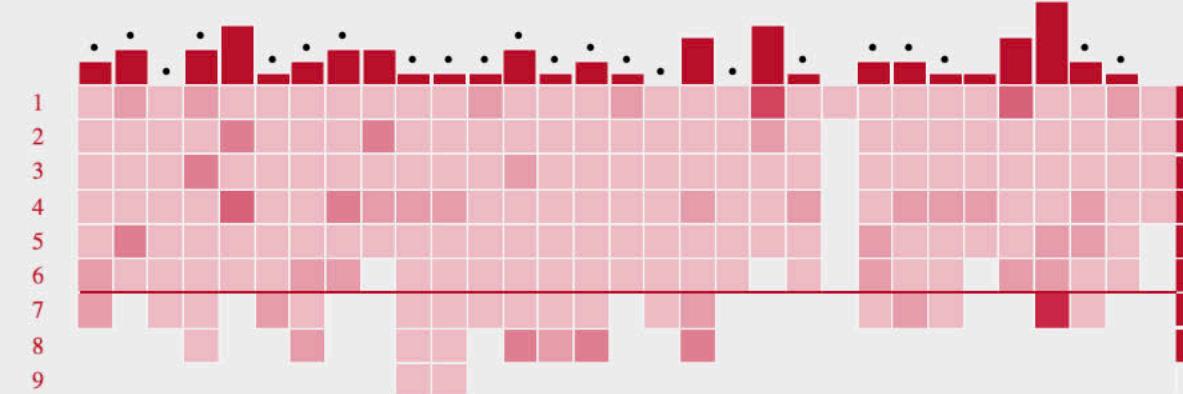
THE CY YOUNGS



MAX SCHERZER

16-6 2.51 ERA 0.90 WHIP 268 SO 22 QS

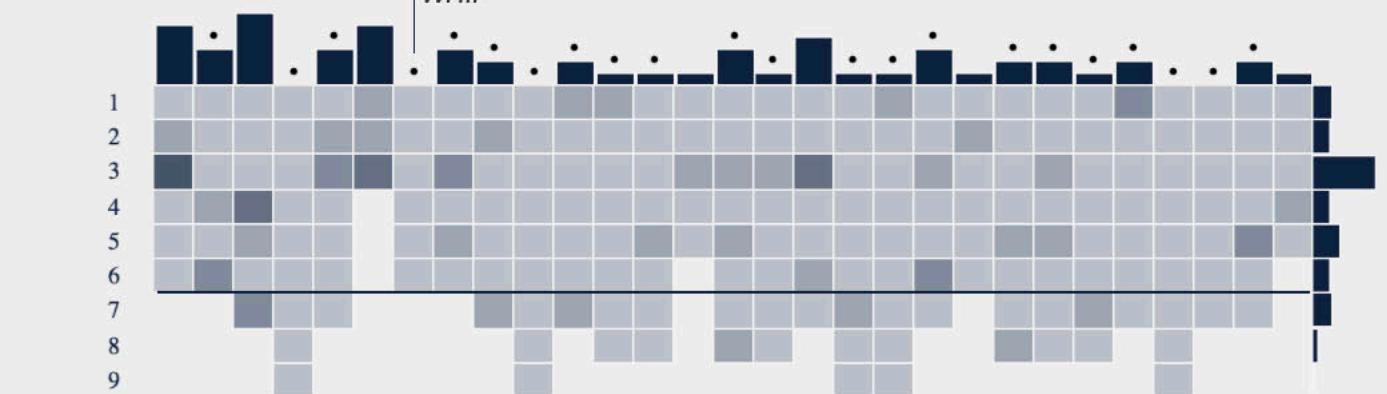
Scherzer led the league with a .178 batting avg against



COREY KLUBER

18-4 2.25 ERA 0.87 WHIP 265 SO 22 QS

From June on, Kluber had a 1.62 ERA and 0.76 WHIP



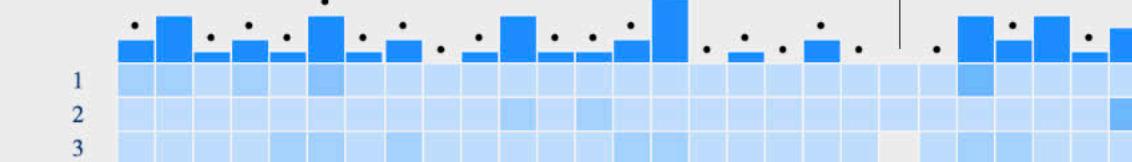
THE 'MAYBE COULD HAVE WON' THE CY YOUNGS



CLAYTON KERSHAW

18-4 2.31 ERA 0.95 WHIP 202 SO 20 QS

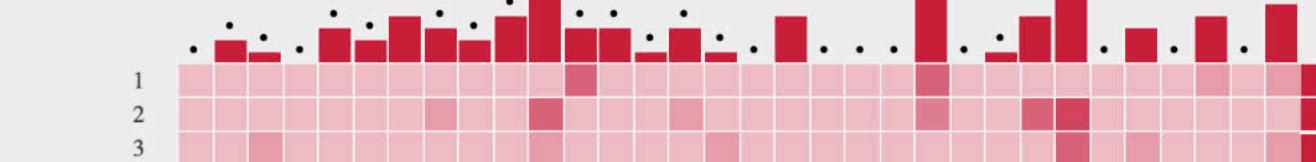
Kershaw left with a back injury



CHRIS SALE

17-8 2.90 ERA 0.97 WHIP 308 SO 23 QS

Sale had the most Ks in the AL since 1999



**Without a narrative,
it's just trivia, list of facts:**



Data-Driven Storytelling

Riche, co-editors

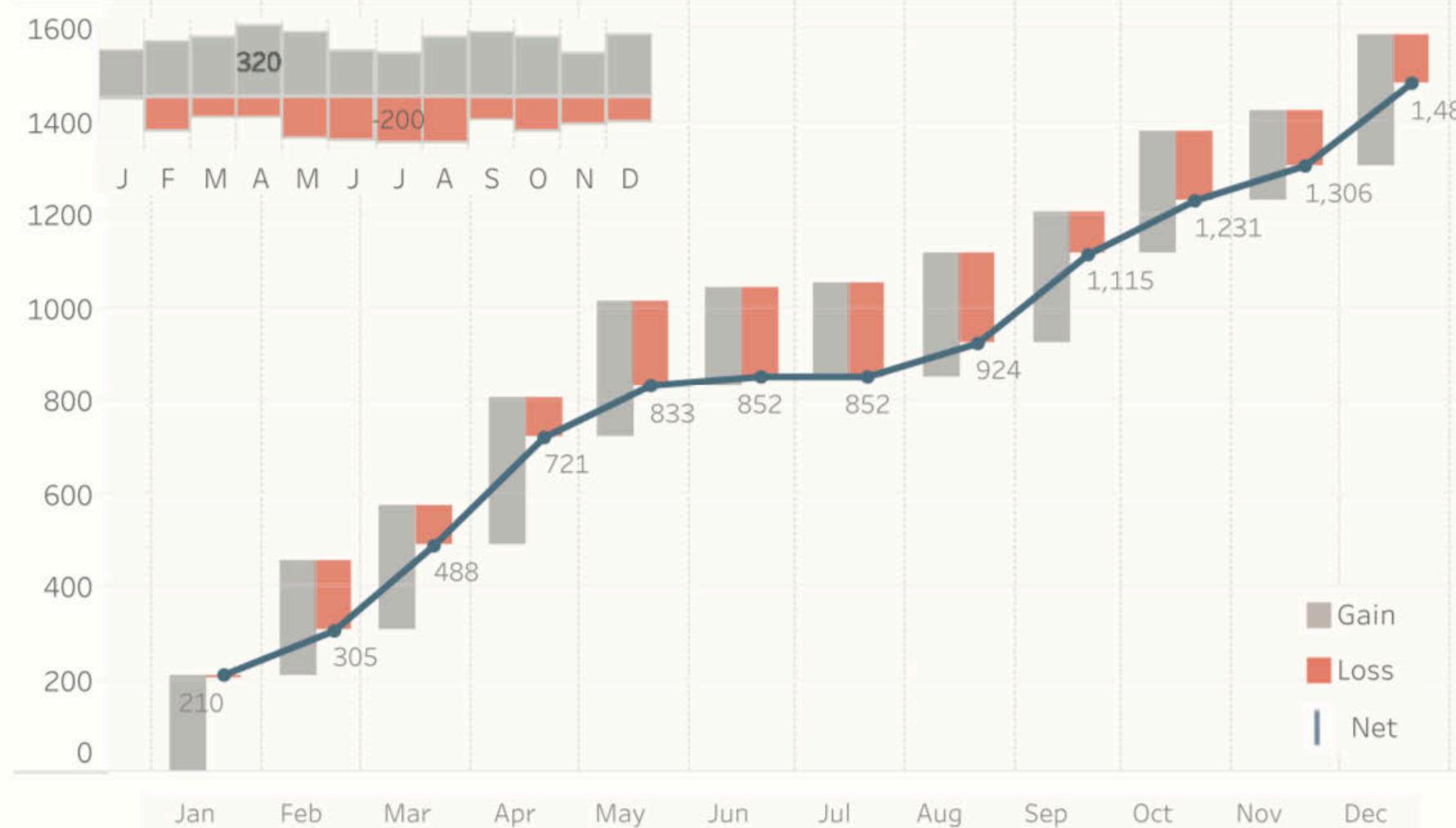
The editors are researchers and professors with focuses on human-computer interaction and information visualization.

“ We differentiated ... “**list of fact**” infographics from the infographics medium as a whole, and chose to **exclude them** because this specific submedium **lacks authorial narrative**. ”

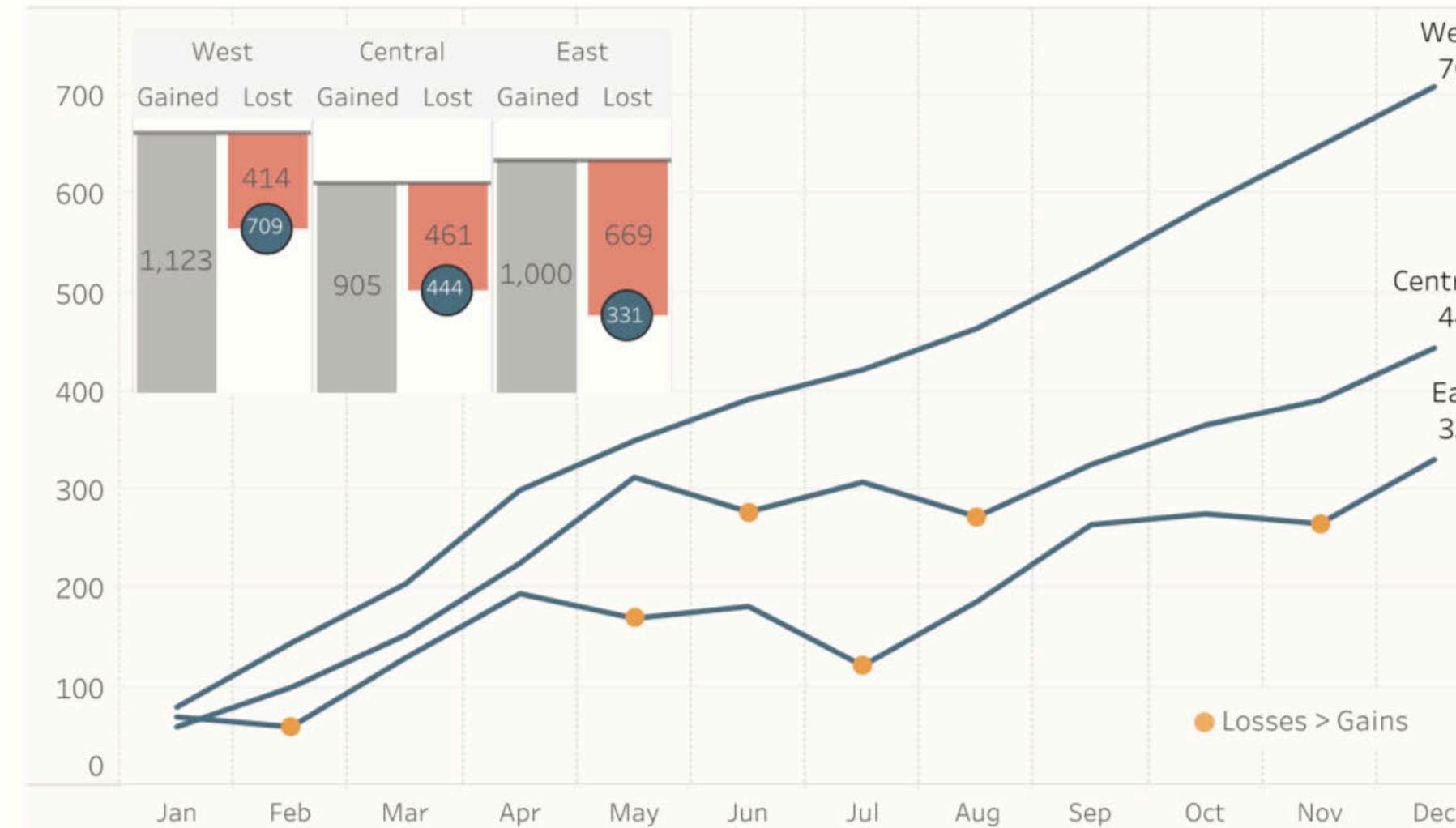
Dashboards, while sometimes a part of an infographic, may lack narrative or story on their own.

