

# New Perspectives on Communicating with Visualization

## From Design Inspiration to Performative Presentation

—

October 2021

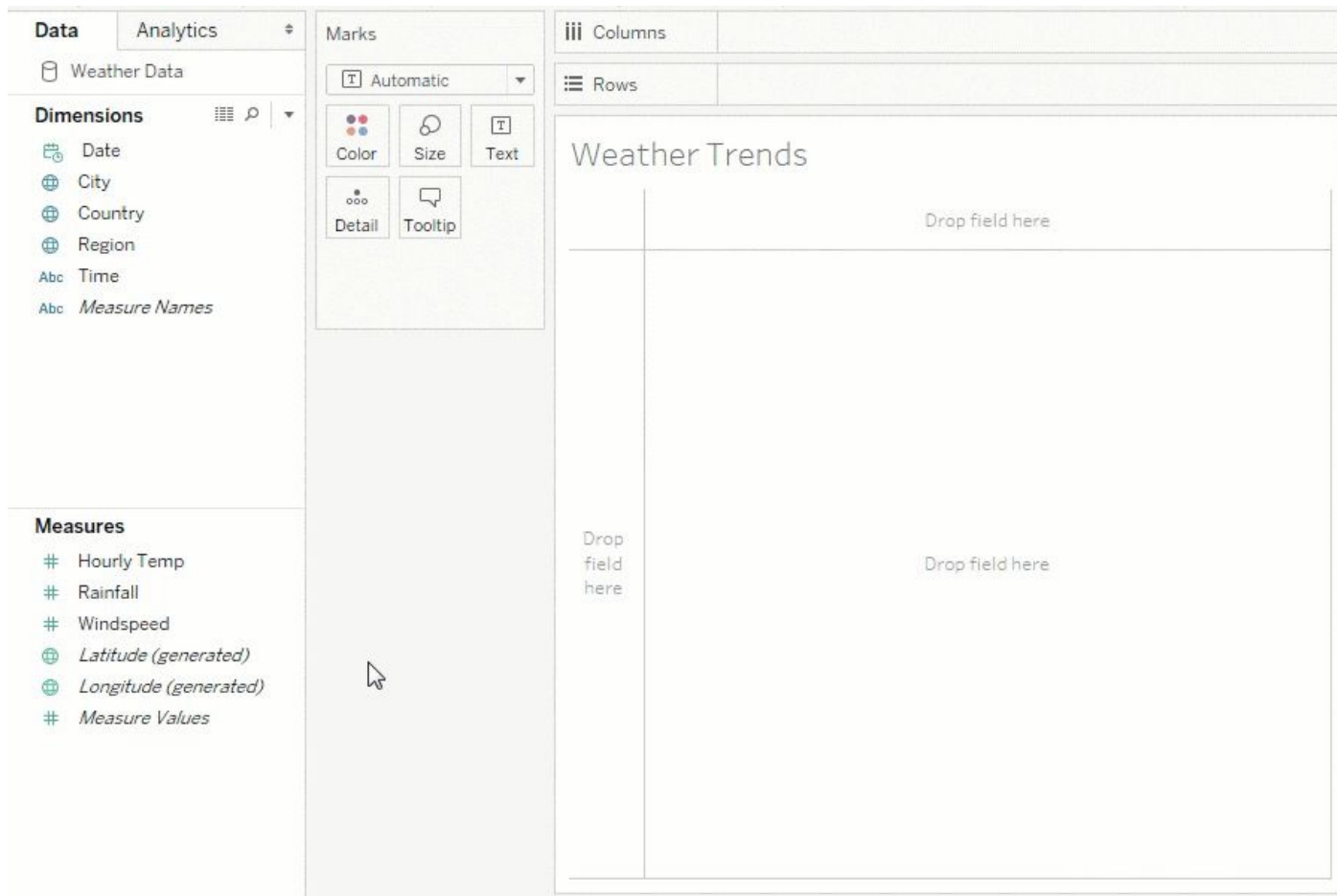


Matthew Brehmer

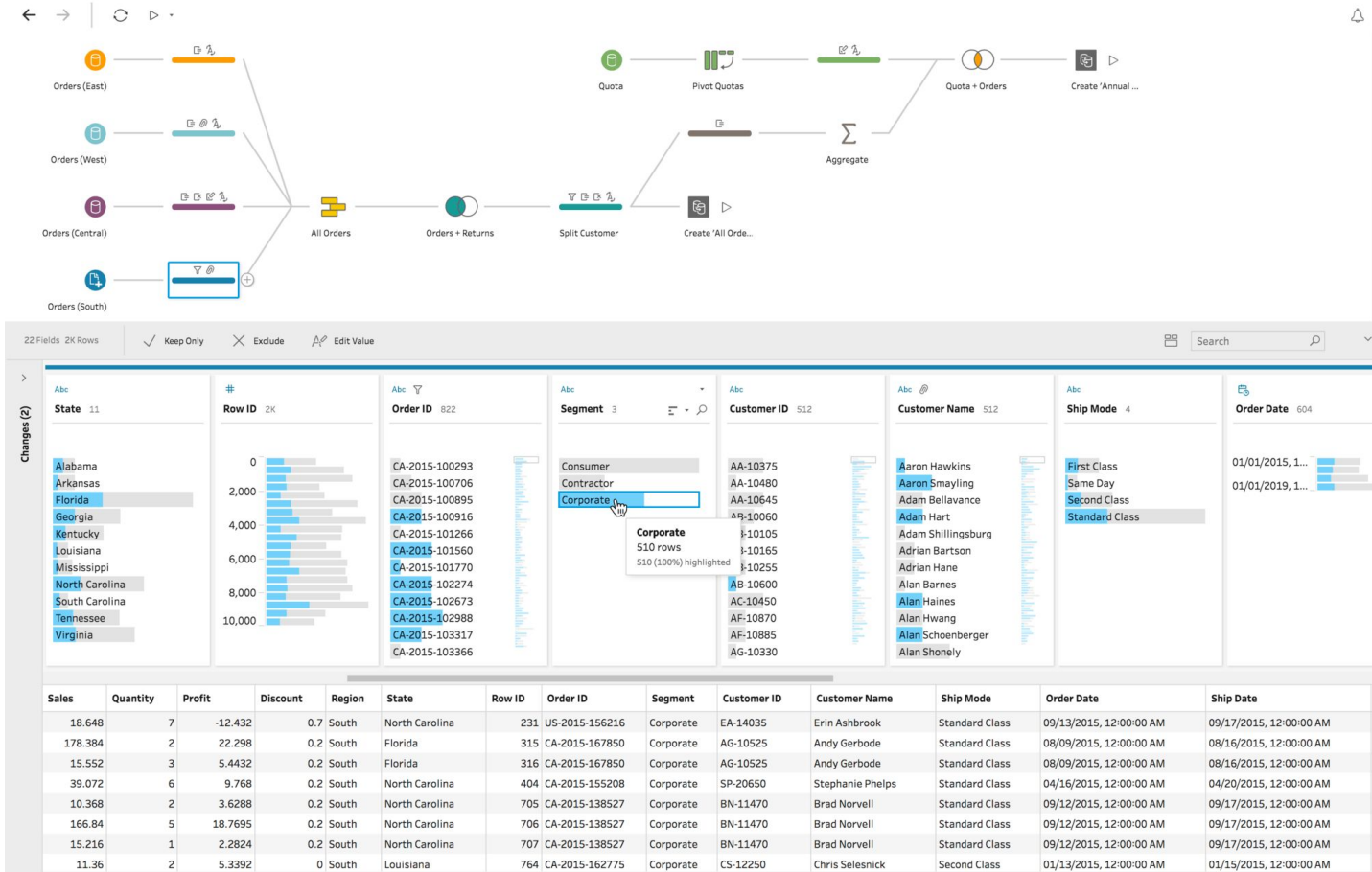
Senior Research Staff, Tableau Research

[research.tableau.com](https://research.tableau.com) | [@mattbrehmer](https://twitter.com/mattbrehmer) | [mbrehmer \[at\] tableau.com](mailto:mbrehmer@tableau.com)

See and Understand Data...




# Tableau Prep





# Tableau Server



Performance Indicat... ▾

Home

Explore

Favorites

Recents

Users

Groups

Schedules

Tasks

Site Status

Settings

Explore / Campaigns and Retention

Search



## Campaigns and Retention

Owner [Emily Chen](#)



Create

Select All

Content type: Show all ▾

Sort by: Type ▾



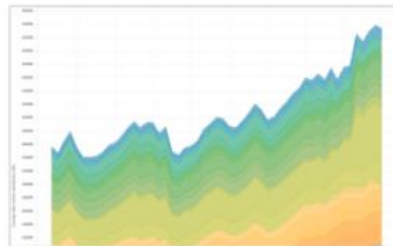
Content Performance



Email Performance Overview



Google Analytics



Historic Trends



Performance by Week



Renewals by Region



# Tableau Online – Share and collaborate in the cloud

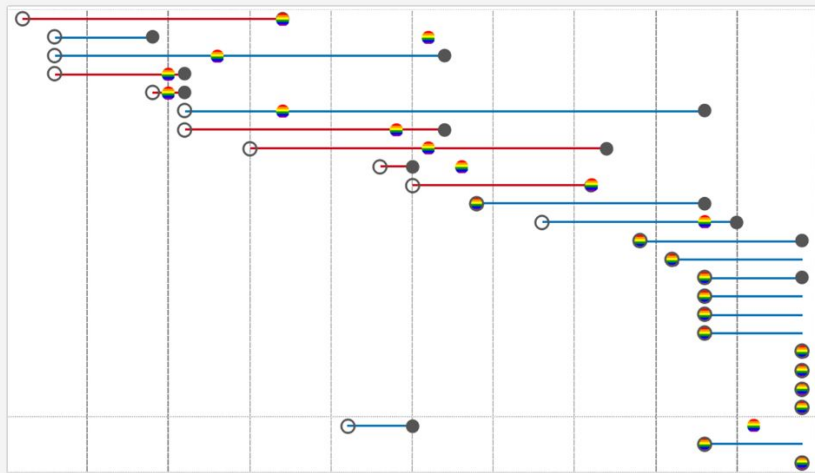


