

# New Perspectives on Communicating with Visualization

## From Design Inspiration to Performative Presentation

–  
October 2021



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See and Understand Data...

**Data**   **Analytics**

Weather Data

**Dimensions**

- Date
- City
- Country
- Region
- Time
- Measure Names

**Measures**

- # Hourly Temp
- # Rainfall
- # Windspeed
- Latitude (generated)
- Longitude (generated)
- # Measure Values

Marks

Automatic

Color   Size   Text

Detail   Tooltip

Columns

Rows

## Weather Trends

Drop field here

Drop field here

Drop field here

# Tableau Prep

Tableau Prep Flow:

```

    graph LR
        O_E[Orders (East)] --> A[All Orders]
        O_W[Orders (West)] --> A
        O_C[Orders (Central)] --> A
        O_S[Orders (South)] --> A
        A --> OR[Orders + Returns]
        OR --> SC[Split Customer]
        SC --> CAO[Create 'All Order...']
        CAO --> Q[Quota]
        Q --> PQ[Pivot Quotas]
        PQ --> AO[Aggregate]
        AO --> QO[Quota + Orders]
        QO --> CA[Create 'Annual ...']
    
```

Tableau Data Editor View:

Fields: 22 Fields, 2K Rows

Changes (2):

- State**: 11 rows, Row ID 2K. Bar chart showing Sales vs State.
- Order ID**: 822 rows, Row ID 2K. Bar chart showing Sales vs Order ID.
- Segment**: 3 rows, Segment 3. Consumer, Contractor, Corporate.
- Customer ID**: 512 rows, Customer ID 512. Aaron Hawks, Aaron Smayling, Adam Bellavance, Adam Hart, Adam Shillingsburg, Adrian Barton, Adrian Hane, Alan Barnes, Alan Haines, Alan Hwang, Alan Schoenberger, Alan Shonely.
- Customer Name**: 512 rows, Customer Name 512. Aaron Hawks, Aaron Smayling, Adam Bellavance, Adam Hart, Adam Shillingsburg, Adrian Barton, Adrian Hane, Alan Barnes, Alan Haines, Alan Hwang, Alan Schoenberger, Alan Shonely.
- Ship Mode**: 4 rows, Ship Mode 4. First Class, Same Day, Second Class, Standard Class.
- Order Date**: 604 rows, Order Date 604. 01/01/2015, 01/01/2019, 01/01/2019, 01/01/2019.

Sales	Quantity	Profit	Discount	Region	State	Row ID	Order ID	Segment	Customer ID	Customer Name	Ship Mode	Order Date	Ship Date
18.648	7	-12.432	0.7	South	North Carolina	231	US-2015-156216	Corporate	EA-14035	Erin Ashbrook	Standard Class	09/13/2015, 12:00:00 AM	09/17/2015, 12:00:00 AM
178.384	2	22.298	0.2	South	Florida	315	CA-2015-167850	Corporate	AG-10525	Andy Gerbode	Standard Class	08/09/2015, 12:00:00 AM	08/16/2015, 12:00:00 AM
15.552	3	5.4432	0.2	South	Florida	316	CA-2015-167850	Corporate	AG-10525	Andy Gerbode	Standard Class	08/09/2015, 12:00:00 AM	08/16/2015, 12:00:00 AM
39.072	6	9.768	0.2	South	North Carolina	404	CA-2015-152508	Corporate	SP-20650	Stephanie Phelps	Standard Class	04/16/2015, 12:00:00 AM	04/20/2015, 12:00:00 AM
10.368	2	3.6288	0.2	South	North Carolina	705	CA-2015-138527	Corporate	BN-11470	Brad Norvell	Standard Class	09/12/2015, 12:00:00 AM	09/17/2015, 12:00:00 AM
166.84	5	18.7695	0.2	South	North Carolina	706	CA-2015-138527	Corporate	BN-11470	Brad Norvell	Standard Class	09/12/2015, 12:00:00 AM	09/17/2015, 12:00:00 AM
15.216	1	2.2824	0.2	South	North Carolina	707	CA-2015-138527	Corporate	BN-11470	Brad Norvell	Standard Class	09/12/2015, 12:00:00 AM	09/17/2015, 12:00:00 AM
11.36	2	5.3392	0	South	Louisiana	764	CA-2015-162775	Corporate	CS-12250	Chris Selesnick	Second Class	01/13/2015, 12:00:00 AM	01/15/2015, 12:00:00 AM

# Tableau Server

Explore / Campaigns and Retention

Search

?

EC

Performance Indicat...

Home

Explore

Favorites

Recents

Users

Groups

Schedules

Tasks

Site Status

Settings

Campaigns and Retention

Owner Emily Chen

Create Select All

Content type: Show all Sort by: Type

Facebook Content Performance

Email Performance Overview

Website Traffic Trends

Content Performance Email Performance Overview Google Analytics

Historic Trends

Performance by Week

Renewals by Region

The screenshot displays the Tableau Server interface. On the left, a sidebar lists navigation options: Home, Explore (selected), Favorites, Recents, Users, Groups, Schedules, Tasks, Site Status, and Settings. The main content area shows a dashboard titled "Campaigns and Retention" owned by Emily Chen. The dashboard includes six visualizations: "Facebook Content Performance" (a bubble chart), "Email Performance Overview" (a dashboard with multiple charts including a bar chart and a map of China), "Google Analytics" (a dashboard with a line chart and a map of France), "Historic Trends" (a line chart showing a steady upward trend), "Performance by Week" (a heatmap showing weekly performance data), and "Renewals by Region" (a map of France with green and yellow dots indicating renewals). A search bar and user profile icons are at the top right.

# Tableau Online – Share and collaborate in the cloud

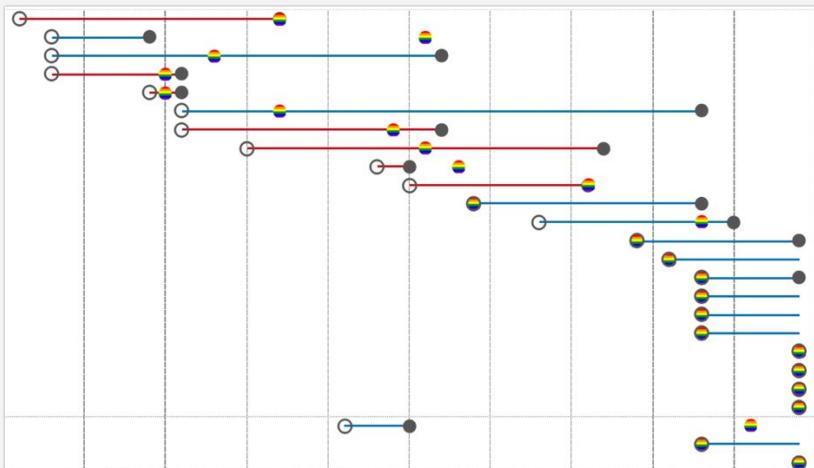


# Gallery / Greatest Hits

Stunning data visualization examples from across the web created with Tableau Public.

## Viz of the Day

## Featured



## LGBTQ+ Americans in Congress

23 known LGBTQ+ Americans have served in the United States Congress. Ten are active today (the highest number ever!) including eight members of the House of Representatives and two Senators. Learn more about these trailblazing politicians in this visualization by Bo McCready.

June 18, 2019



research.tableau.com



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SARAH BATTERSBY



SENIOR RESEARCH STAFF  
MATTHEW BREHMER



SENIOR RESEARCH STAFF  
MICHAEL CORRELL



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ROBERT KOSARA



PRINCIPAL RESEARCH SCIENTIST  
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SCOTT SHERMAN



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ARJUN SRINIVASAN



DIRECTOR, TABLEAU RESEARCH  
MAUREEN STONE



SENIOR RESEARCH SCIENTIST  
DANIEL TING

See and Understand Data...

See and Understand Data...  
...from someone else's point of view

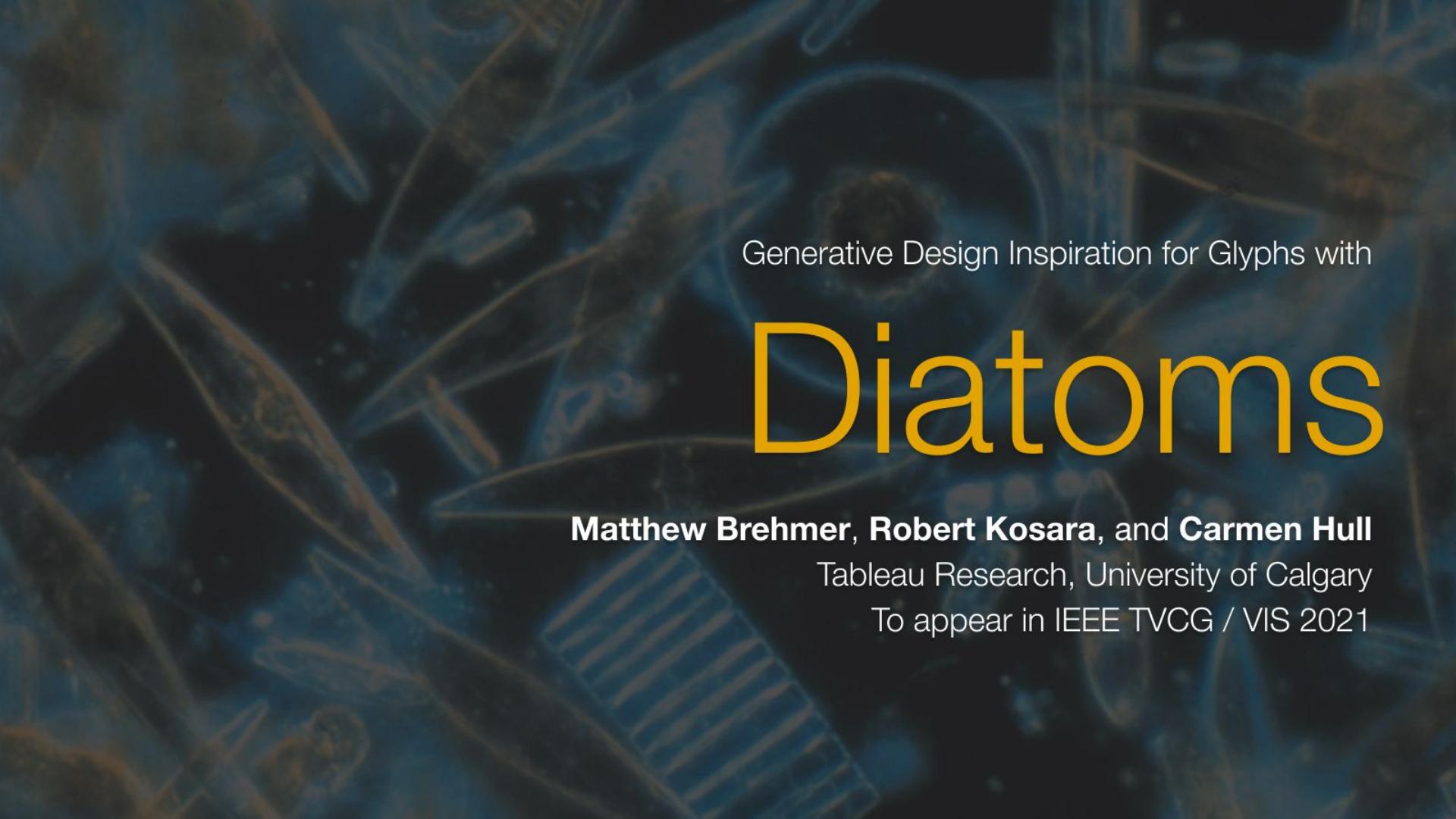
Communicating with and **Collaborating** around data

## Recent Areas of Interest

1. Expressive visualization design for communication
2. Preparing for and delivering presentations involving visualization

# Recent Areas of Interest

1. Expressive visualization design for communication
  - IEEE VIS 2021: *Generative Design Inspiration for Glyphs with Diatoms*
2. Preparing for and delivering presentations involving visualization
  - IEEE VIS 2021: *From Jam Session to Recital: Synchronous Communication and Collaboration Around Data in Organizations*
  - Information+ 2021: *The Information in Our Hands*

The background of the slide features a dark, abstract pattern of glowing, translucent blue and orange organic shapes, resembling diatoms or microscopic organisms, which provides a scientific and organic feel to the presentation.

