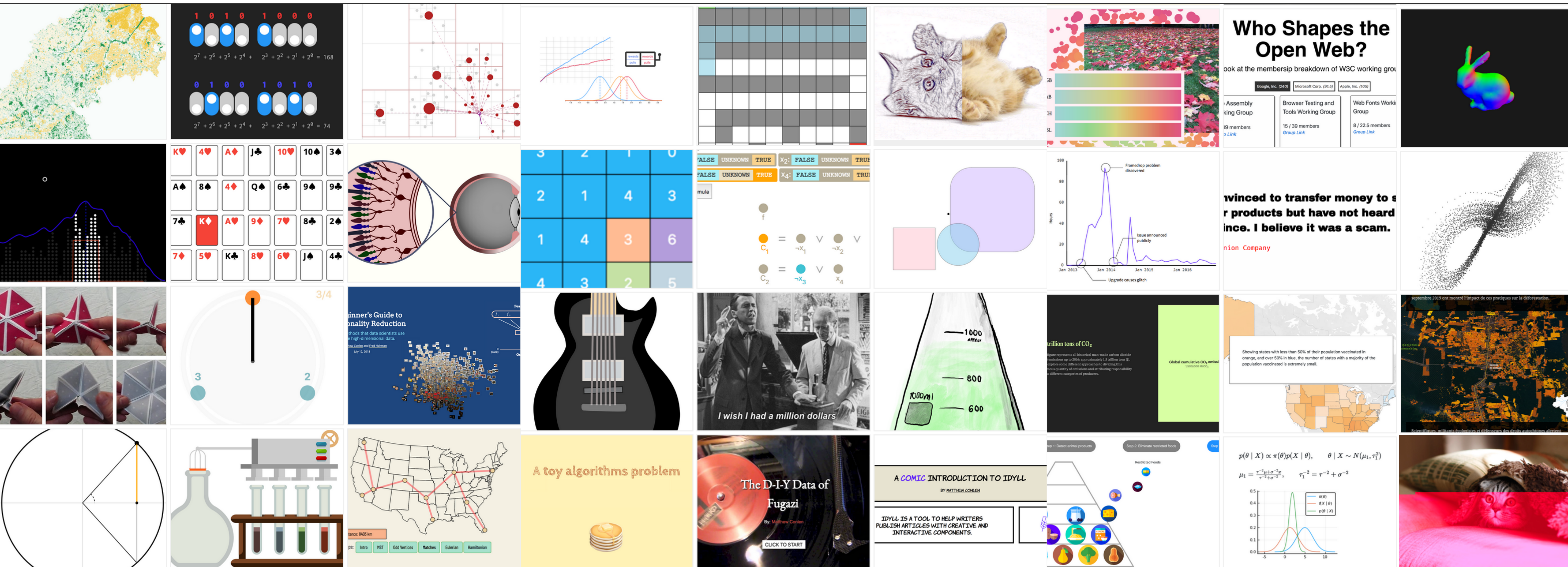


CSE 512

Narrative Visualization



Matthew Conlen

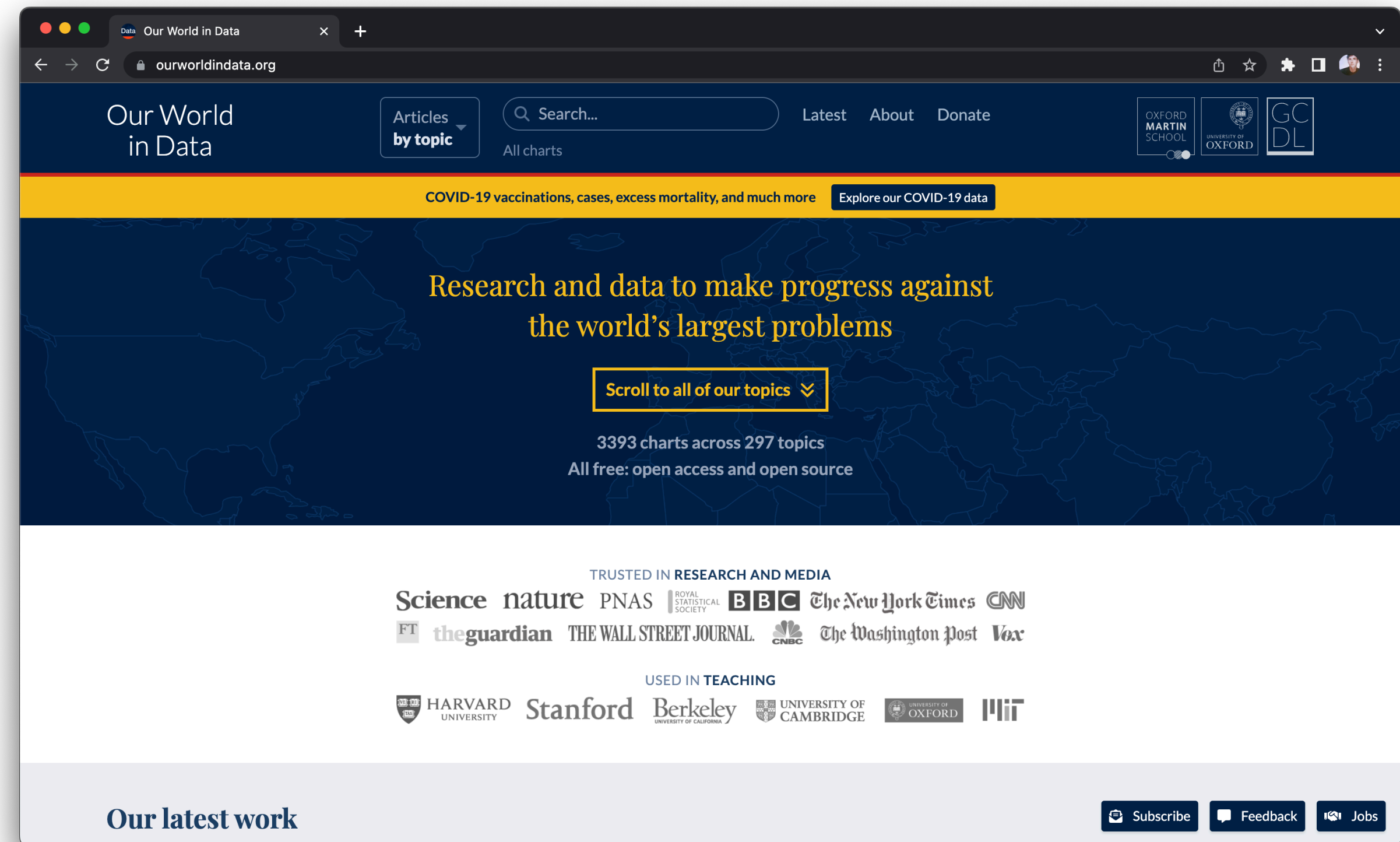
(with material from Jeff Heer, Edward Segel)

About Me

I am an HCI researcher and data journalist

- Ph.D. from UW in 2021
- Work at NYTimes, FiveThirtyEight, CNN, New Yorker

Currently Head of Product & Design at *Our World in Data*, contributor to *The Upshot* at NYT



@mathisonian
mathisonian.com

About Me

My CS research is inspired by working as a journalist

- Tools for interactive and data-driven storytelling
- Interactive research papers and educational materials
- Better decision making tools for policymakers
- Transparent and data-driven journalism on a deadline

Lecture will be biased toward data journalism but the material is more generally relevant (education, scientific publishing, policymaking).



When Could the United States Reach Herd Immunity? It’s Complicated.

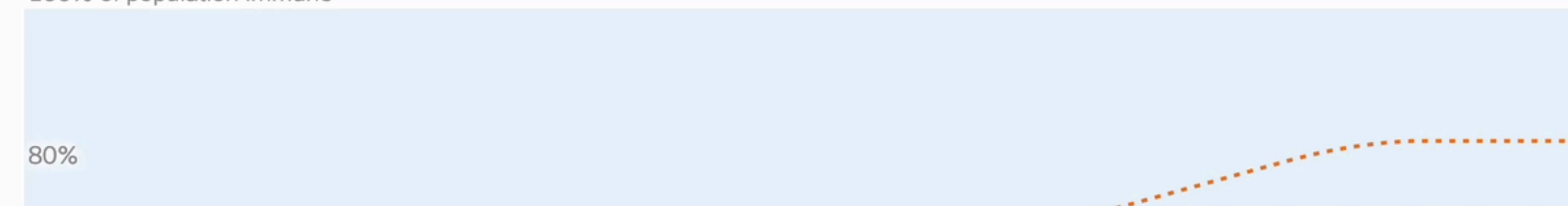
By Matthew Conlen and Charlie Smart Feb. 20, 2021

With the [vaccine rollout](#) underway and [coronavirus cases](#) declining after a dark winter surge, it may seem as though the end of the pandemic is in sight. In reality, how soon could we get there?

One answer lies in herd immunity, the point when enough people are immune to the virus that it can no longer spread through the population. Getting there, however, depends not just on how quickly we can vaccinate but on other factors, too, like how many people have already been infected and how easily the virus spreads.

An estimate for the path to herd immunity

100% of population immune



When Could the United States Reach Herd Immunity? It’s Complicated.

Conlen & Smart, New York Times 2021

Motivation

Transparency in journalism

“A sense of the tentativeness of truth.”

- *Philip Meyer, Precision Journalism, 2002*

More engaged audience

Greussing & Boomgaarden, *Digital Journalism*
2019

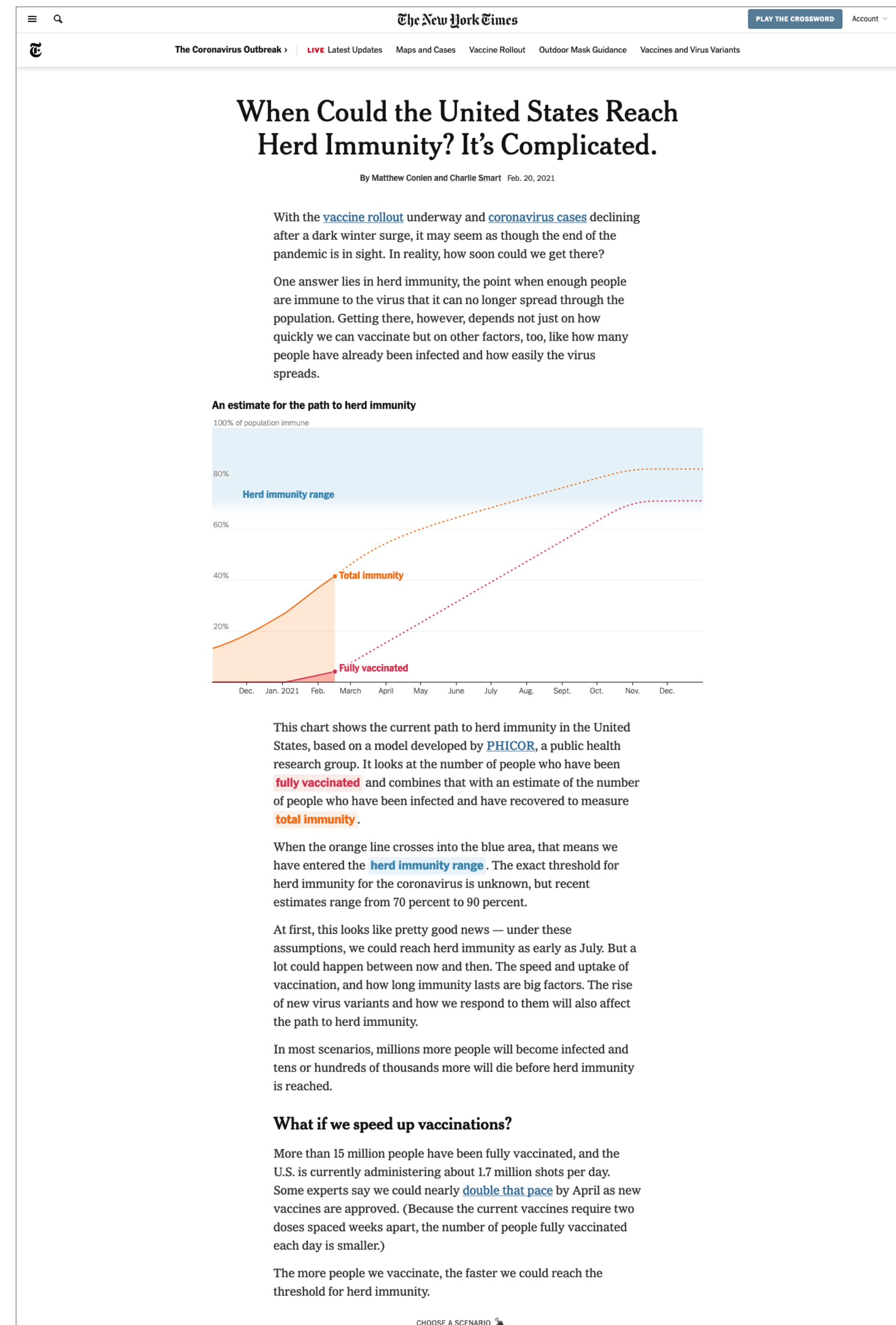
Better learning outcomes

Mayer’s Multimedia Principles, 2005

Promote active reading

Victor’s “Explorable Explanations”, 2011

...also many challenges!



Topics

Storytelling

- How different mediums can be used to tell stories

Design of narrative visualizations & interactive articles

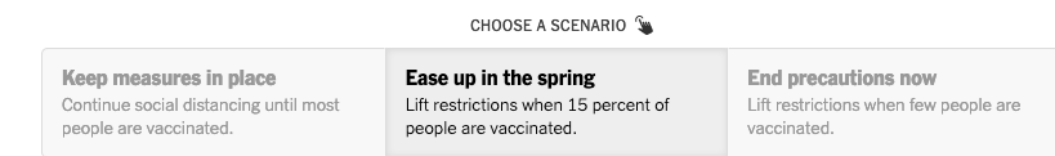
- Segel & Heer, 2010
- Hohman, et al 2020

Research on Authoring Tools

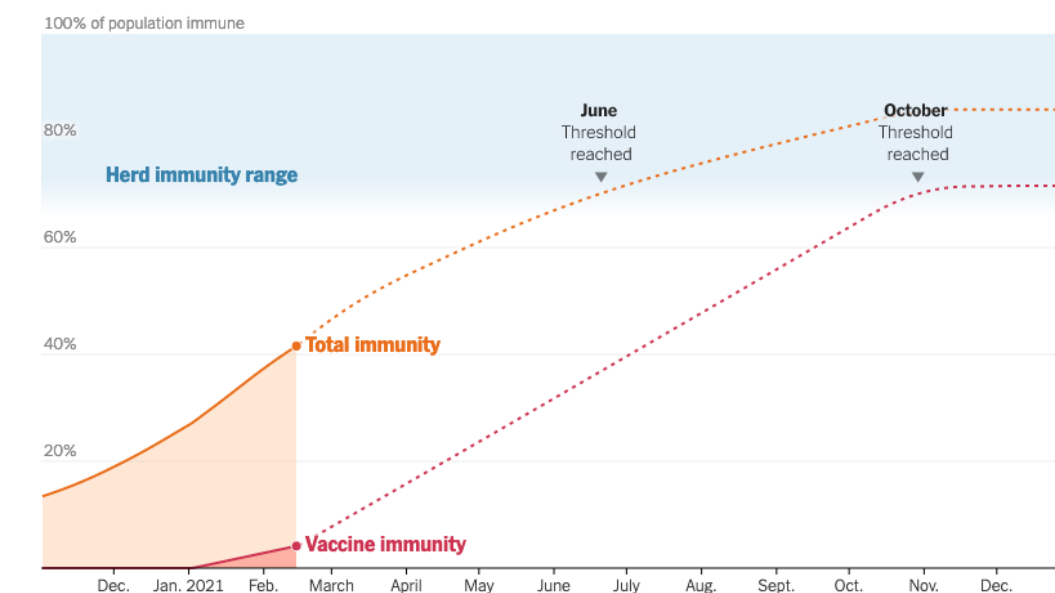
- Idyll, *UIST 2018*
- Idyll Studio, *UIST 2021*

Design exercise

While this means we would reach herd immunity sooner because more people would get sick and develop antibodies, that speed would come at a grim cost.



If we end restrictions in April, we could reach the herd immunity threshold by **June**. But in that time, **170,000** people could die from the virus.

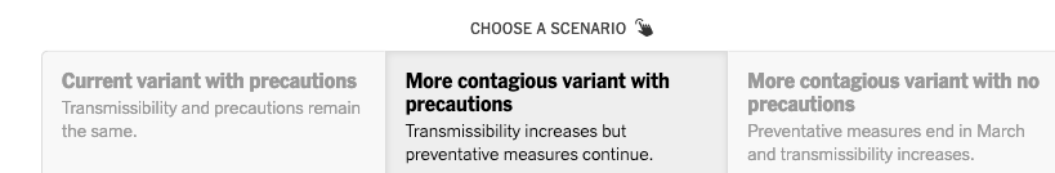


Precautions remain especially important as new variants of the virus emerge. If social distancing measures aren't followed, a stronger virus could rapidly infect and kill hundreds of thousands of people before they can be vaccinated.

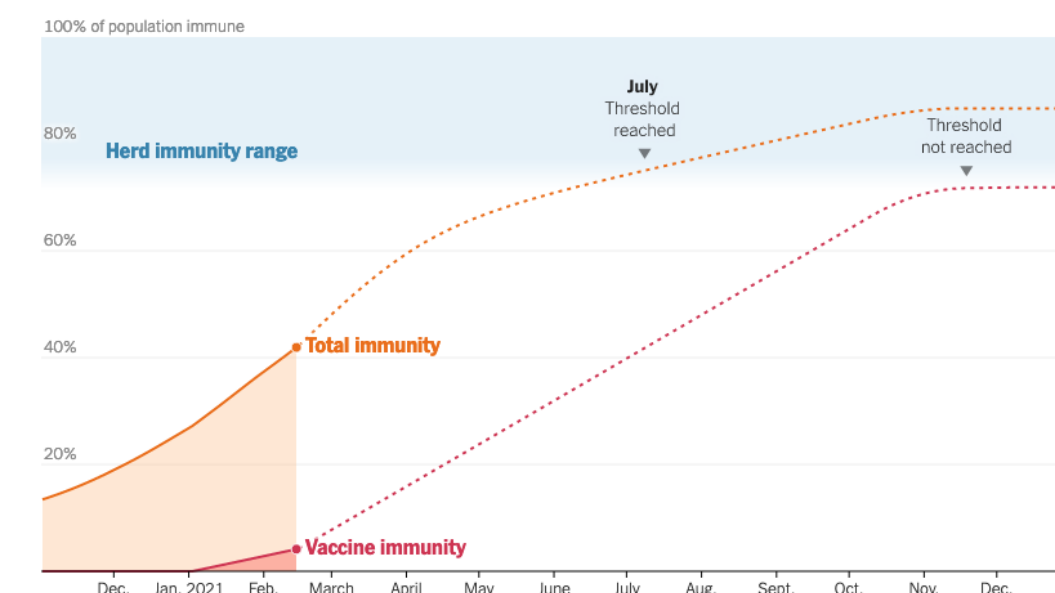
What if a more contagious variant spreads?

A more contagious variant of the virus, like the one first identified in Britain that is now [spreading](#) throughout the United States, could further complicate the path to herd immunity.

If the virus becomes more contagious, the threshold for herd immunity will go up. It may be hard for vaccines to keep pace, and precautions will be even more necessary to stem the spread.



A more contagious variant will spread faster and raise the herd immunity threshold. We could still expect to reach herd immunity in **July**, but new deaths could double, to **200,000** people.

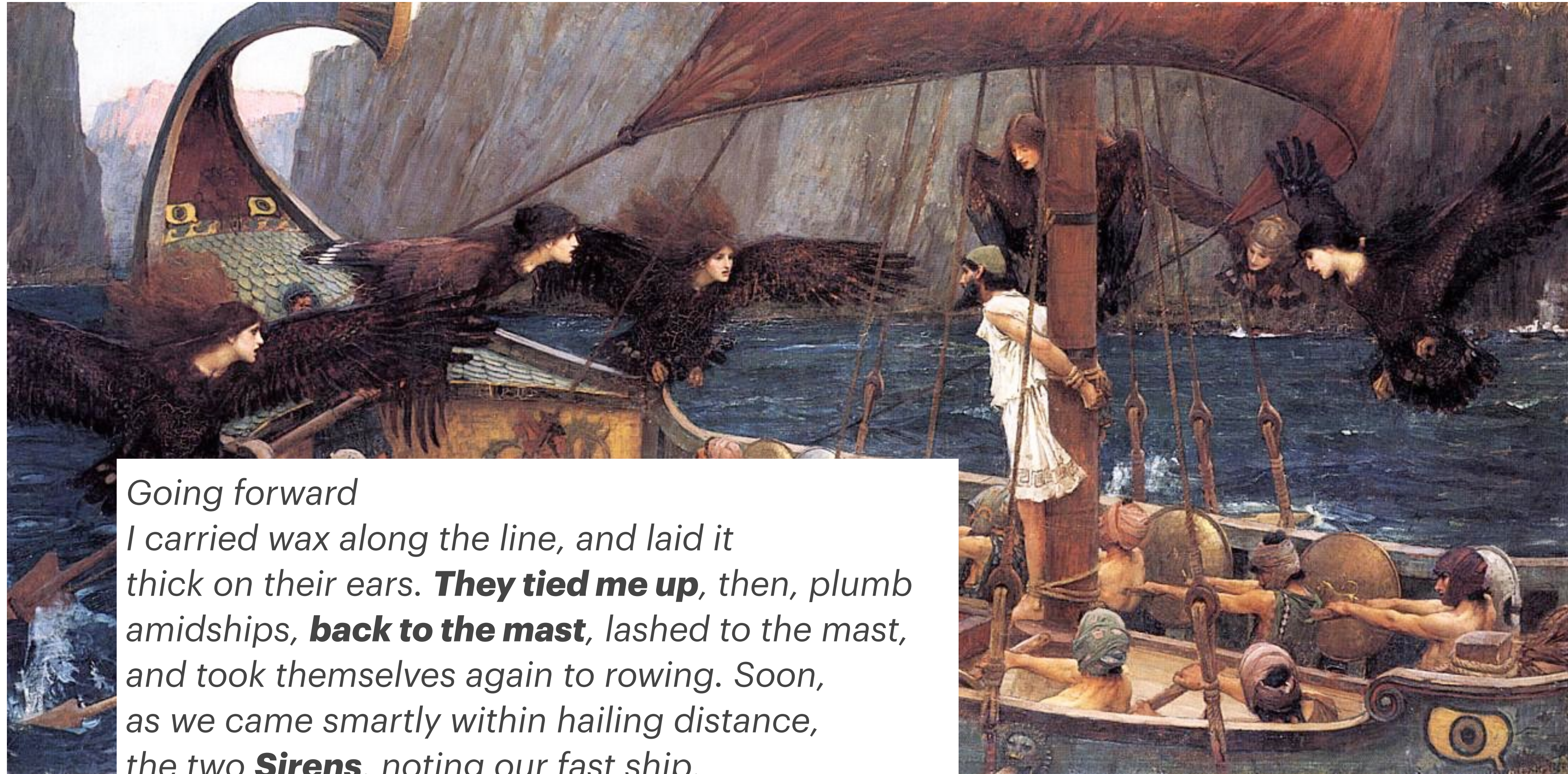


The spread of new virus variants makes it impossible to put a firm date on when we'll reach herd immunity or when the pandemic will end. There's a chance a mutation could lead to a version of the virus that doesn't respond to existing immunity, leading us to start the journey to herd immunity all over again.