# Gallery / Greatest Hits

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

## Viz of the Day

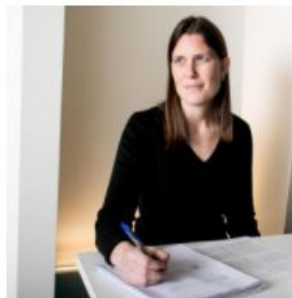
## Featured



## 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



PRINCIPAL RESEARCH SCIENTIST  
SARAH BATTERSBY



SENIOR RESEARCH STAFF  
MATTHEW BREHMER



SENIOR RESEARCH STAFF  
MICHAEL CORRELL



SENIOR RESEARCH STAFF  
ANAMARIA CRISAN



LEAD RESEARCH STAFF  
CHRIS FRALEY



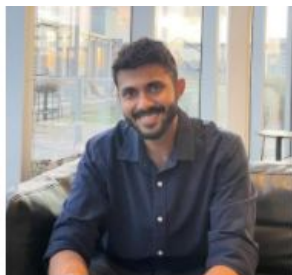
SENIOR RESEARCH SCIENTIST  
ROBERT KOSARA



PRINCIPAL RESEARCH SCIENTIST  
VIDYA SETLUR



SOFTWARE ENGINEERING ARCHITECT  
SCOTT SHERMAN



SENIOR RESEARCH STAFF  
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 is a dark, textured image featuring various diatoms. These microscopic organisms are shown in shades of blue and yellow, with some appearing as elongated, needle-like structures and others as more complex, circular or rectangular forms with intricate patterns. The overall effect is a dense, organic, and somewhat abstract composition.