Subscriber Churn Analysis

Subscriber activity - All



Net subscriber activity by division



Details

		Gained	Lost	Net	Running total
West	January	80	0	80	80
	February	80	-15	65	145
	March	90	-30	60	205
	April	120	-25	95	300
	May	100	-50	50	350
	June	119	-77	42	392
	July	75	-45	30	422
	August	119	-77	42	464
	September	90	-30	60	524
	October	80	-15	65	589
	November	80	-20	60	649
	December	90	-30	60	709
	Total	1,123	-414	709	
Central	January	60	0	60	60
	February	85	-45	40	100
	March	80	-27	53	153
	April	90	-17	73	226
	May	120	-33	87	313
	June	45	-80	-35	278
	July	75	-45	30	308
	August	45	-80	-35	273
	September	80	-27	53	326
	October	85	-45	40	366
	November	60	-35	25	391
	December	80	-27	53	444
	Total	905	-461	444	
East	January	70	0	70	70
	February	80	-90	-10	60
	March	100	-30	70	130
	April	110	-45	65	195
	May	70	-95	-25	170
	June	45	-33	12	182
	July	50	-110	-60	122
	August	99	-34	65	187
	September	112	-34	78	265
	October	99	-88	11	276
	November	55	-65	-10	266
	December	110	-45	65	331
	Total	1,000	-669	331	
Grand Total					
3,028 -1,544 1,484					

Malofiej—Infographics World Summit

“The Pulitzer Prizes
of Infographics”

Interviews of Malofiej speakers on infographics



Gregor Aisch

Infographics is an abbreviated form of “information graphics”. It seems to mean a lot of different things to different people. I rarely use the term.



Federica Fragapane

A visual translation of data and information: a language to communicate topics, contents and **stories** to people.



Laris Karklis

Infographics is . . . using visuals **to tell a story**.



Nadieh Bremer

Infographics ... combine graphical elements, such as a drawn portion of an animal, human, map, etc. with small mini **data visualizations** (a small bar chart for example) and **annotations** **to tell a story**.

We want information graphics to ...

Tell a complete story where the purpose is to inform, entertain or persuade the audience. It should:

simple, focused messages

new, surprising information

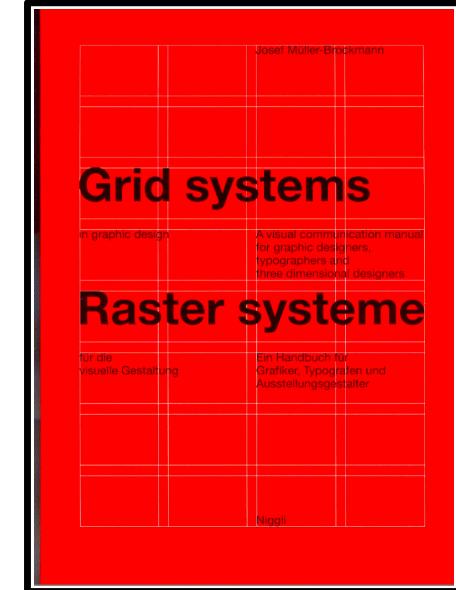
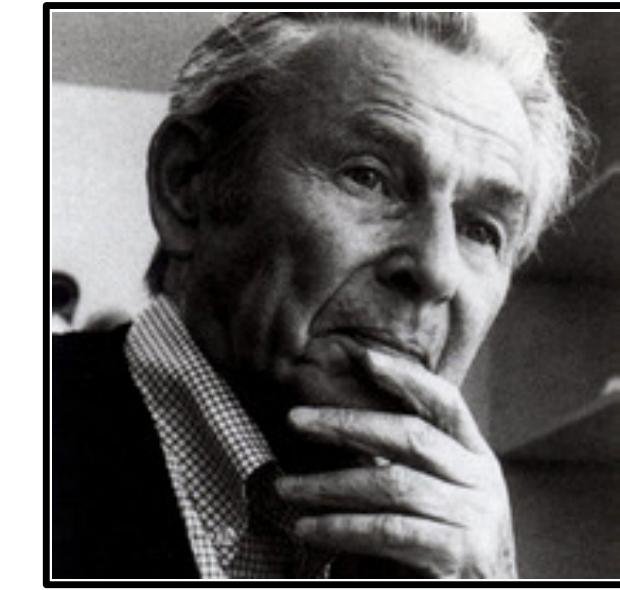
credible data sources

visually coherent, integrated

use comparisons for context, meaning

principles of information design, organized

Organizing information graphics

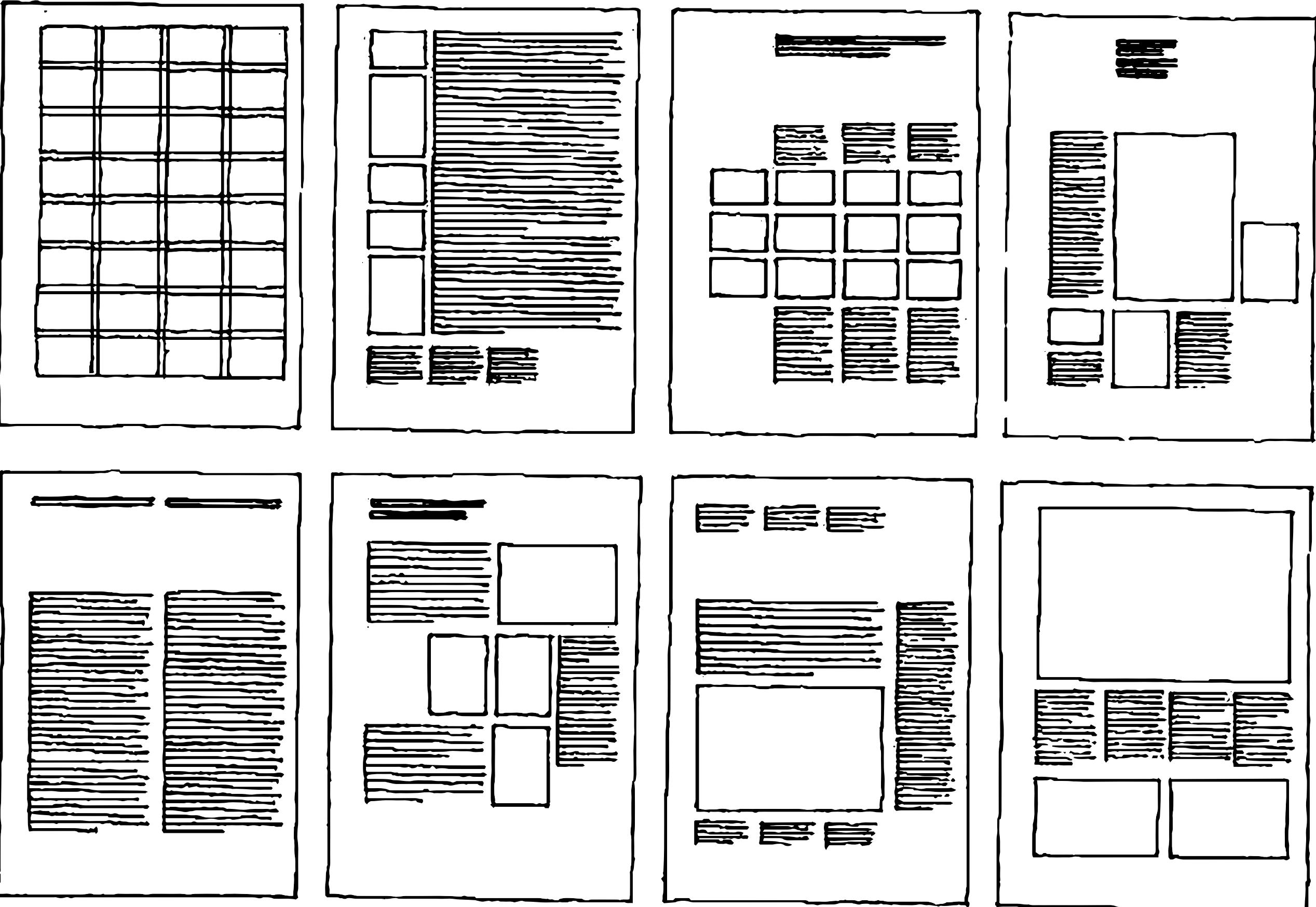


Grid Systems in Graphic Design

Müller-Brockmann

His book, an in-depth analysis of layout in design, is seminal and remains influential among theory of communication through visual design.

Arranging surfaces and spaces into a grid creates conformity among texts, images and diagrams. The size of each implies its importance. Reducing elements in a grid suggests planning, intelligibility, clarity, and orderliness of design. **One grid allows many creative ways to show relationships:**

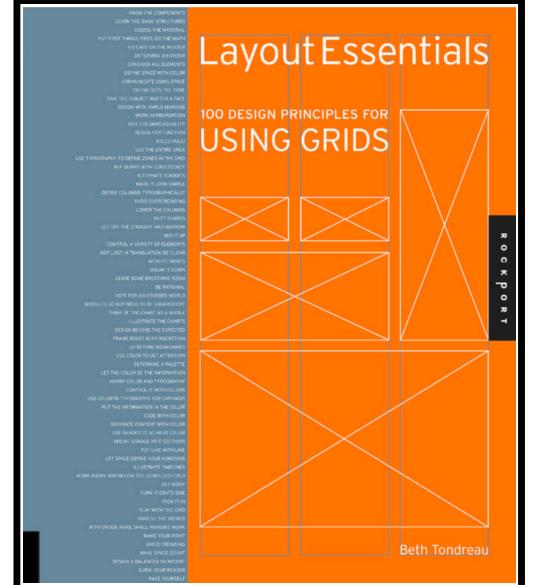


Orderliness adds credibility to the information and **induces confidence**. Information presented with clear and logically set out titles, subtitles, texts, illustrations and captions will not only be **read more quickly and easily** but the information will also be **better understood**.

Layout Essentials

Tondreau

Before founding a design firm, Tondreau was Design Director at Viking / Penguin publishing company. Her book on layout essentials helps readers consider information organization.



The main components of a grid are margins, markers, columns, flowlines, spatial zones, and modules.