Dr. Lee said that coronaviruses have relatively high mutation rates and that it is likely that new variants of the virus will continue to emerge. "The question will be how different might these variants be," he said. If a variant of the virus stops responding to the

STORYTELLING

as ancient as mankind



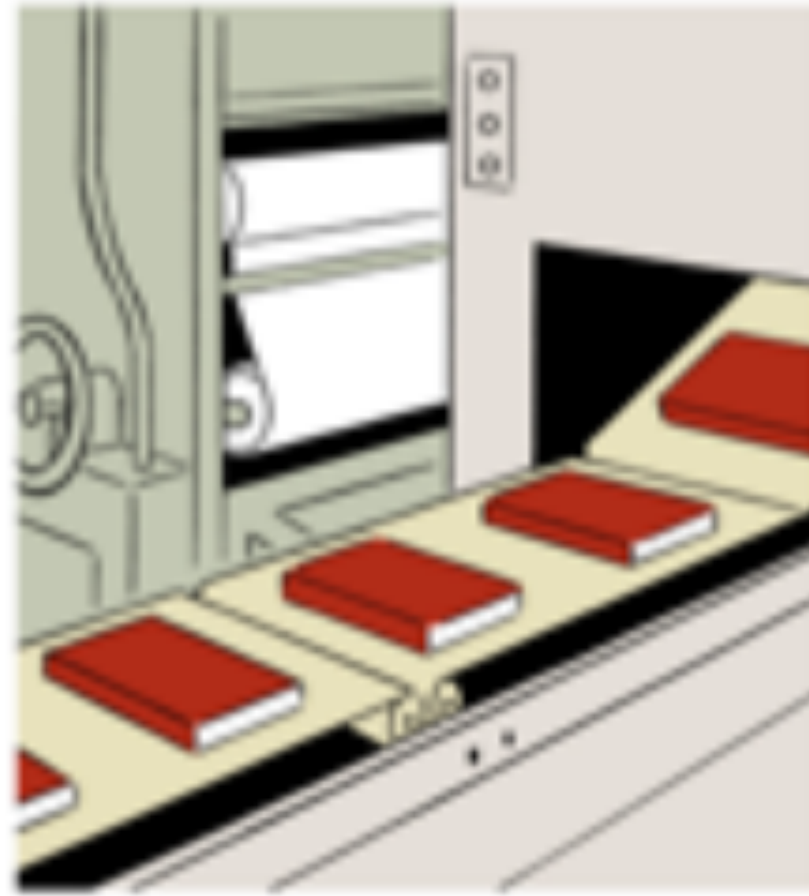
Going forward
*I carried wax along the line, and laid it
thick on their ears. **They tied me up**, then, plumb
amidships, **back to the mast**, lashed to the mast,
and took themselves again to rowing. Soon,
as we came smartly within hailing distance,
the two **Sirens**, noting our fast ship,
off their point, **made ready, and they sang...***

Narrative Storytelling

narrative (n): An account of a series of events, facts, etc., given in order and with the establishing of connections between them.

Effective storytelling “require[s] skills like those familiar to movie directors, beyond a technical expert’s knowledge of computer engineering and science.” - Gershon & Page ‘01







Justice Stephen G. Breyer to Retire From Supreme Court



Justice Stephen G. Breyer was appointed to the Supreme Court in 1994 by President

WASHINGTON — Justice Stephen G. Breyer, the senior member of the Supreme Court's three-member liberal wing, will retire, two people familiar with the decision said, providing President Biden a chance to make good on his campaign pledge to name a Black woman to the court.

Mr. Biden is expected to formally announce the retirement at the White House on Thursday, according to one person familiar with the planning for the event.

Justice Breyer, 83, the oldest member of the court, was appointed in 1994 by President Bill Clinton. After [the death of Justice Ruth Bader Ginsburg in 2020](#) and [the appointment of Justice Amy Coney Barrett](#) by President Donald J. Trump, he became the subject of an energetic campaign by liberals who wanted him to step down to ensure that Mr. Biden could name his successor while Democrats control the Senate.

Justice Stephen G. Breyer to Retire From Supreme Court



Justice Stephen G. Breyer was appointed to the Supreme Court in 1994 by President

WASHINGTON — Justice Stephen G. Breyer, the senior member of the Supreme Court’s three-member liberal wing, will retire, two people familiar with the decision said, providing President Biden a chance to make good on his campaign pledge to name a Black woman to the court.

Mr. Biden is expected to formally announce the retirement at the White House on Thursday, according to one person familiar with the planning for the event.

Justice Breyer, 83, the oldest member of the court, was appointed in 1994 by President Bill Clinton. After [the death of Justice Ruth Bader Ginsburg in 2020](#) and [the appointment of Justice Amy Coney Barrett](#) by President Donald J. Trump, he became the subject of an energetic campaign by liberals who wanted him to step down to ensure that Mr. Biden could name his successor while Democrats control the Senate.

Lede
(lead paragraph)

Justice Stephen G. Breyer to Retire From Supreme Court



Justice Stephen G. Breyer was appointed to the Supreme Court in 1994 by President

WASHINGTON — Justice Stephen G. Breyer, the senior member of the Supreme Court's three-member liberal wing, will retire, two people familiar with the decision said, providing President Biden a chance to make good on his campaign pledge to name a Black woman to the court.

Mr. Biden is expected to formally announce the retirement at the White House on Thursday, according to one person familiar with the planning for the event.

Justice Breyer, 83, the oldest member of the court, was appointed in 1994 by President Bill Clinton. After [the death of Justice Ruth Bader Ginsburg in 2020](#) and [the appointment of Justice Amy Coney Barrett](#) by President Donald J. Trump, he became the subject of an energetic campaign by liberals who wanted him to step down to ensure that Mr. Biden could name his successor while Democrats control the Senate.

**Nut Graf
(nutshell paragraph)**

STORYTELLING

across various media

PEOPLE TELL STORIES

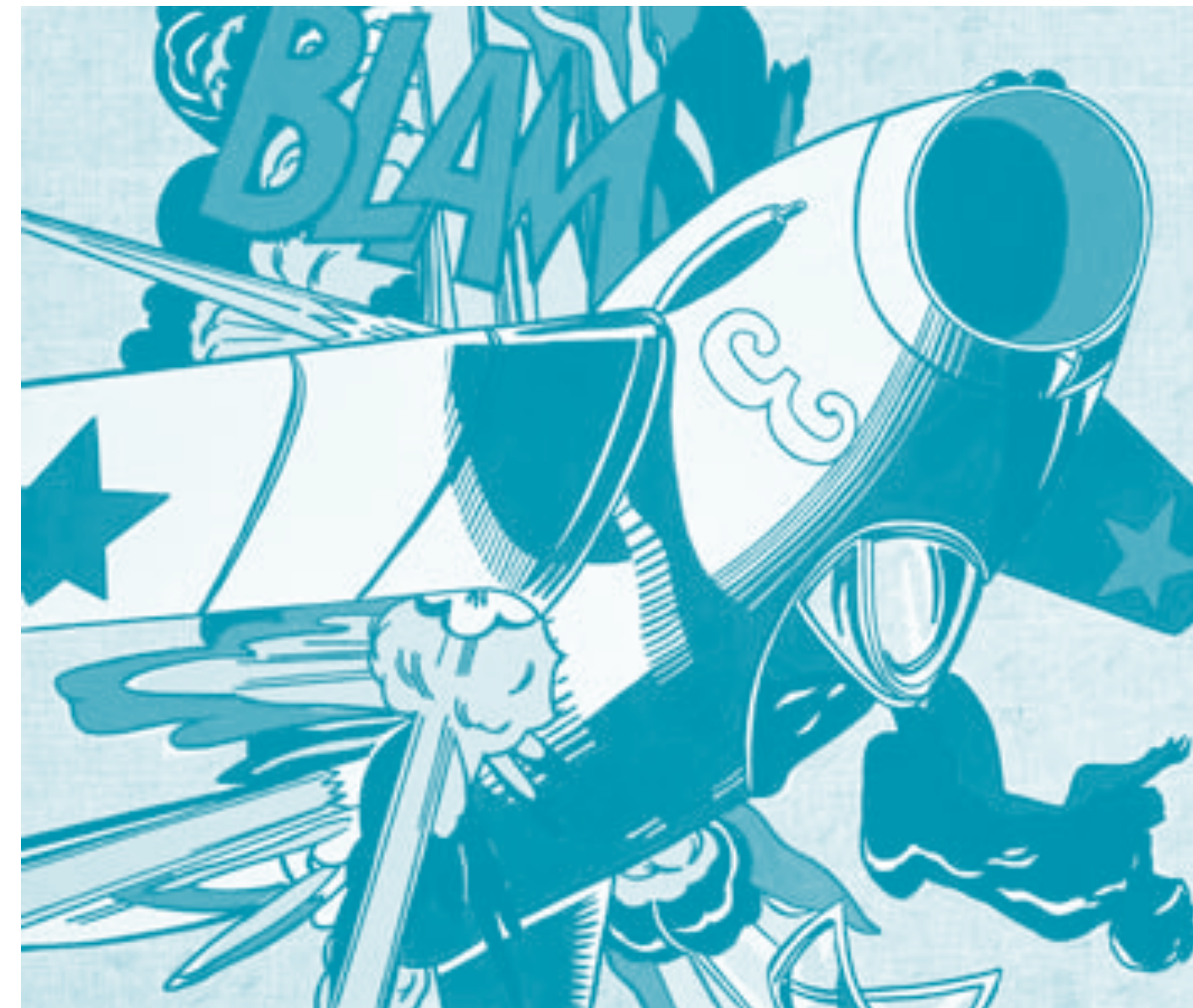
WORDS TELL STORIES

IMAGES TELL STORIES

COMICS TELL STORIES

MOVIES TELL STORIES

DATA TELLS STORIES?





Privacy and the internet

Lives of others

BY JEFFREY M. HARRIS

Facebook and Google face a backlash from users and regulators alike over the way they have handled sensitive data

JENNIFER STODOLSKY, Canada's privacy commissioner, infatuated with Facebook, in August 2010, the social networking site struck a deal, agreeing to change its policies within a year to comply with the country's privacy law. Now, says Ms Stodolsky, the company appears to be reneging on an important part of that deal, which included giving users a clear and easy-to-implement choice over whether to share private data with third parties. "It doesn't seem to me that Facebook is going in the right direction on this issue," she says, hinting that, without a change of course, the firm could soon become the subject of another formal investigation by her organisation.

Facebook is not the only internet giant to provide the head of data watchdogs. Google endured withering criticism this week following news that it had recruited some personal communication logs over unauthorised Wi-Fi data networks in homes and offices in some 30 countries. On May 11th Peter Schaar, Germany's federal commissioner for data protection, called for an independent investigation into Google's behaviour, claiming that it had "simply disregarded normal rules in the development and usage of software".

The cases highlight rising tension between guardians of privacy and internet firms. And they reflect concern among web users about how private data has been made public. Several prominent internet

typiests such as Cory Doctorow, a science-fiction author, and Ian Japane, a politician, have abandoned Facebook. Since such as that Facebook has more as a way of life to its users, it is not surprising that it has become a target for critics.

There is no likely to stop the momentum of Facebook, which is poised to claim half a billion members and which draws over 100 million visitors a day to its site (see chart). But users have been rattled at the company's headquarters in Silicon Valley, where bosses are ordering new laws to respond. Several senior folk are now hinting that Facebook will soon roll out stricter privacy controls to make it easier to keep more data hidden. MySpace, a rival, is already making its controls stricter in an effort to woo disaffected Facebookers to its service.

A month ago, Facebook's handling of privacy has been hovering for some time. In December the social network changed the default settings on its privacy controls so that individuals' personal information would be shared with "everyone" rather than selected friends. Facebook argued this reflected a shift in society towards greater openness and noted that users could still adjust privacy settings back again. But increased privacy activism lobbied for it to be reversed.

The switch should not have come as a surprise. Early on, many social networks

Also in this section

- 68 Spring conspiracies
- 69 The recovery of General Motors
- 69 Business crime in China
- 70 Indian retail
- 70 Japan's drug firms on the move
- 71 Brazil's telecoms
- 71 Schumpeter: Overstretched

For daily analysis and debate on business, visit economist.com/business-forecast

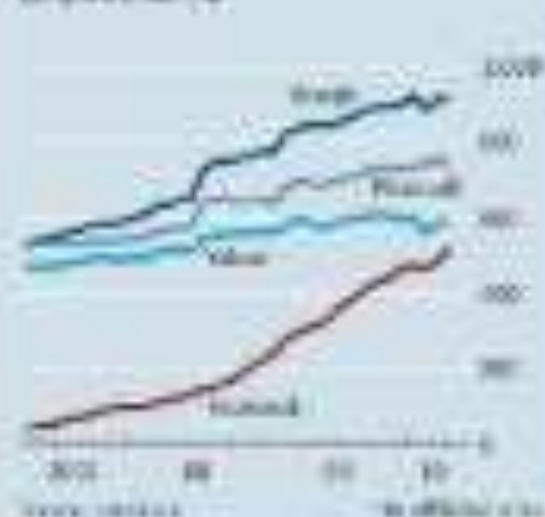
exposed itself to high scrutiny policies in order to attract and motivate users. But as new jobs, controls are gradually loosened to encourage more sharing. As people share more, Facebook can increase the data for which it sells advertising. And the more it knows about users' likes and dislikes, the better it can target ads that generate hundreds of millions of dollars.

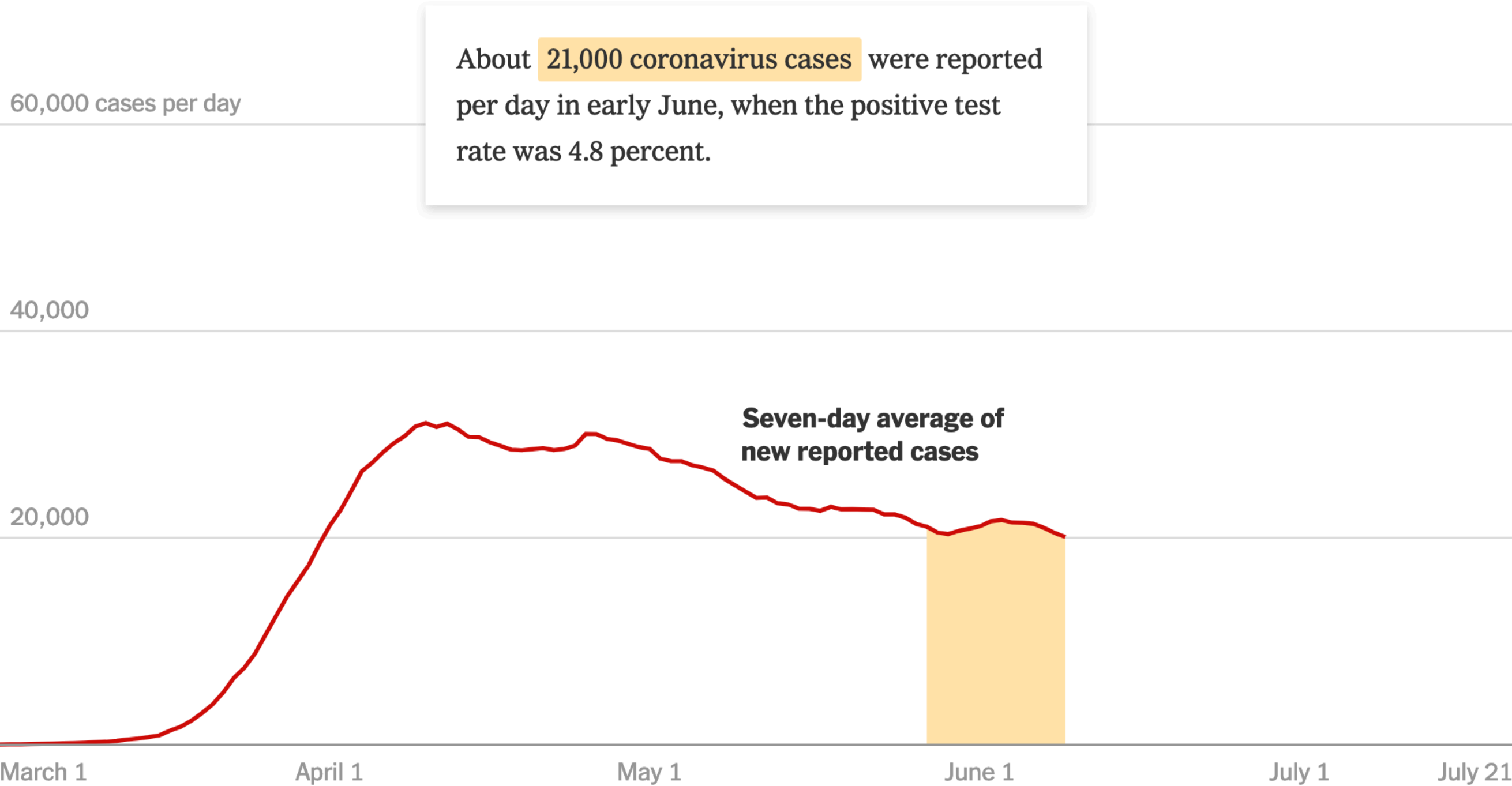
Privacy grew faster still following a developers' conference last month at which Mark Zuckerberg, Facebook's boss, announced yet another series of policy changes. One that raised criticism was an "extended personalisation" feature that lets create third-party websites access Facebook data when people visit. Critics say that Facebook has made it risky to delete this feature, which may explain why its standard settings have been so much.

European officials are growing wary about Facebook too. This month a group of data-protection experts who advise the European Commission wrote to the social network, calling its default settings the default settings "unacceptable". And in the US

Not letting face

Facebook's growth





CASE STUDY COVID-19 TESTING
Conlen, 2020

CASE STUDY COVID-19 TESTING

Input Data

Daily case and test counts.