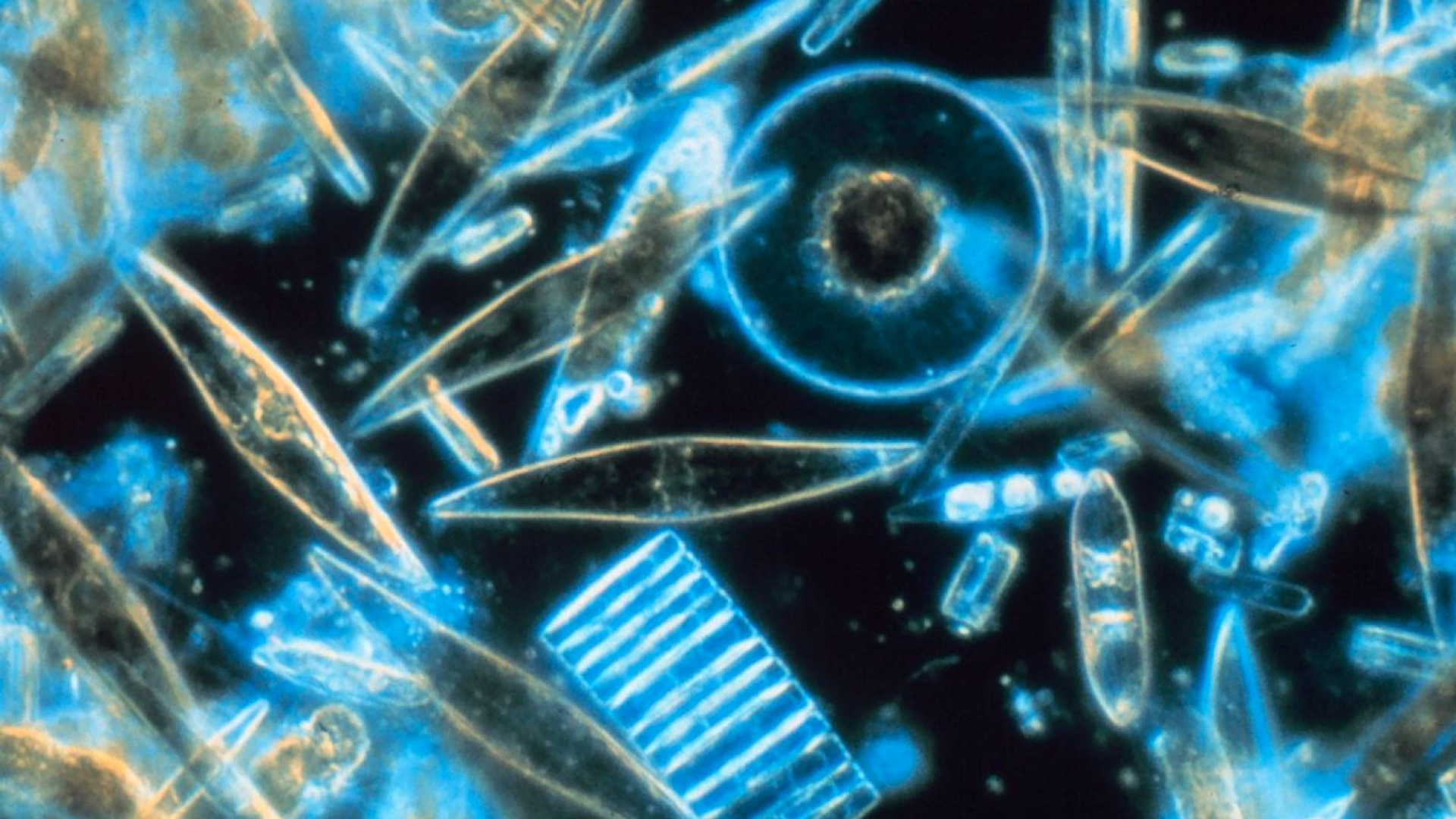
Generative Design Inspiration for Glyphs with

# Diatoms

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

Tableau Research, University of Calgary

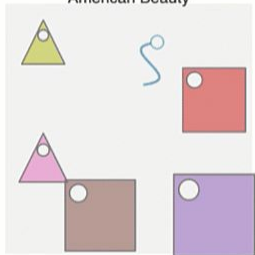
To appear in IEEE TVCG / VIS 2021



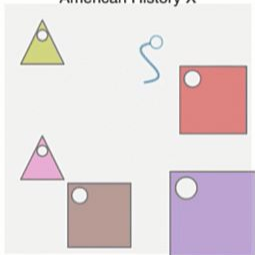




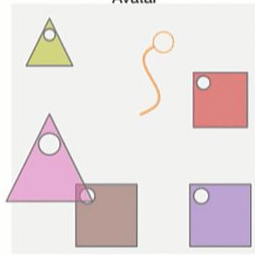
American Beauty



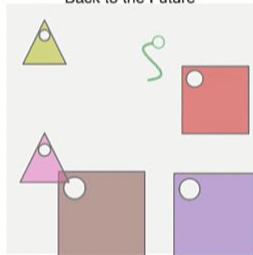
American History X



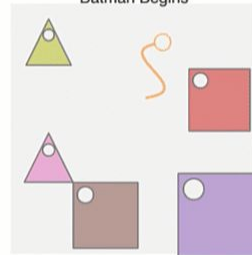
Avatar



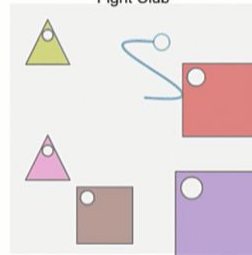
Back to the Future



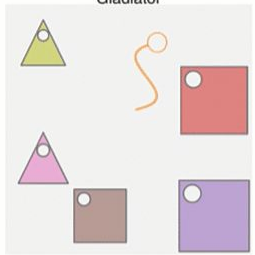
Batman Begins



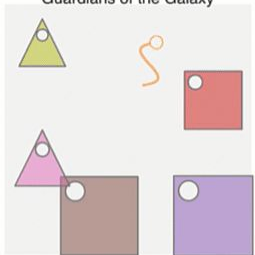
Fight Club



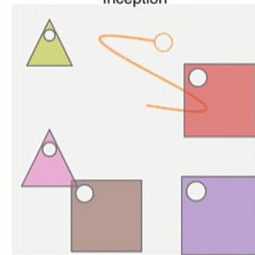
Gladiator



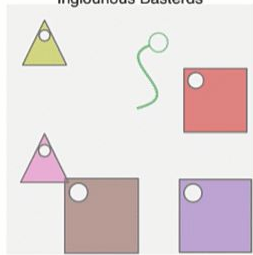
Guardians of the Galaxy



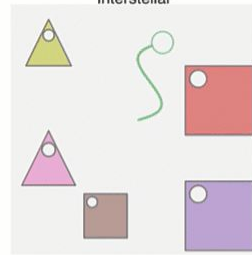
Inception



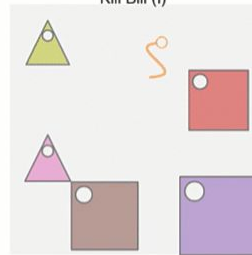
Inglourious Basterds



Interstellar



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)

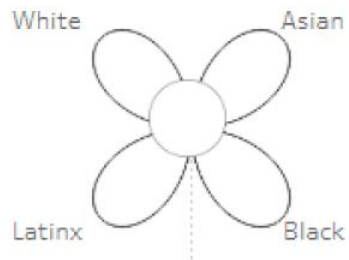
# Gender & ethnic disparities in Tech companies