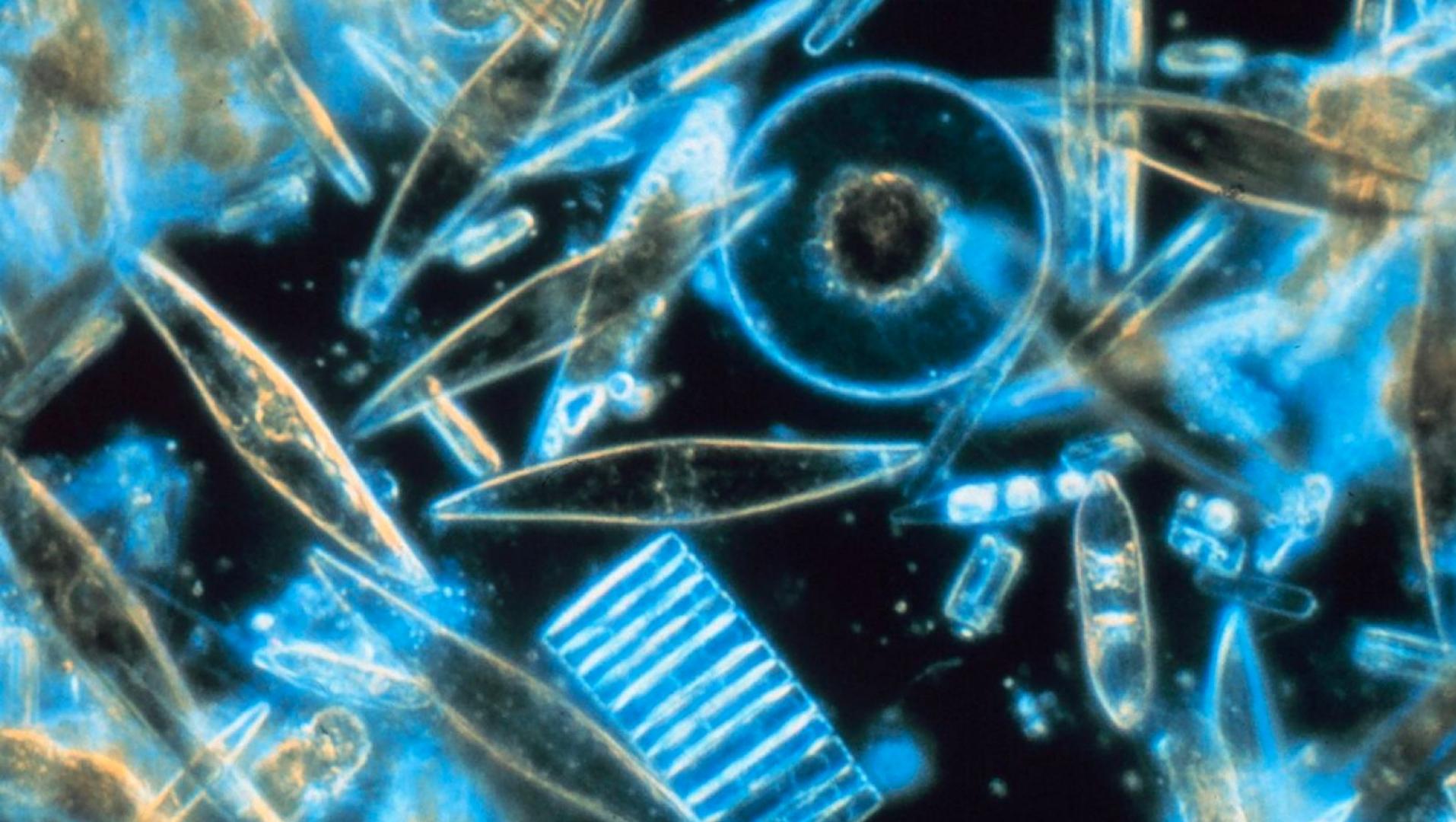
Generative Design Inspiration for Glyphs with

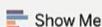
# Diatoms

**Matthew Brehmer, Robert Kosara, and Carmen Hull**

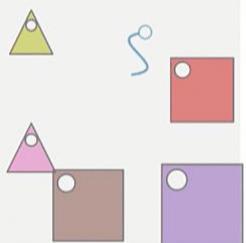
Tableau Research, University of Calgary

To appear in IEEE TVCG / VIS 2021

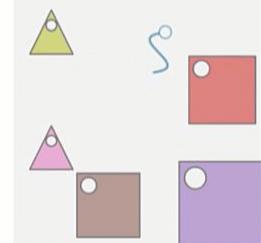




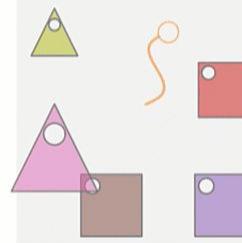
American Beauty



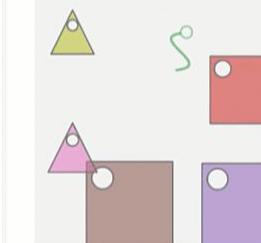
American History >



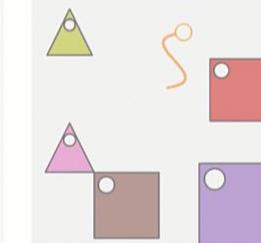
Avatar



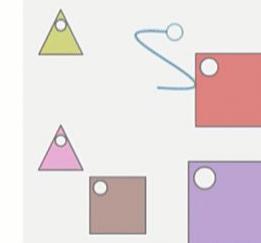
Back to the Future



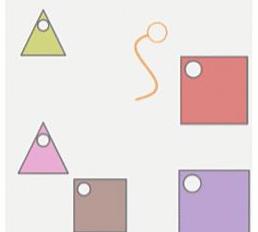
Batman Begin



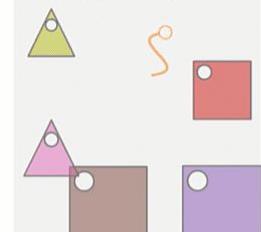
Fight Club



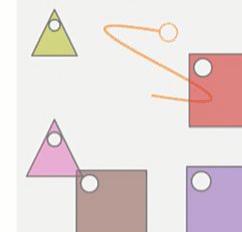
## Gladiator



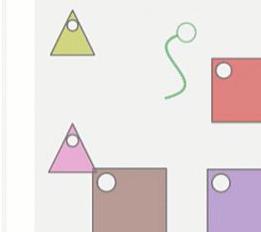
Guardians of the Galaxy



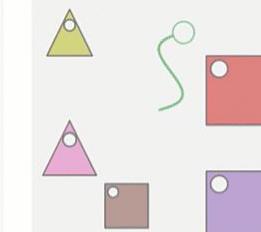
Inception



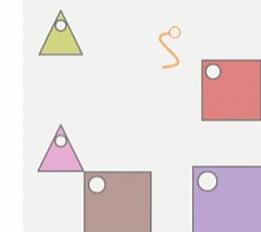
Inglourious Basterd



Interstell



Kill Bill (I)



# Glyphs

Glyphs: “*a small visual object that depicts attributes of a data record.*”

– Borgo et al (2013)

Glyphs: “*a small visual object that depicts attributes of a data record.*”

– Borgo et al (2013)

“*single data points are encoded individually by assigning their dimensions to one or more marks and their visual variables.*”

– Fuchs et al (2016)

# Gender & ethnic disparities in Tech companies

MALE 80%

60%

60% FEMALE

- Leadership
- Technical

50/50  
Gender Split

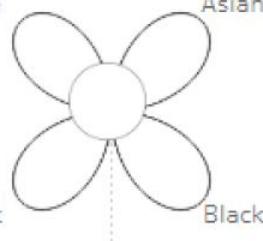
Dear Tech People is dedicated to unearthing the data behind diversity in tech, starting with a race/gender ranking of 100 top tech companies.

//Select a company on the bar chart to see its flower.  
//Click on the center of a flower to look it closer.

## HOW TO READ IT

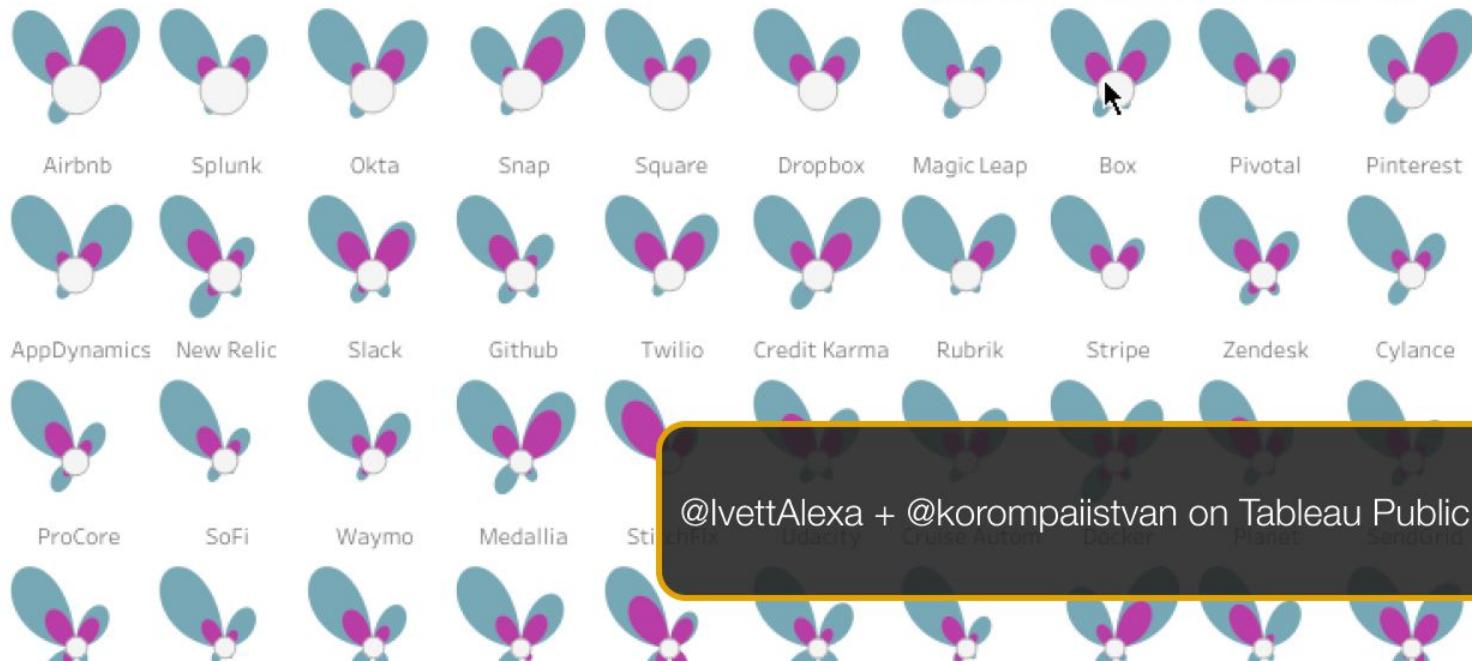
A leaf of a flower means an ethnicity.

White

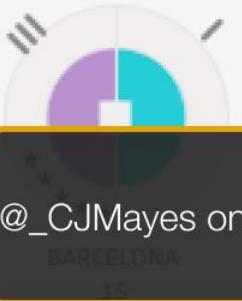
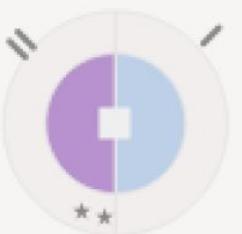
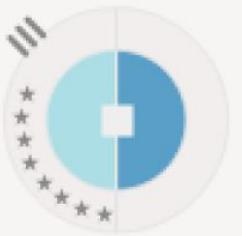
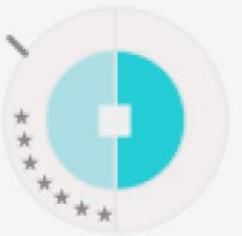
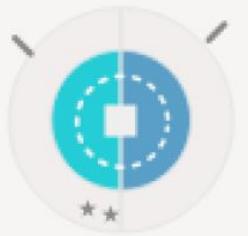


Total # of employees

Size means the  
#of employees in  
the specific  
ethnicity



@lvertAlexa + @korompaiistvan on Tableau Public



@\_CJMayes on Tableau Public

# 140 YEARS OF MICHIGAN FOOTBALL

This graphic, inspired by Giorgia Lupi's data portraits, shows 140 years of Michigan Football, with each circle representing a season and graphical elements within that circle describing that season's results.