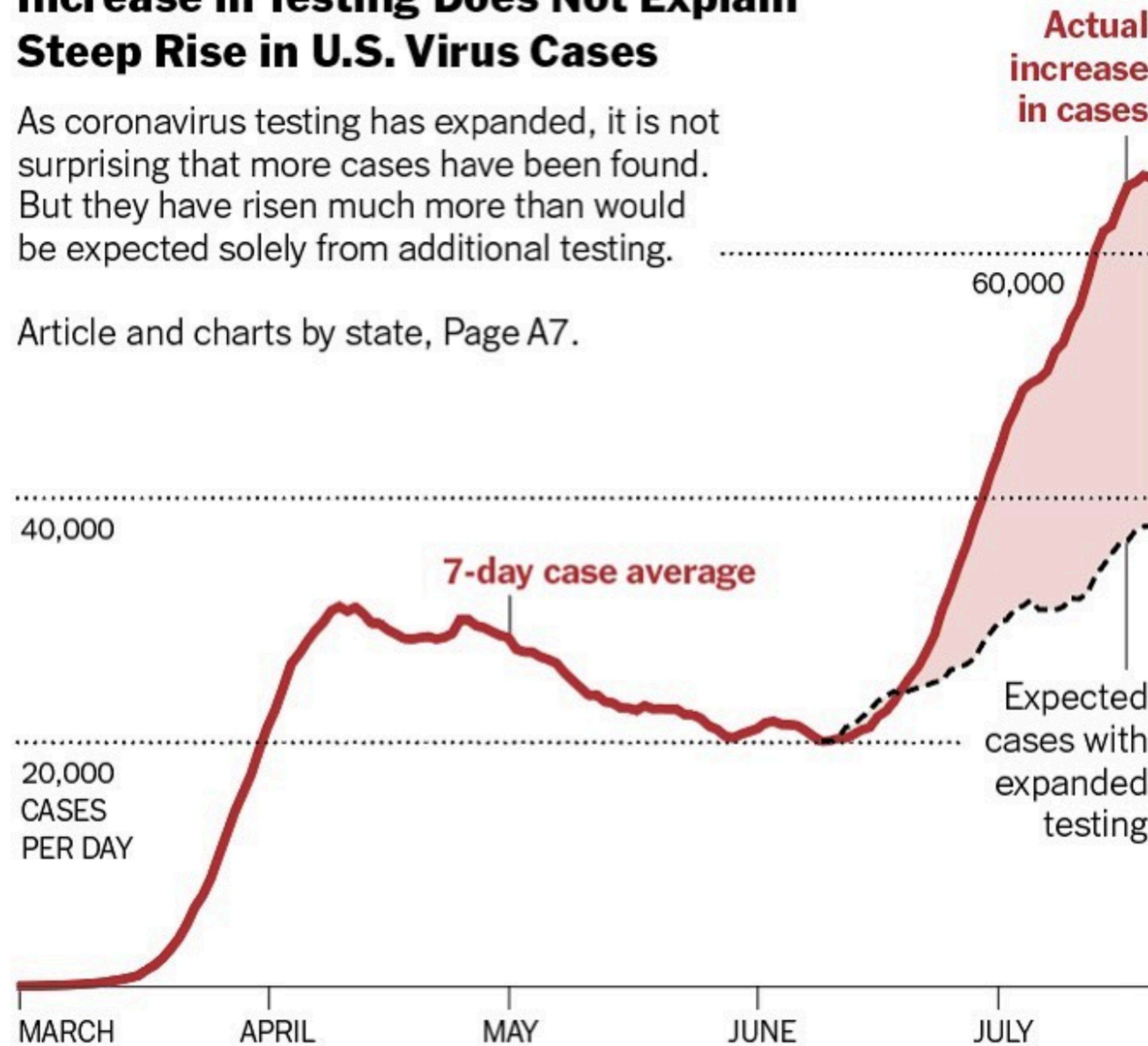
Points of Focus

1. Baseline (smoothed average of daily cases)
2. Counterfactual case curve
(baseline positivity rate * daily test counts),
3. Actual case curve (daily cases)

Increase in Testing Does Not Explain Steep Rise in U.S. Virus Cases

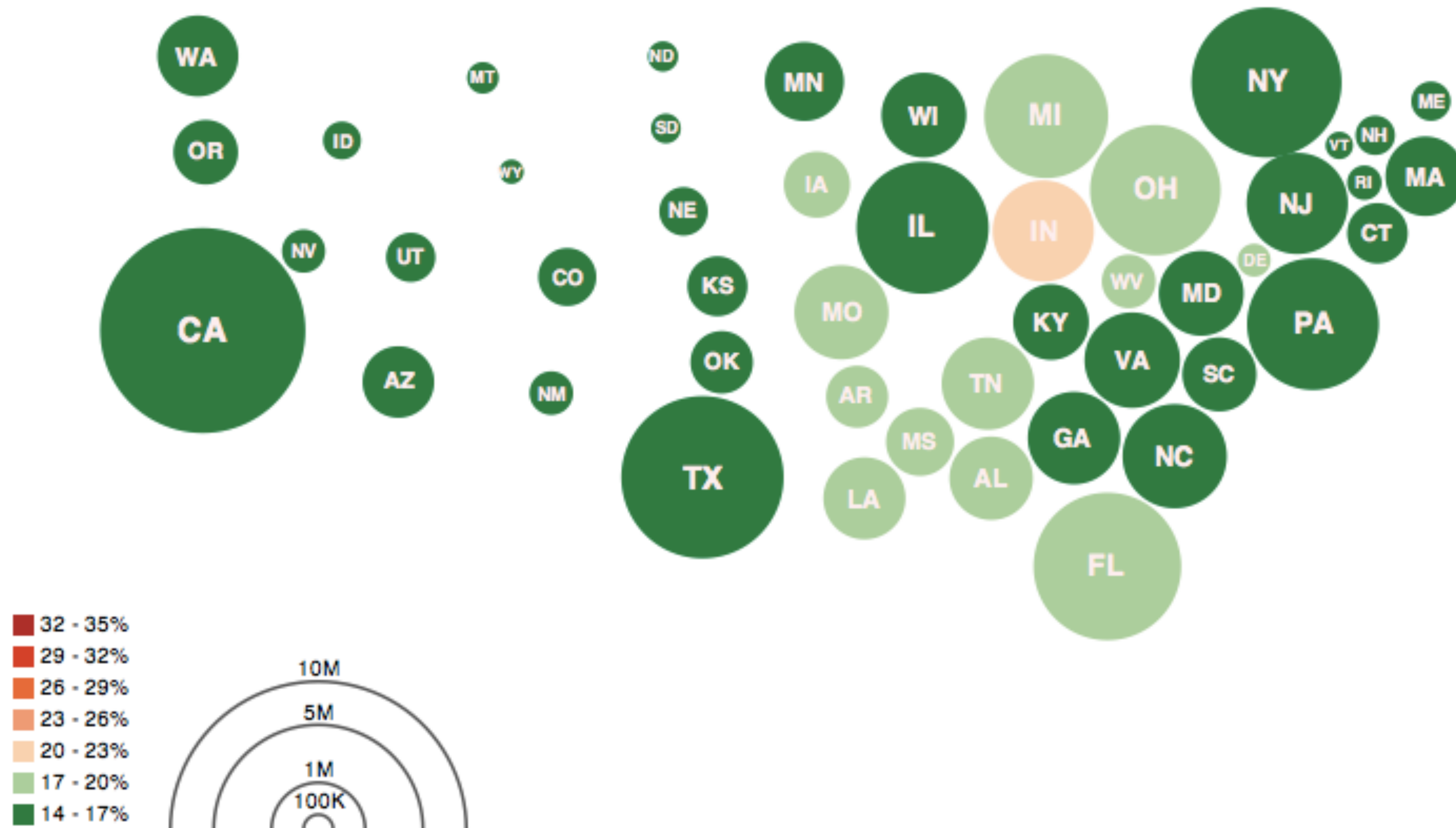
As coronavirus testing has expanded, it is not surprising that more cases have been found. But they have risen much more than would be expected solely from additional testing.

Article and charts by state, Page A7.

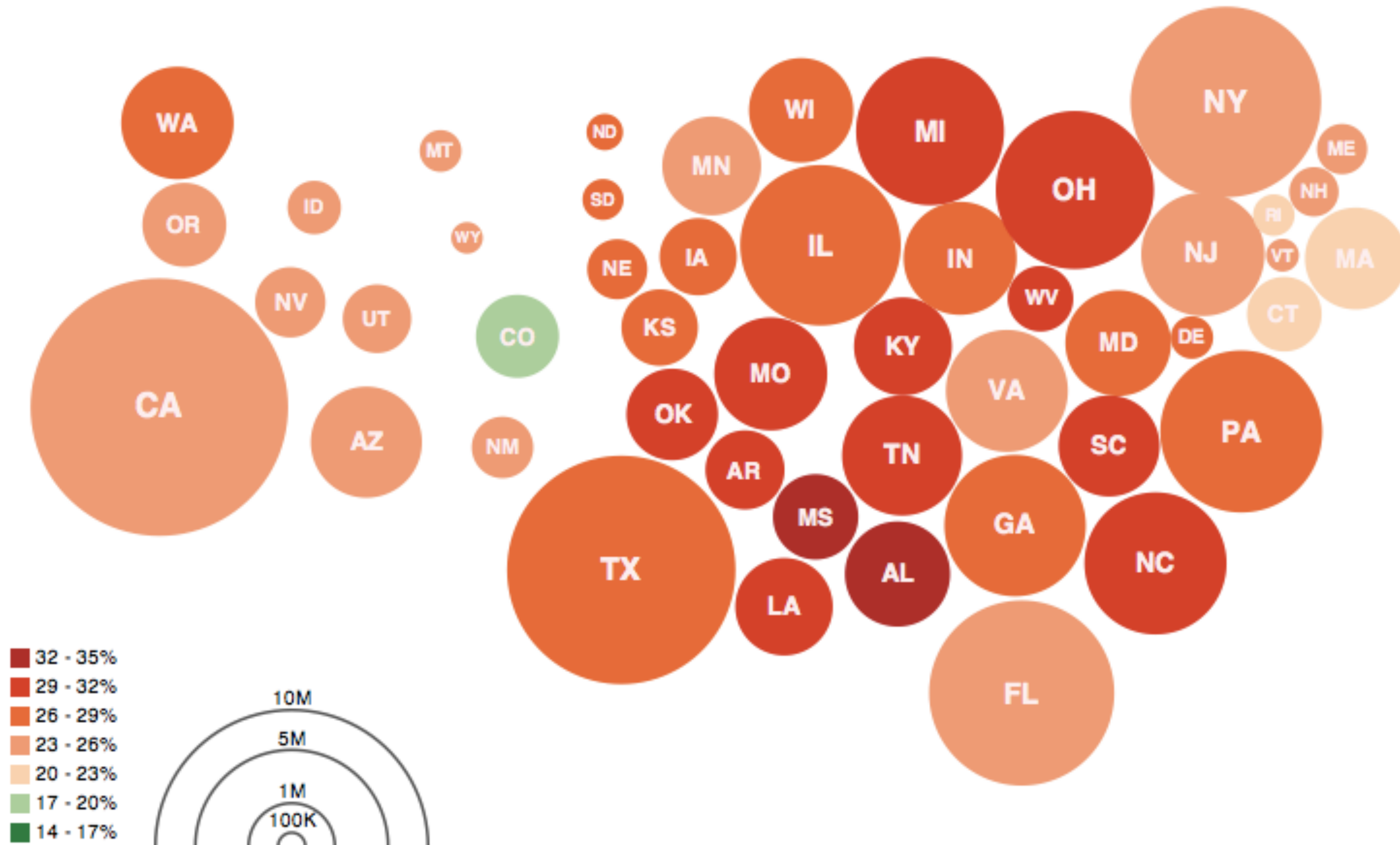


Source: The COVID Tracking Project

MATTHEW CONLEN/THE NEW YORK TIMES



Obesity Map Vadim Ogievetsky
1995



Obesity Map Vadim Ogievetsky
2008

Of the 7,666 times that police officers killed people in the U.S. between 2013 and 2019...

25 (0.3%) resulted in a conviction



74 (1.0%) resulted in a charge but no conviction >



and...



monachalabi • Follow

United States



monachalabi Total disbelief about the system doing the bare minimum. George Floyd deserved so much more than this, he deserved to live.

Some detail about those 25 sentences:

Unknown sentence = 4 police killings

Just probation = 3

3 months in jail = 1

1 year in jail, 3 years suspended = 1

1 year in prison = 1

18 months in prison = 1

2.5 years in prison = 1

4 years in prison = 1

5 years in prison = 1

6 years in prison = 1

16 years in prison = 1

20 years in prison = 1

30 years in prison = 2



22,976 likes

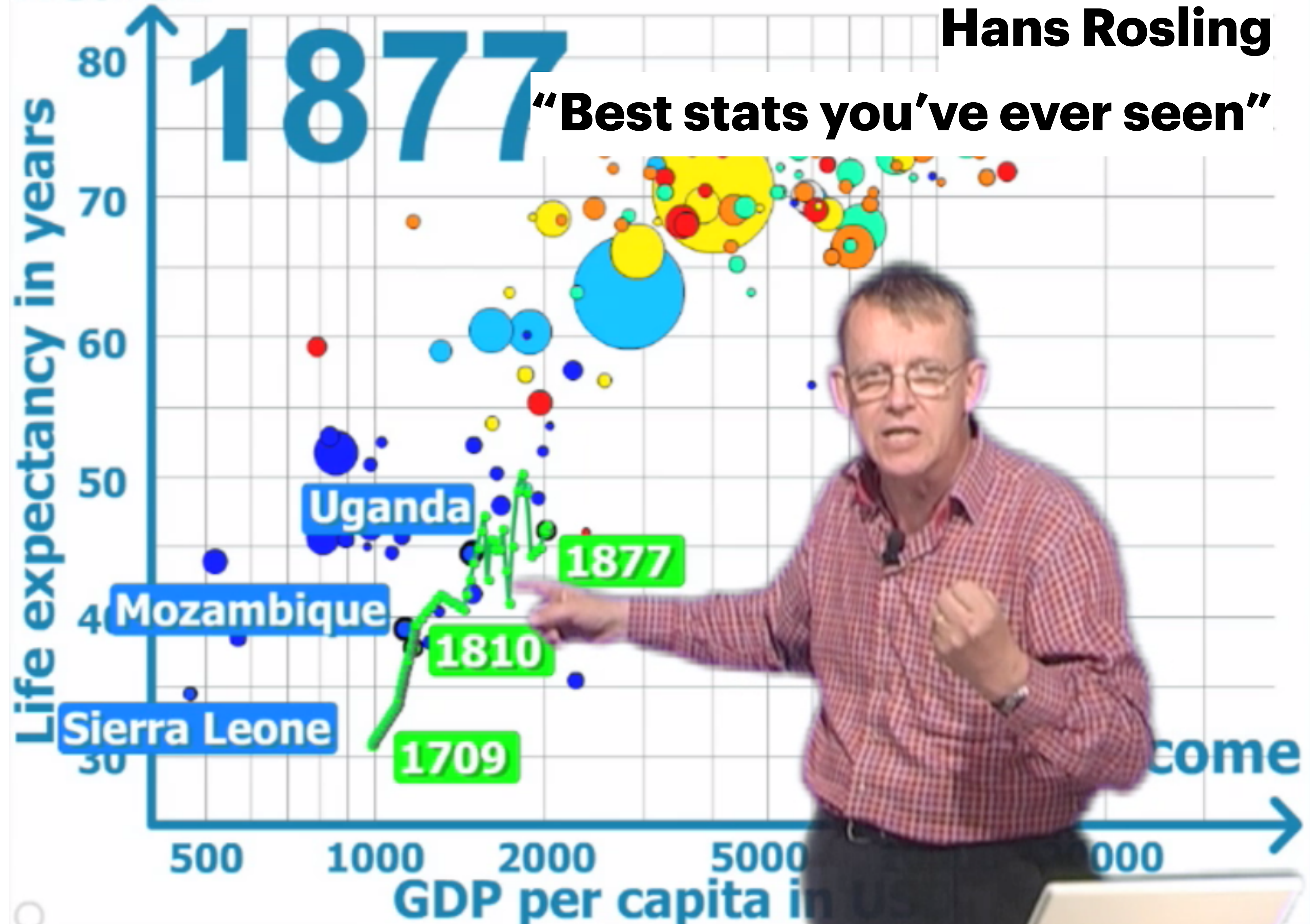
3 HOURS AGO

Log in to like or comment.

Health

Hans Rosling

"Best stats you've ever seen"



Narrative Devices

What devices communicates best?