COLUMNS

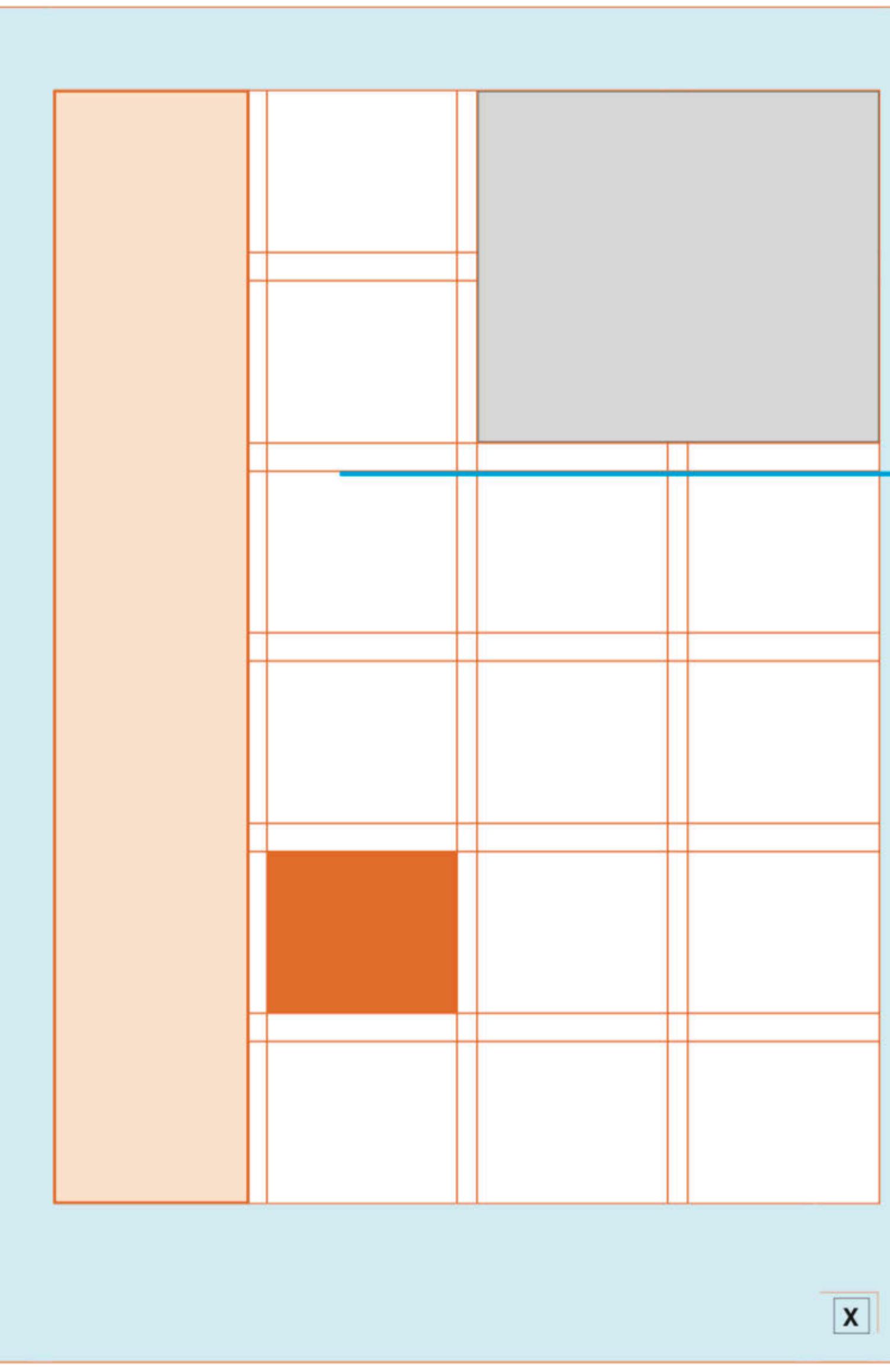
are vertical containers that hold type or images. The width and number of columns on a page or screen can vary, depending on the content.

MODULES

are individual divisions separated by consistent space, providing a repeating, ordered grid. Combining modules can create columns and rows of varying sizes.

MARGINS

are buffer zones. They represent the amount of space between the trim size, including gutter, and the page content. Margins can also house secondary information, such as notes and captions.



SPATIAL ZONES

are groups of modules or columns that can form specific areas for type, ads, images, or other information.

FLOWLINES

are alignments that break space into horizontal bands. Not actual lines, flowlines are a method for using space and elements to guide a reader across a page.

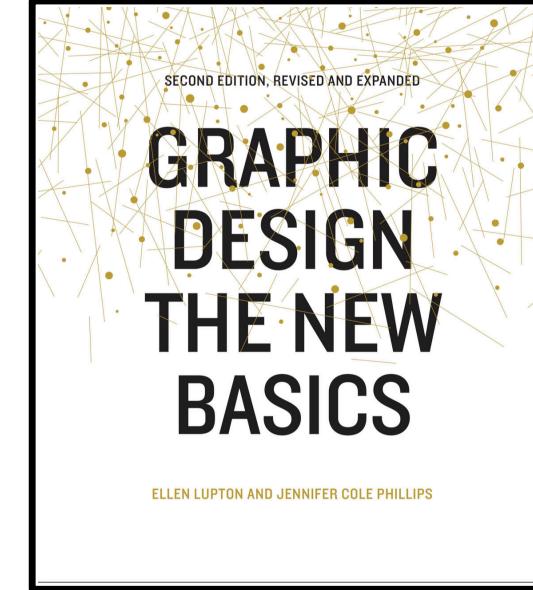
MARKERS

help a reader navigate a document. Indicating placement for material that appears in the same location, markers include page numbers, running heads and feet (headers and footers), and icons.

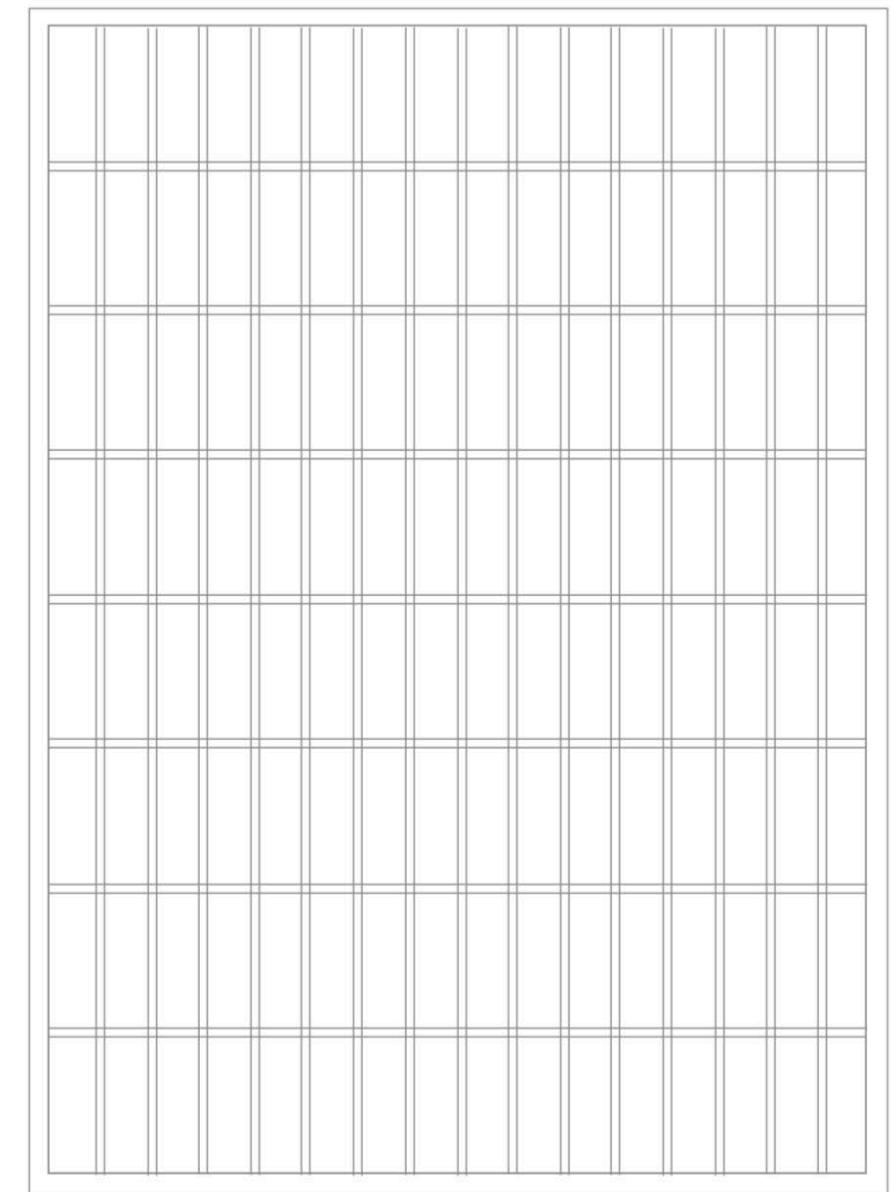
Graphic Design The New Basics

Lupton & Phillips

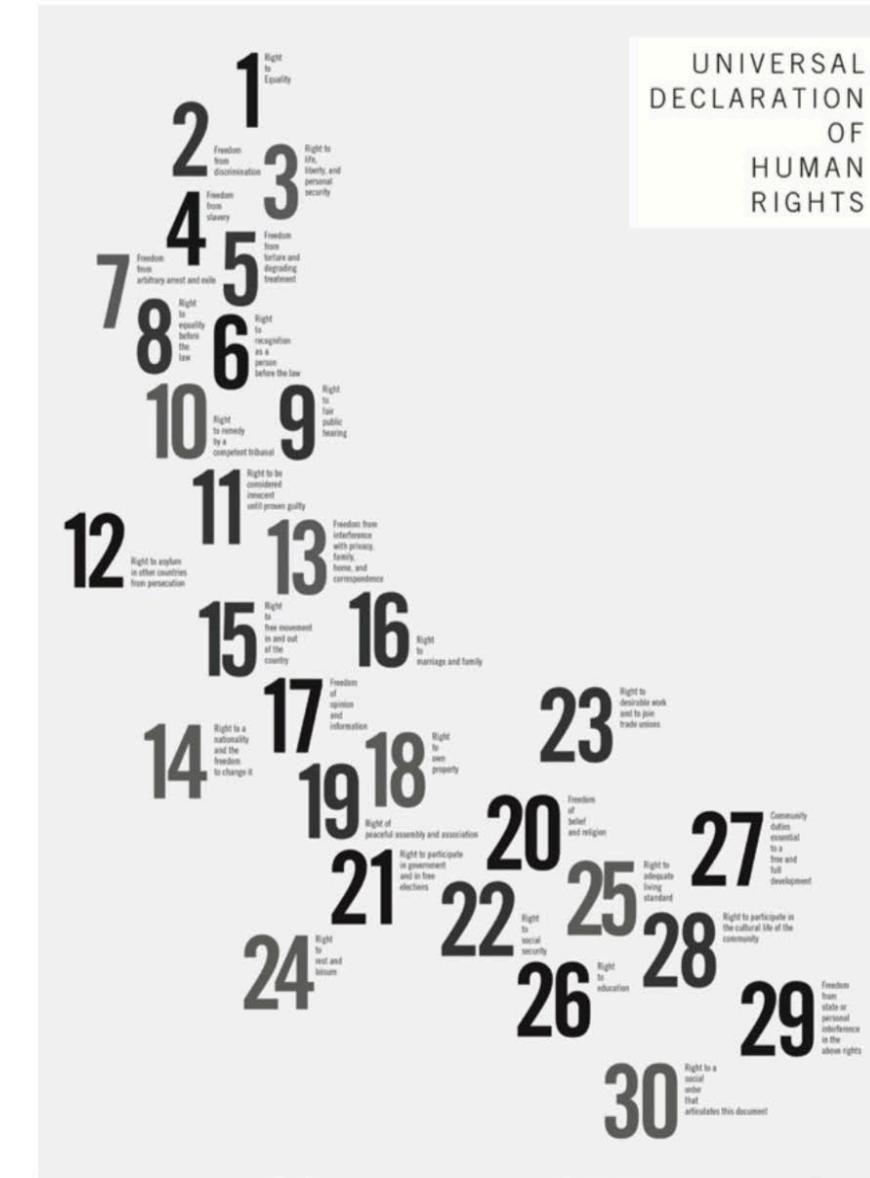
Lupton is Curator of Contemporary Design, Cooper-Hewitt, National Design Museum, Smithsonian Institution, New York and Director, Graphic Design MFA Program, Maryland Institute College of Art, Baltimore. she is the recipient of numerous awards in design.