## HOW TO READ

SHADING AT TOP LEFT  
INDICATES CONFERENCE  
PALE YELLOW = INDEPENDENT;  
TAN = WESTERN;  
YELLOW = BIG TEN



A FILLED BLACK STAR UP HERE IS A  
NATIONAL CHAMPIONSHIP  
AN OUTLINED BLUE STAR IS A  
CONFERENCE CHAMPIONSHIP

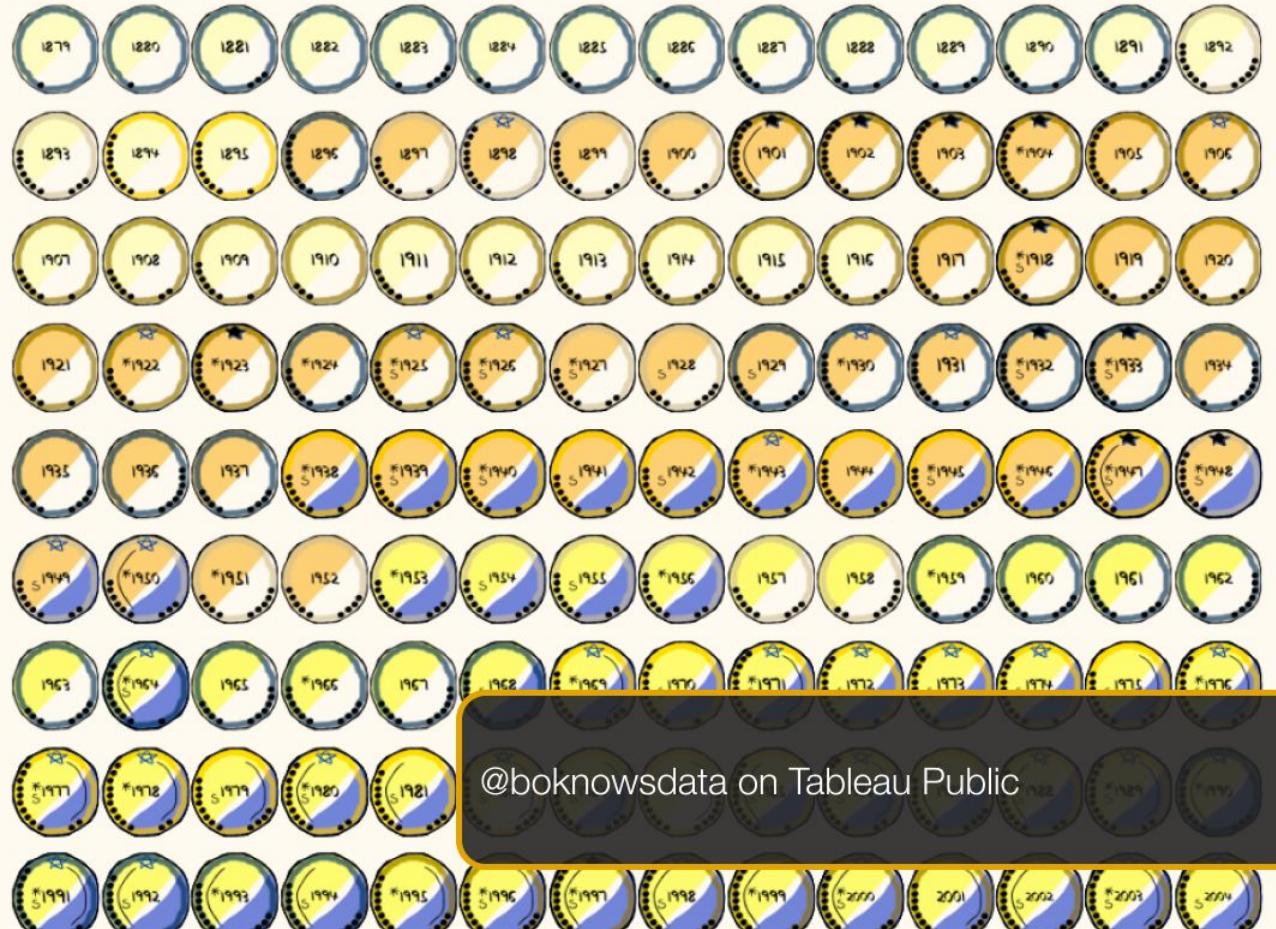
DOTS ON THE  
LEFT ARE WINS

DOTS ON THE  
RIGHT ARE LOSSES

AN ARC ON THE LEFT  
REPRESENTS A TOP 25  
RANKING AT THE END  
OF THE YEAR

AN ARC ON THE RIGHT  
IS A BOWL LOSS

\* BEAT OHIO STATE  
S BEAT MICHIGAN STATE



@boknowsdata on Tableau Public

Take  
my  
breath  
away

Cities around the world are failing to meet the World Health Organisation (WHO) guidelines for **air particulate** - tiny material in the air that can be harmful if breathed in.

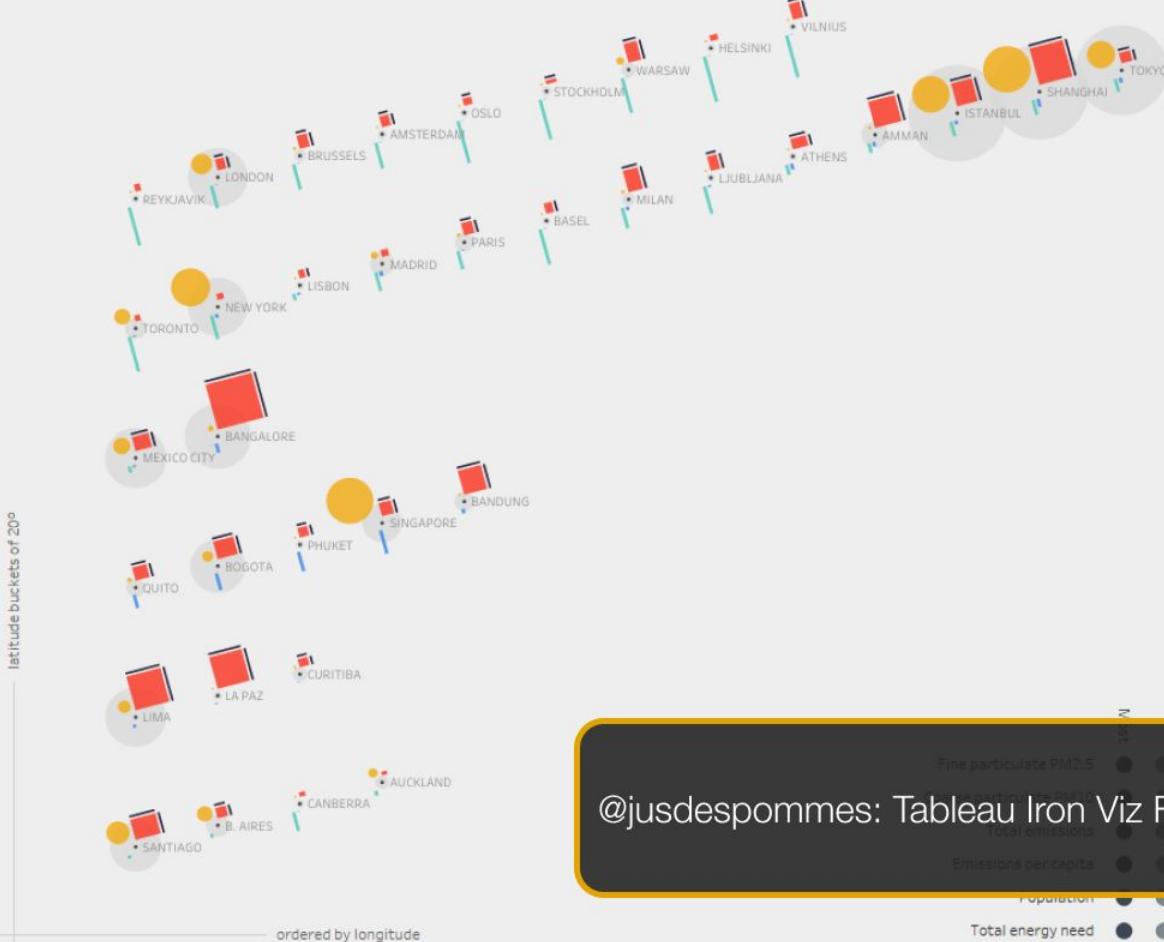
#### Context

In 1800 years, we amassed a World population of 1 bn people - fast forward 200 years and we are now at near 8 bn.

Common-sense dictates that more people means more consumption of energy and the raw materials needed to produce it - this consumption has byproducts.

These byproducts are now causing unprecedented air pollution from emissions that affect our planet and air particulate that affects our health.

#### How to read chart



@jusdespommes: Tableau Iron Viz Finalist 2020

Index

Responses

Countries ▾



@moritz\_stefaner for the OECD Better Life Index

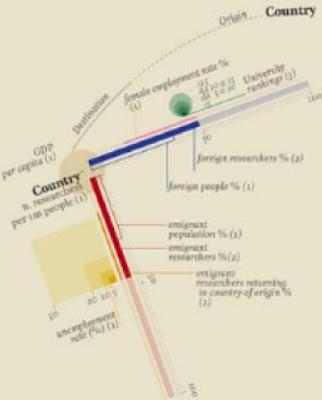
# Brain drain

The phenomena of so-called «brain drain» is explored through a map showing incoming and outgoing flows of researchers in 16 countries. Using a series of parameters, the map is an attempt to discover the motivations that move researchers from one country to another.

Each country is visualized through the representation of: GDP per capita, female employment rate, overall unemployment rate, university rankings, percentage of foreign researchers, percentage of overall foreign population, percentage of emigrant researchers, percentage of overall emigrant population, percentage of researchers returning to their country of origin, and the main countries researchers come from and move to.

## How to read it?

The countries are positioned according to:  
% of GDP invested in R&D (x axis)  
+ n. of researchers per 1m people (y axis)  
The analysis is based on the following data



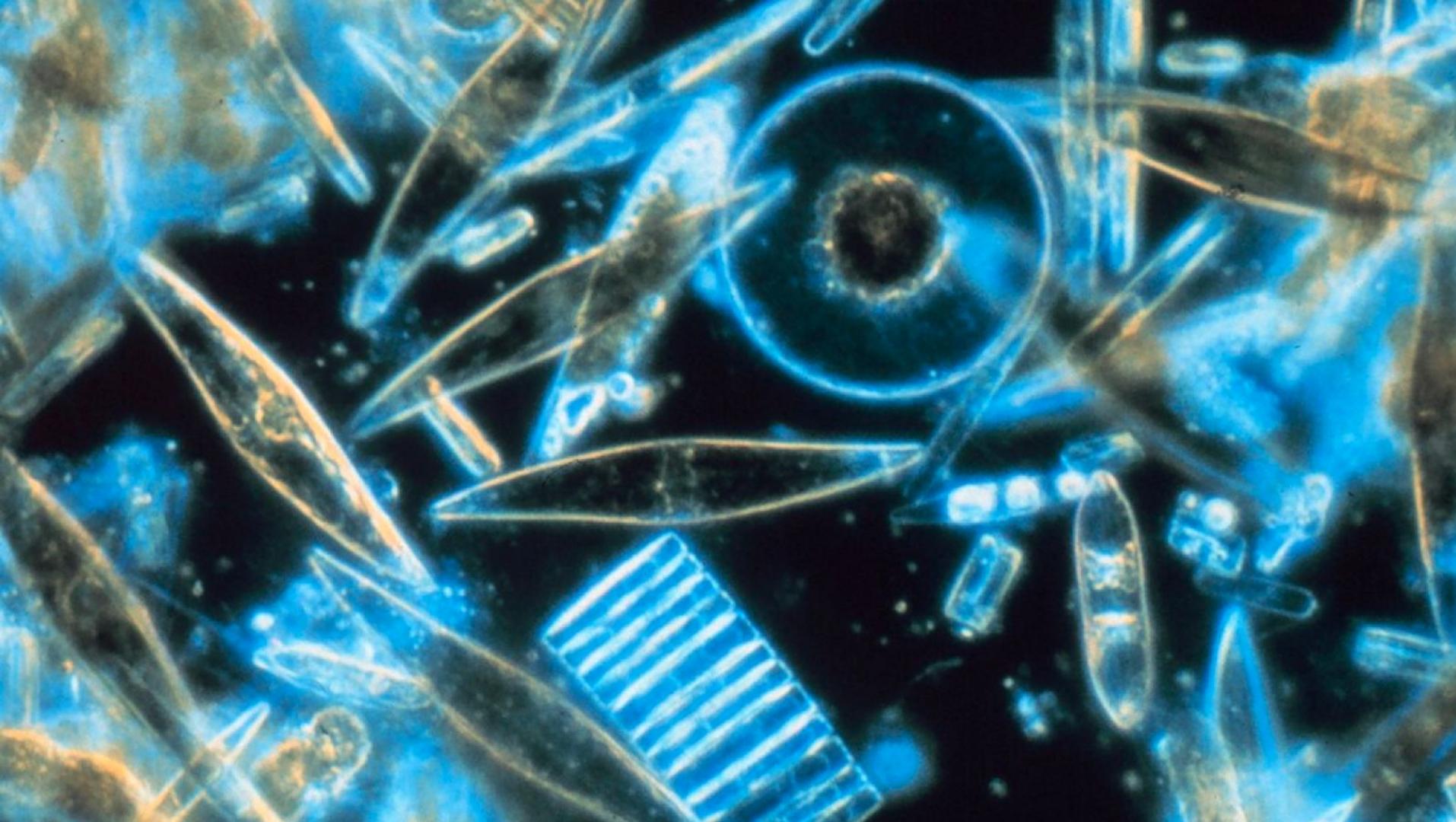
y axis: n. of researchers per 1m people (z)