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

## HOW TO READ IT

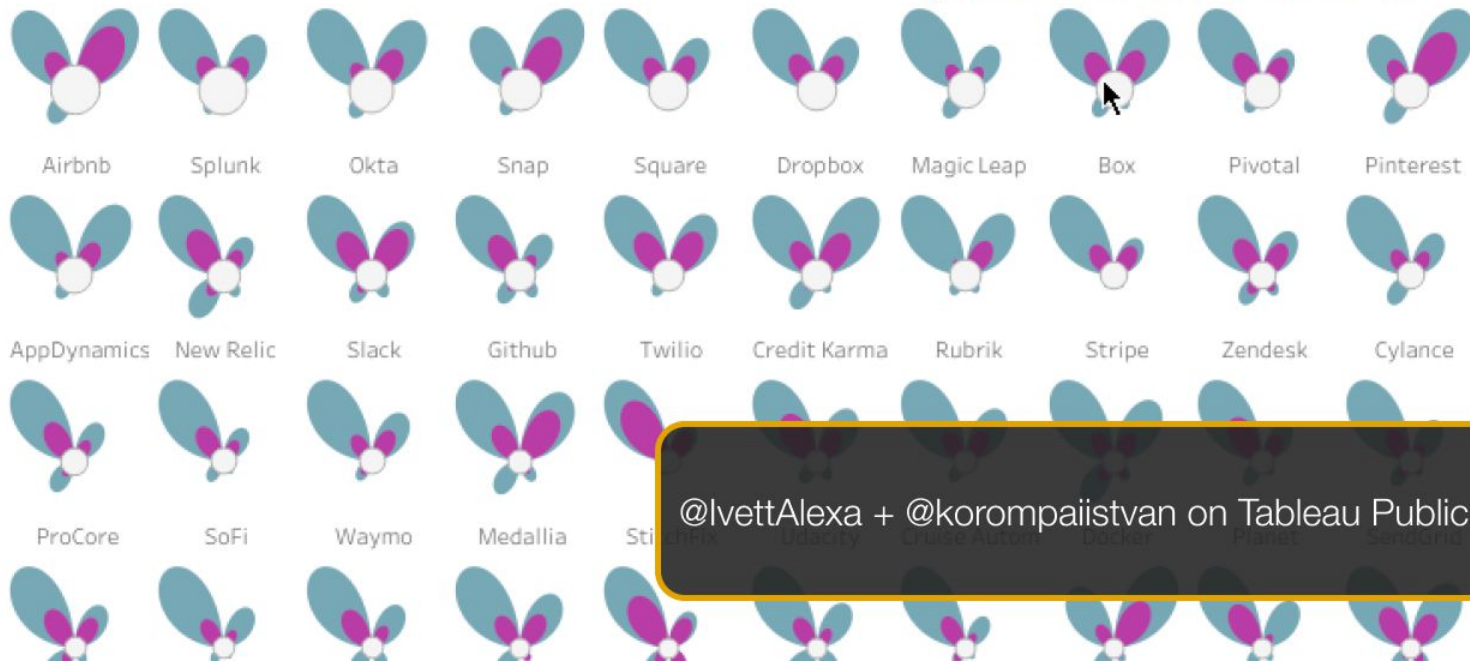
A leaf of a flower means an ethnicity.



Total #of employees

Size means the #of employees in the specific ethnicity.

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

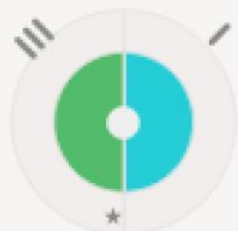


@IvettAlexa + @korompaiistvan on Tableau Public

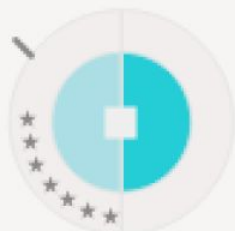




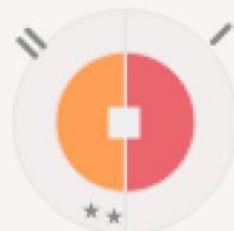
JUVENTUS  
96



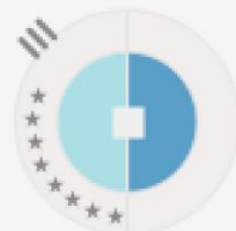
BORUSSIA DORTMUND  
97



REAL MADRID  
98



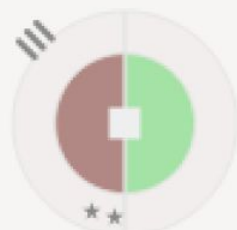
MANCHESTER UNITED  
99



REAL MADRID  
00



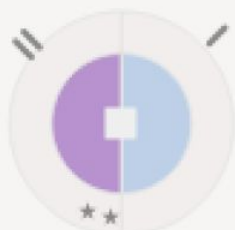
BAYERN  
01



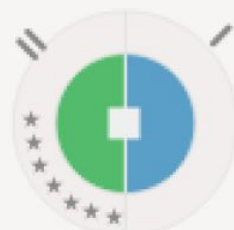
PORTO  
04



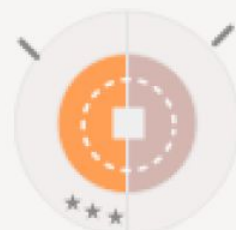
LIVERPOOL  
05



BARCELONA  
06



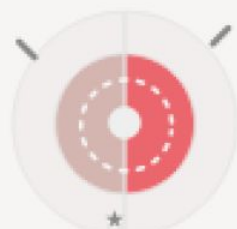
MILAN  
07



MANCHESTER UNITED  
08



BARCE  
09



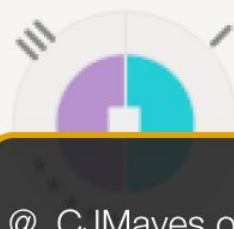
CHELSEA  
12



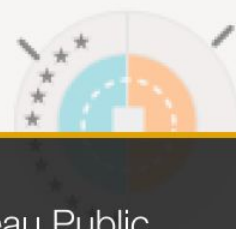
BAYERN MUNICH  
13



REAL MADRID  
14



BARCELONA  
15



REAL MADRID  
16



REAL M  
17

@\_CJMayes on Tableau Public

# 140 YEARS OF MICHIGAN FOOTBALL

This graphic, inspired by Georgia 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

Year

1997

BLUE SHADING  
REPRESENTS A TOP 25  
RANKING AT THE END  
OF THE YEAR

AN ARC ON THE LEFT  
IS A BOWL WIN

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 ailing 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.