Highly dependent on: audience, context, format

Format

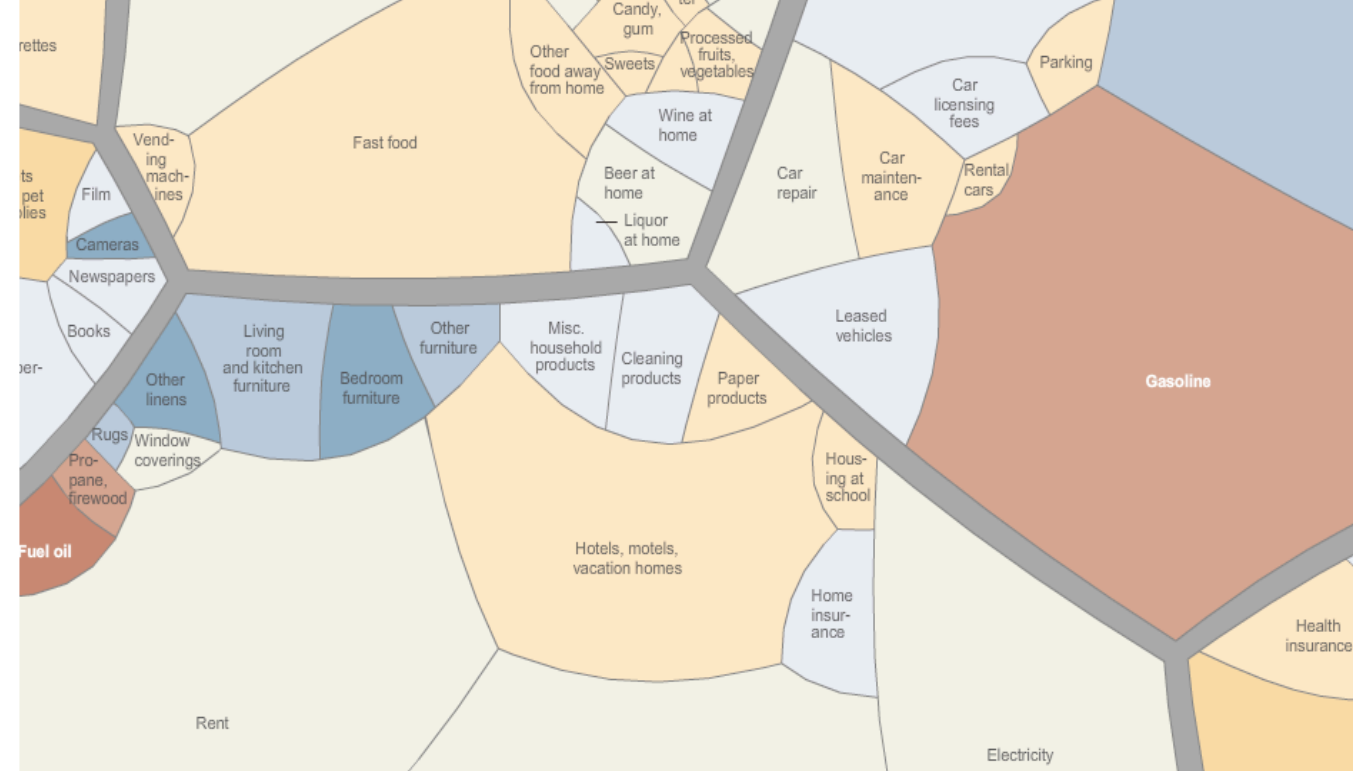
Interactive Article

Animation

Lecture

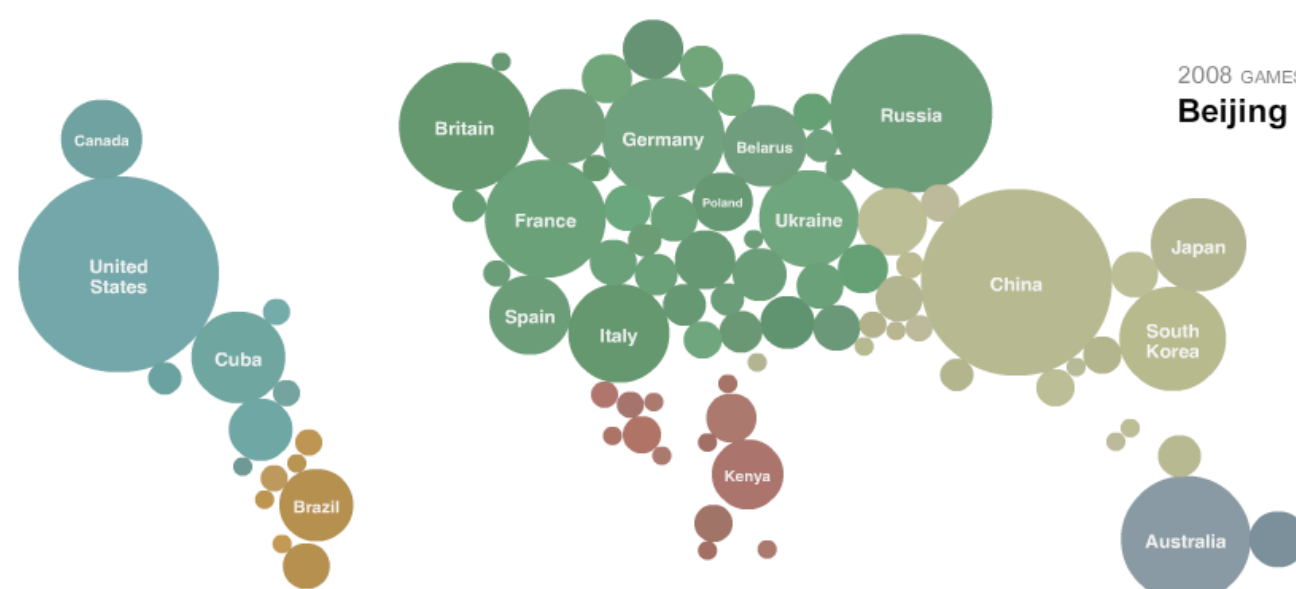
Still Image

Video

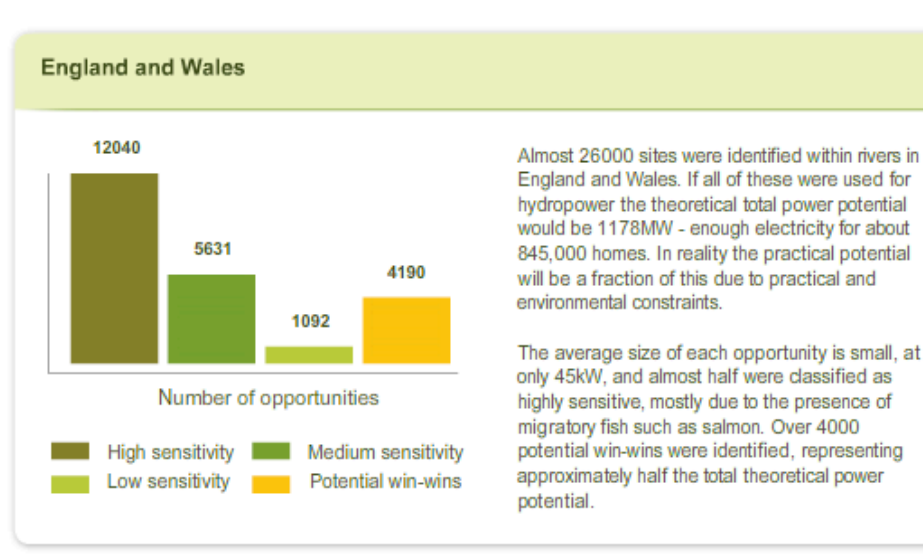
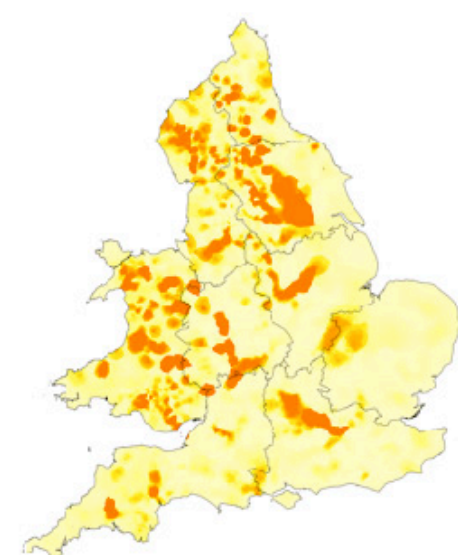
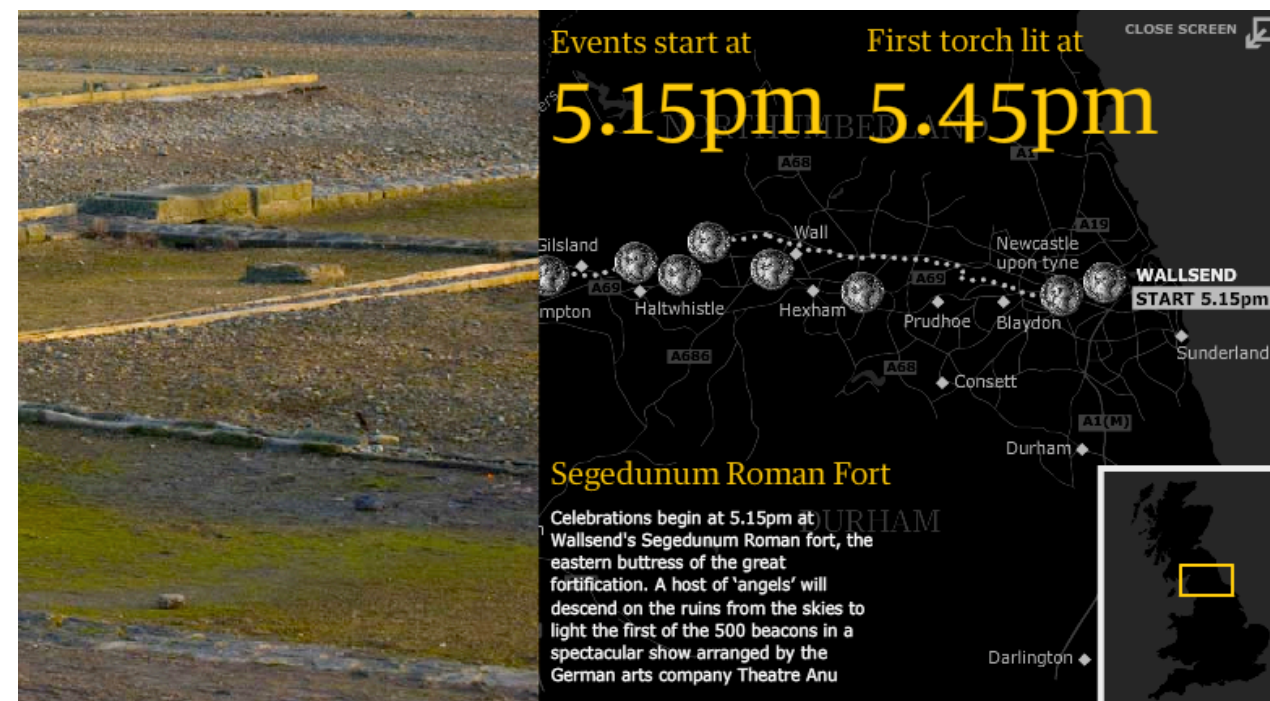
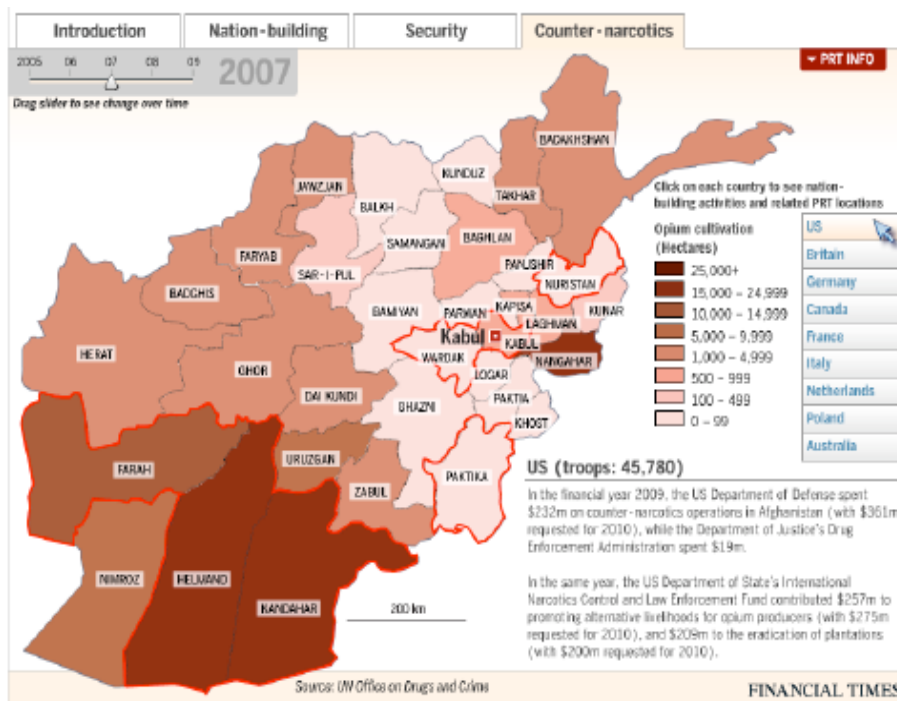
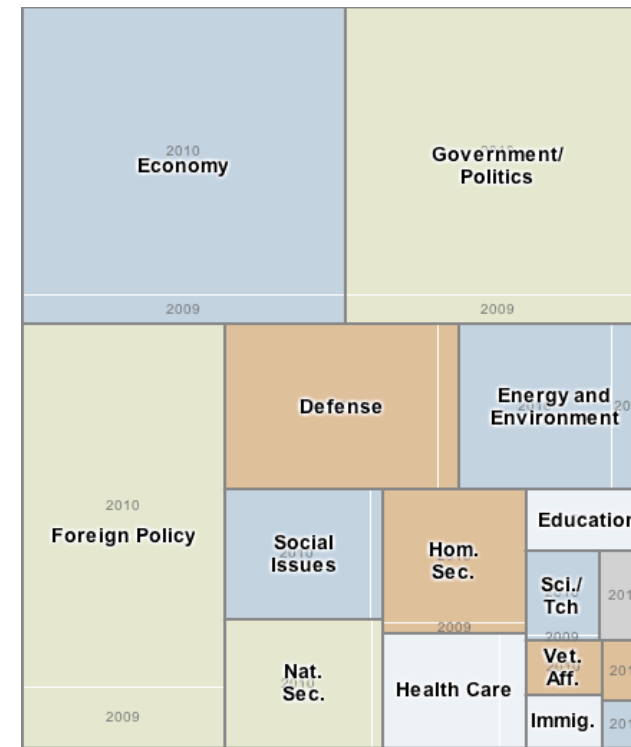


58 CASE STUDIES

70% Journalism
20% Business
10% Research



2008 Medal Count



Segel & Heer, 2010

755

Steroids or Not, the Pursuit Is On

Barry Bonds is taking aim at the career home run record. He needs only six more to tie Babe Ruth and 47 to equal Hank Aaron.

Lines are cumulative home runs.

Hank Aaron
755 homers
23 seasons



Babe Ruth
714 homers
22 seasons



Barry Bonds
708 homers
20 seasons

Bonds takes lead
Home runs
after 16 seasons
Bonds 567
Aaron 554
Ruth 516

14th season

According to allegations in a book about Bonds, he began taking steroids before the 1999 season, his 14th in the league. Two seasons later, he hit 73 home runs, surpassing Aaron's career pace.

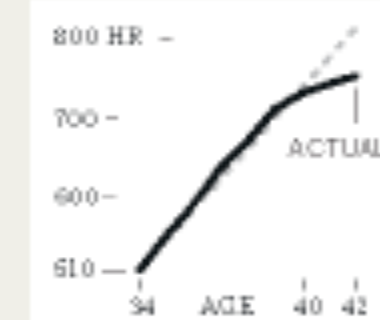
Homer Pace After Age 34

If the accusations are correct, Bonds was 34 in his first season on steroids. Here are projected home run paces for each player after age 34.

----- PROJECTED PACE BASED ON AVERAGE OF PREVIOUS FIVE SEASONS

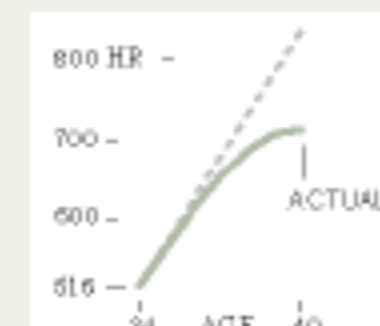
Aaron

Actual homers slightly outpace projected homers for five seasons.



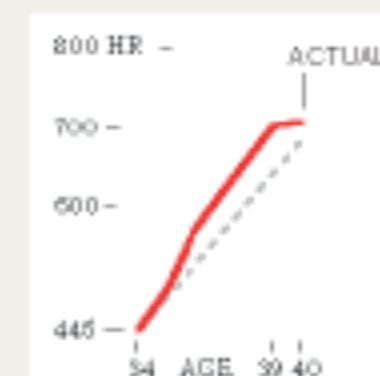
Ruth

Averaged 46.4 homers a season from age 30 to 34. Averaged 42.5 for next four seasons.



Bonds

From age 35 to 39, he averaged 14 more homers a season than projected.



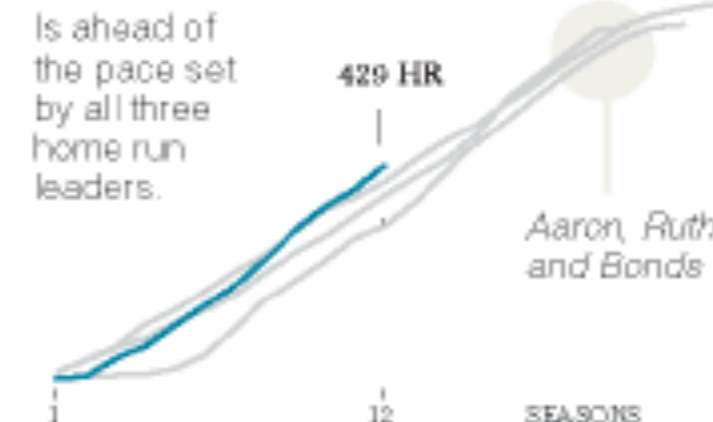
Note: Ages as of July 1 of each season.

Others Taking Aim



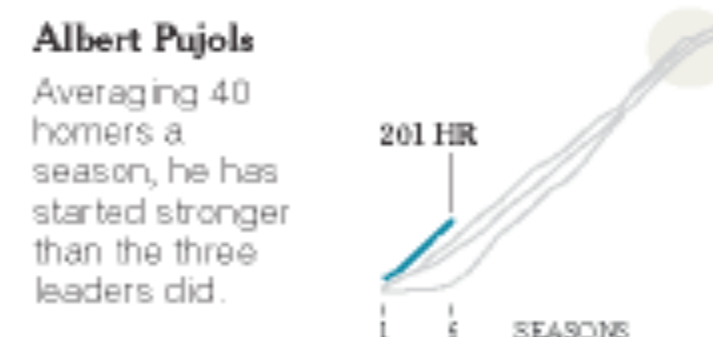
Alex Rodriguez

Is ahead of the pace set by all three home run leaders.



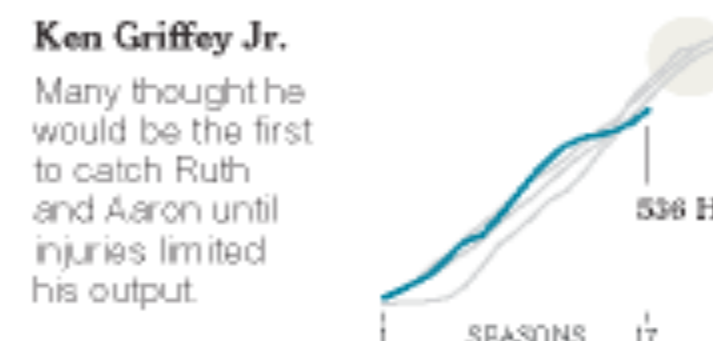
Albert Pujols

Averaging 40 homers a season, he has started stronger than the three leaders did.



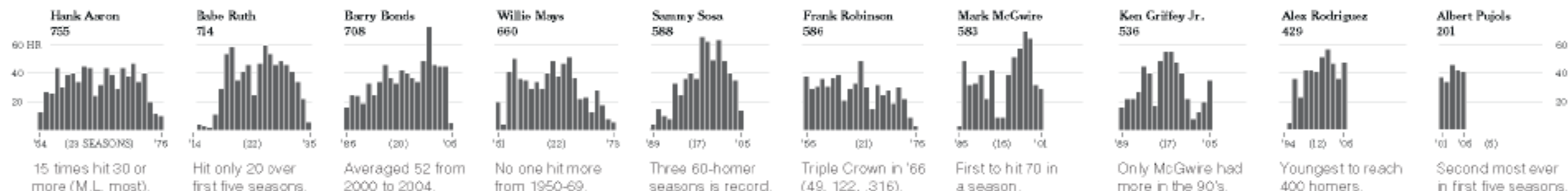
Ken Griffey Jr.

Many thought he would be the first to catch Ruth and Aaron until injuries limited his output.

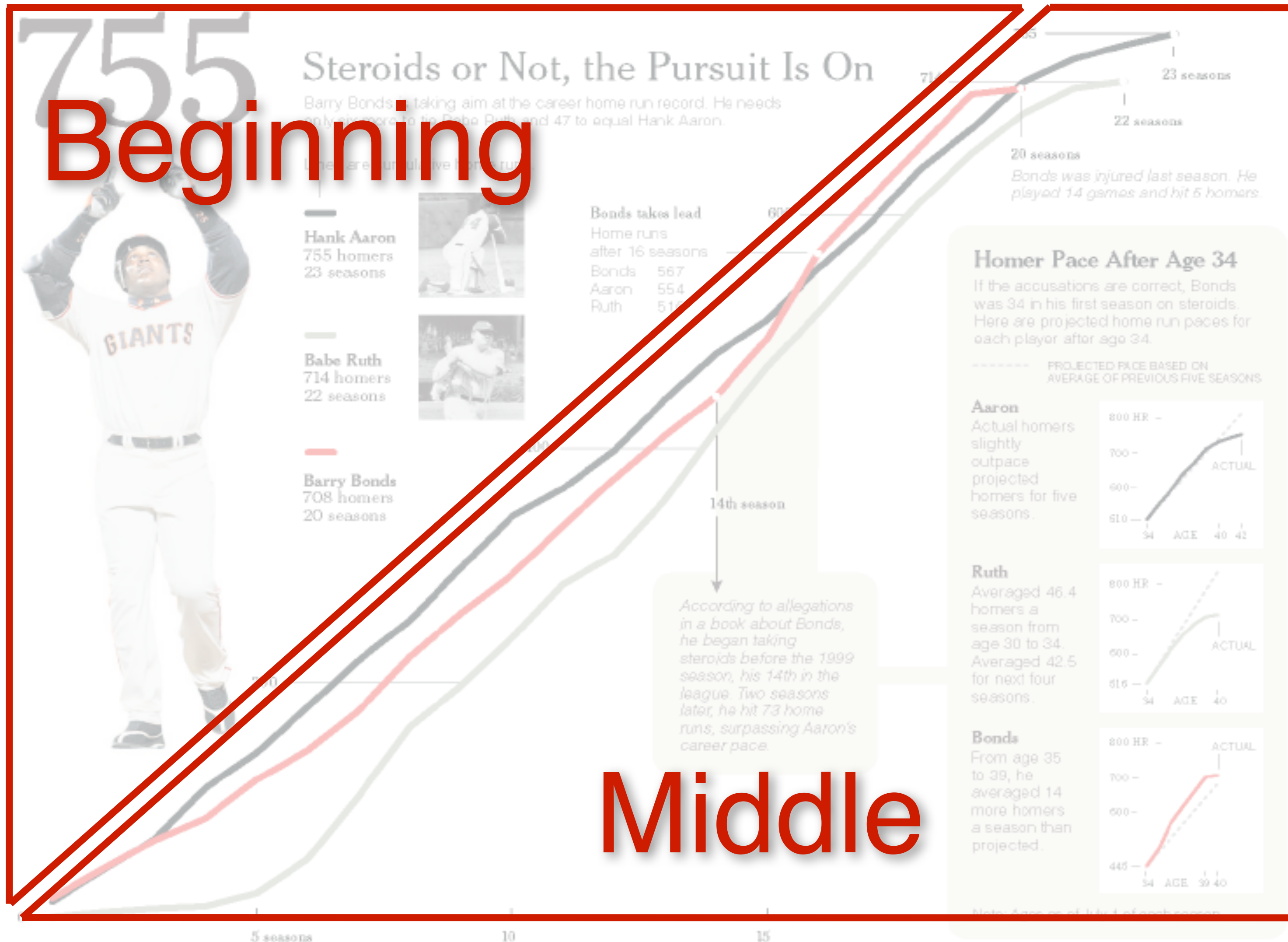


Differing Paths to the Top of the Charts

The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (37th) and Pujols (tied 257th).



Beginning

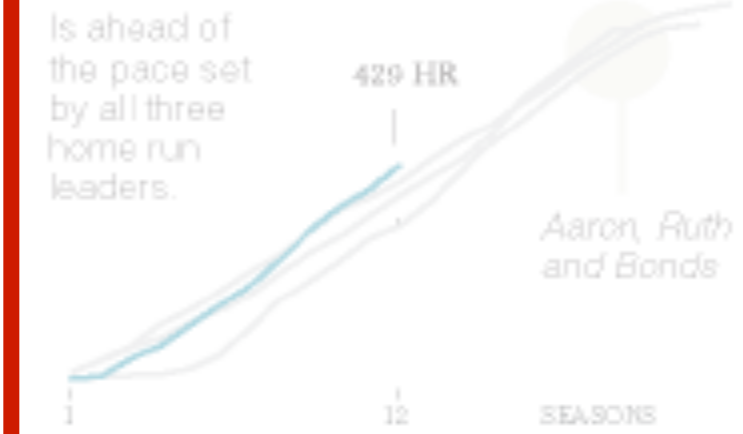


Middle

Others Taking Aim

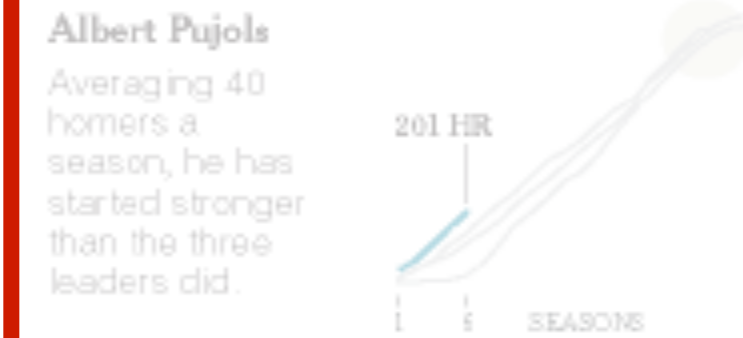
Alex Rodriguez

Is ahead of the pace set by all three home run leaders.



Albert Pujols

Averaging 40 homers a season, he has started stronger than the three leaders did.



Ken Griffey Jr.

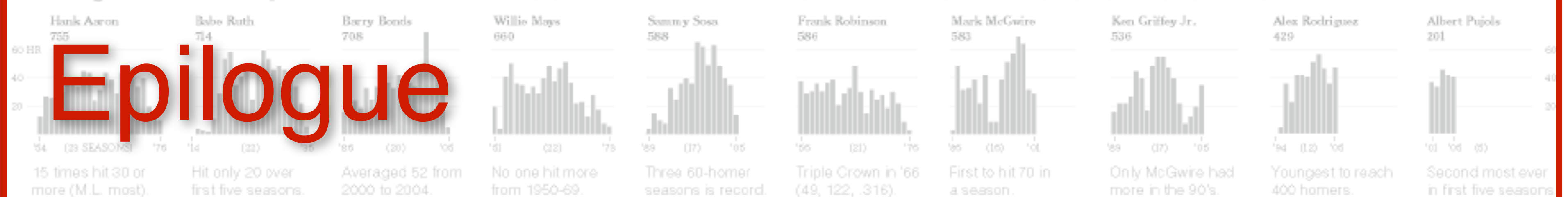
Many thought he would be the first to catch Ruth and Aaron until injuries limited his output.



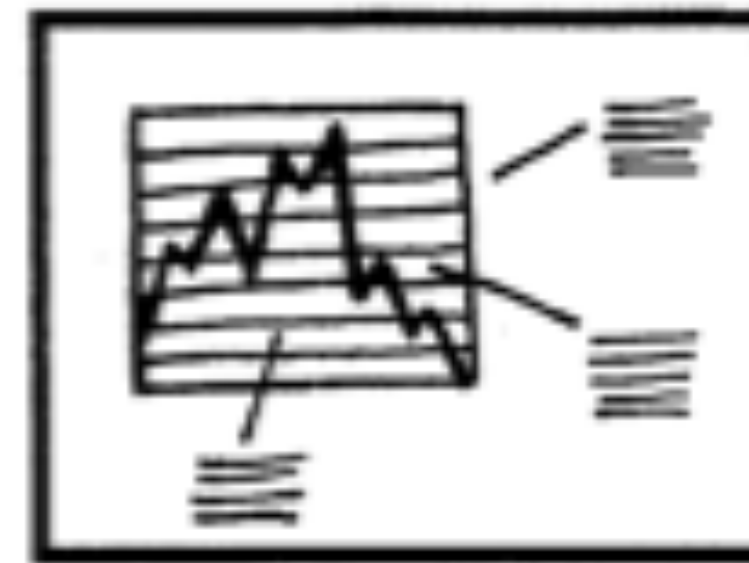
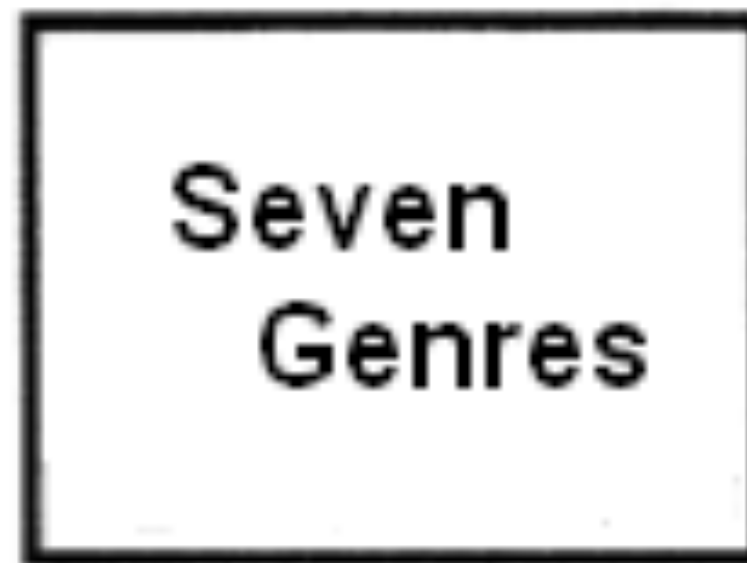
End

Differing Paths to the Top of the Charts

The top seven players on the career home run list, along with a look at Griffey (12th), Rodriguez (37th) and Pujols (tied 257th).