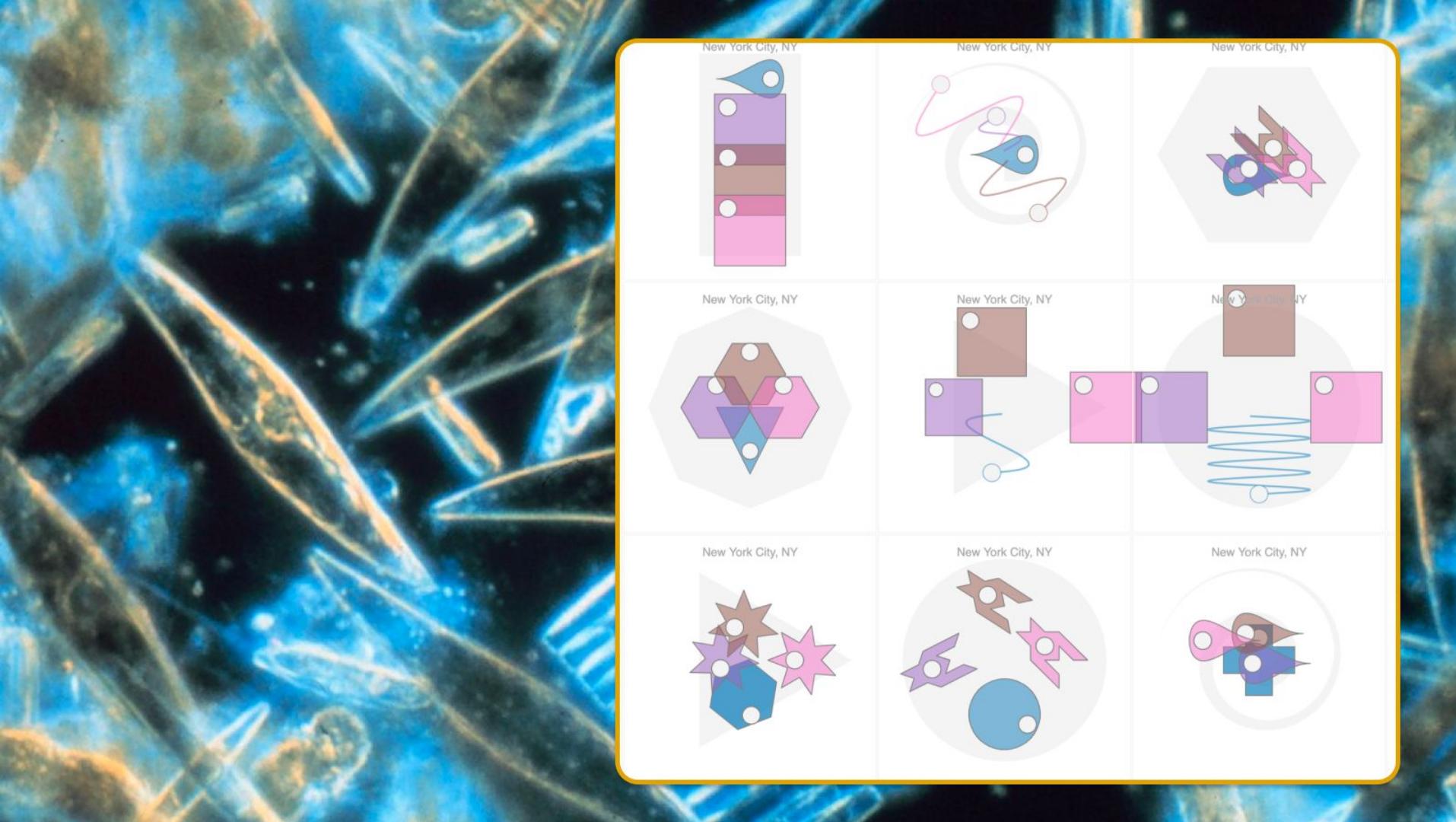


Glyph      Glyph  
Design      Authoring

# Glyph Design

Inspiration from existing designs,  
visual metaphors, figurative associations,  
Gestalt groupings, perceptual clarity,  
symmetry, visual hierarchy, ...





New York City, NY



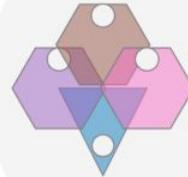
New York City, NY



New York City, NY



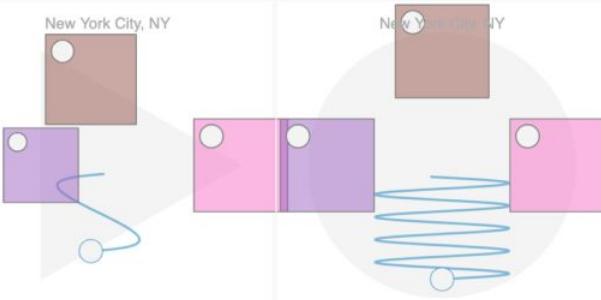
New York City, NY



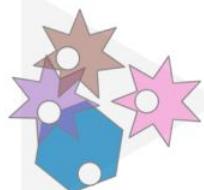
New York City, NY



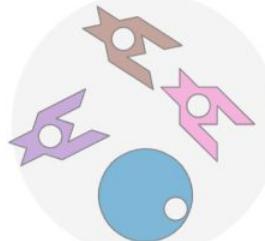
New York City, NY



New York City, NY



New York City, NY



New York City, NY



# Diatoms

Design Inspiration +  
Design Externalization

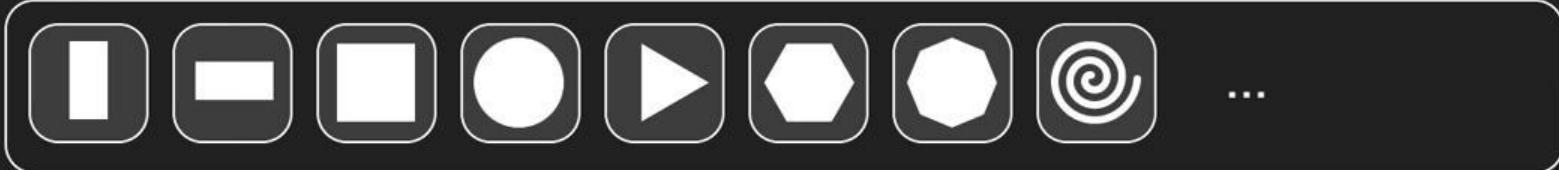
# Generative Design

Repetition, Randomness, and Logic:

*“...traditional craftsmanship recedes into the background, and abstraction and information become the new principal elements.”*

– Groß et al (2018)

Glyph  
Scaffold  
Palette



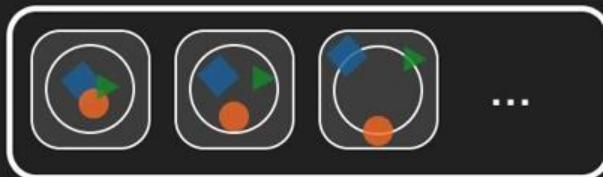
Encoding  
Channel  
Palette



Mark Shape  
Palette



Scaffold  
Gravity



Scaffold



Channel Assignment



Mark Assignment



Conjunction



Repeat

Place	Region	Column Set #1		Column Set #2		
		Area	Population	Bike Score	Transit Sc.	Walk Score
Boston	Northeast	232	672,840	70	73	81
Chicago	Midwest	607	2,704,965	70	65	78
...	...	...	...	...	...	...

# Small Multiples Design B

Mark  
Shapes

Encoding  
Channels

Glyph  
Scaffolds



...



...



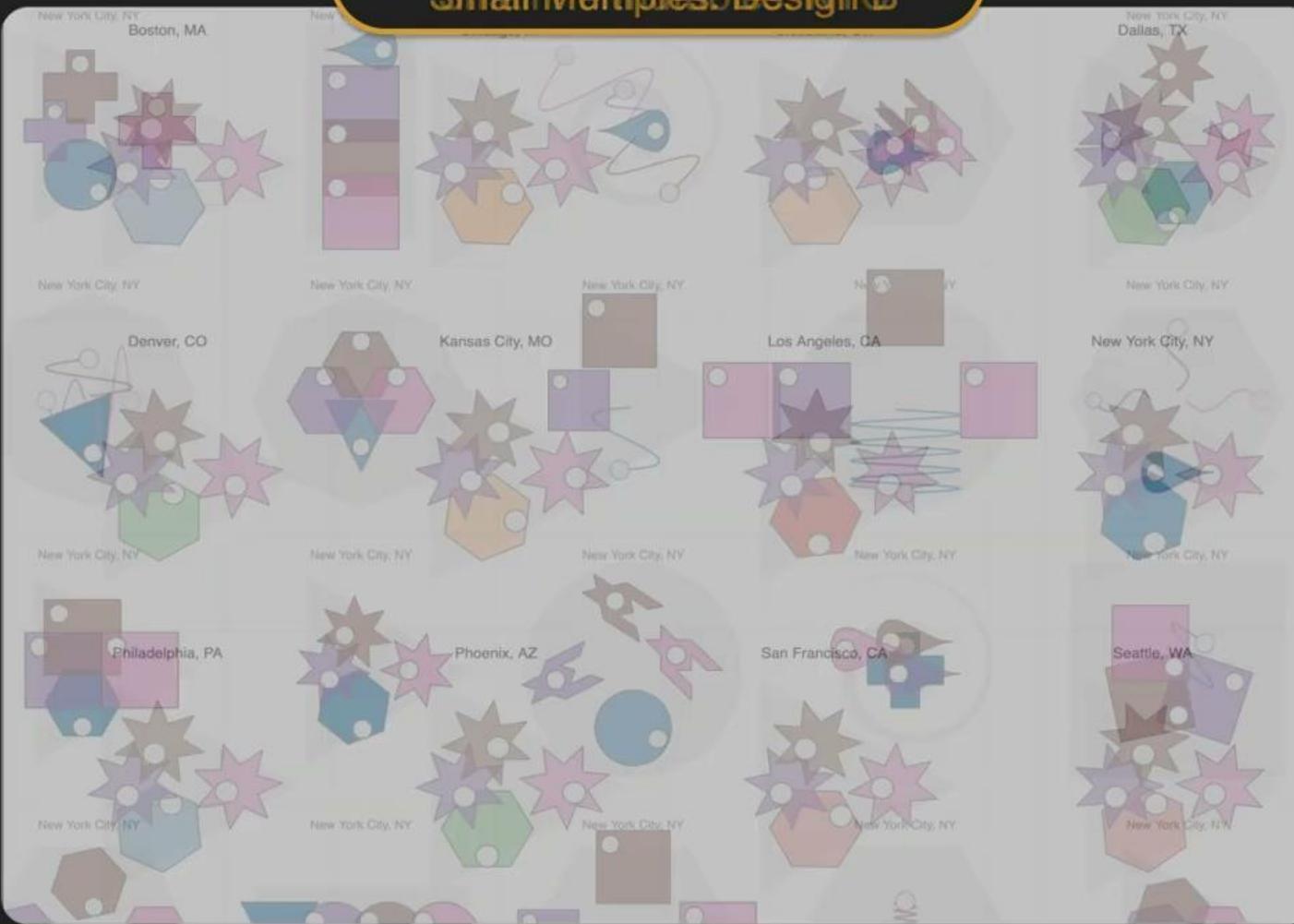
...



...



...