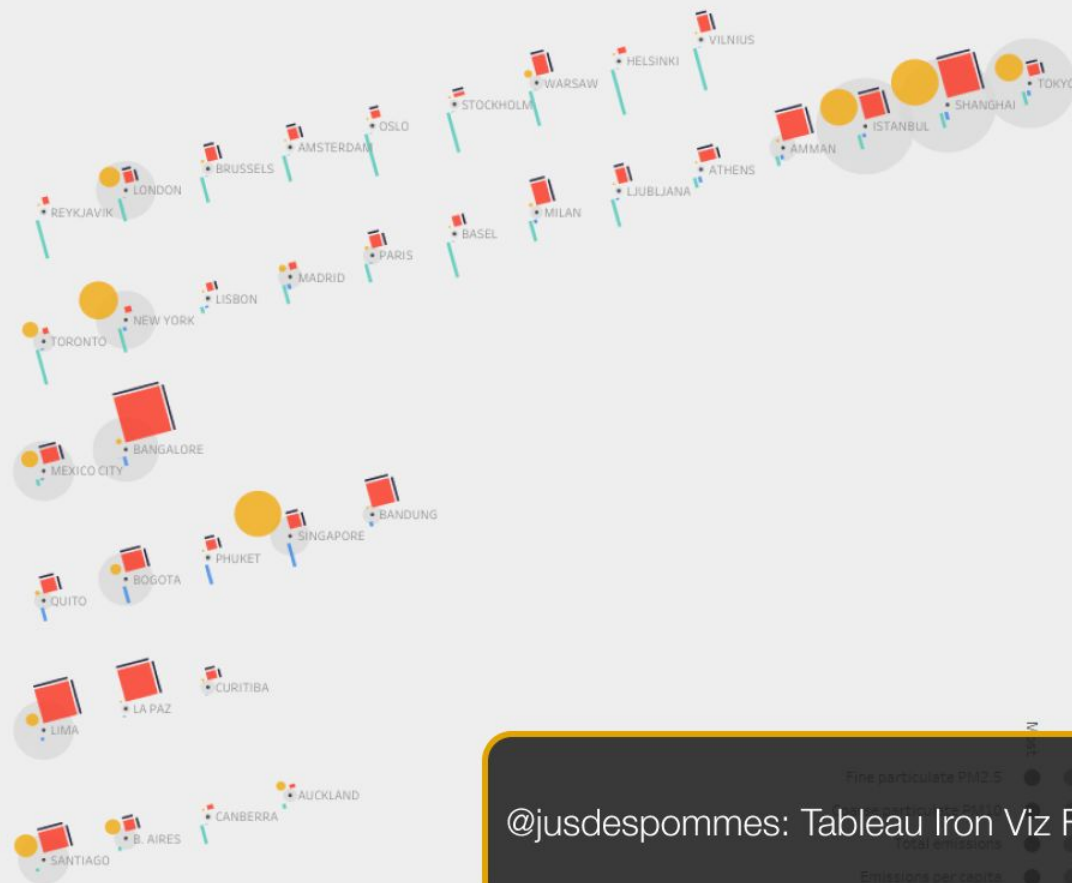
Common-sense dictates that more people means more consumption of energy and the raw materials needed to produce it - this consumption has byproducts.

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



latitude buckets of 20°



@jusdespommes: Tableau Iron Viz Finalist 2020

Show me insight 36

Emission scope

Fine particulate PM2.5

Total emissions

Emissions per capita

Population

Total energy need





@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.

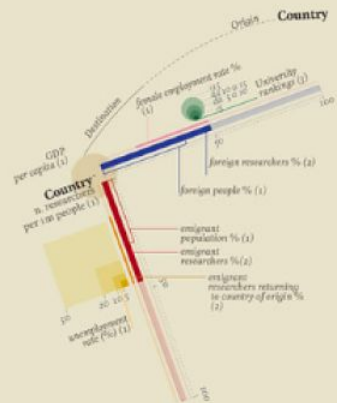
Using a series of parameters, the map is an attempt to discover the motivations that move researchers from one country to another.

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 (1)