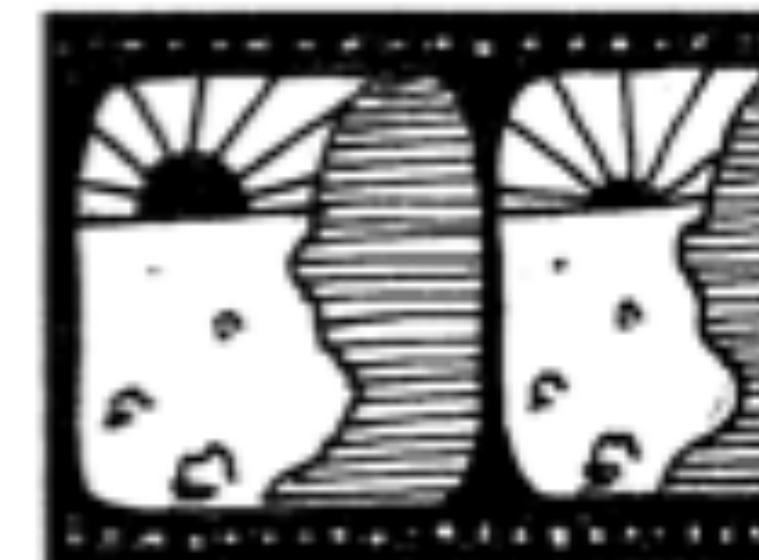
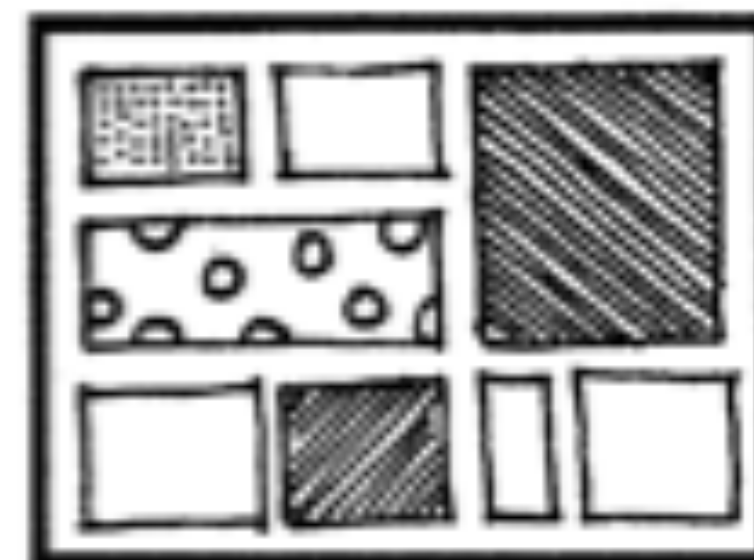
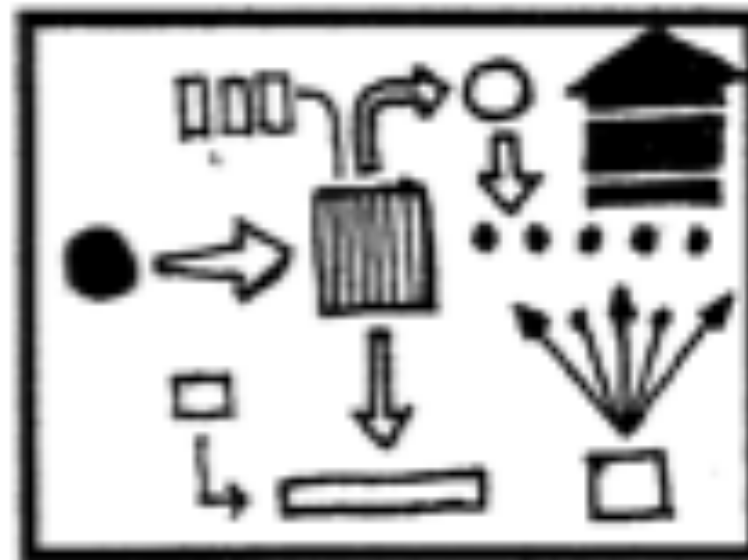
Epilogue



Magazine Style

Annotated Chart

Partitioned Poster



Flow Chart

Comic Strip

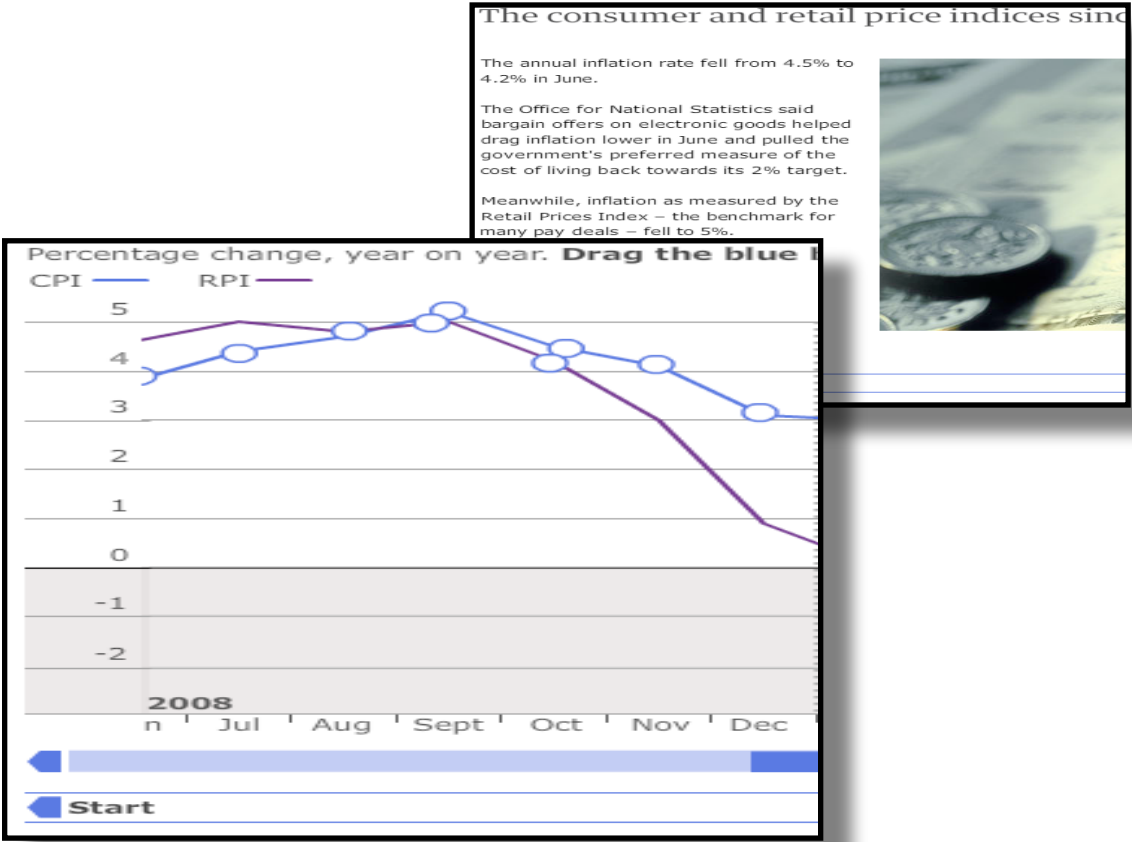
Slide Show

Film/Video/Animation

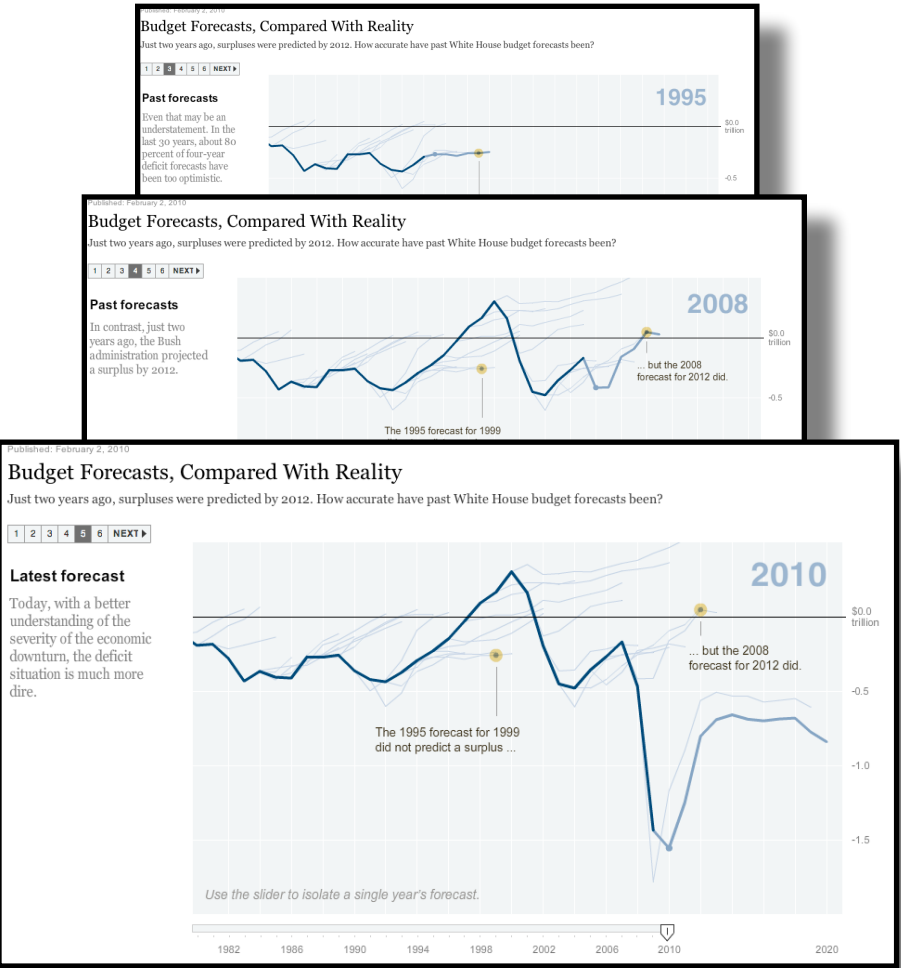
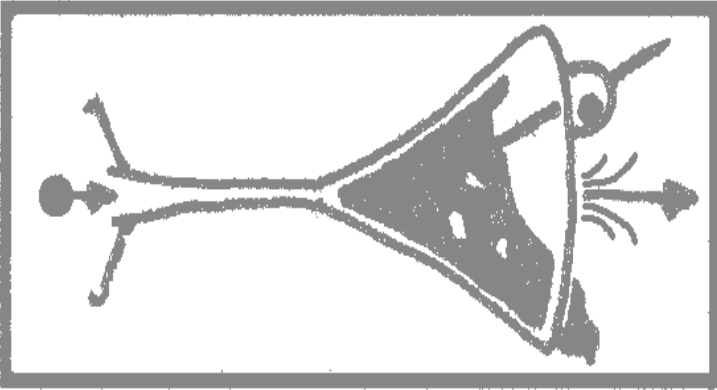
Genres for Narrative Visualization (2010)

Genres + Interactivity + Messaging =
DESIGN SPACE

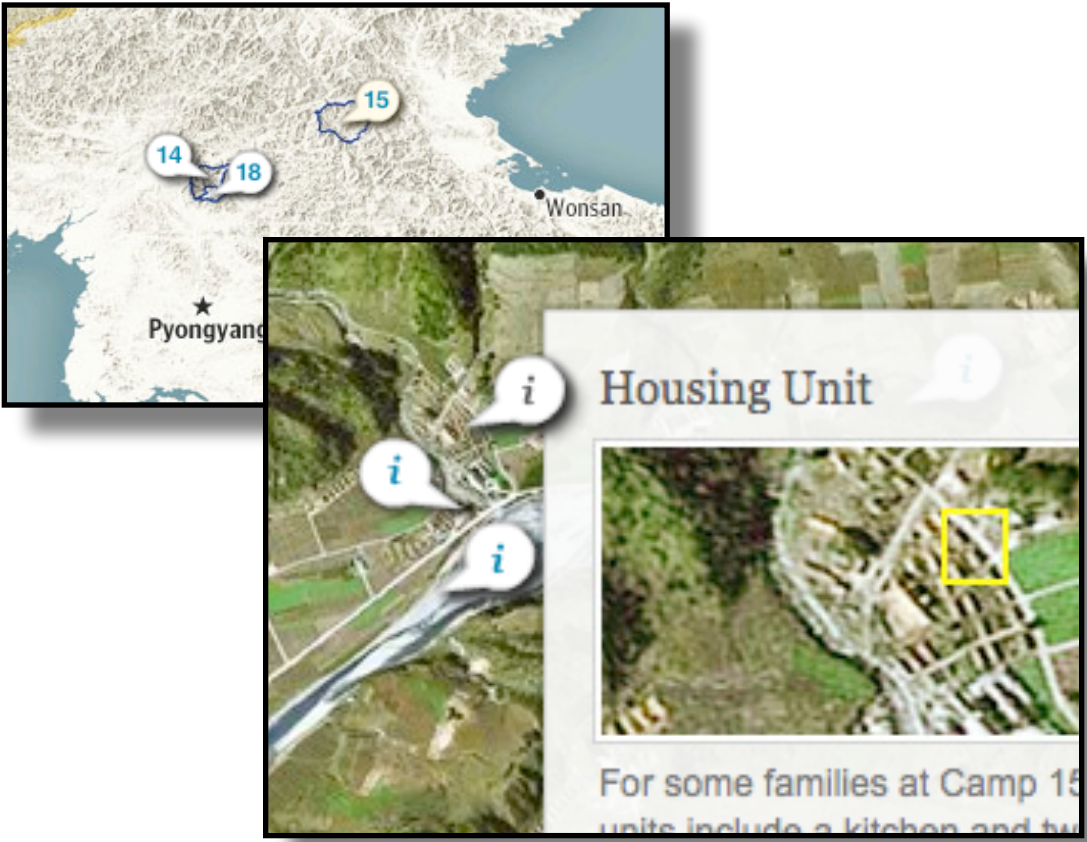
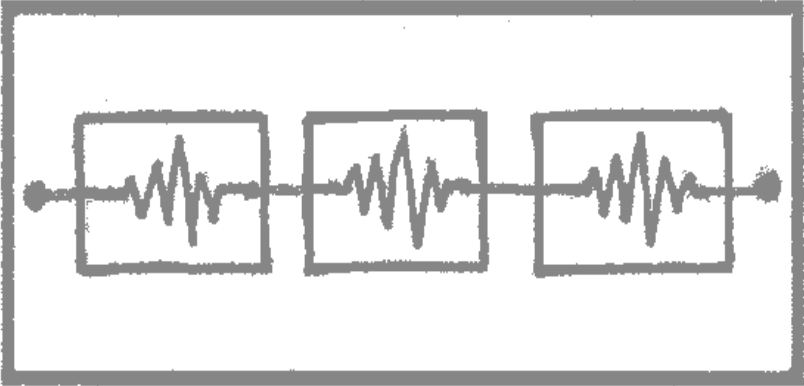
STORYTELLING	Author Driven strong ordering heavy messaging limited interactivity	Reader Driven weak ordering light messaging free interactivity	ASK QUESTIONS
CLARITY			EXPLORE
SPEED			FIND



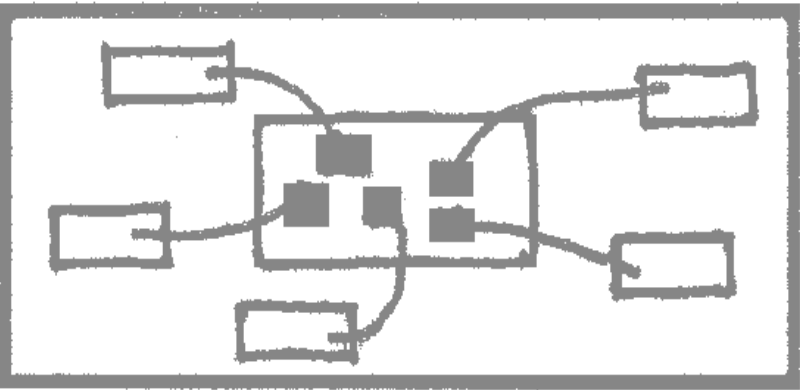
martini
glass



interactive
slideshow



drill-down
story

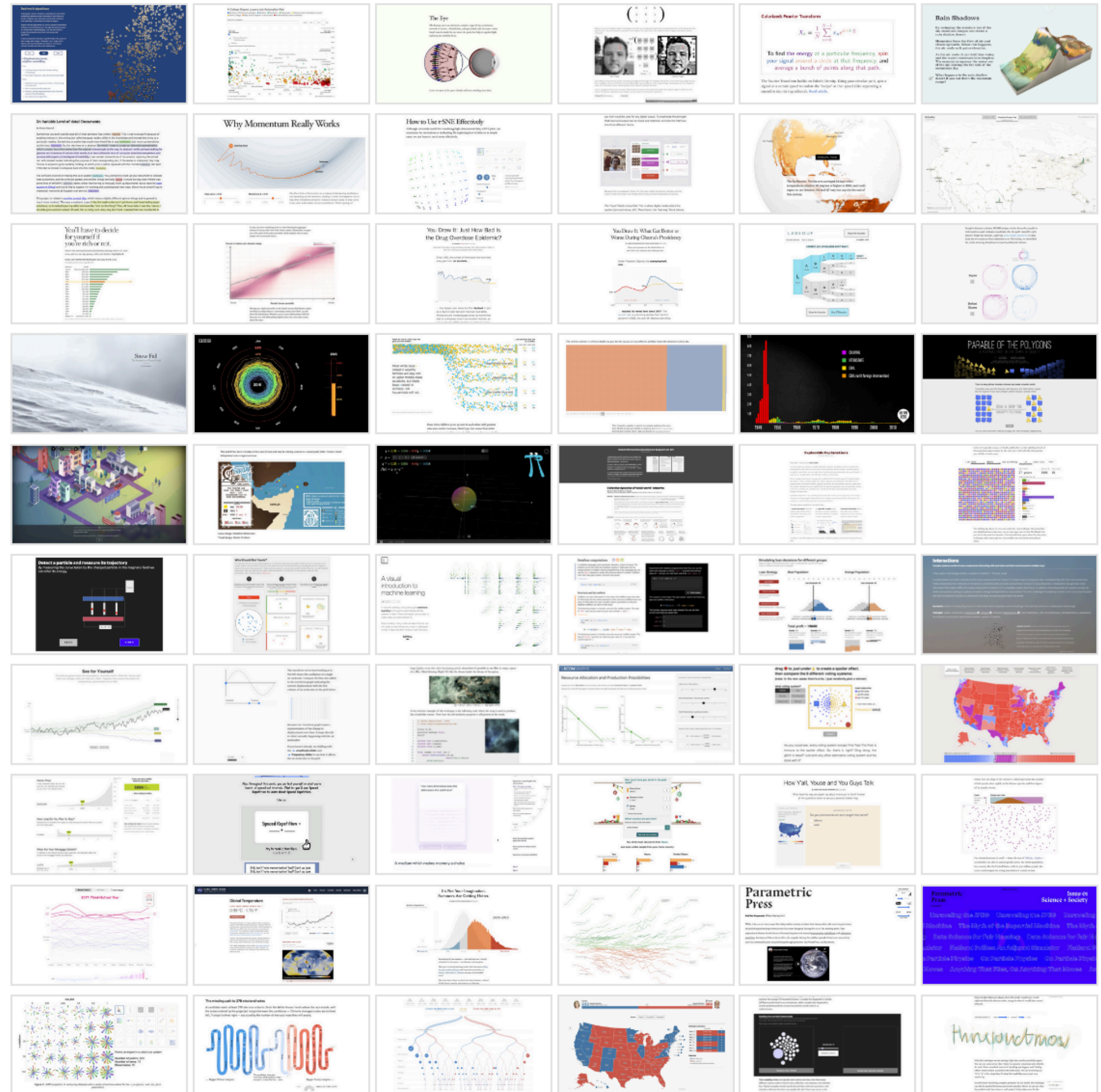


Communicating with Interactive Articles

60 Interactive Articles

NYTimes, WaPo, Distill, VisXAI, ...

Tied together research from
HCI, multimedia learning,
infovis, digital journalism



Hohman, Conlen, Heer, Chau, Distill, 2020

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Making Systems Playful.

Run interactive simulations directly in the browser. No setup required.

Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.

Use effective representations to make complex topics more intuitive.

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Making Systems Playful.

Run interactive simulations directly in the browser. No setup required.

Reducing Cognitive Load.

Use effective representations to make complex topics more intuitive.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Follow the lives of 932 boys who grew up in rich families ...

Grew up rich

Most white boys raised in wealthy families will stay rich or upper middle class as adults, but black boys raised in similarly rich households will not.

Adult outcomes reflect household incomes in 2014 and 2015.

Even when children grow up next to each other with parents who earn similar incomes, black boys fare worse than white

...and see where they end up as adults:

WHITE MEN	BLACK MEN
0%	0%
0%	0%
0%	0%
0%	0%
0%	0%

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Making Systems Playful.