# Diatoms in Tableau

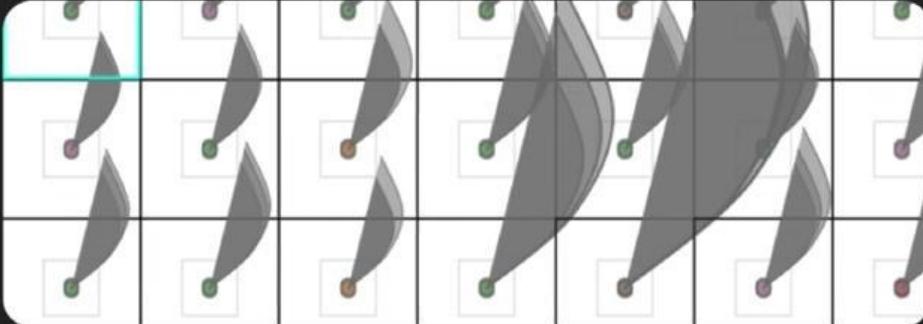
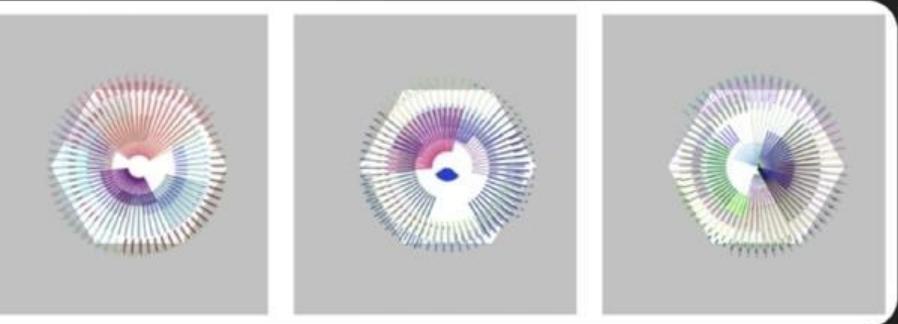
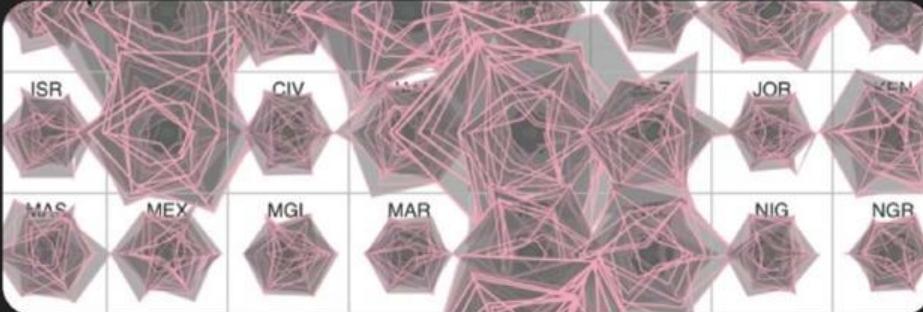
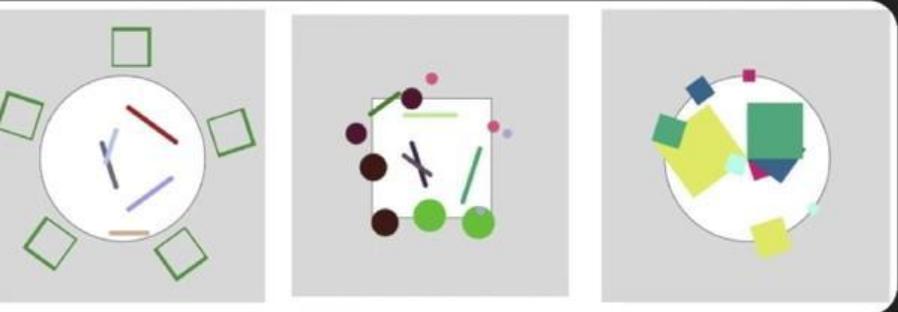
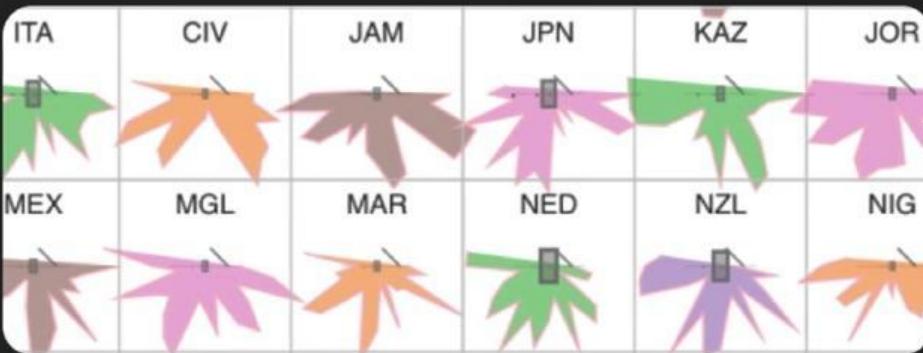
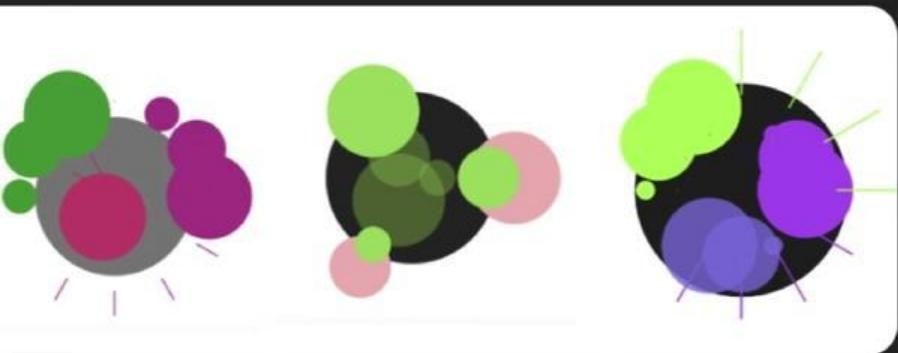


Generative Design Inspiration for Glyphs with

# Diatoms

**Matthew Brehmer, Robert Kosara, and Carmen Hull**  
mbrehmer | rkosara [at] tableau.com, carmen.hull [at] ucalgary.ca  
[research.tableau.com](http://research.tableau.com) • IEEE VIS 2021





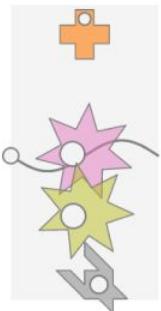
# Interviews with Designers

- 12 Participants (7F, 5M)
  - 7 Information design students
  - 5 Professional designers
- Interview + chauffeured demos
- Follow-up with students after glyph design assignment

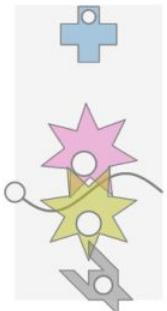
Comparing and winnowing glyph designs  
Observations on mark and channel sampling  
Scaffold refinement + hierarchical scaffolds  
Semantic and figurative associations

# P2's Glyph Designs

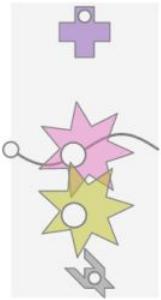
Australia



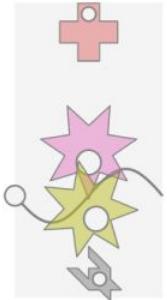
Brazil



United Kingdom

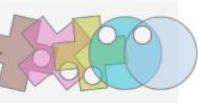


Indonesia



# P3's Glyph Design

WALL-E



WALL-E



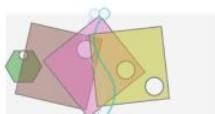
WALL-E



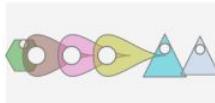
WALL-E



WALL-E



WALL-E



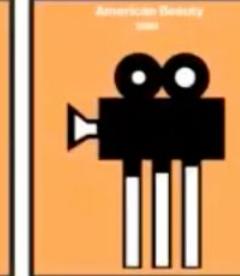
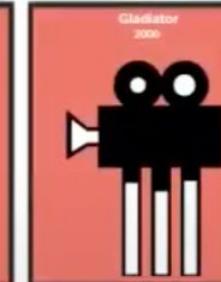
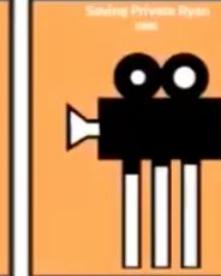
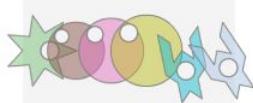
WALL-E



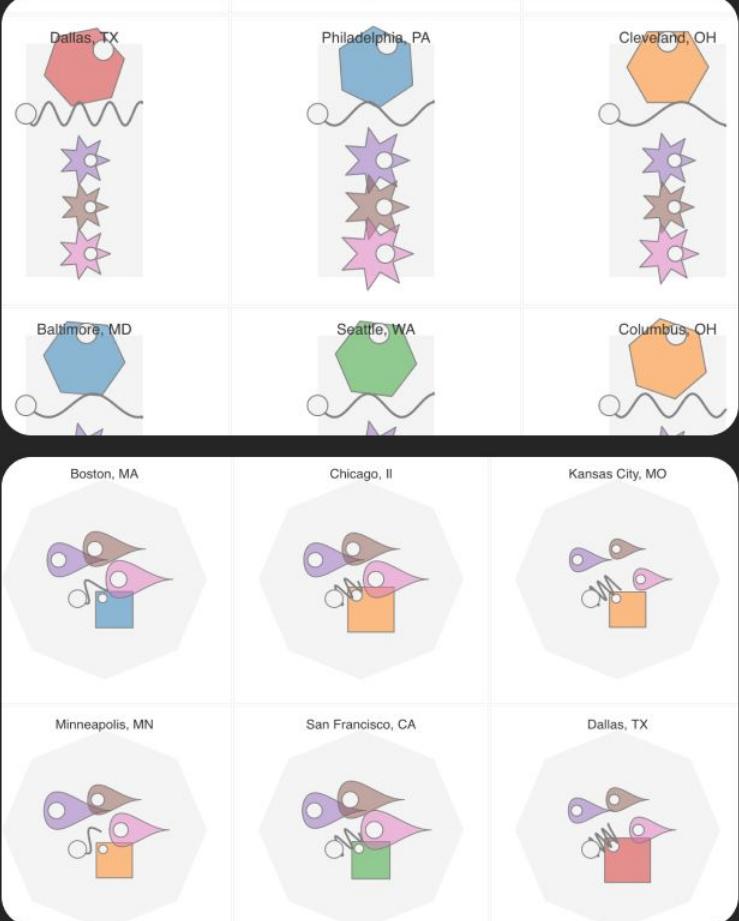
WALL-E



WALL-E



# P5's Glyph Design



San Antonio

# Opportunities with Diatoms

Curation: tweaking and breeding designs

Curation: tweaking and breeding designs  
Bring-your-own palettes

Curation: tweaking and breeding designs

Bring-your-own palettes

Visualization authoring tool integration

Curation: tweaking and breeding designs

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Visualization authoring tool integration