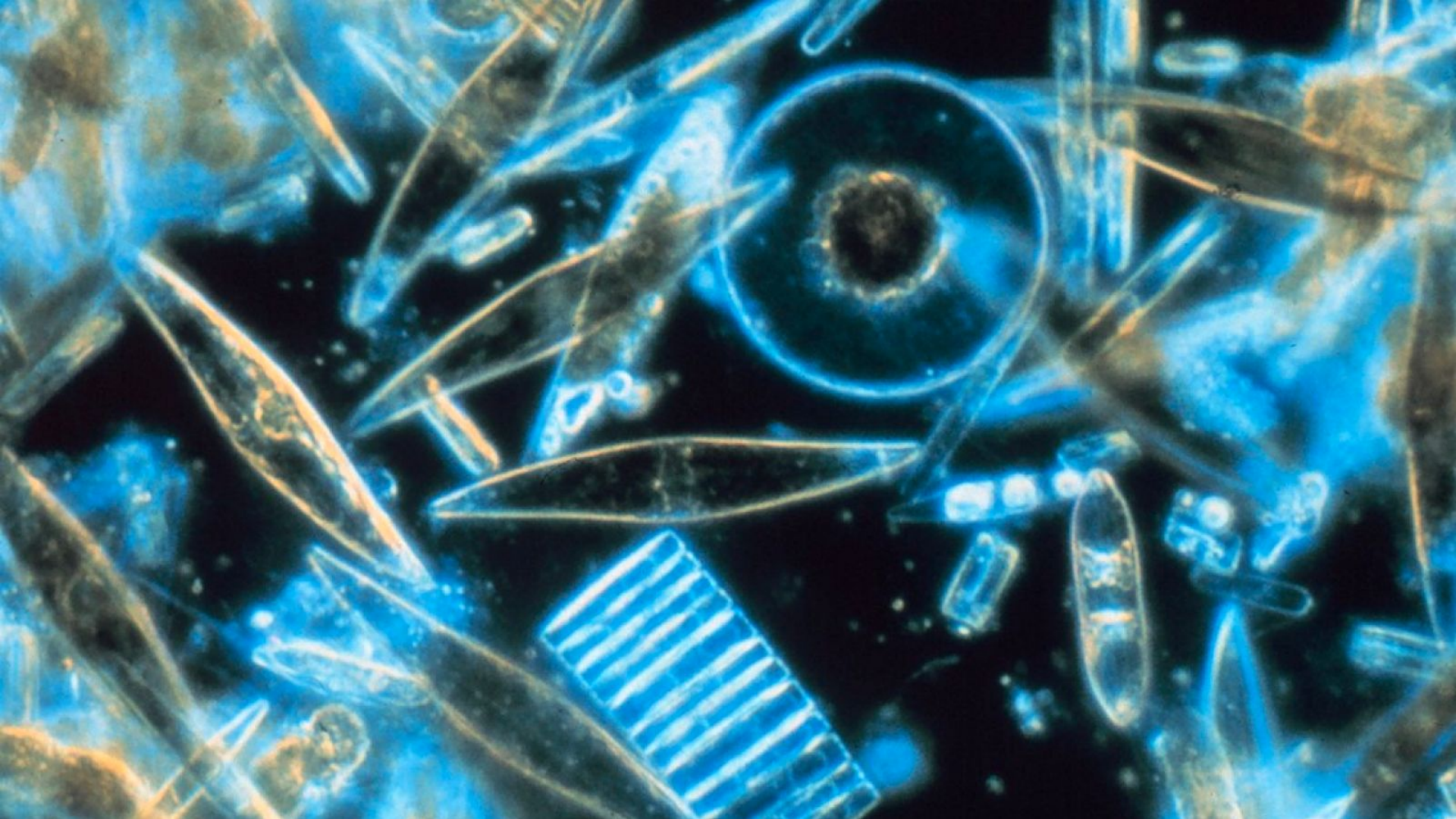
@accuratstudio for La Lettura

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



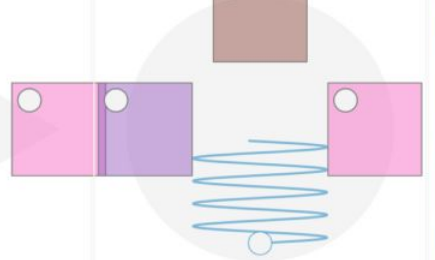
New York City, NY



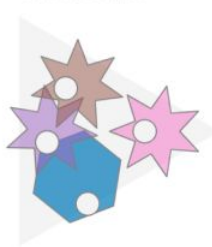
New York City, NY



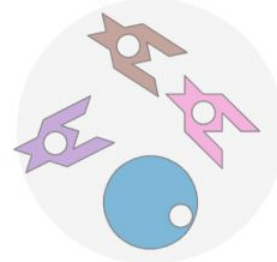
New York City, NY



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

Column Set #1

Column Set #2

Place	Region	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

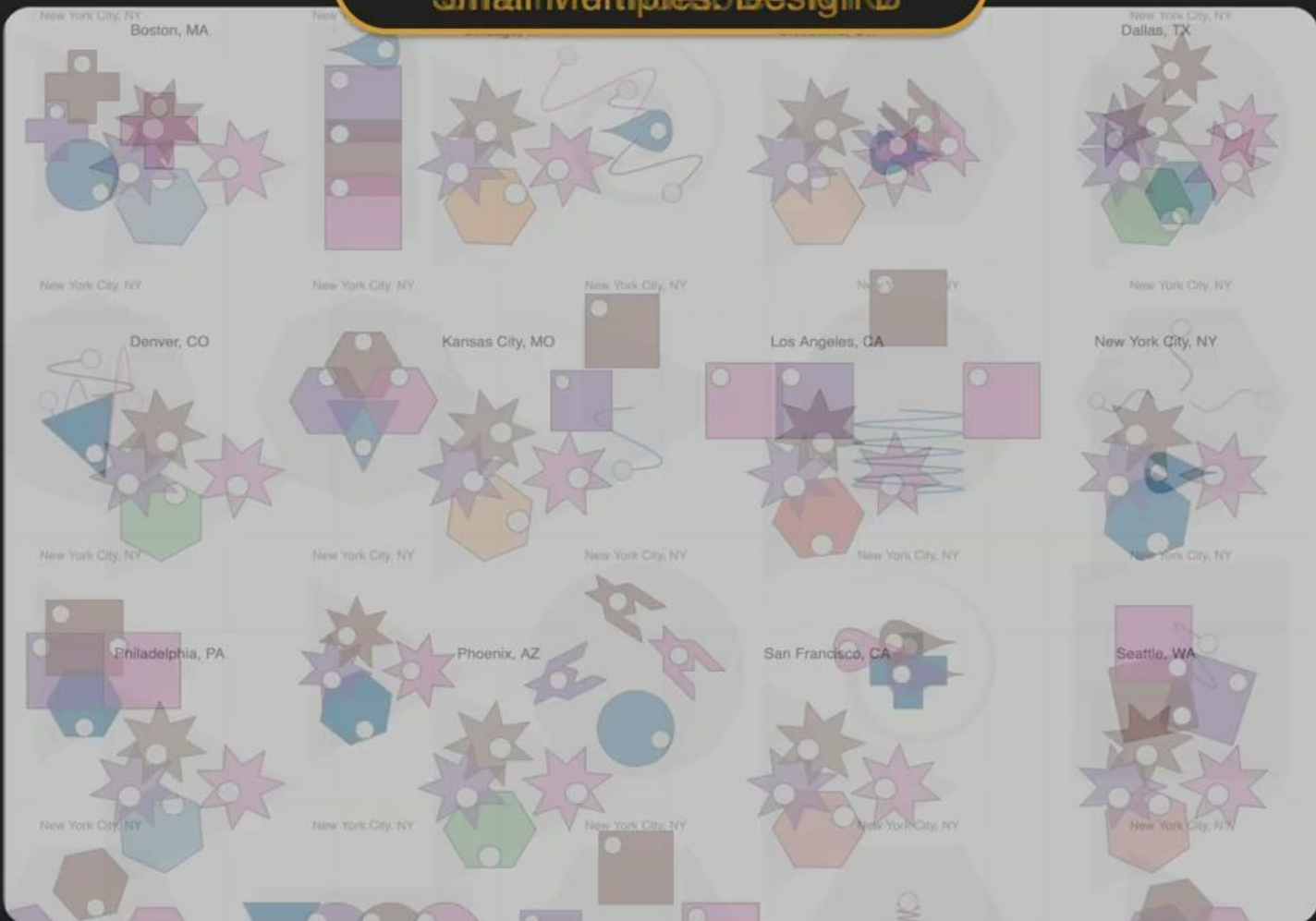
## Mark Shapes



## Encoding Channels



## Glyph Scaffolds



# Diatoms in Tableau

Generative Design Inspiration for Glyphs with

# Diatoms

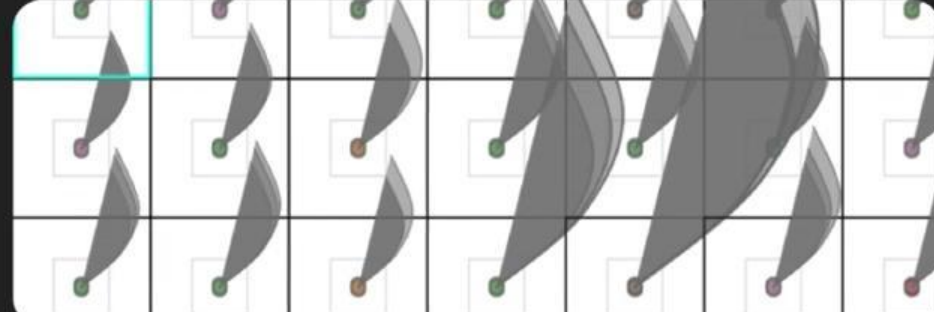
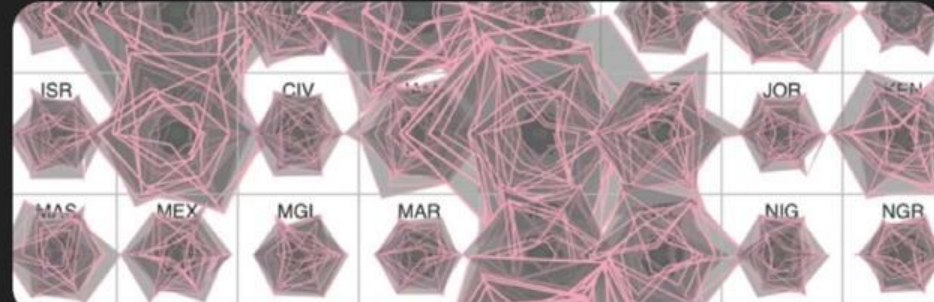