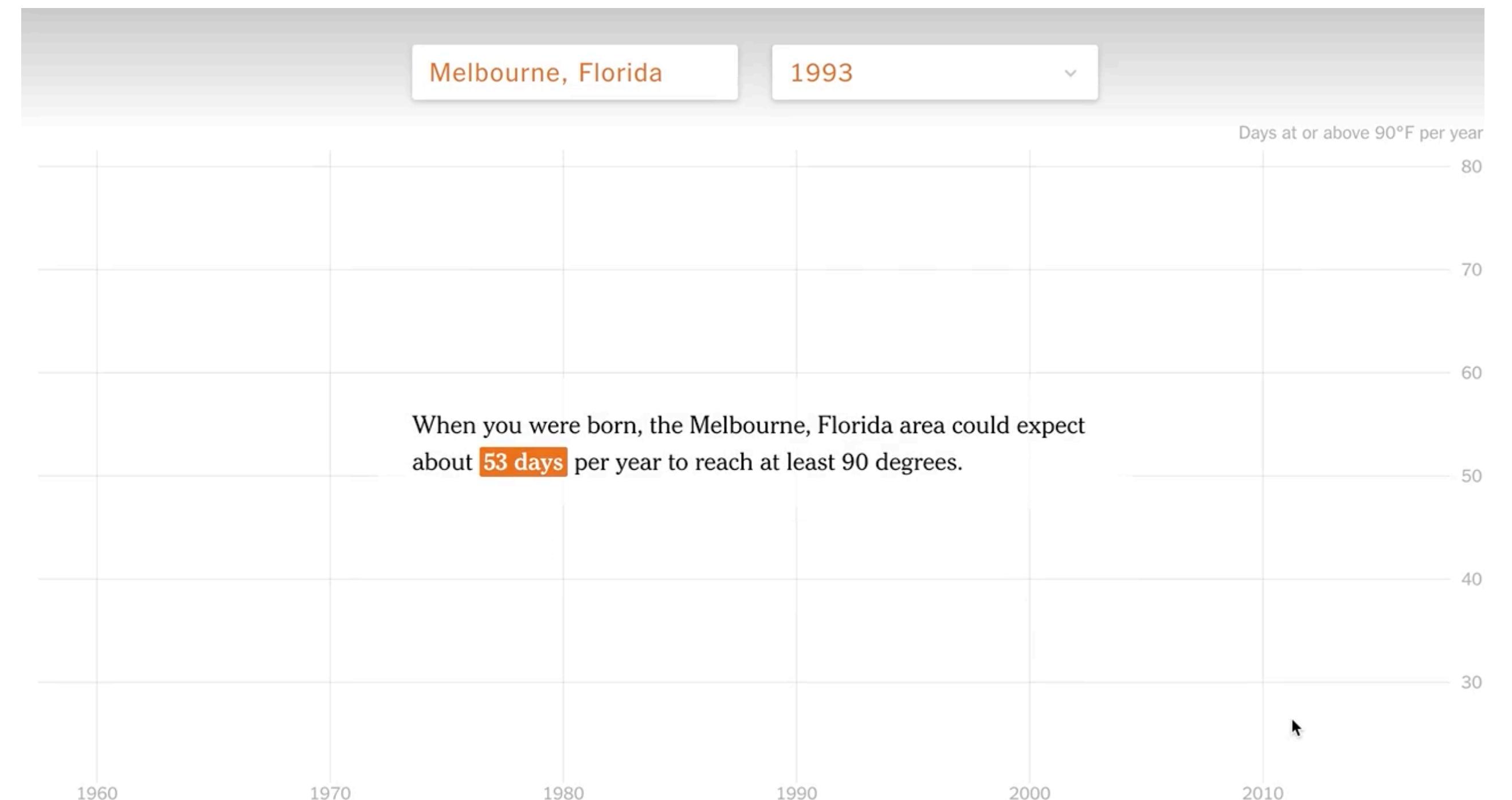
Run interactive simulations directly in the browser. No setup required.

Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.

Use effective representations to make complex topics more intuitive.



Popovich, Migliozi, Taylor, Williams, Watkins
NYTimes, 2018

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Making Systems Playful.

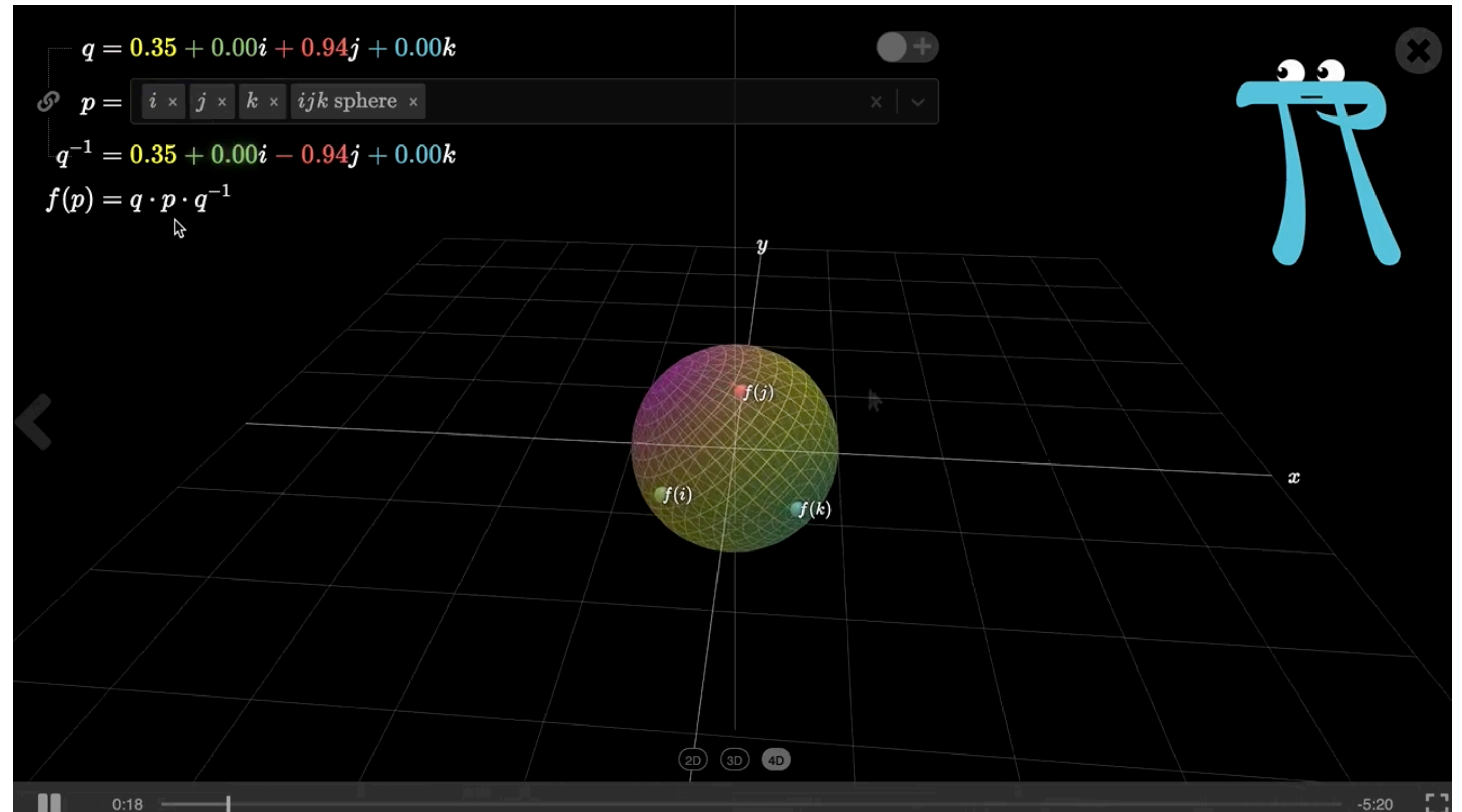
Run interactive simulations directly in the browser. No setup required.

Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.

Use effective representations to make complex topics more intuitive.



Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Making Systems Playful.

Run interactive simulations directly in the browser. No setup required.

Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.

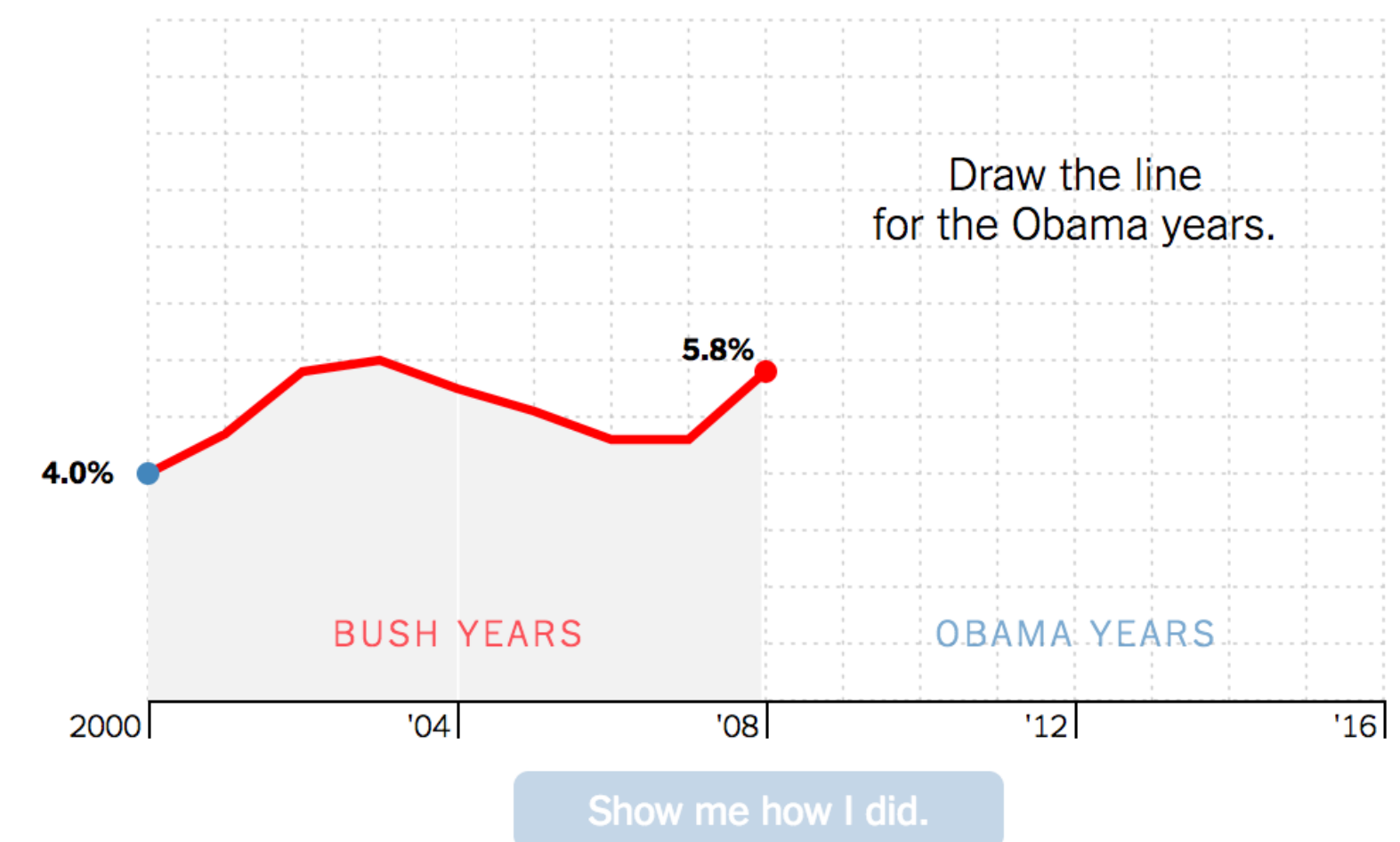
Use effective representations to make complex topics more intuitive.

You Draw It: What Got Better or Worse During Obama's Presidency

By LARRY BUCHANAN, HAEYOUN PARK and ADAM PEARCE JAN. 15, 2017

Draw your guesses on the charts below to see if you're as smart as you think you are.

Under President Obama, the **unemployment rate** ...



Buchanan, Park, Pearce, *NYTimes*, 2017

Interactive Articles - Design

Five affordances of the format

Connecting People and Data.

Make data pleasant to work with. Happy readers are engaged readers.

Personalizing Reading.

Let readers choose the content that is relevant to their own experience.

Making Systems Playful.

Run interactive simulations directly in the browser. No setup required.

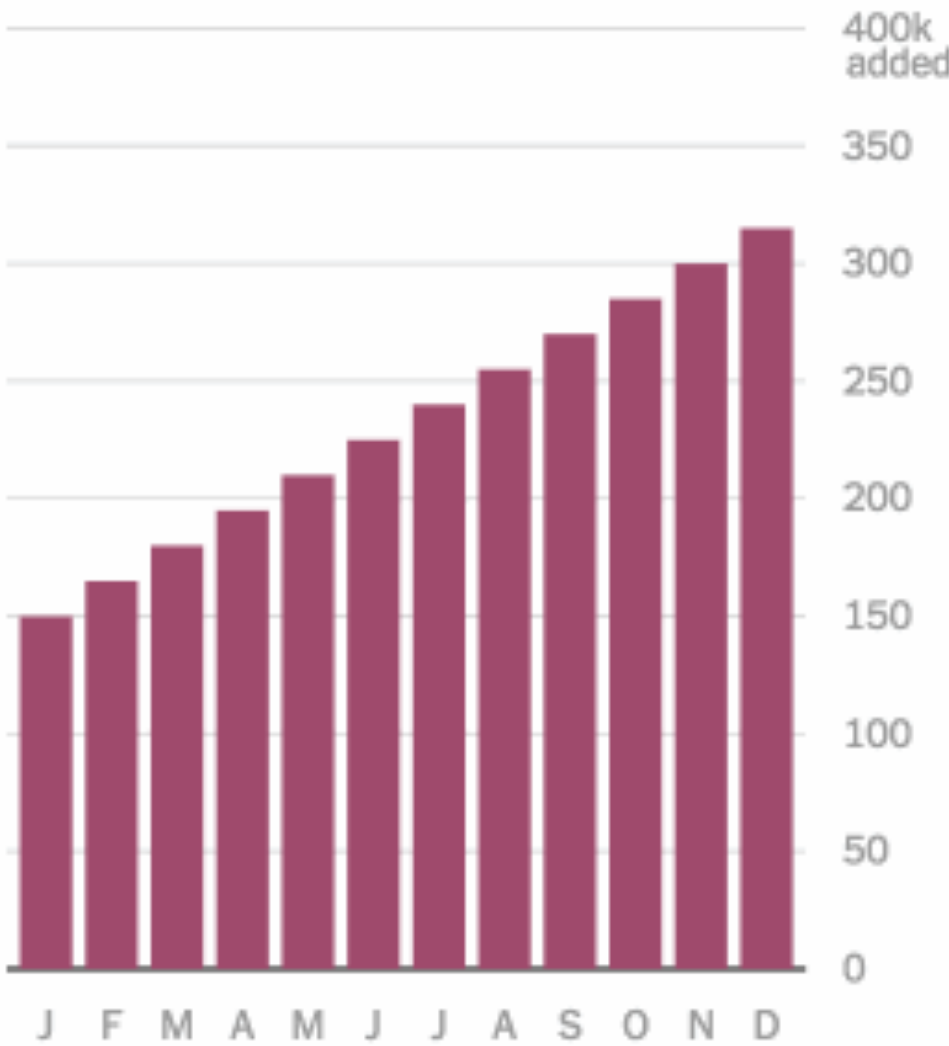
Prompting Self-Reflection.

Help readers learn by asking them to reflect in a low pressure environment.

Reducing Cognitive Load.

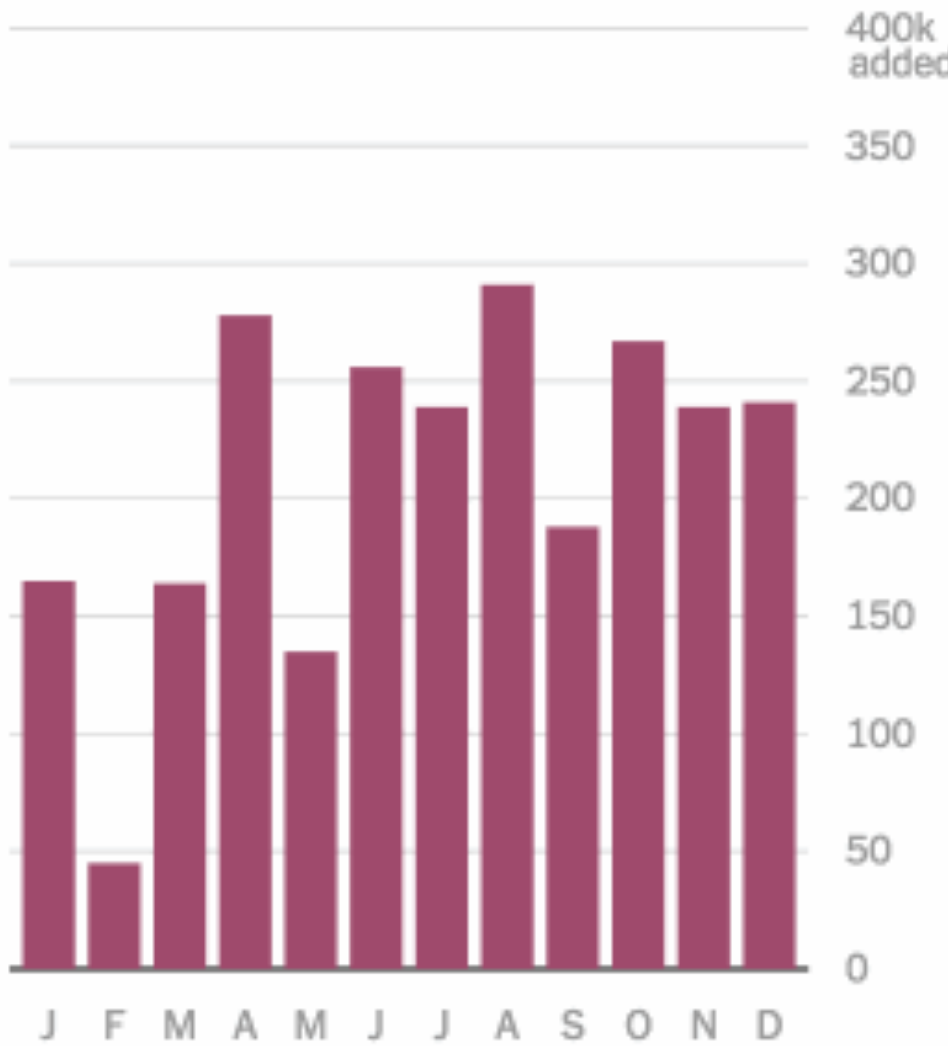
Use effective representations to make complex topics more intuitive.

If job growth **had**
been accelerating...



...the jobs report
could look like this:

Pause



Challenges

Few authoring tools available

Those that do exist are too low level or lack expressivity

Not suitable for production usage

Requires general purpose programming

In practice need to be a web developer

Difficult to evaluate

Limited empirical evidence; hard to analyze usage data; lack of metrics

Lack of design guidance

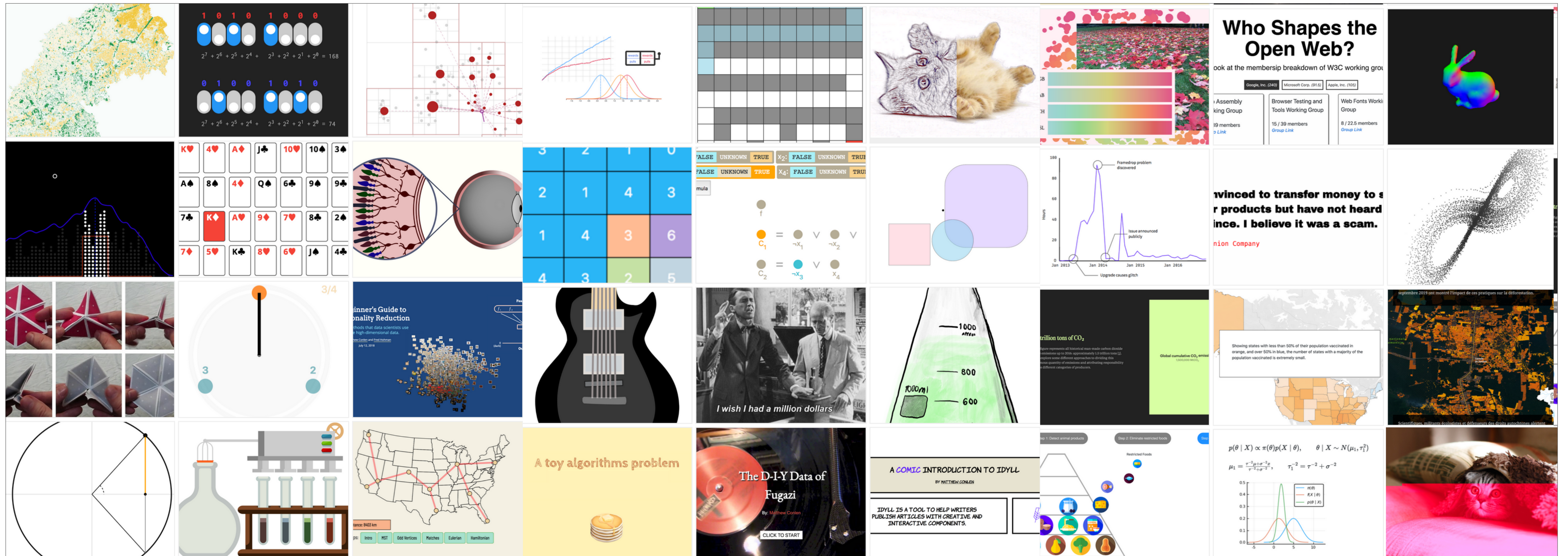
Integration between text and media

Multiple output targets

How to make content accessible?