Pedagogical use? Divergent thinking exercise

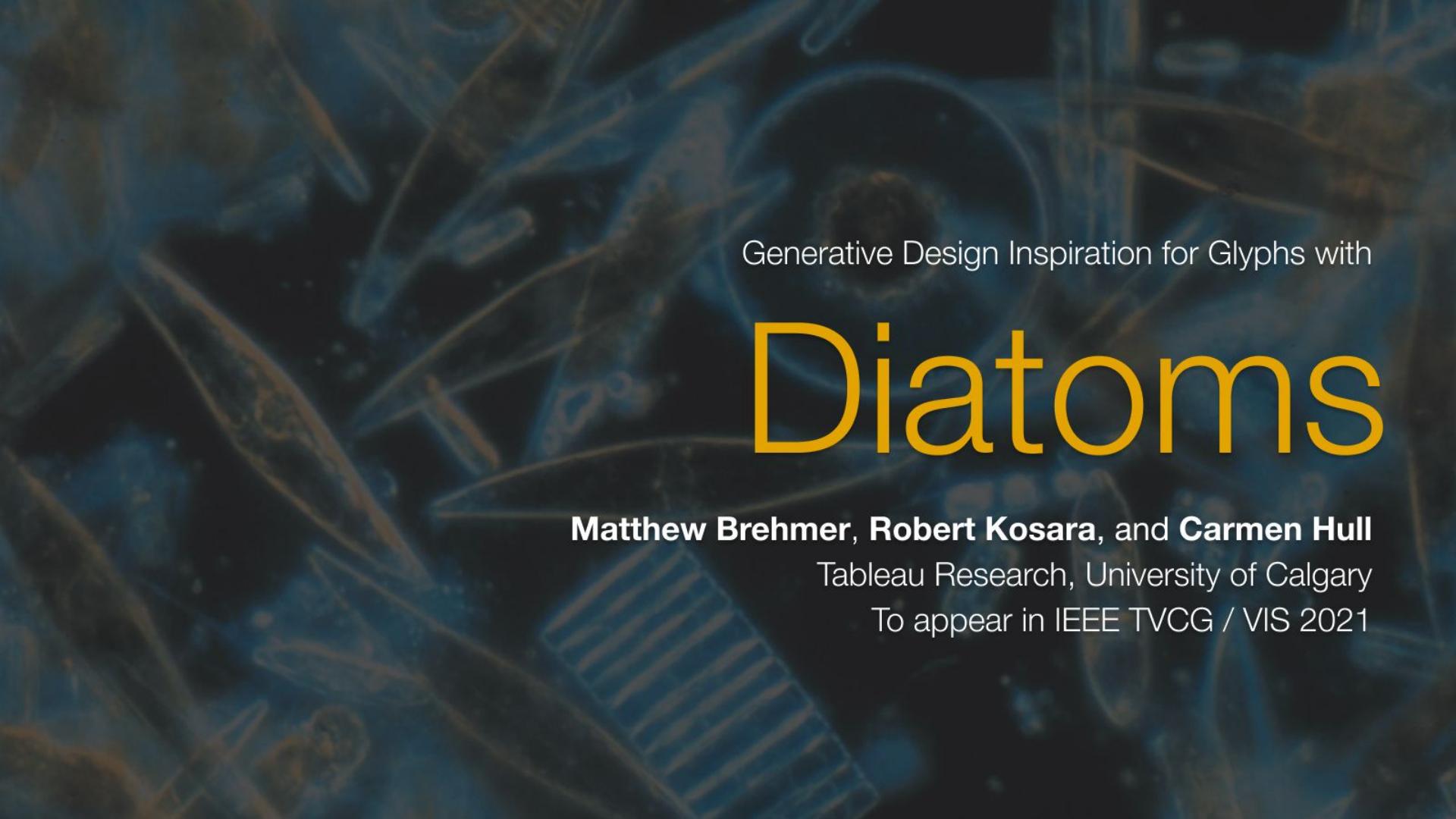
Curation: tweaking and breeding designs

Bring-your-own palettes

Visualization authoring tool integration

Pedagogical use? Divergent thinking exercise

Analytical use? A visual calibration exercise

The background of the slide features a dark, abstract pattern of glowing blue and orange organic shapes, resembling diatoms or microscopic organisms, which provides a scientific and organic feel to the presentation.

Generative Design Inspiration for Glyphs with

# Diatoms

**Matthew Brehmer, Robert Kosara, and Carmen Hull**

Tableau Research, University of Calgary

To appear in IEEE TVCG / VIS 2021

# Recent Areas of Interest

1. Expressive visualization design for communication
  - IEEE VIS 2021: *Generative Design Inspiration for Glyphs with Diatoms*
2. Preparing for and delivering presentations involving visualization
  - IEEE VIS 2021: *From Jam Session to Recital: Synchronous Communication and Collaboration Around Data in Organizations*
  - Information+ 2021: *The Information in Our Hands*

# From Jam Session to Recital

Synchronous Communication and Collaboration

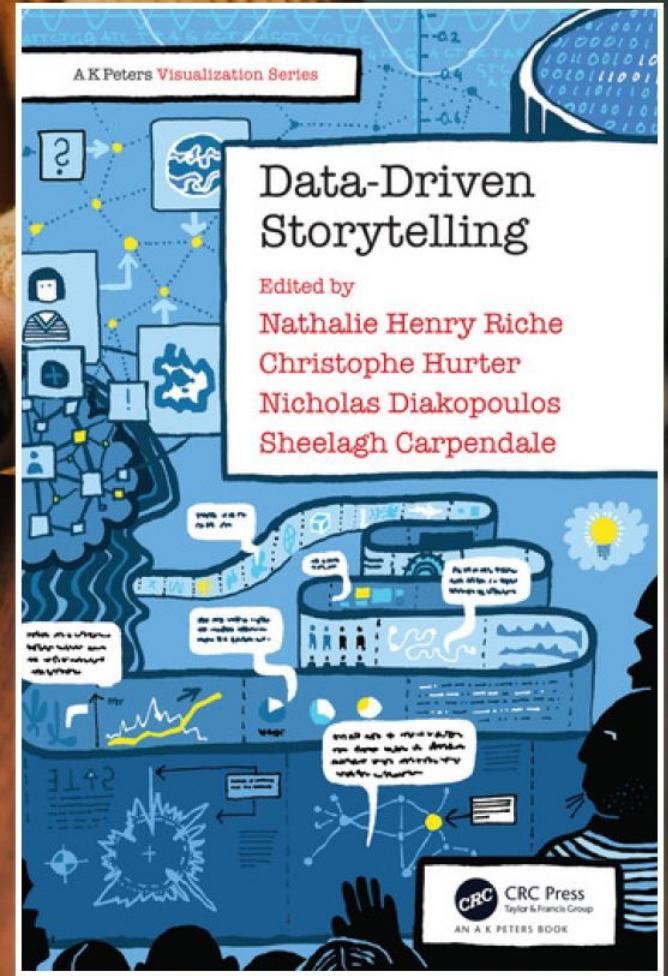
Around Data in Organizations

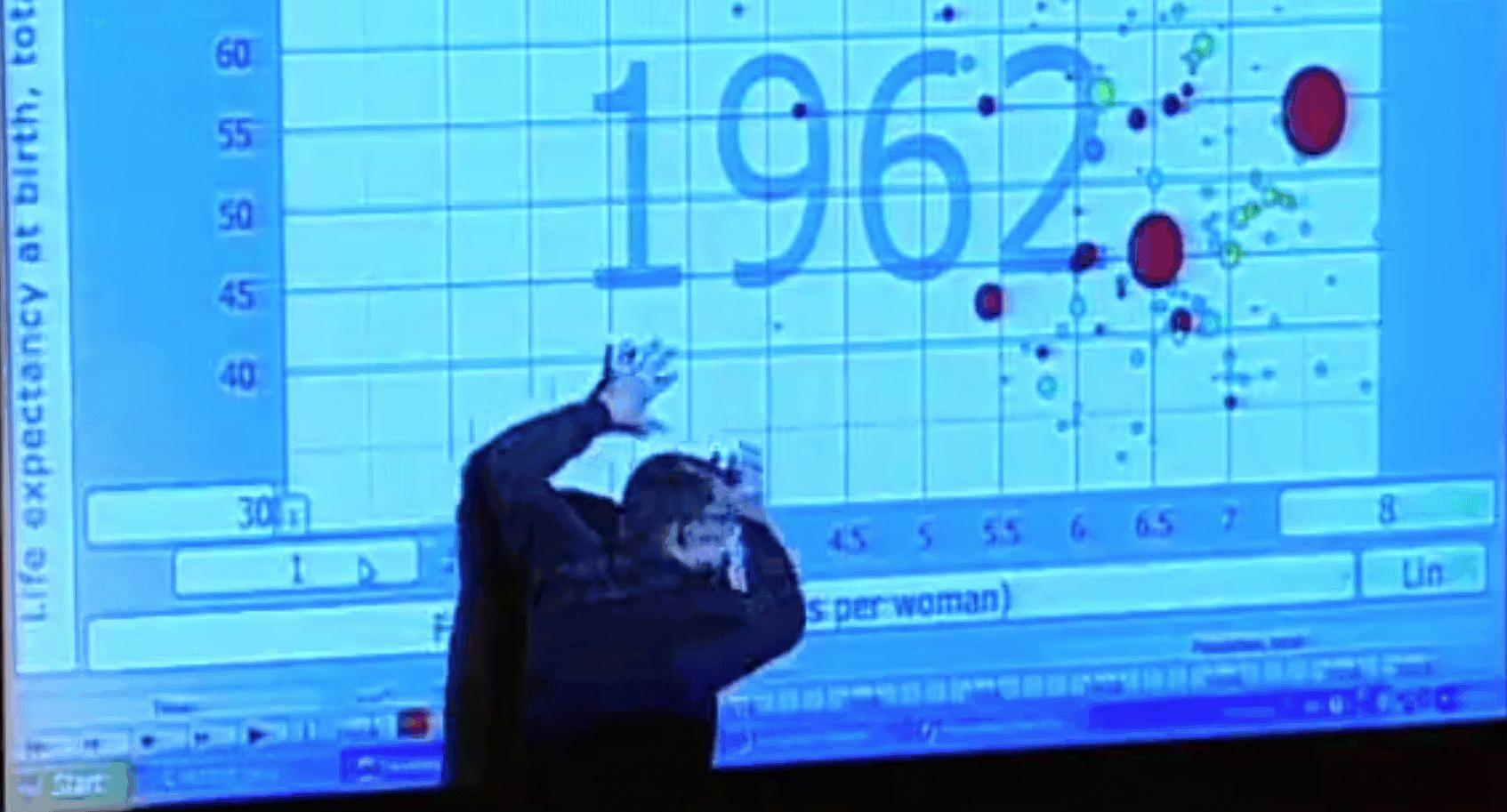
To appear in IEEE TVCG / VIS 2021

**Matt Brehmer, Robert Kosara**



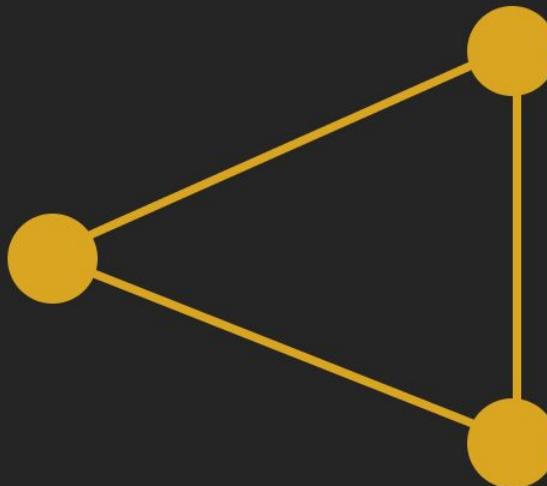






# Data in Organizations

Narrative Vis



Collaborative Vis

# Interviews

Retrospectives + Design Probes

# Design Probes







# Findings

# Scenarios





*“...showing them the doors,  
metaphorically speaking,  
the doors that are available that I  
found in the data, and then they  
would open them.”*

– P4, retail consulting analyst

...[presentation materials used to]

*“prove our point with charts.”*

– P3, manufacturing association analyst

SOCIAL  
JAZZ



*“If you go to my engineering team, [...] they care about the meaning [...]; for the sales team, [...] you are just looking at quotas: have you met the goal or not?”*

– P13, data strategist



*“As soon as everyone’s tied off on the validity and the accuracy of the numbers, we screenshot what we have here and put that image directly into a slide.”*

**– P05 + P06, sales analyst + communication specialist**

*“I get this sense of failure every time  
I’m going into PowerPoint [...].”*

*“if it will take three hours to build a ten  
minute presentation, I ain’t gonna do it”.*

– P18, regional vice-president of sales

*“I want to break up an otherwise boring series of charts [...].”*

*“I hate bar charts [...].”*

*“sometimes you need to do it in different ways to keep the attention.”*

– P09, marketing manager



Accessible presentation / attention mgmt.

Reveal for suspense and drama.

Flexibility and scope of reveals.

Tool-switching / material unrelated to data.

Presenter tools beyond filters and notes.

Presentations, not tool demonstrations.

No concern for changes behind the curtain.

Simple loop-based audience experience.

Timely yet unexpected presentation tools.

Analytical onboarding presentations.

Presenter tool templates.

Presentation authoring complexity.

Accessible presentation / attention mgmt.

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Presentation authoring complexity.