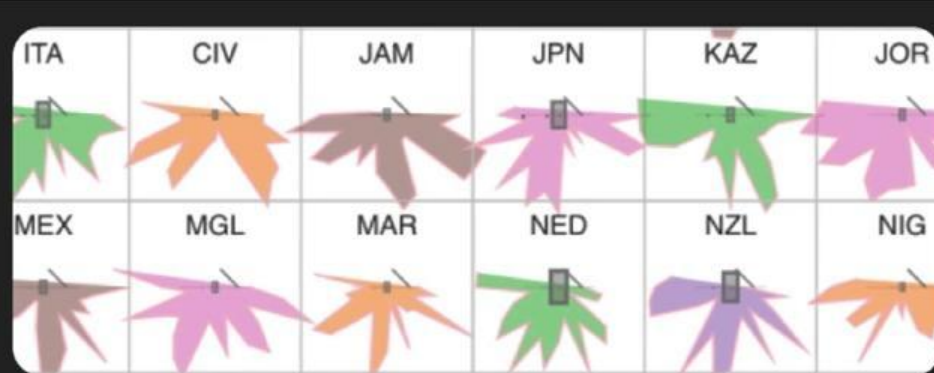
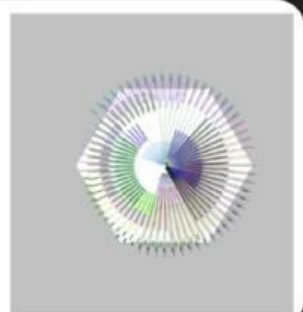
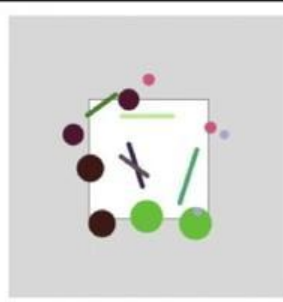
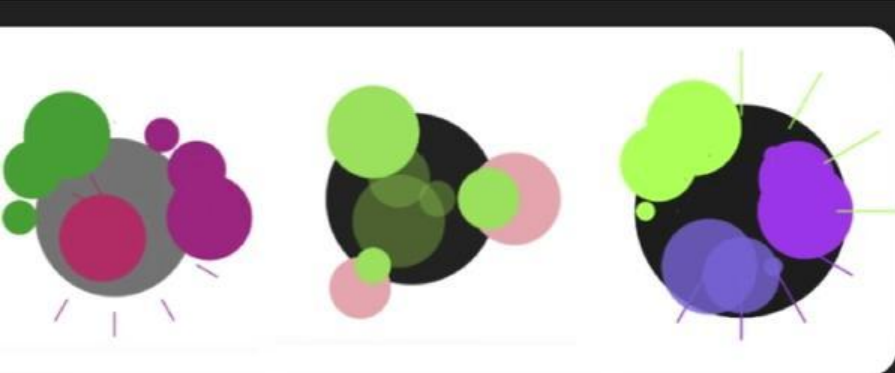
**Matthew Brehmer, Robert Kosara, and Carmen Hull**

mbrehmer | rkosara [at] tableau.com, carmen.hull [at] ucalgary.ca

research.tableau.com • IEEE VIS 2021







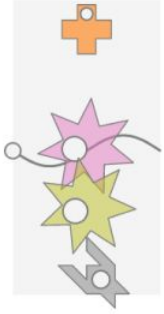
The background is a dark, textured surface with a complex pattern of thin, intersecting lines in shades of blue and yellow. There are also larger, faint geometric shapes, including a prominent circle in the upper right and a rectangular shape with horizontal lines in the lower left. The overall effect is a dense, abstract composition.