Grids provide form to creativity



A well-made grid **encourages the designer to vary the scale and placement of elements** without relying wholly on arbitrary or whimsical judgments. The grid offers a rationale and a starting point for each composition, converting a blank area into a structured field.



By marking space into numerous equal units, the grid makes the entire surface available for use; the edges become as important as the center. Grids help designers create active, asymmetrical compositions in place of static, centered ones. By breaking down space into units, grids encourage designers to leave some areas open rather than filling up the whole page.

Information graphics, examples for discussion

Figurative Map of the successive losses in men of the French Army in the Russian Campaign 1812 ~1813.

Drawn up by M. Minard, Inspector General of Bridges and Roads in retirement.

Paris, November 20, 1869.

The numbers of men present are represented by the widths of the colored zones at a rate of one millimeter for every ten thousand men; they are further written across the zones. The red designates the men who enter into Russia, the black those who leave it. — The information which has served to draw up the map has been extracted from the works of M.M. Thiers, of Séguir, of Fezensac, of Chambray and the unpublished diary of Jacob, pharmacist of the Army since October 28th. In order to better judge with the eye the diminution of the army, I have assumed that the troops of Prince Jérôme and of Marshal Davout who had been detached at Minsk and Moghilev and have rejoined around Orsha and Vitebsk, had always marched with the army.

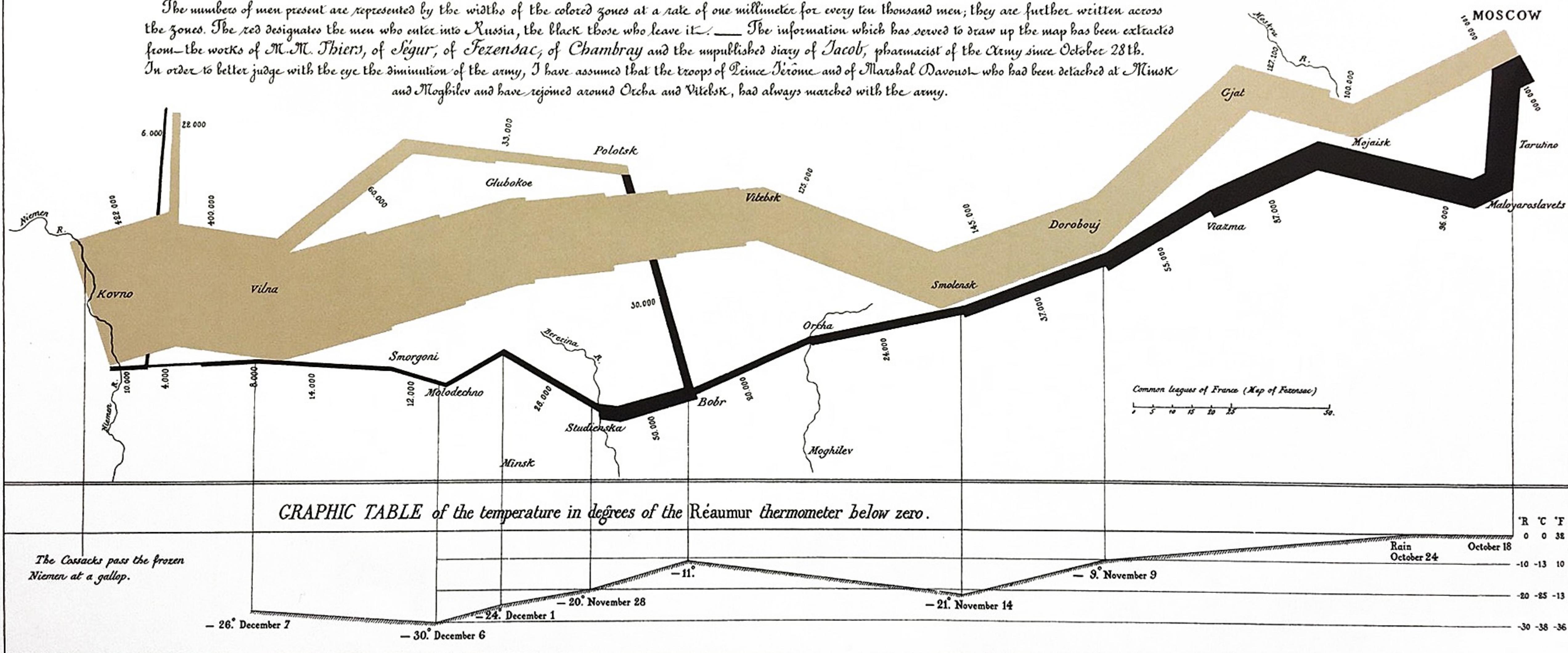


Table 20.1 Napoleon's March Data

lonc	latc	city	lont	temp	date	lonp	latp	survivors	direction	group
24.0	55.0	Kowno	37.6	0	Oct 18	24.0	54.9	340,000	A	I
25.3	54.7	Wilna	36.0	0	Oct 24	24.5	55.0	340,000	A	I
26.4	54.4	Smorgoni	33.2	-9	Nov 9	25.5	54.5	340,000	A	I
26.8	54.3	Molodexno	32.0	-21	Nov 14	26.0	54.7	320,000	A	I
27.7	55.2	Gloubokoe	29.2	-11		27.0	54.8	300,000	A	I
27.6	53.9	Minsk	28.5	-20	Nov 28	28.0	54.9	280,000	A	I
28.5	54.3	Studienska	27.2	-24	Dec 1	28.5	55.0	240,000	A	I
28.7	55.5	Polotzk	26.7	-30	Dec 6	29.0	55.1	210,000	A	I
29.2	54.4	Bobr	25.3	-26	Dec 7	30.0	55.2	180,000	A	I
30.2	55.3	Witebsk				30.3	55.3	175,000	A	I
30.4	54.5	Orscha				32.0	54.8	145,000	A	I
30.4	53.9	Mohilow				33.2	54.9	140,000	A	I
32.0	54.8	Smolensk				34.4	55.5	127,100	A	I
33.2	54.9	Dorogobouge				35.5	55.4	100,000	A	I
34.3	55.2	Wixma				36.0	55.5	100,000	A	I
34.4	55.5	Chjat				37.6	55.8	100,000	A	I
36.0	55.5	Mojaisk				37.7	55.7	100,000	R	I
37.6	55.8	Moscou				37.5	55.7	98,000	R	I
36.6	55.3	Tarantino				37.0	55.0	97,000	R	I
36.5	55.0	Malo-jarosewli				36.8	55.0	96,000	R	I
						35.4	55.3	87,000	R	I
						34.3	55.2	55,000	R	I
						33.3	54.8	37,000	R	I
						32.0	54.6	24,000	R	I
						30.4	54.4	20,000	R	I
						29.2	54.3	20,000	R	I
						28.5	54.2	20,000	R	I
						28.3	54.3	20,000	R	I
						27.5	54.5	20,000	R	I
						26.8	54.3	12,000	R	I
						26.4	54.4	14,000	R	I
						25.0	54.4	8,000	R	I
						24.4	54.4	4,000	R	I
						24.2	54.4	4,000	R	I
						24.1	54.4	4,000	R	I
						24.0	55.1	60,000	A	II
						24.5	55.2	60,000	A	II
						25.5	54.7	60,000	A	II
						26.6	55.7	40,000	A	II
						27.4	55.6	33,000	A	II
						28.7	55.5	33,000	A	II
						28.7	55.5	33,000	R	II
						29.2	54.2	30,000	R	II
						28.5	54.1	30,000	R	II
						28.3	54.2	28,000	R	II
						24.0	55.2	22,000	A	III
						24.5	55.3	22,000	A	III
						24.6	55.8	6,000	A	III
						24.6	55.8	6,000	R	III
						24.2	54.4	6,000	R	III
						24.1	54.4	6,000	R	III

Winner, Information is Beautiful Award

TASS



TASS



1812

WHEN NAPOLEON VENTURED EAST

HOW THE 1812 PATRIOTIC WAR TURNED NAPOLEON'S GRAND ARMY INTO A HANDFUL OF SURVIVORS

PYC ENG



Nobels no degrees

This visualization explores Nobel Prizes and graduate qualifications from 1901 to 1912, by analysing the age of recipients at the time prizes were awarded, average age evolution through time and among categories, graduation grades, main university affiliations and the principal hometowns of the graduates.

How to read it?

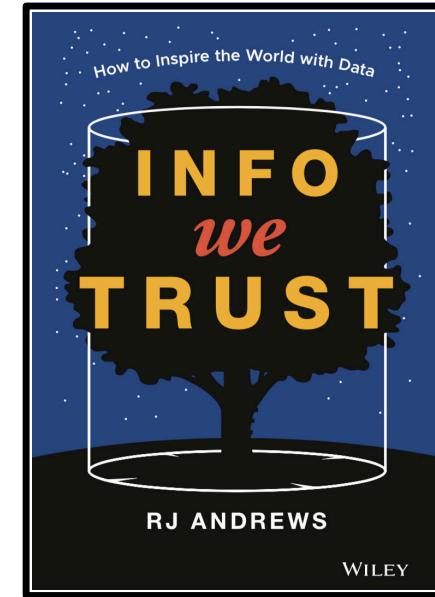
Each dot represents a Nobel laureate, each recipient is positioned according to the year the prize was awarded (x axis) and age of the person at the time of the award (y axis).



Winner, Information is Beautiful Award

Lupi, Fragapane

The co-authors work together at Lupi's design firm, whom we've previously met when considering this visualization.

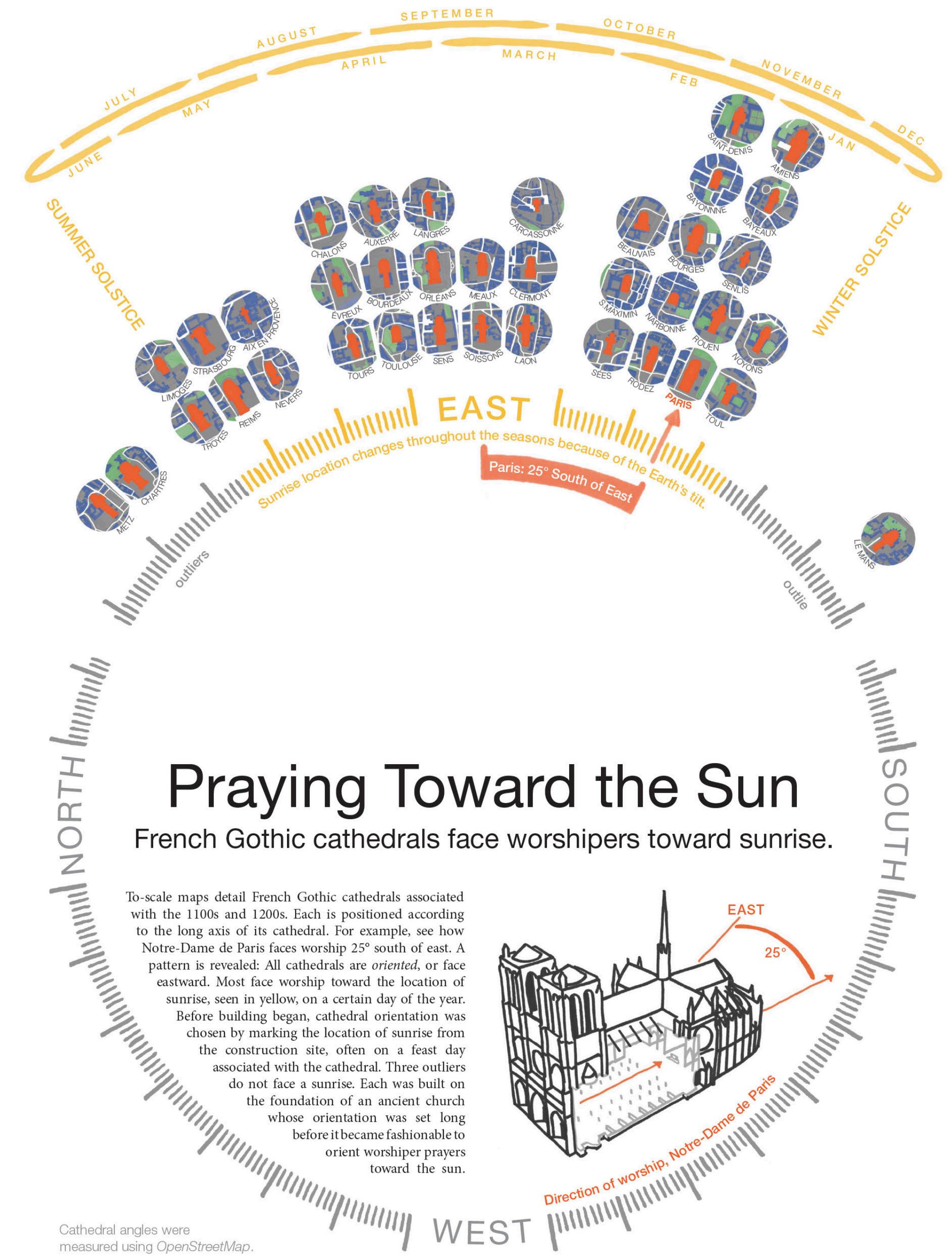


Info We Trust

How to inspire the world with data

Andrews

He is a data storyteller. His book is an adventure exploring how to inspire the world with data. RJ is the creator of www.infowetrust.com, where he makes available some of his data stories.