*“when we’ve had a big week, having a  
big reveal speaks to that.”*

– P18, regional vice-president of sales



*“it really feels like a presentation  
versus a demo.”*

– P05, communications specialist



*“The useful idea would be to use this for teaching people how to interact with the dashboard.”*

– P13, data strategist



- Synch. communication around data beyond slideware
  - Creativity support for presenting data

# From Jam Session to Recital

Synchronous Communication and Collaboration

Around Data in Organizations

To appear in IEEE TVCG / VIS 2021

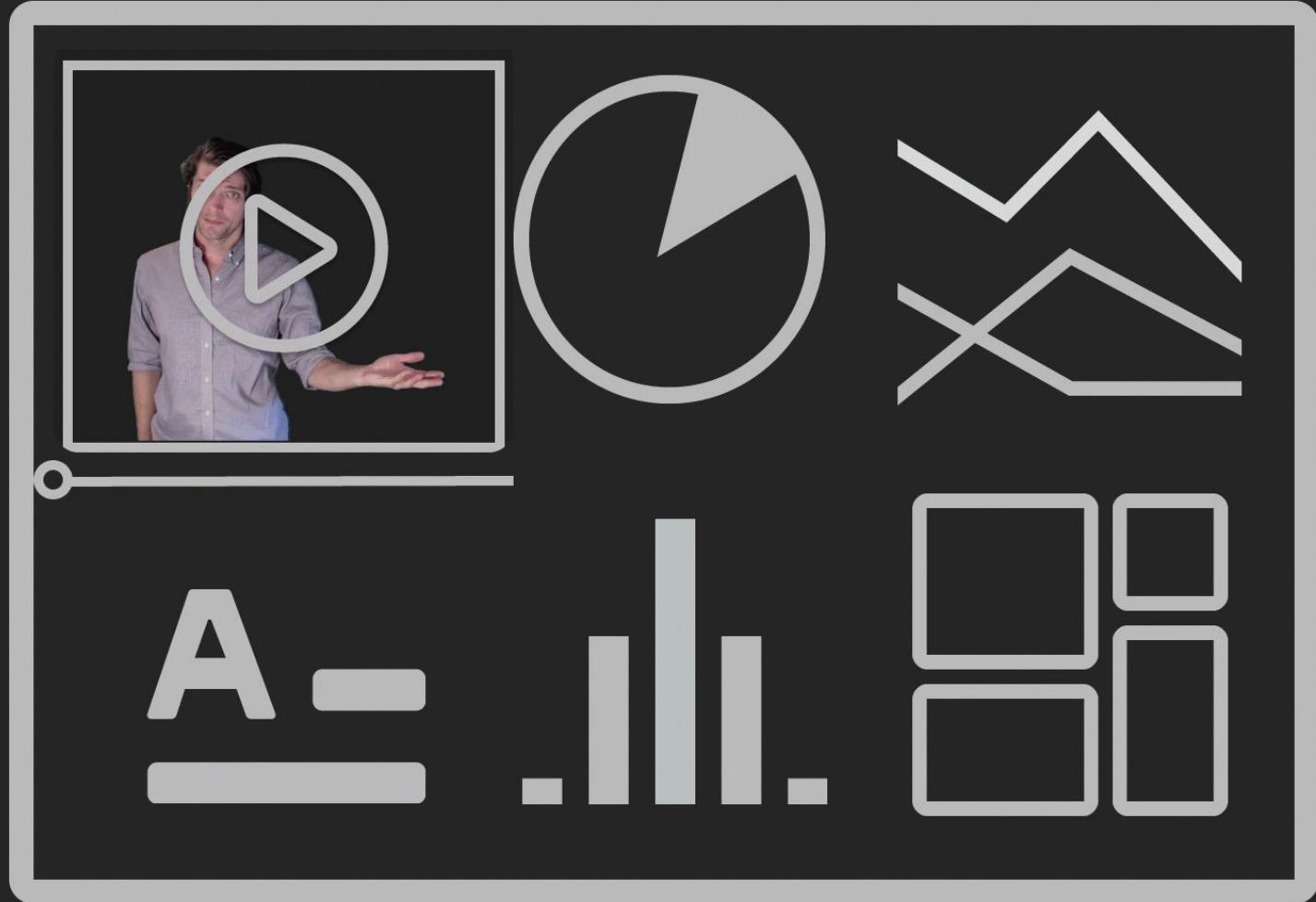
**Matt Brehmer, Robert Kosara**

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# The Information in Our Hands

Information+ 2021 - Matthew Brehmer



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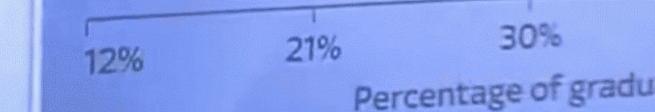
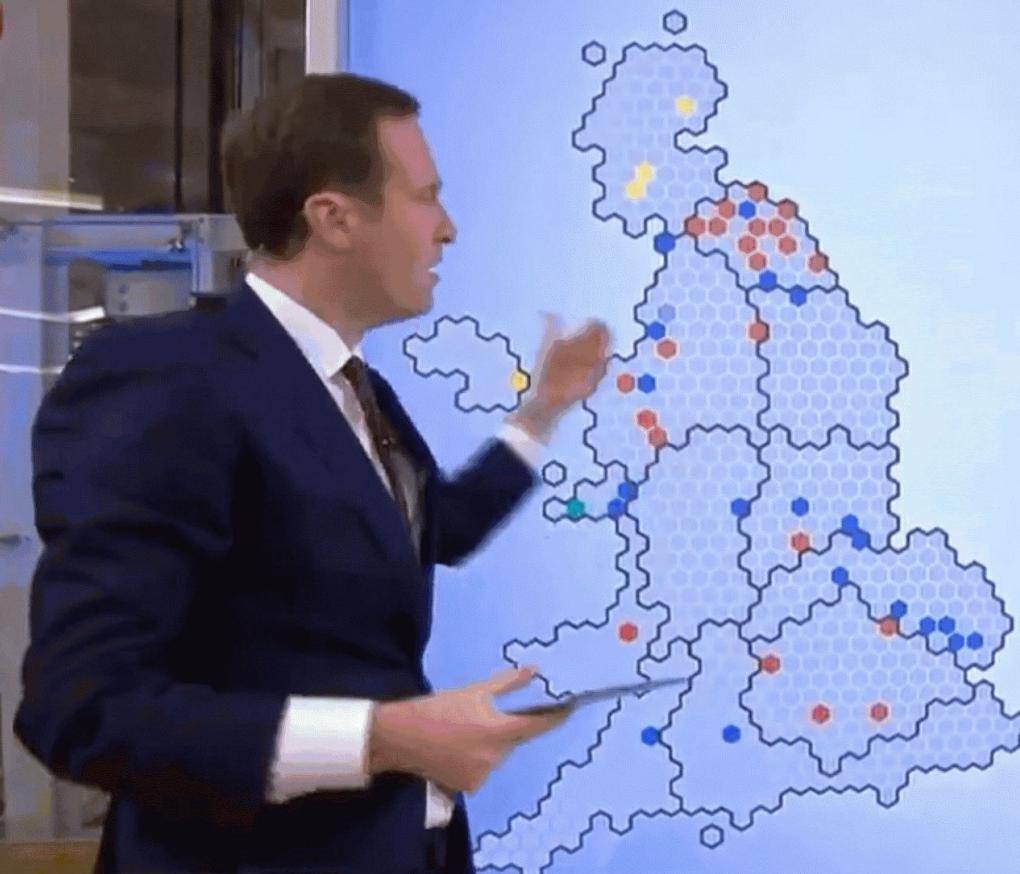
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## EXIT POLL

CONSERVATIVE WIN  
MAJORITY 86

## ALLIANCE GAIN DOWN NORTH FROM IND

CON HOLD HARLOW  
CON GAIN LEIGH FROM LAB

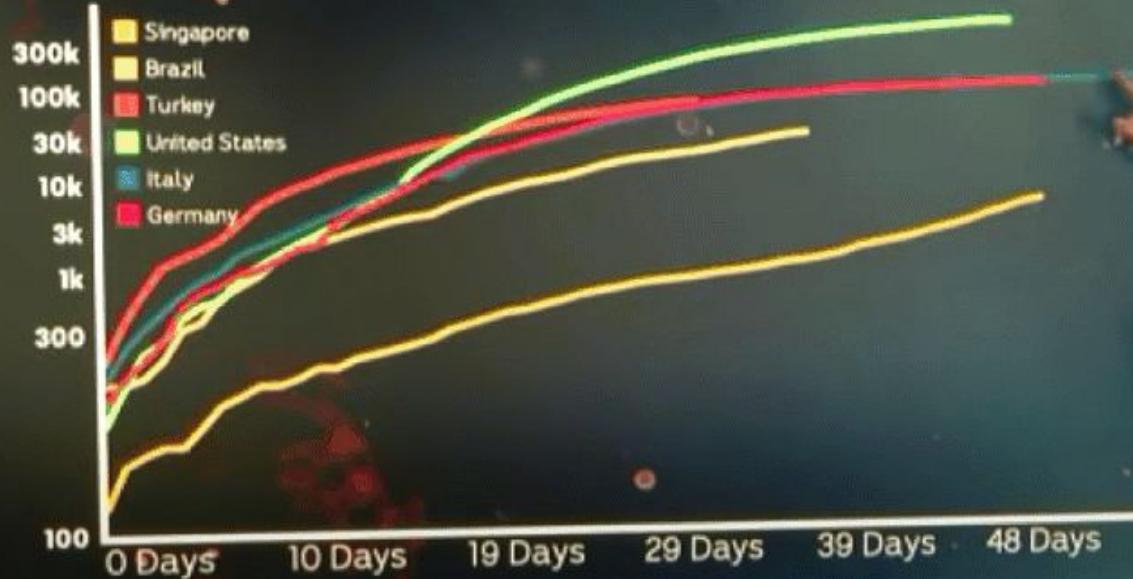
## TARGET

20	23	0	0	3	2
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## 326 TO WIN

+5	-7	0	0	+2	0
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# TRAJECTORIES Confirmed



Data courtesy Johns Hopkins University



## SWING BY REGION

Com-Lab

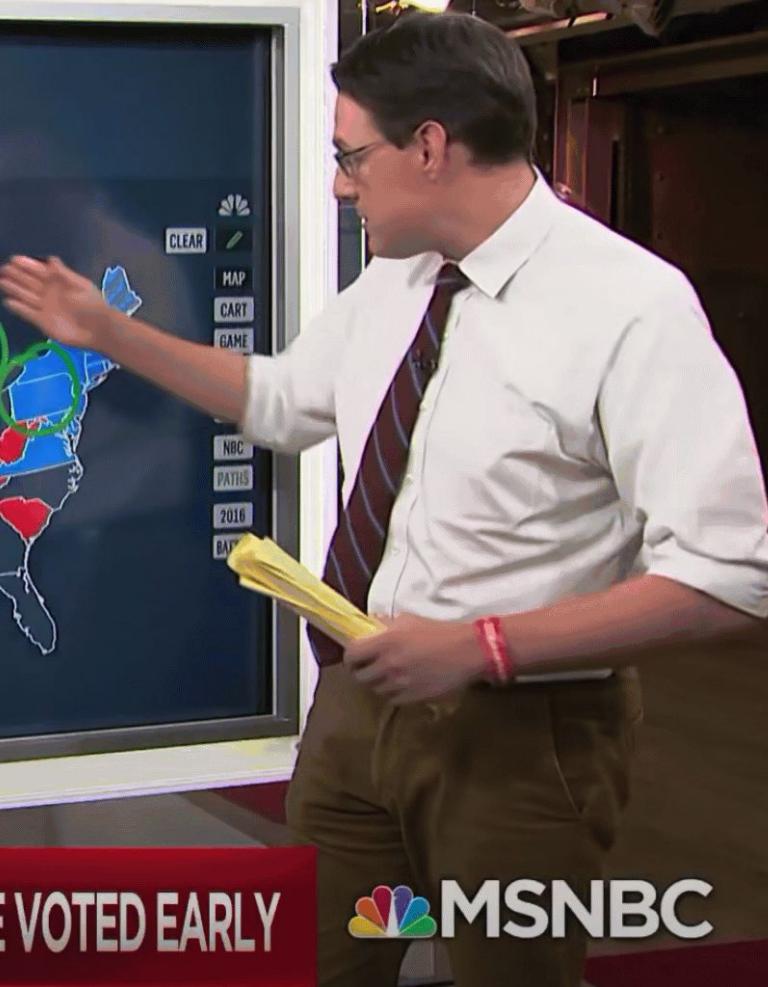
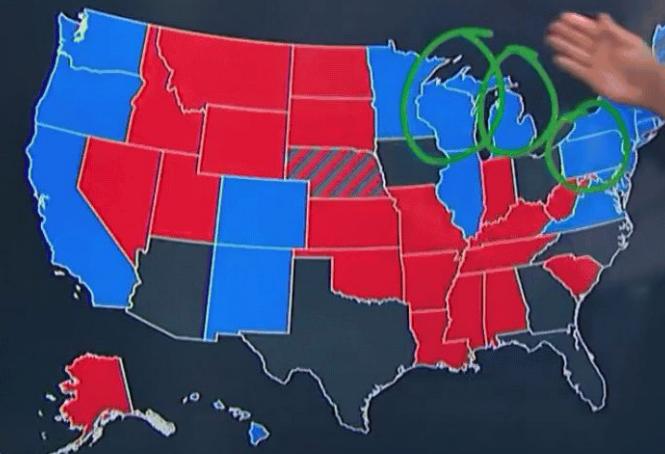