Idyll

A Markup Language for Authoring and Publishing Interactive Articles on the Web



DSL for Interactive Articles

Idyll Markup

```
[Header  
  title:“Hi Idyll!” /]
```

```
This is the text  
of my article.
```

```
[Graphic  
  value:x /]
```

```
And that was a  
custom graphic.
```

Input:

extended markdown

domain-specific graphics

DSL for Interactive Articles

Idyll Markup

```
[Header  
title:“Hi Idyll!” /]
```

```
This is the text  
of my article.
```

```
[Graphic  
value:x /]
```

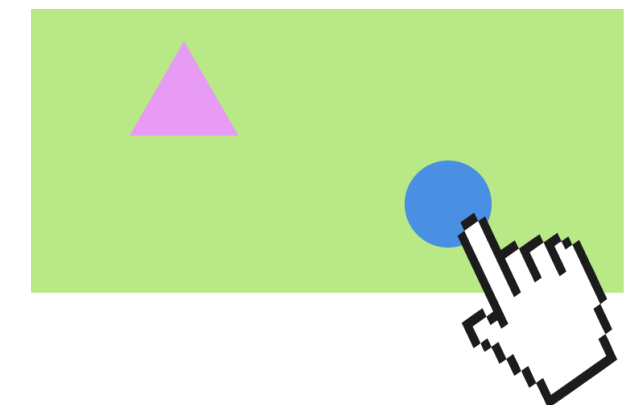
```
And that was a  
custom graphic.
```

Live Web Page

Hello Idyll

April 22, 2021

This is the text of
my article



And that was a
custom graphic

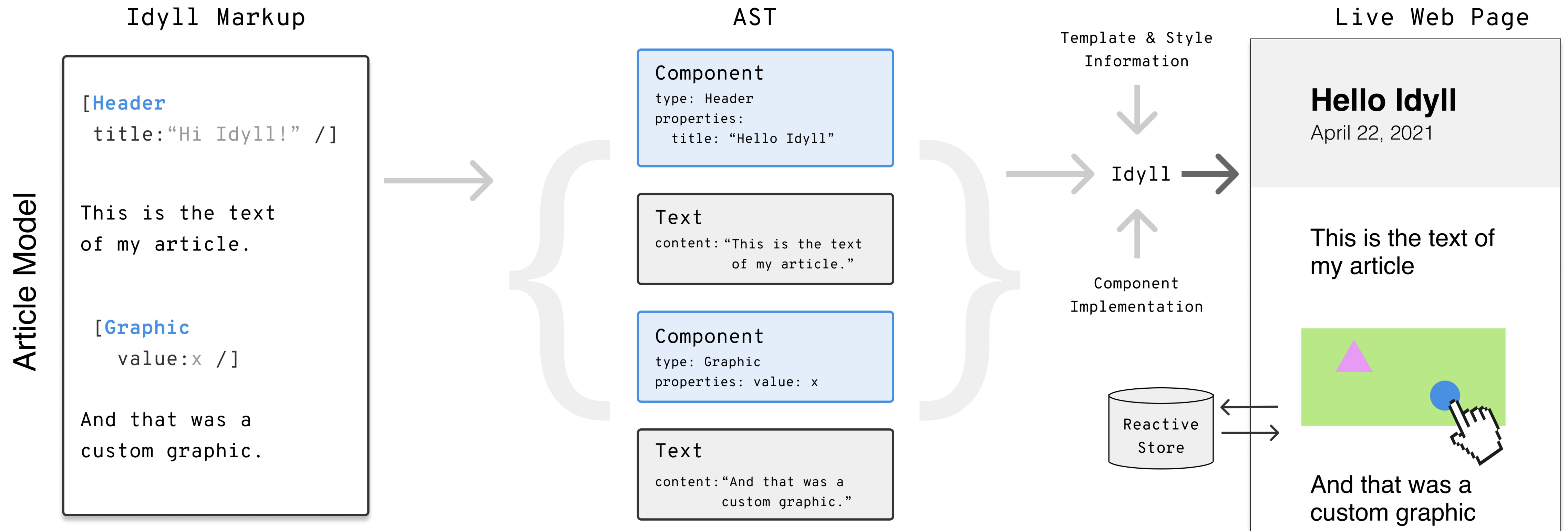
Input:

extended markdown
domain-specific graphics

Output:

javascript,html,css

DSL for Interactive Articles



interactive document schema

(Interactions, linked text+graphics, events)

Input:

extended markdown
domain-specific graphics

Output:

javascript,html,css

Text + Parameterized Graphics

Write articles in
markdown.

Embed
parameterized
graphics.

Connect *reactive*
variables to user
input widgets to
add interactivity.

Text + Parameterized Graphics

Write articles in
markdown.

Embed
parameterized
graphics.

Connect *reactive*
variables to user
input widgets to
add interactivity.

INPUT (EDITABLE)

```
# Hello World
```

```
[var name:"x" value:5 /]
```

```
The value of x is [Display value:x format:"d" /].
```

```
[Range value:x min:0 max:10 /]
```


Text + Parameterized Graphics

Write articles in
markdown.

Embed
parameterized
graphics.

Connect *reactive*
variables to user
input widgets to
add interactivity.

INPUT (EDITABLE)

```
# Hello World

[var name:"x" value:5 /]

The value of x is [Display value:x format:"d" /].

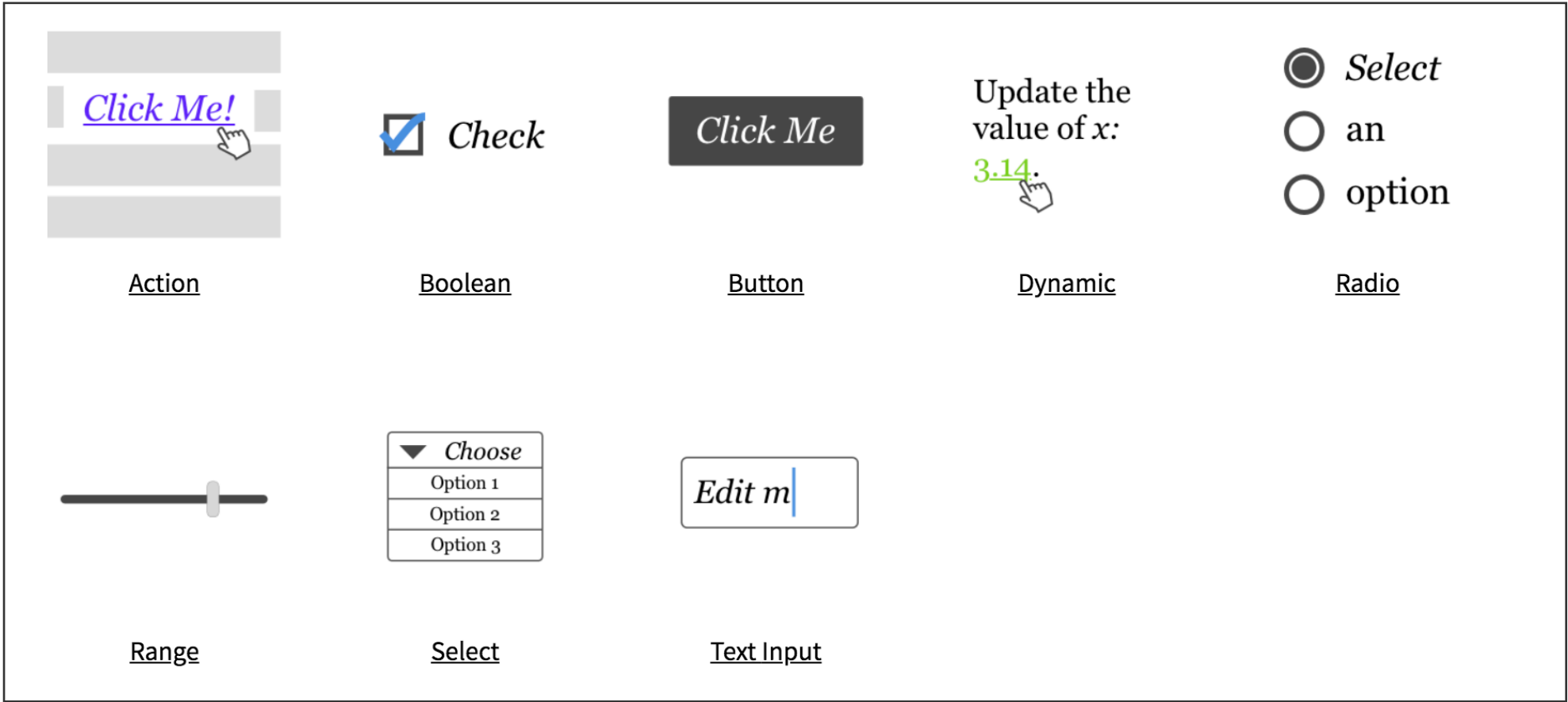
[Range value:x min:0 max:10 /]
```

Hello World

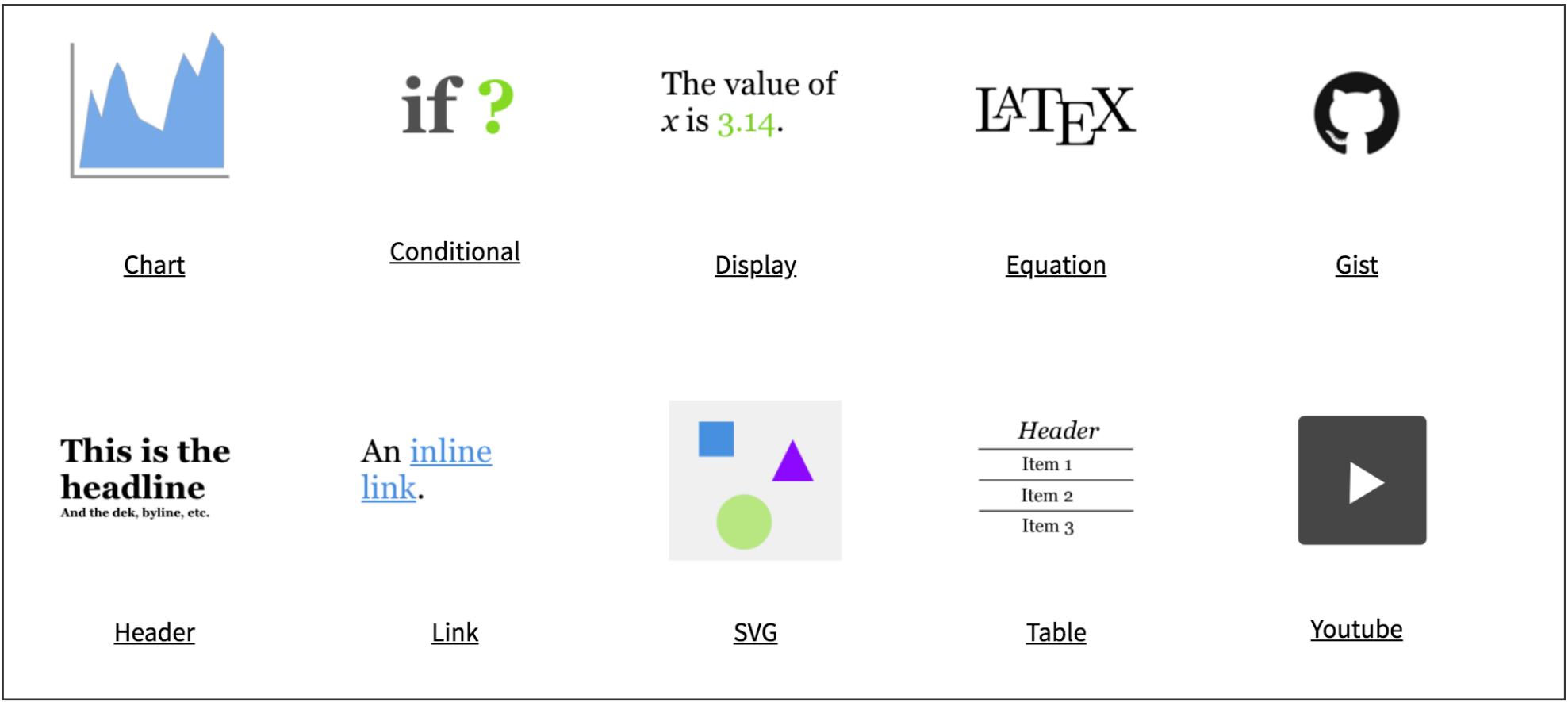
The value of x is 5.



Component Library



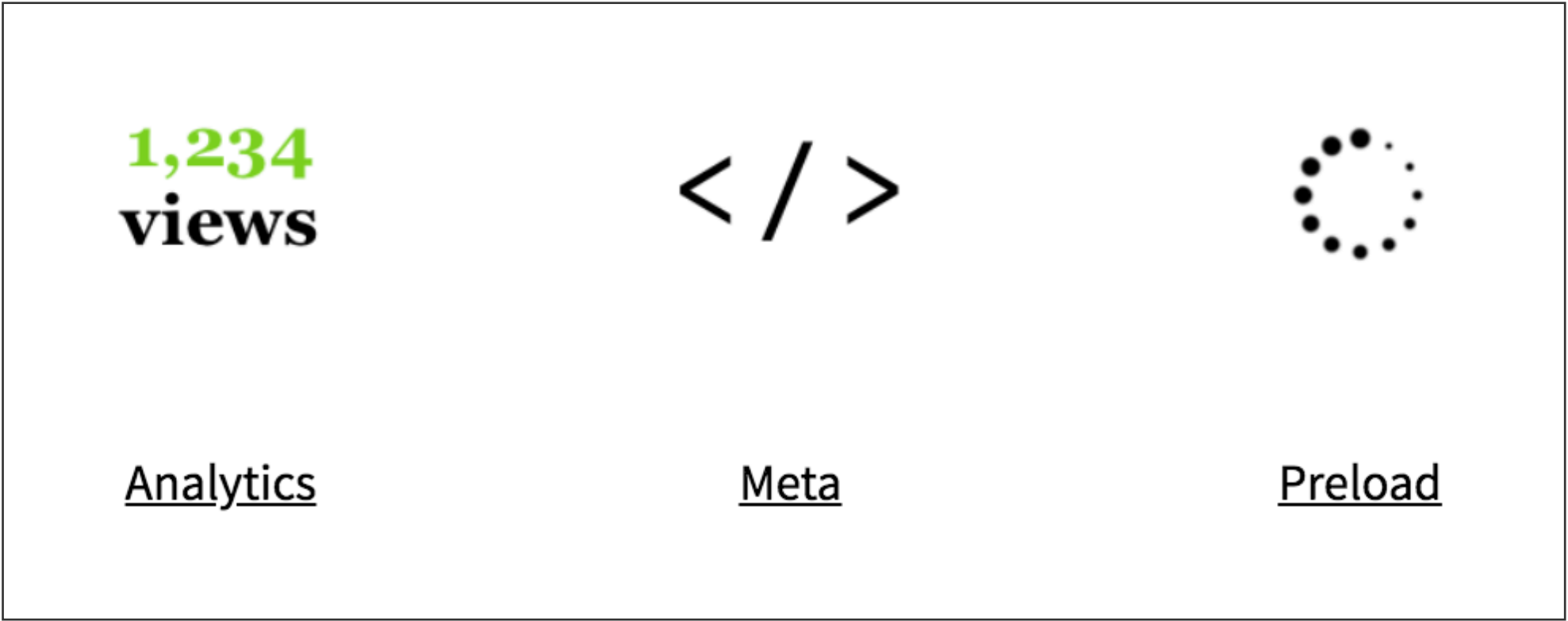
Input



Presentation



Layout



Helpers

Bring your own graphics

A JavaScript component API is exposed to end users.

Use with libraries like D3, Vega-Lite, Mapbox, Processing (P5), React, ...

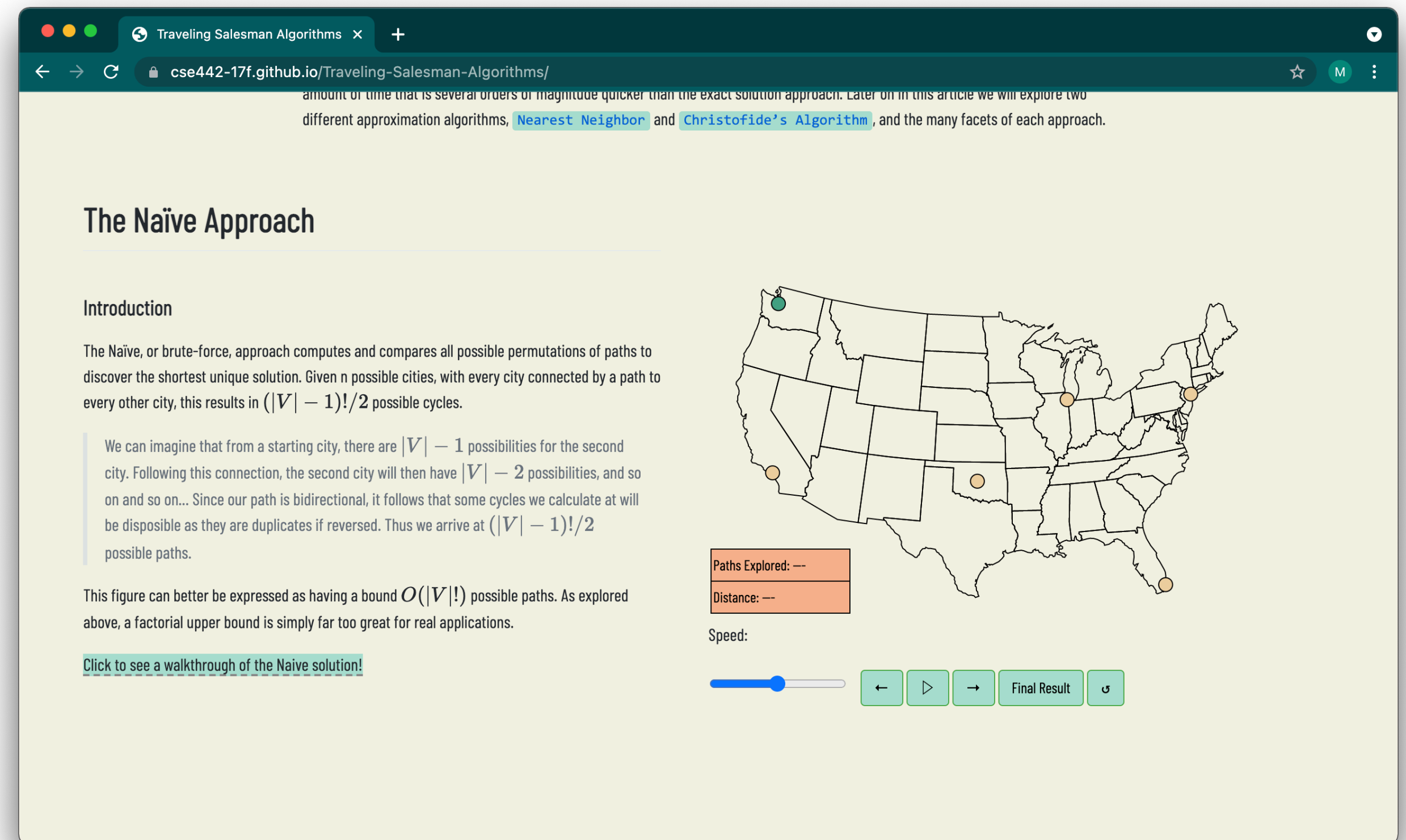


Usage

Refined design through expert interviews.

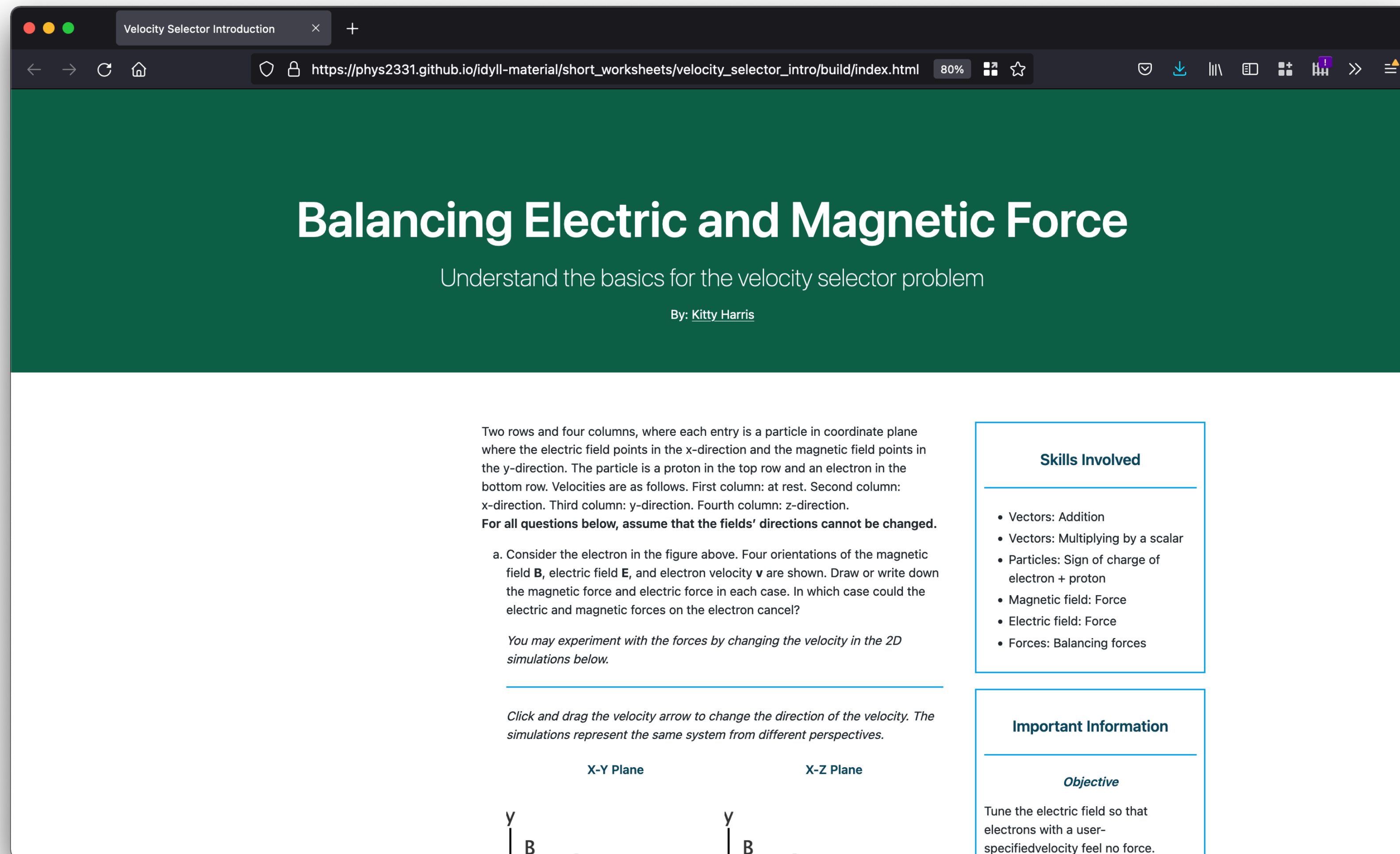
Deployed with undergrad CS students at UW.