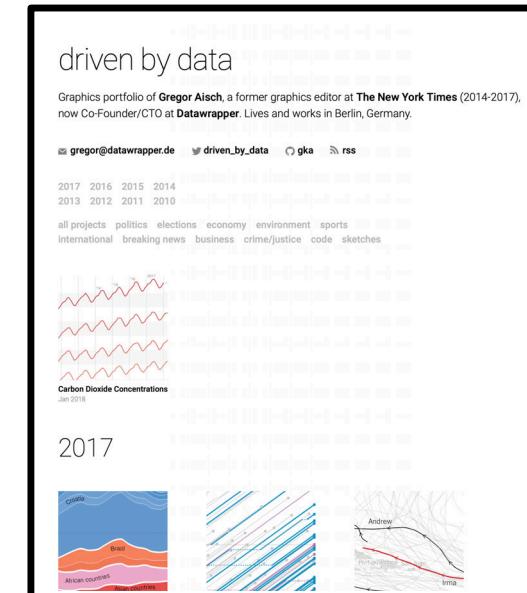


The Cost of Mobile Ads on 50 News Websites

By GREGOR AISCH, WILSON ANDREWS and JOSH KELLER OCT. 1, 2015

Ad blockers, which Apple first allowed on the iPhone in September, promise to conserve data and make websites load faster. But how much of your mobile data comes from advertising? We measured the mix of **advertising** and editorial on the mobile home pages of the top 50 news websites – including ours – and found that **more than half of all data came from ads** and other content filtered by ad blockers. Not all of the news websites were equal. [RELATED ARTICLE](#)

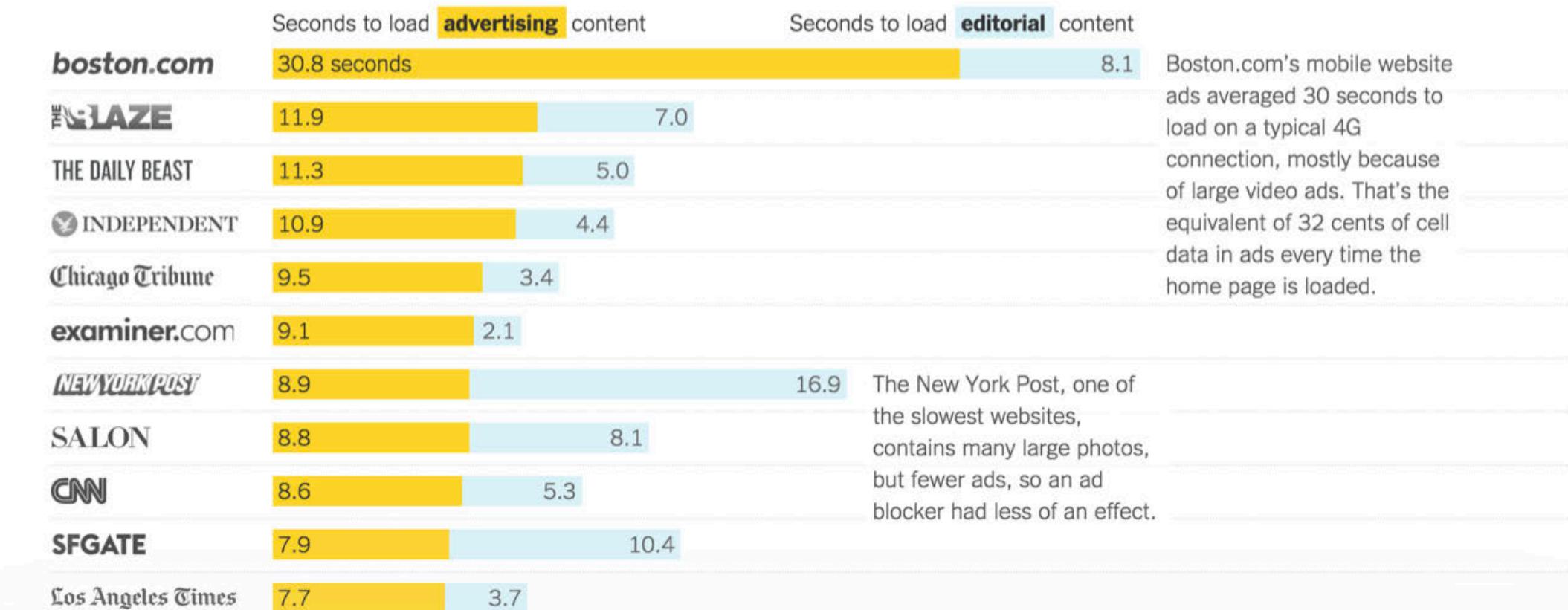
Estimated load time on a 4G LTE network	Data usage to load mobile home page	Cost per page on a typical data plan
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Graphics portfolio, NYT Infographic

Aisch

Gregor was graphics editor at the NY Times, and recipient of infographics awards at Malofiej.



Boston.com's mobile website ads averaged 30 seconds to load on a typical 4G connection, mostly because of large video ads. That's the equivalent of 32 cents of cell data in ads every time the home page is loaded.

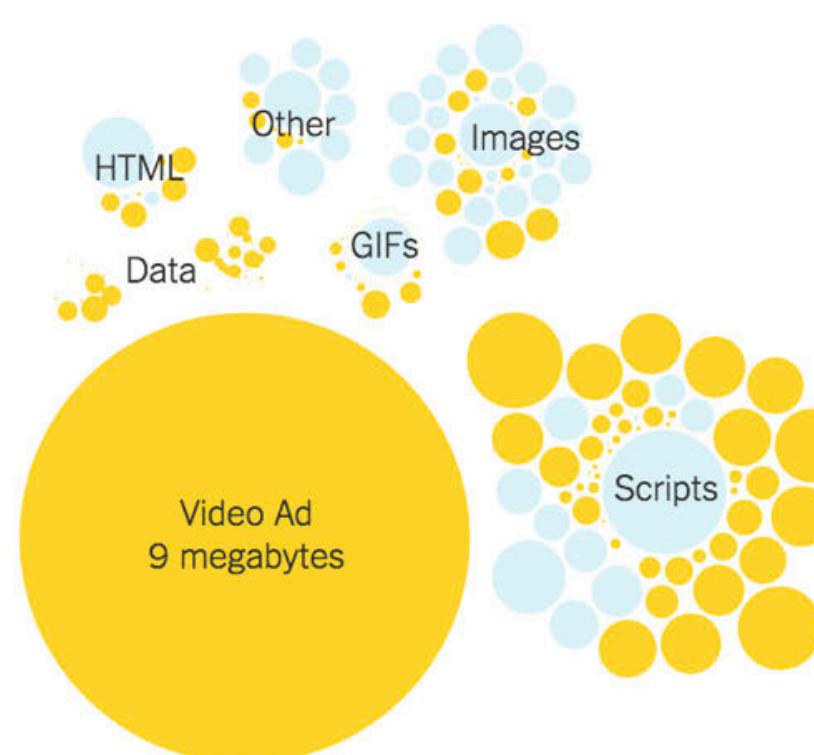
The New York Post, one of the slowest websites, contains many large photos, but fewer ads, so an ad blocker had less of an effect.

boston.com

Here are all the files that made up the Boston.com data during one visit, including one large video ad and many script files used by ad networks. With an ad blocker, those files were gone.