# ROAD TO 270 WHAT IF



272

131

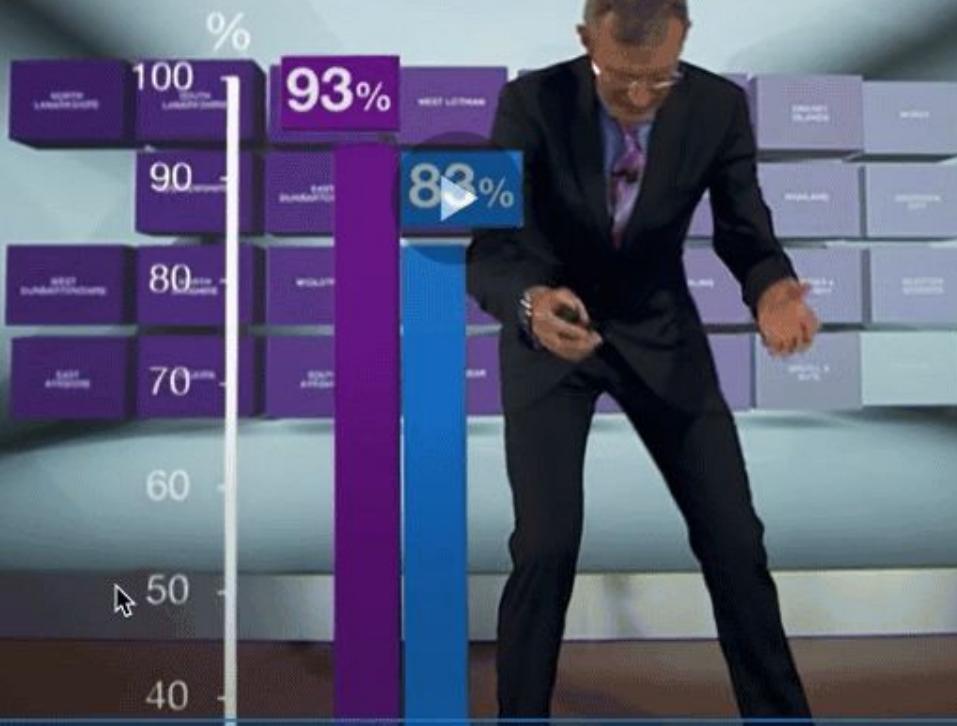


**BREAKING NEWS**

NBC NEWS/TARGETSMART: 82 MILLION+ AMERICANS HAVE VOTED EARLY

MSNBC

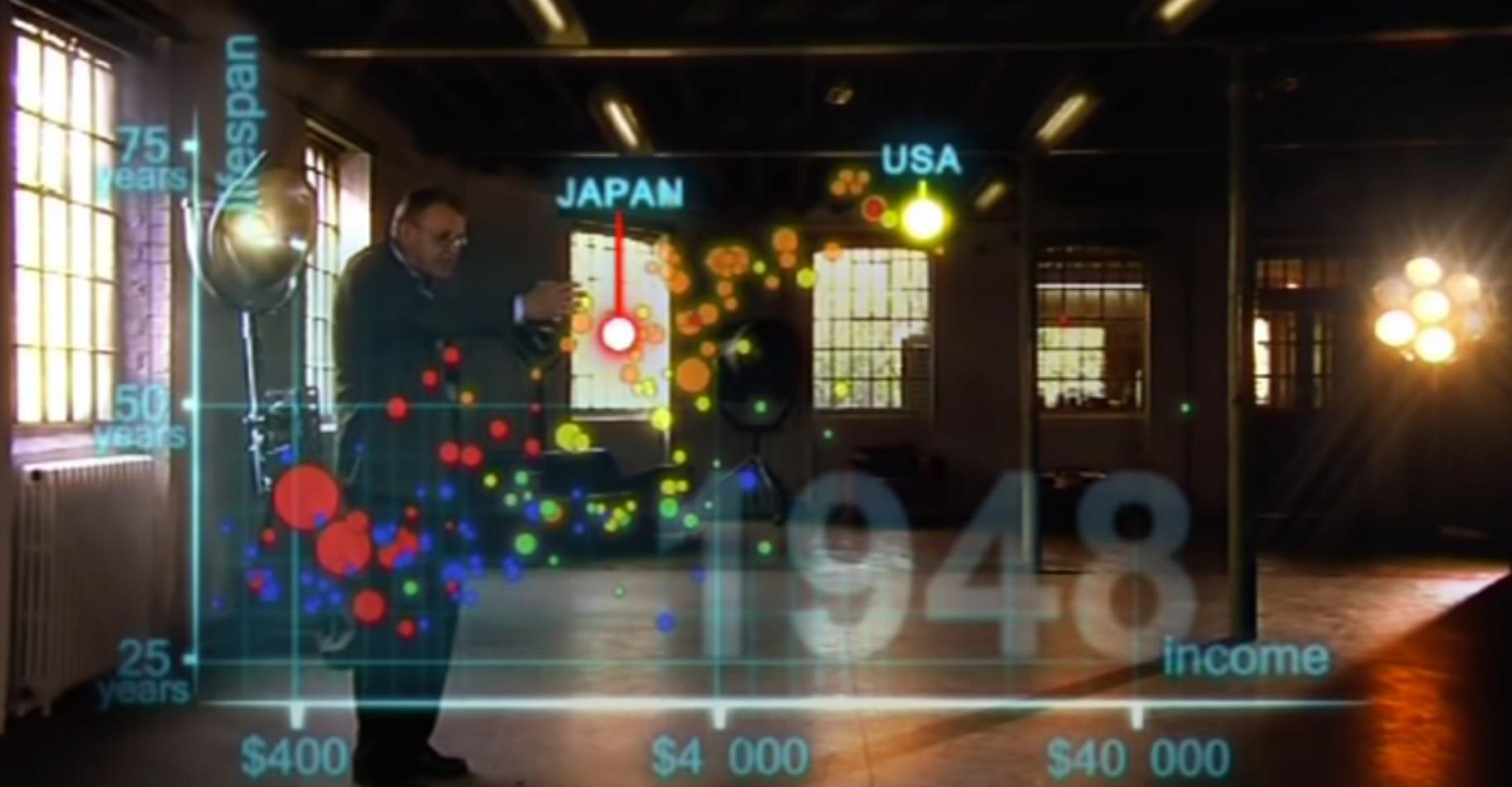
# COUNCILS BY BIRTH PLACE: SCOTLAND



POWERED BY









# Using space to talk and gesture about numbers

## Evidence from the TV News Archive

Bodo Winter, Marcus Perlman\*, and Teenie Matlock

University of California, Merced / \*University of Wisconsin, Madison

This paper examines naturally occurring gestures produced in descriptions of numbers and quantities in television newscasts. The results of our analysis show that gestures reveal the metaphorical and spatial nature of numerical thinking. That is, speakers' hands mimic known spatial mappings between space and quantity, including horizontal mappings (smaller quantities left, larger quantities right), vertical mappings (smaller quantities down, larger quantities up) and size-based mappings (smaller quantities "small", larger quantities "large"). Speakers frequently switch between these different spatial mappings, and they sometimes combine them within the same gesture. This points to the flexibility of how metaphors can become expressed in gesture, and how domains such as number and quantity can be conceptualized through multiple compatible source domains.

**Keywords:** metaphor, mathematics, number, quantity, TV news

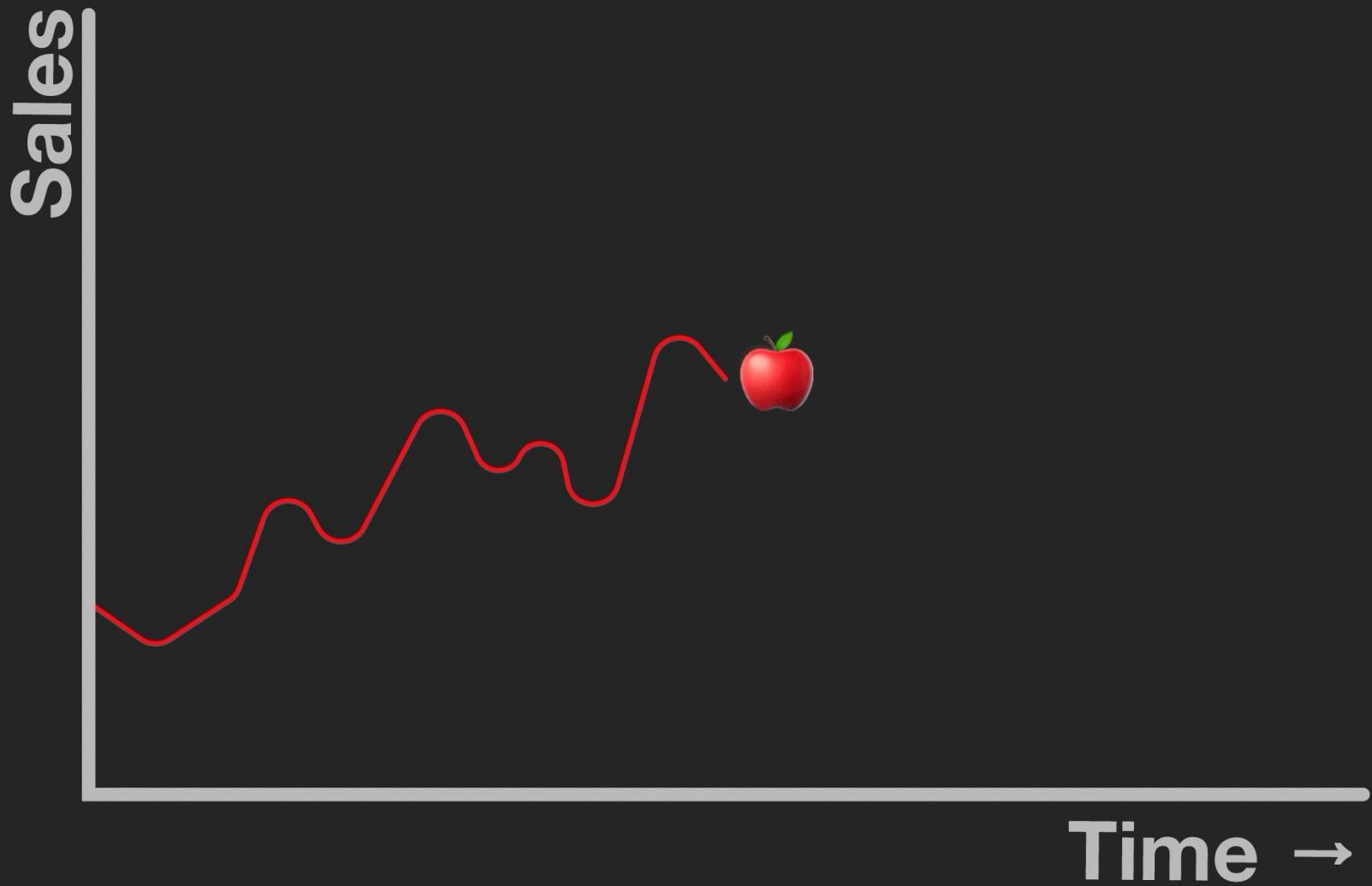






# SALES

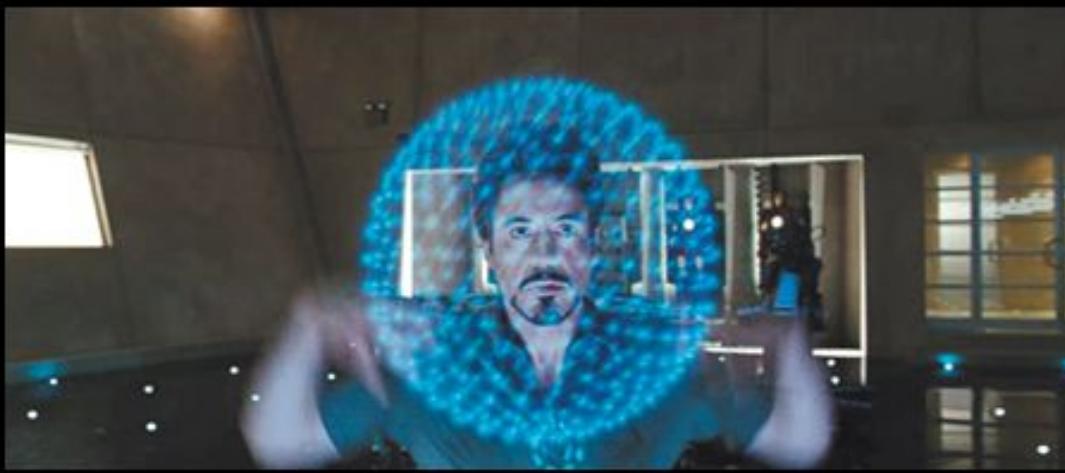








ANDERTON







# The Information in Our Hands

Information+ 2021 - Matthew Brehmer

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# New Perspectives on Communicating with Visualization

## From Design Inspiration to Performative Presentation

We're hiring interns in 2022! Questions?



Matthew Brehmer

Senior Research Staff, Tableau Research

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