Students successfully in creating highly customized explorable explanations of algorithms.



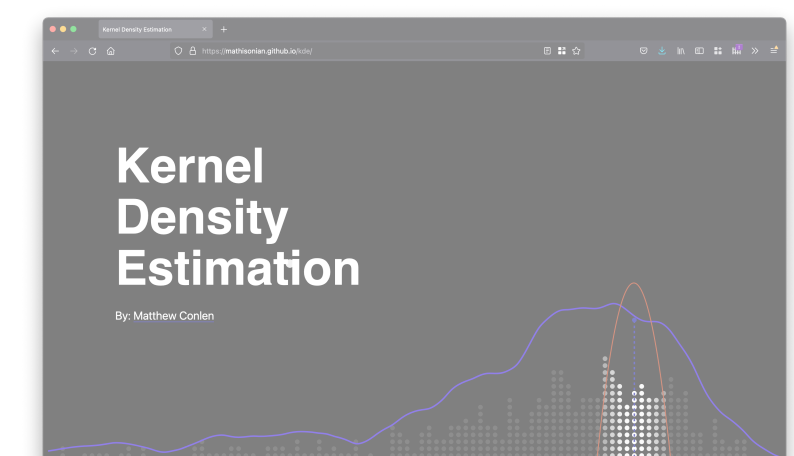
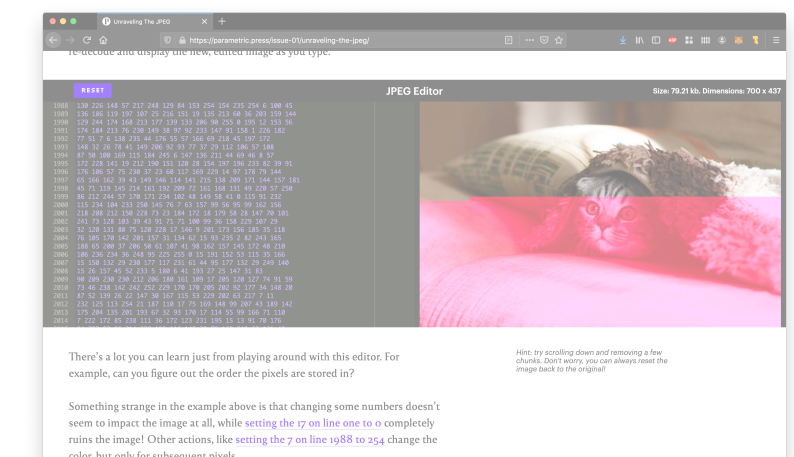
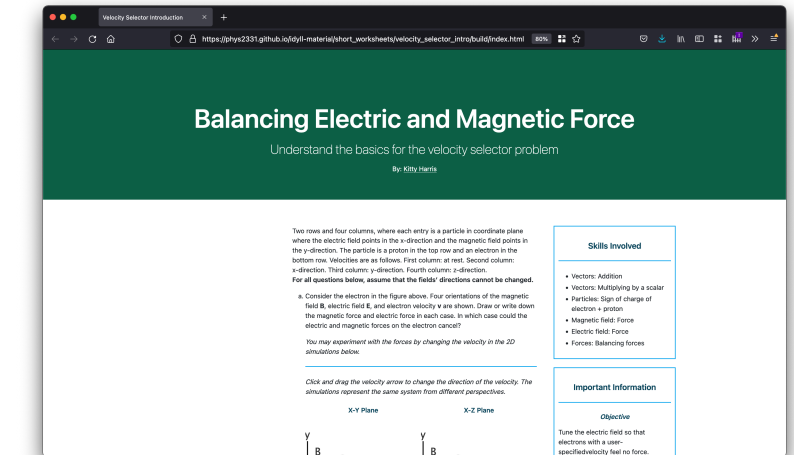
Mathew, Cherukupalli, Pusich, Zhao, *Traveling Salesman Algorithms*, CS442 '17

Idyll in the wild



UC Denver

Undergraduate physics material (interactive worksheets)



Idyll...

Seems great but...

...still requires learning and writing markup syntax

...requires use of general-purpose programming tools, e.g. to make a new post, run development server

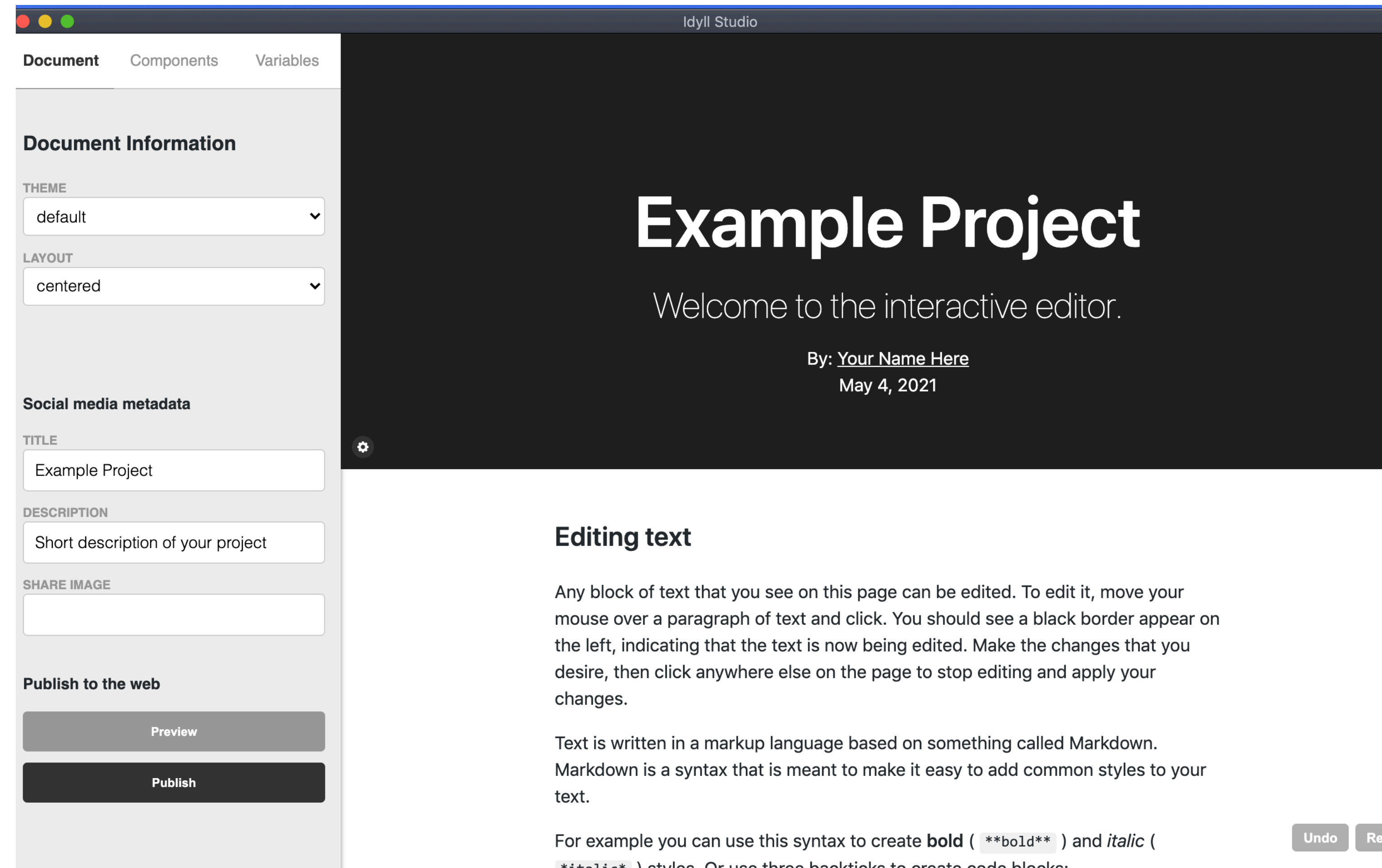
Idyll Studio

Built a **structured editor** for editing and creating Idyll programs

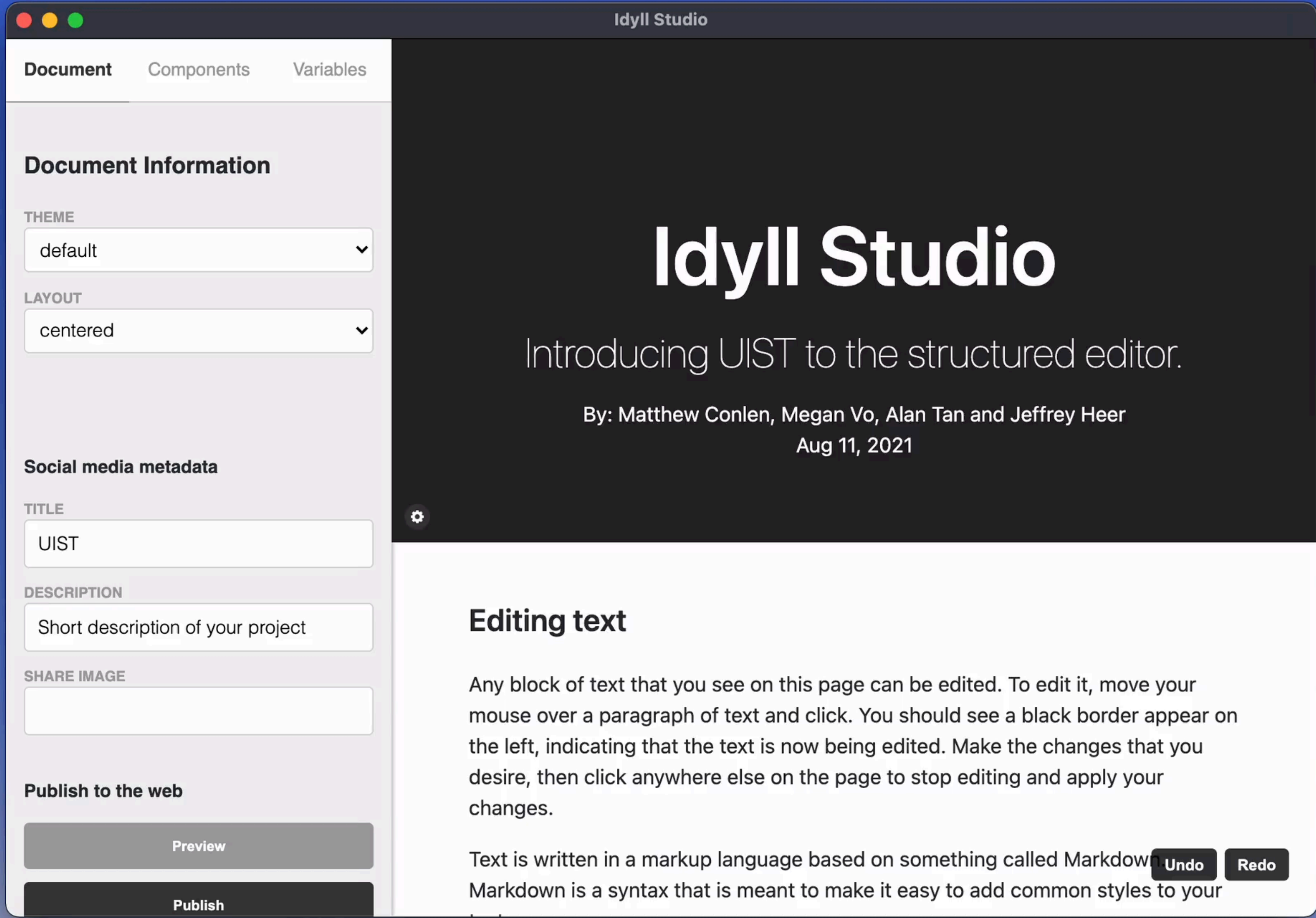
Reduce use of general-purpose programming tools.

Eliminate a class of syntax errors.

Reify Idyll model.



Conlen, Vo, Tan, Heer, *UIST 2021*



Document Information

THEME

default

LAYOUT

centered

Social media metadata

TITLE

UIST

DESCRIPTION

Short description of your project

SHARE IMAGE

Publish to the web

Preview

Publish

Idyll Studio

Introducing UIST to the structured editor.

By: Matthew Conlen, Megan Vo, Alan Tan and Jeffrey Heer
Aug 11, 2021



Editing text

Any block of text that you see on this page can be edited. To edit it, move your mouse over a paragraph of text and click. You should see a black border appear on the left, indicating that the text is now being edited. Make the changes that you desire, then click anywhere else on the page to stop editing and apply your changes.

Text is written in a markup language based on something called Markdown. Markdown is a syntax that is meant to make it easy to add common styles to your

Undo

Redo

Idyll Studio Findings

1. The interface enabled users to **rapidly create designs with less stress**.

2. But some users struggled to synthesize multiple concepts. Others **needed time to understand the reactive model**.

3. The interface **should provide more visual feedback**, promote experimentation, provide documentation on demand, and have **guardrails to prevent likely mistakes**.

4. The interface empowered users and **provided better support to less technical users compared to existing tools**.

	Role	Tech.	I1	D1	I2	D2	I3	D3
P1	comp. biologist	4.2	y	y	y	y	y	y
P2	programmer	4.2	y	y	y	y	y	y
P3	hci researcher	3.8	y	y	y	y	y	y
P4	vis. practitioner	3.7	y	y	y	y	y	y
P5	hci researcher	3.5	y	y	y	y	y	y
P6	journalist	3.4	y	y	y	y	y	y
P7	hci researcher	3.4	y	y	y	y	y	y
P8	lab manager	3.4	y	y	y	y	y	y
P9	programmer	3.2	y	y	y	y	y	y
P10	vis. practitioner	2.9	y	y	y	y	y	y
P11	editor	2.9	y	y	y	y	y	y
P12	cs/journ. student	2.5	y	y	y	y	y	y
P13	data scientist	2.5	y	y	y	y	n	n
P14	analyst	2.3	y	y	y	y	n	n
P15	designer	2.3	y	y	y	y	n	n
P16	writer	1.8	y	y	y	n	n	n
P17	ux researcher	1.8	y	y	y	y	y	y
P18	designer	1.3	y	y	y	y	n	n

Design Prompt

Design Prompt ELECTION NIGHT

You want to keep the public as informed as possible of the status of the 2024 presidential election as it happens.

May want to convey:

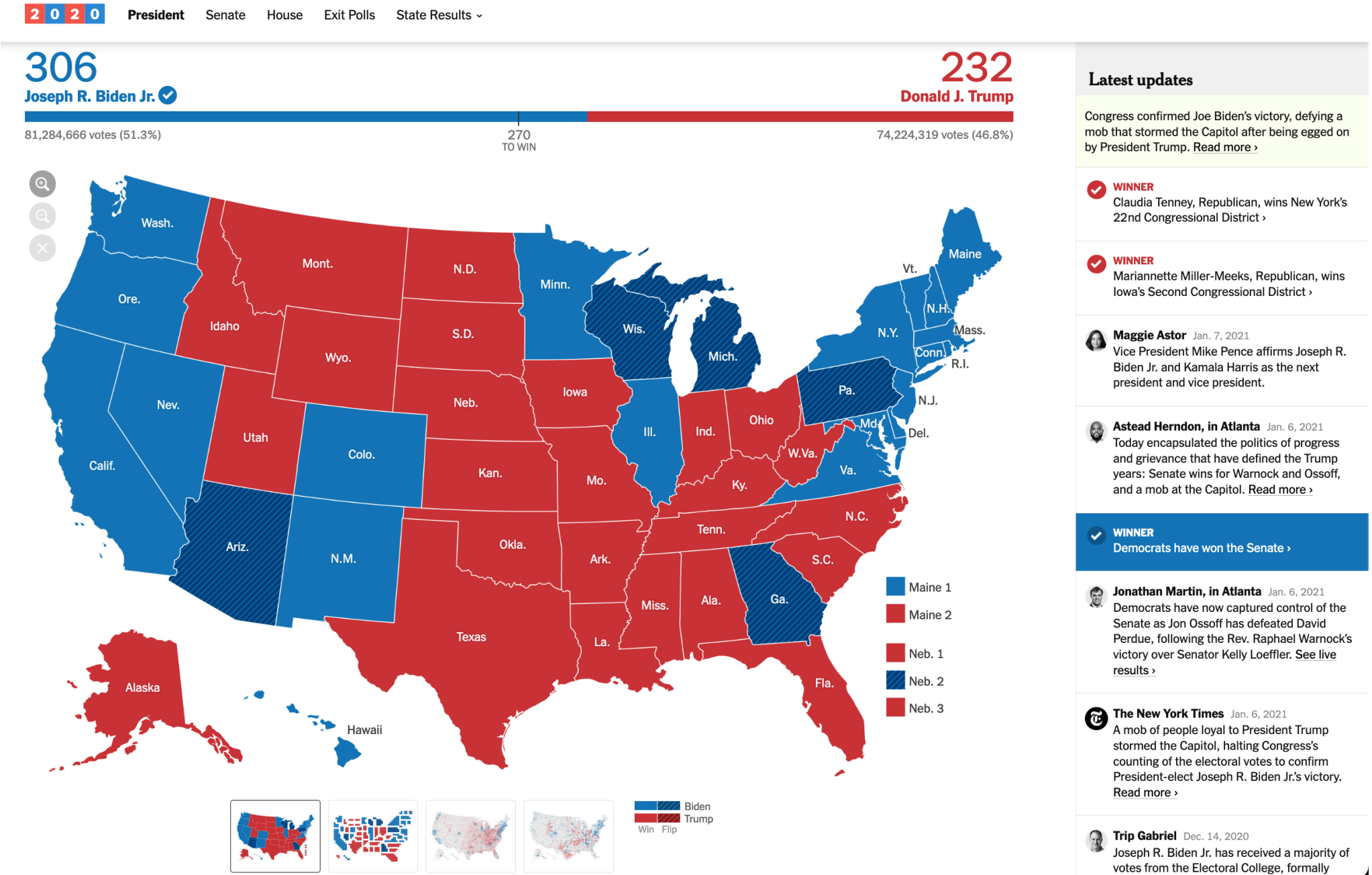
Current snapshot

Likely outcomes

Awareness of uncertainty

Historical context

Any unusual circumstances
(e.g. delayed returns)



Design Prompt ELECTION NIGHT

Input Data

Vote counts

candidate, state, method, timestamp, # votes

Race calls

candidate, state, timestamp

Constraints

Near real time

Never seen the data before

Data may contain errors

Should not erode public trust

Design Prompt ELECTION NIGHT

Input Data

Vote counts

candidate, state, method, timestamp, # votes

Race calls

candidate, state, timestamp

Constraints

Near real time

Never seen the data before

Data may contain errors

Should not erode public trust

**How would you
visualize this?**

**What data would
you use?**

Design Prompt ELECTION NIGHT

Input Data

Vote counts

candidate, state, method, timestamp, # votes

Race calls

candidate, state, timestamp

Constraints

Near real time

Never seen the data before

Data may contain errors

Should not erode public trust

**How would you
visualize this?**

**What data would
you use?**

You want to keep the public as informed as possible of the status of the 2024 presidential election as it happens.

May want to convey:

Current snapshot

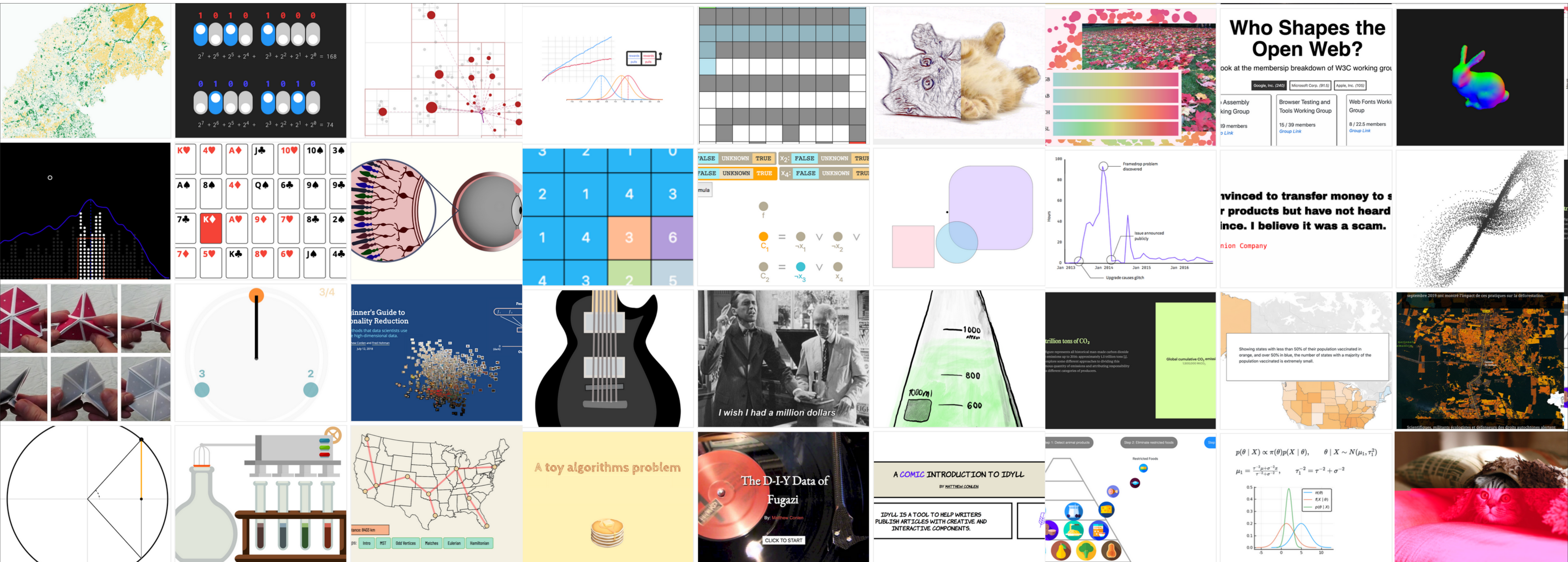
Likely outcomes

Awareness of uncertainty

Historical context

Any unusual circumstances

Thank you!



Contact: mpconlen@gmail.com
@mathisonian