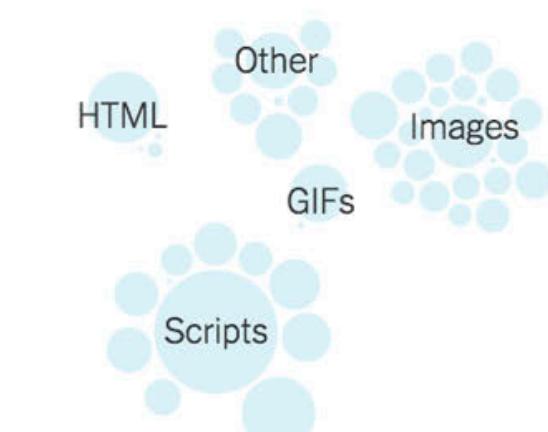
Without ad blocker

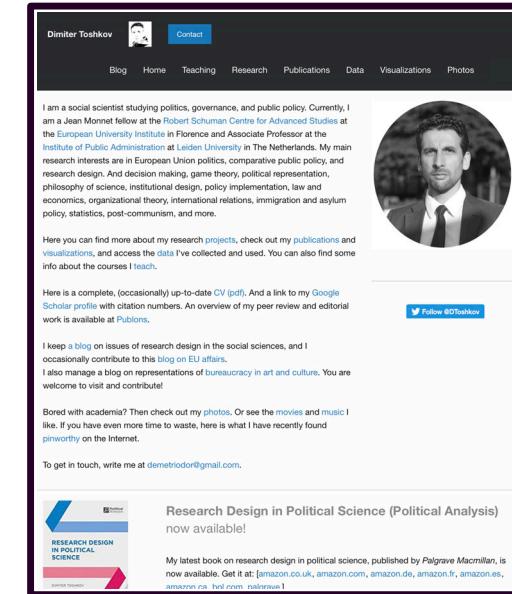
389 files, 16.3 megabytes, 33 seconds



With ad blocker

52 files, 3.5 megabytes, 7 seconds



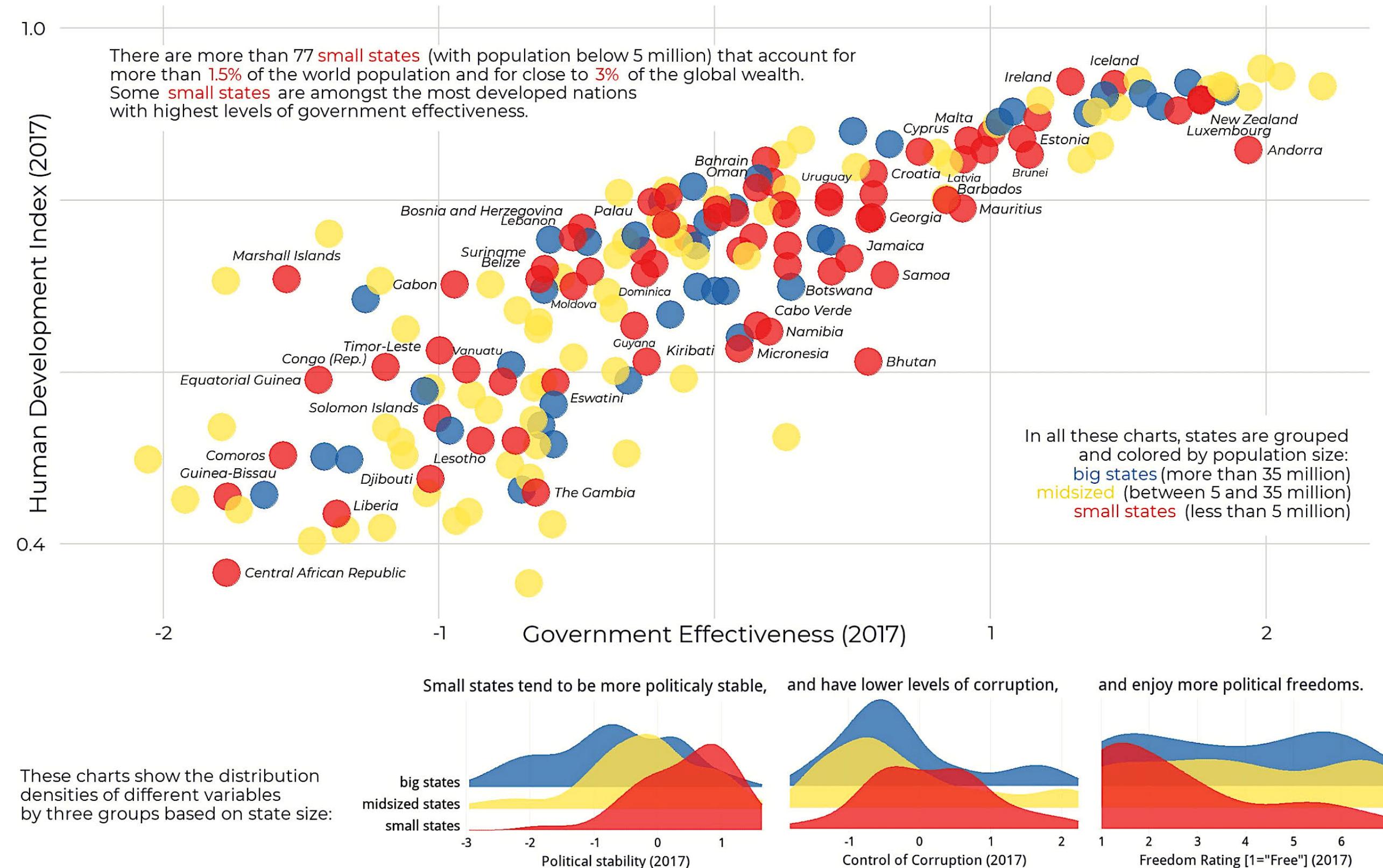


Winner, Information is Beautiful Award

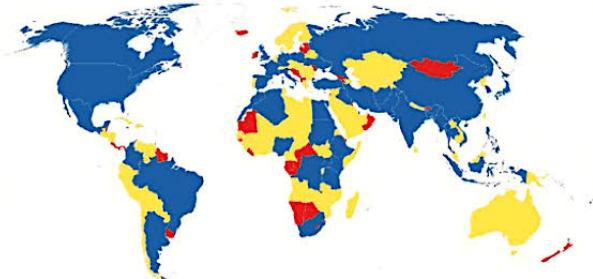
Toshkov

Associate Professor at the Institute of Public Administration, won an award for this infographic, which was made using R.

Small States Can Be Big Players in Development and Good Governance



Data: Human Development Index from Human Development Reports. Government Effectiveness, Control of Corruption, and Political Stability from Worldwide Governance Indicators. Freedom Rating from Freedom House.



But small states have improved less

-0.05 0.00 0.05 0.10 0.15

Change in HDI, 2017-2000

and have even lost some ground.

-0.5 0.0 0.5

Change in Government Effectiveness, 2017-2012



CBO

Even the Congressional Budget Office relies on infographics to convey large tomes of information in summary form.



Summary of long term budget report

Congressional Budget Office

The 2012 Long-Term Budget Outlook

June 2012

CBO's long-term projections reflect two broad scenarios:

EB

CBO's Extended Baseline Scenario

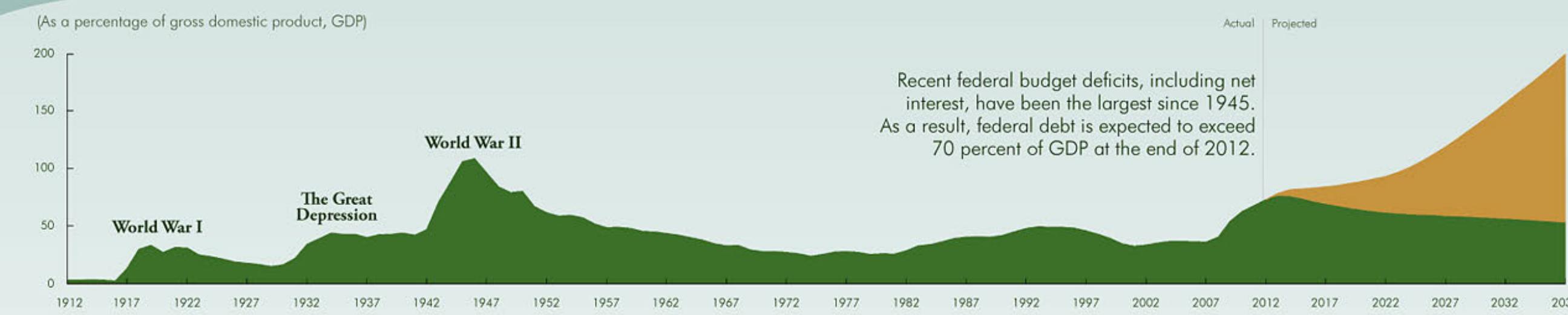
Reflects the assumption that current laws generally remain unchanged, implying that lawmakers will allow tax increases and spending cuts scheduled under current law to occur and that they will forgo measures routinely taken in the past to avoid such changes. Noninterest spending continues to rise, however, pushed up by the aging of the population and the rising costs of health care, and revenues reach historically high levels.

EAF

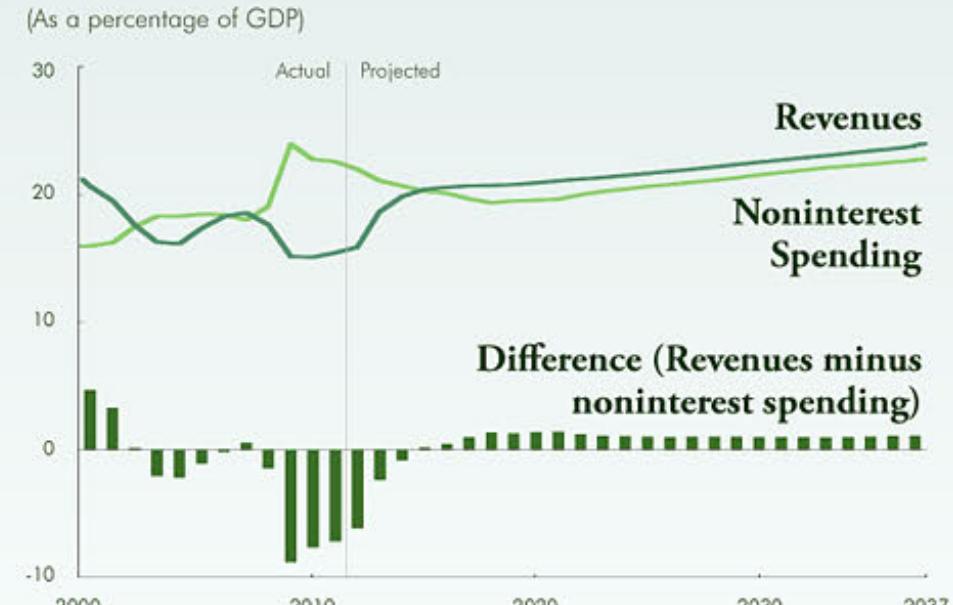
CBO's Extended Alternative Fiscal Scenario

Maintains what might be deemed current policies, as opposed to current laws, implying that lawmakers will extend most tax cuts and other forms of tax relief currently in place but set to expire and that they will prevent automatic spending reductions and certain spending restraints from occurring. Therefore, revenues remain near their historical average, and the gap between noninterest spending and revenues widens over the long term.

Federal Debt Held by the Public, Historically and Projected Under Two Policy Scenarios



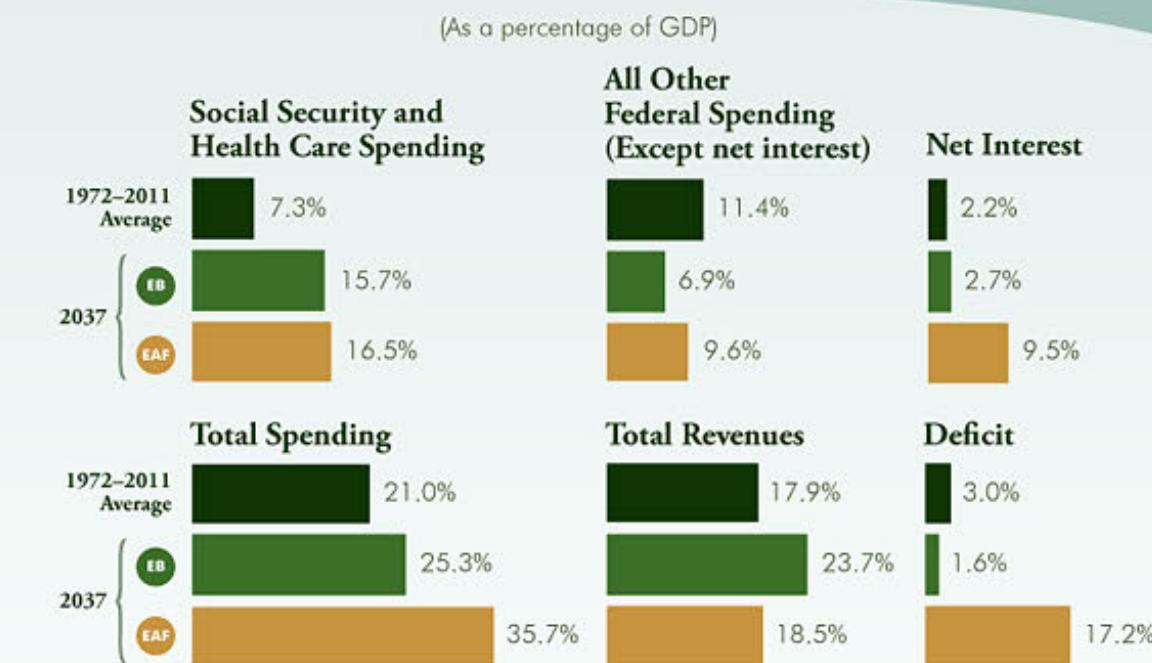
Extended Baseline Scenario EB



Extended Alternative Fiscal Scenario EAF



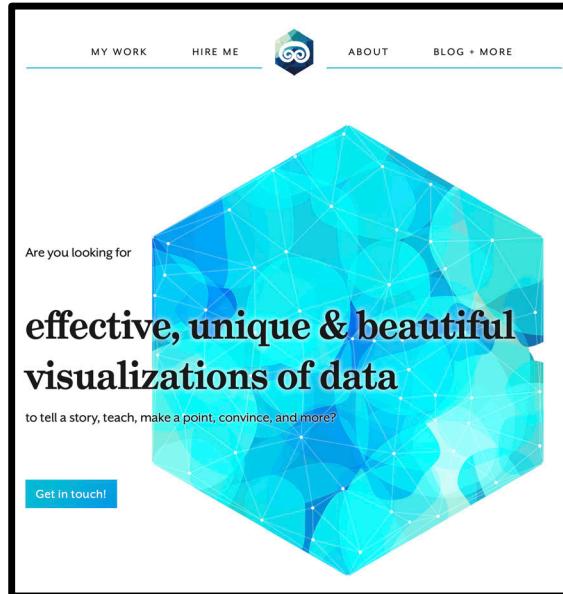
Components of the Federal Budget



Prepared by Maureen Costantino and Jonathan Schwabish
Contact: Long-Term Modeling Group



Sources: Congressional Budget Office; Office of Management and Budget
For details, see *The 2012 Long-Term Budget Outlook*, June 2012; <http://go.usa.gov/dKY>



Winner, Information is Beautiful Award

Bremmer

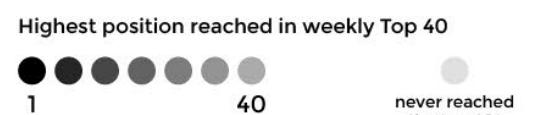
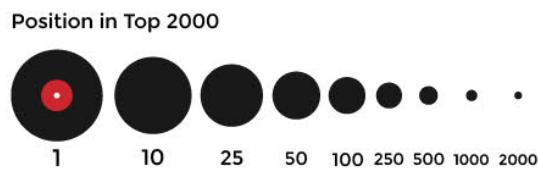
Previously an astronomer and analyst at a consulting company, Nadieh is a powerhouse freelance data visualization designer, and winner of numerous awards.

TOP 2000 ❤️ 70's & 80's

Since 1999 the 2000 most popular songs of all time, as voted by the show's audience, are played on Dutch national Radio 2 in a yearly marathon. The 2000 songs are on the air between noon on December 25th until New Year's Eve and over half of the Dutch population listens to the Top 2000 each year.

Each ● to the right represents a song in the Top 2000. It is placed according to its year of release. In the legend below you can see what the size and color of a song means.

The bulk of the songs and most of the top 10 are from the 70's & 80's...



Golden oldie
The oldest song in the list, Billie Holiday's *Strange Fruit*, is from 1939. It's 17 years older than the second-oldest song. If it will make the 2017 edition remains to be seen, it's barely in now, on position 189.

Year of release

The Beatles
No other artist or band has more songs in the Top 2000 as the Beatles. With 38 songs they are responsible for 14% of all titles before 1970. Nonetheless, only 5 years ago they still had 50 songs in the list.

Newly discovered
Although already released in 1972, *Starman* from David Bowie is the highest new song in the list. It never appeared in the previous 17 editions of the Top 2000 and entered in 2016 on position 270.

Prince
Another legend who passed away in 2016 (on April 21st). It seems that new people discovered his works, with all 9 songs that were in 2015's list rising significantly and 8 more songs joining in 2016.

6 | Avond
Boudewijn de Groot | 1997

8 | Mag ik dan bij jou
Claudia de Breij | 2011

High riser
Adèle's *When we were young* from 2015 apparently needed some time to become fully appreciated. It is the song with the highest increase in the list, shooting 1599 places from position 1743 to 144.

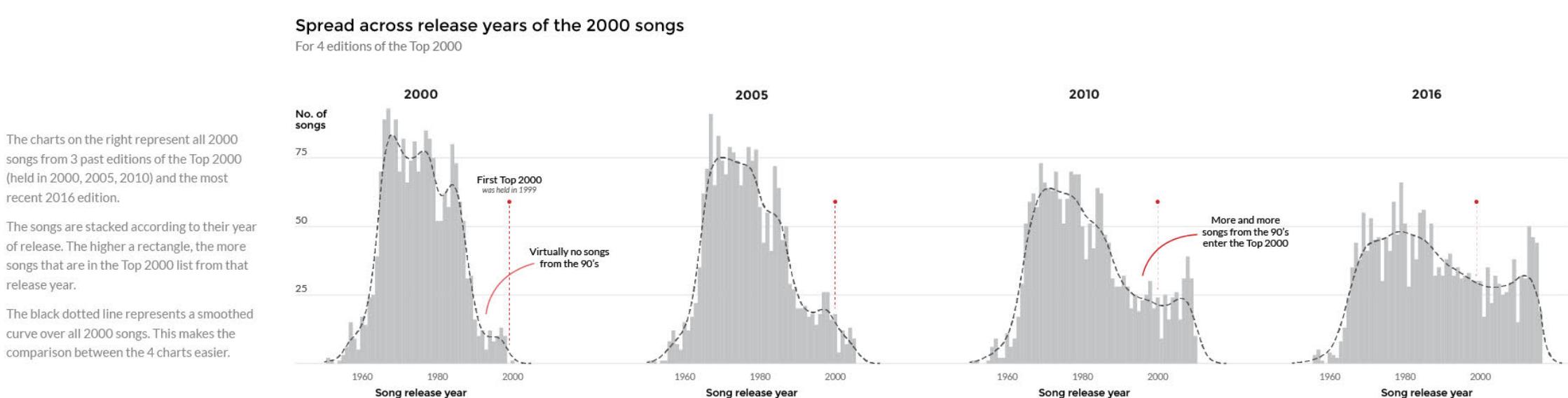
2010
2000
1990
1980
1970
1960

2016's most popular
The swinging new song from Justin Timberlake, *Can't stop the feeling*, is the highest newcomer song that was released in 2016. It is part of the soundtrack of the animated movie *Trolls*.

Pokémon
Already in the list in 2015 due to a social media campaign, nobody can deny the impact that Pokémon had on many people's daily lives in 2016. *Gotta catch 'em all* by Jason Paige rises 1434 spots to position 232!

David Bowie
Passing away only days after the release of his new album *Blackstar* on January 10th 2016. His legend remains strong with 26 songs in the Top 2000. His most popular song *Heroes* jumps from 34 to position 7.

2000
2005
2010
2016



Created by Nadieh Bremer | VisualCinnamon.com for the December edition of data sketch|es

Visit tinyurl.com/2016top2000 for the interactive visual and see the name & title of each song

But they're losing tracks to the new Millennium

It makes sense that the Top 2000 will be more spread out for each new edition, since there are more songs to choose from. However, if we compare the distributions of the Top 2000 songs over 4 editions, we see that, especially, the 90's has been gaining a lot of popularity.

Even though all songs from the 90's were out in the 2000 edition, only a few songs from that decade were chosen. Whereas in the 2016 edition the number of songs from the 90's has risen significantly. This could be due to a new generation who has grown up during the 90's taking over from those who voted in the early 2000's (who apparently didn't appreciate the new music).

Data | Top 2000 list from Radio 2 | Top 40 info from Mediamarkt's Top 40

CitiBike example, infographic

CITI BIKE HOURLY BALANCE

IMBALANCE HOTSPOTS - A.M. PEAK HOUR - AVG. WEEKDAY - OCTOBER 2013

● OUTLIER STATIONS (BALANCED STATIONS WITHIN AN IMBALANCE HOTSPOT)

DESTINATIONS

ORIGINS

Spatial Information Design Lab - GSAPP - Columbia University

0 0.25 0.5 MILES

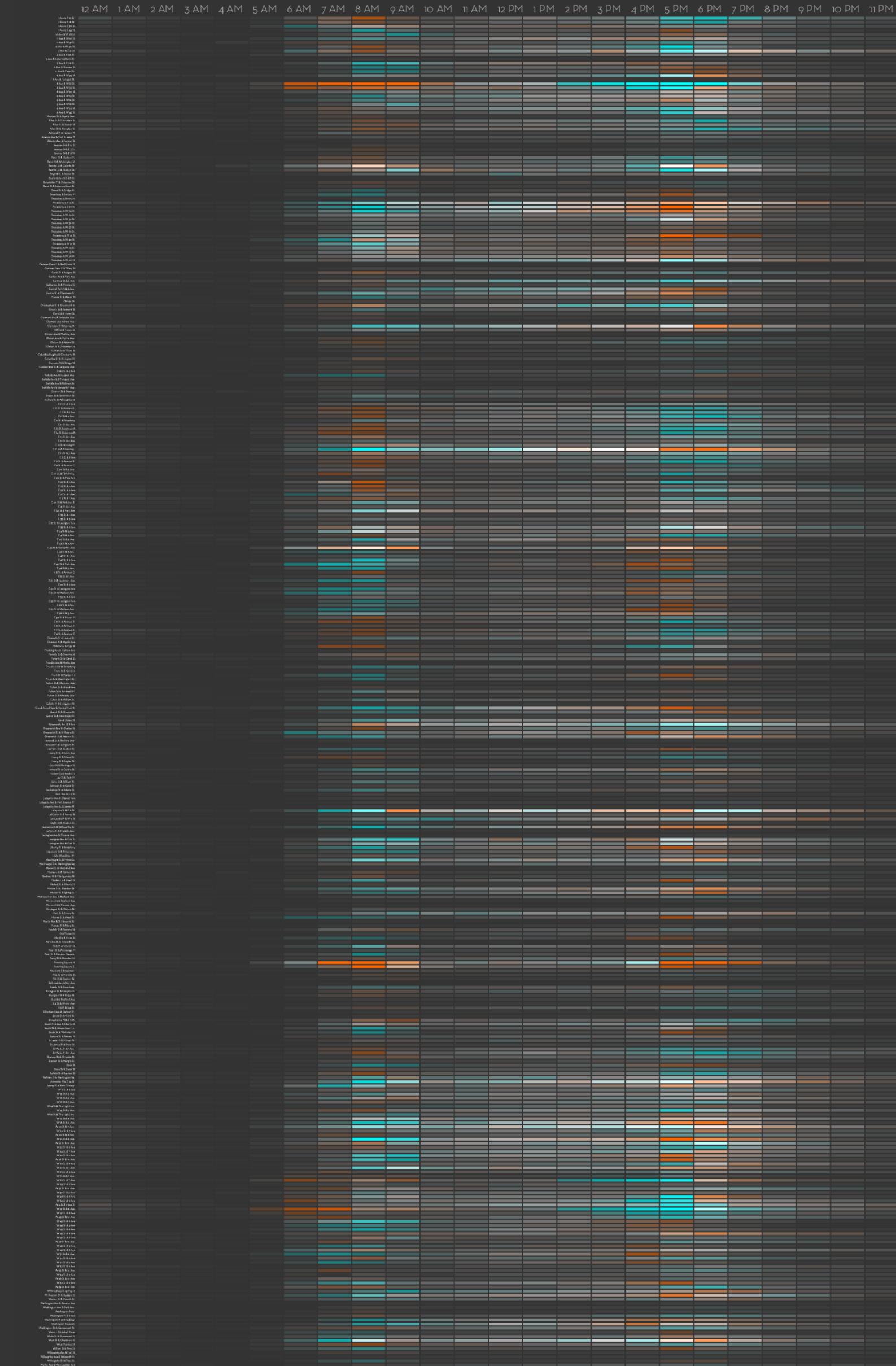
CITI BIKE HOURLY ACTIVITY AND BALANCE

ACTIVITY AND IMBALANCE MATRIX - AVG. WEEKDAY - OCTOBER 2013

DESTINATIONS

ORIGINS

ACTIVITY GRADIENT



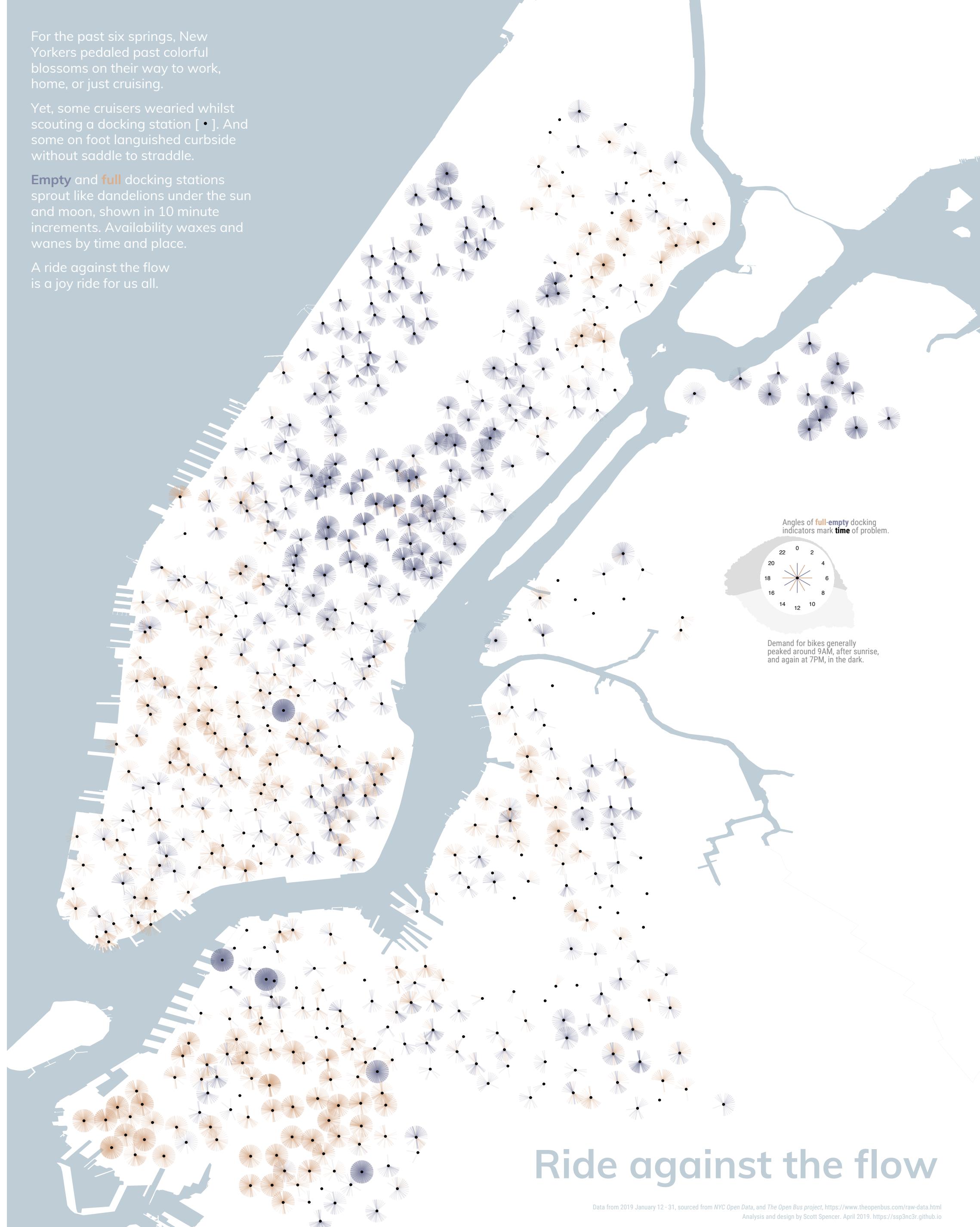
Spatial Information Design Lab - GSAPP - Columbia University

For the past six springs, New Yorkers pedaled past colorful blossoms on their way to work, home, or just cruising.

Yet, some cruisers woreid whilst scouting a docking station [•]. And some on foot languished curbside without saddle to straddle.

Empty and **full** docking stations sprout like dandelions under the sun and moon, shown in 10 minute increments. Availability waxes and wanes by time and place.

A ride against the flow is a joy ride for us all.



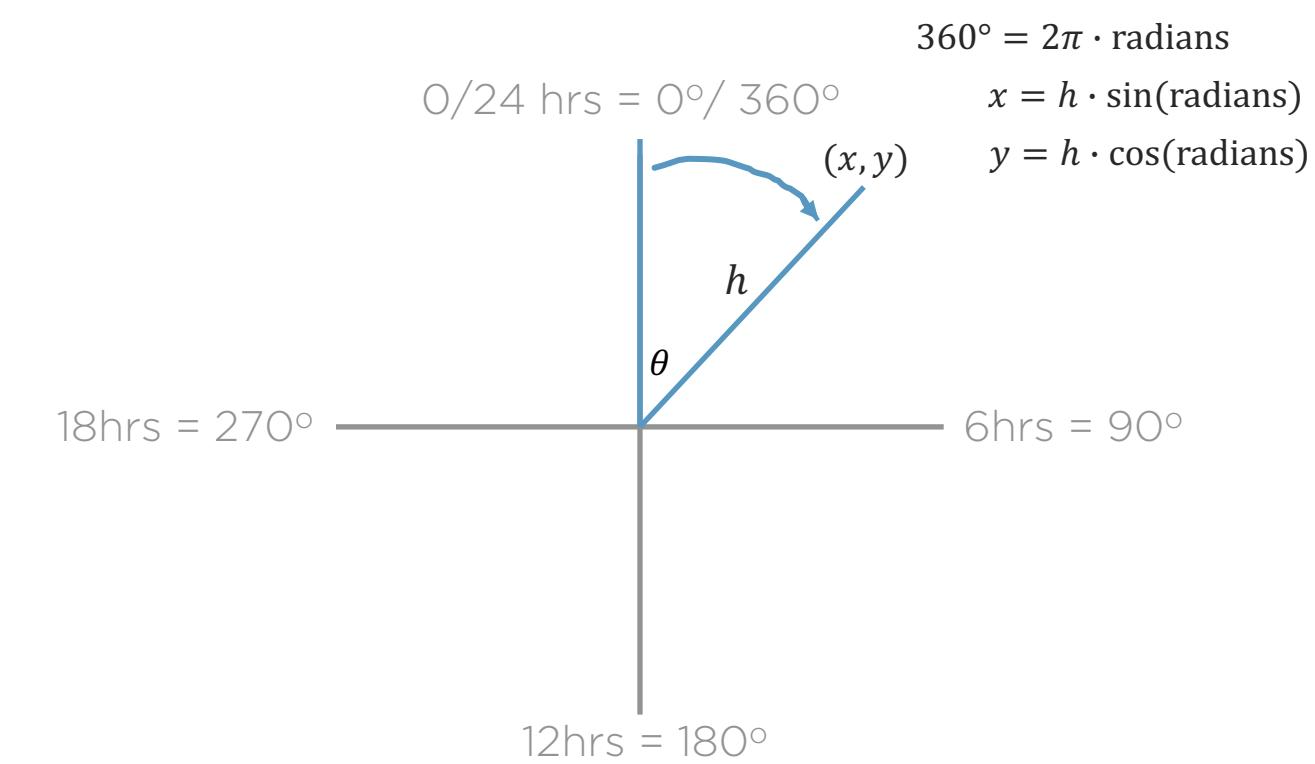
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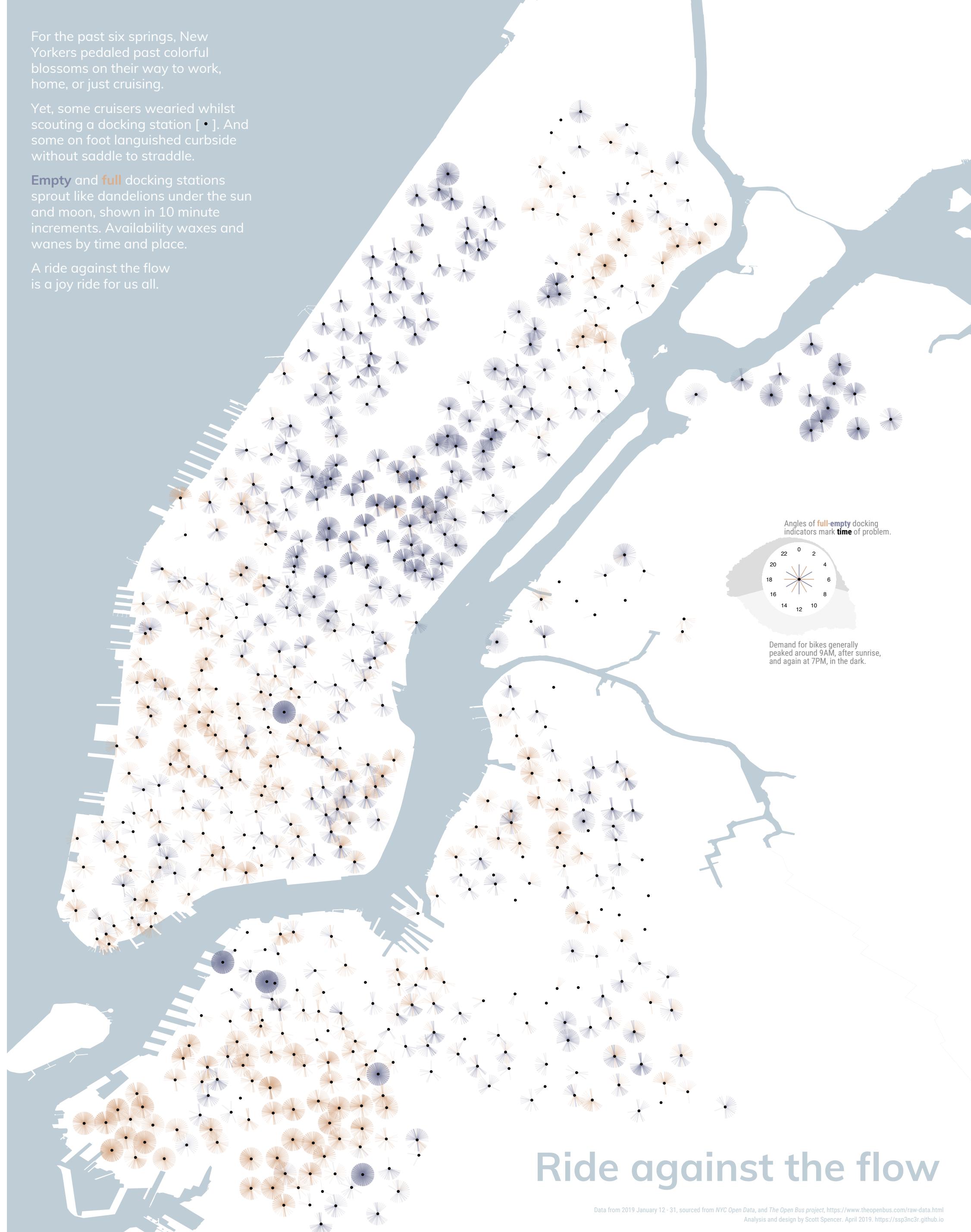
Empty and full docking stations sprout like dandelions under the sun and moon, shown in 10 minute increments. Availability waxes and wanes by time and place.

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Maths to create data encodings at each dock station



Opacity is the lack of transparency. Opacity was lowered so that a single unavailable bike or full station would not be very noticeable but several markings at that time (on different days) would increase opacity, making the marking brighter and thus increase its visual importance.



Basic math can help when making custom graphics. If you'd like a refresher on basic algebra, geometry, trigonometry: [Simmons, George F. Precalculus Mathematics in a Nutshell](#). Barnes & Noble Books, 1987. Print.

Let's look ahead

For Next Week, Module 10:

Agenda next week

The minimum

Next deliverable, *draft* information graphic

More on information graphics

Kay, Matthew et al. *When (Ish) Is My Bus? User-Centered Visualizations of Uncertainty in Everyday, Mobile Predictive Systems*. New York, New York, USA: ACM Press, 2016. 5092–5103. Web.

Consider how test subjects responded to varying visual representations of uncertainty, and any implications for your projects.

Fischhoff, Baruch. *Communicating Uncertainty: Fulfilling the Duty to Inform*. Issues in Science and Technology 28.4 (2012): 63–70. Print.

Consider the author's view on issues with communicating uncertainty, and his suggestions for addressing these issues.

Wainer, Howard. *The Most Dangerous Equation*, in Chapter 1, *Picturing the Uncertain World*. Princeton University Press, 2009. Print.

Consider the issues he raises of when variation is misunderstood, and the exemplary implications.

Feedback

Looking back?

Of the material covered so far, what material, if any, would you like further review?

Group work

Next week we will work as groups on your information graphic. How would you like feedback from your colleagues structured to best help you? What questions should they help give you perspective?

**See you
next week!**