# 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

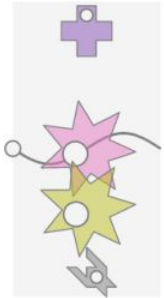
Australia



Brazil



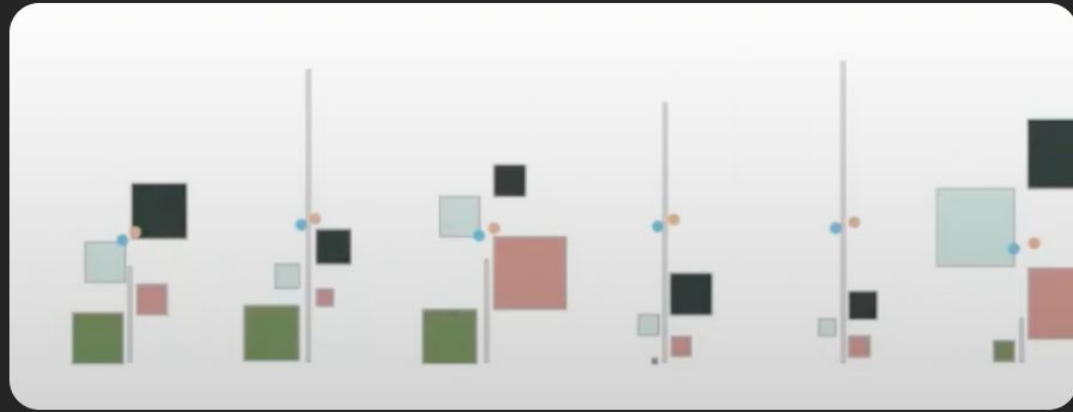
United Kingdom



Indonesia

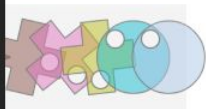


## P2's Glyph Designs



# P3's Glyph Design

WALL-E



WALL-E



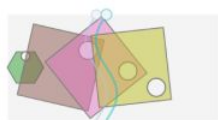
WALL-E



WALL-E



WALL-E



WALL-E



WALL-E



WALL-E



WALL-E



Titans  
1987



American History &  
1993



Saving Private Ryan  
1998



American Beauty  
2000



The Green Mile  
2009



The Matrix  
1999



Gladiator  
2000



Memento  
2000



The Lord of the Rings (I)  
2001



K8R (K1) (I)  
2001



Pirates of the Caribbean (I)  
2001

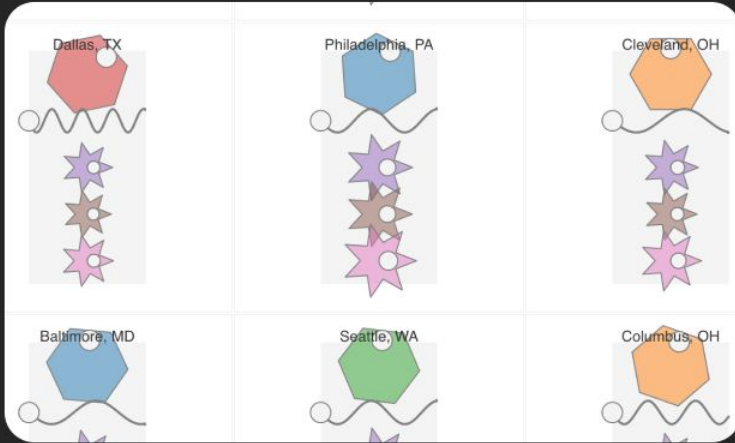


The Lord of the Rings (III)  
2001





# P5's Glyph Design



A microscopic image of various diatoms, which are single-celled algae with silica-based cell walls. The image shows a variety of shapes, including elongated, rectangular, and circular forms, some with intricate patterns and structures. The background is dark, and the diatoms are illuminated in shades of blue and yellow.

# 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

Bring-your-own palettes

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 is a dark, textured image featuring various diatoms, which are microscopic algae with intricate, often geometric, silica-based cell walls. These structures appear in shades of blue and brown against a dark background, creating a complex, organic pattern.

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

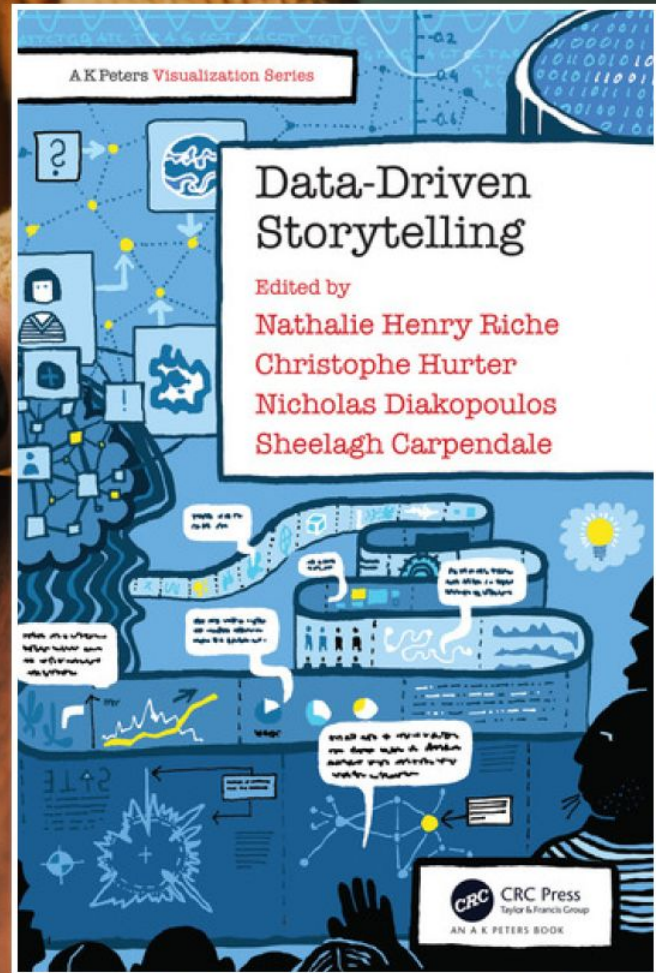
To appear in IEEE TVCG / VIS 2021

**Matt Brehmer, Robert Kosara**









Life expectancy at birth, tot

60  
55  
50  
45  
40

1962

30

1

45 5 55 6 65 7

8

s per woman)

Lin

Start

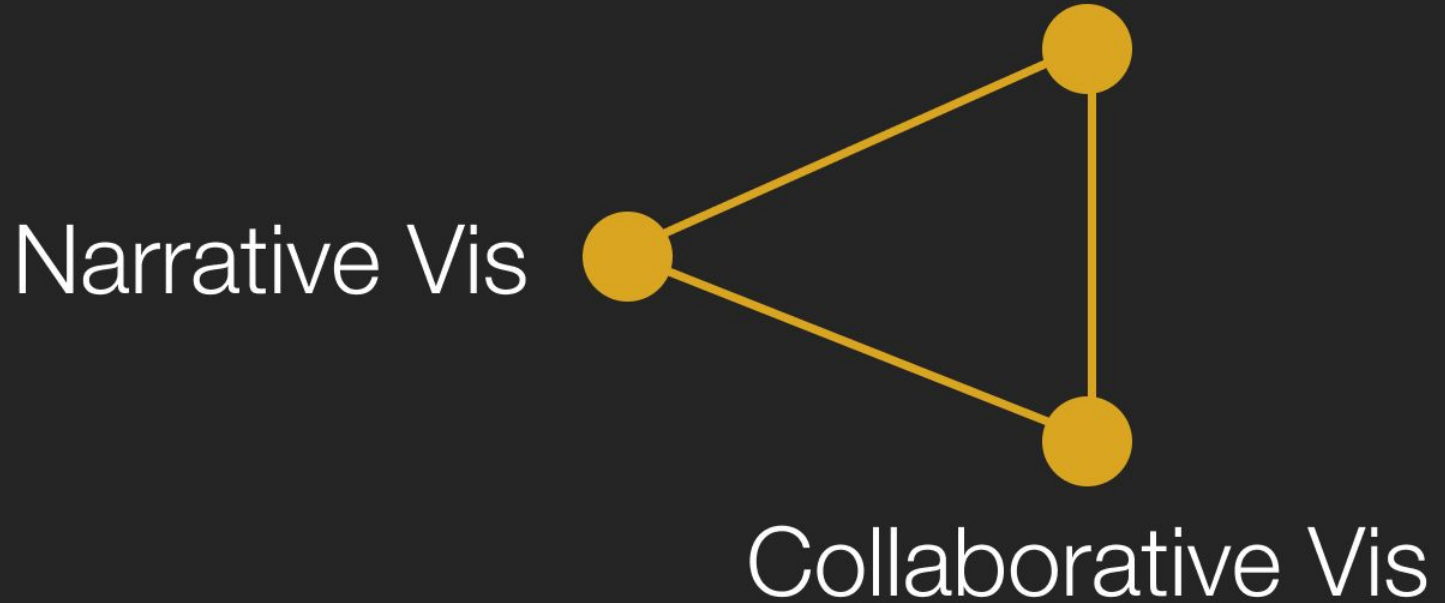
Current time

Stop





# Data in Organizations

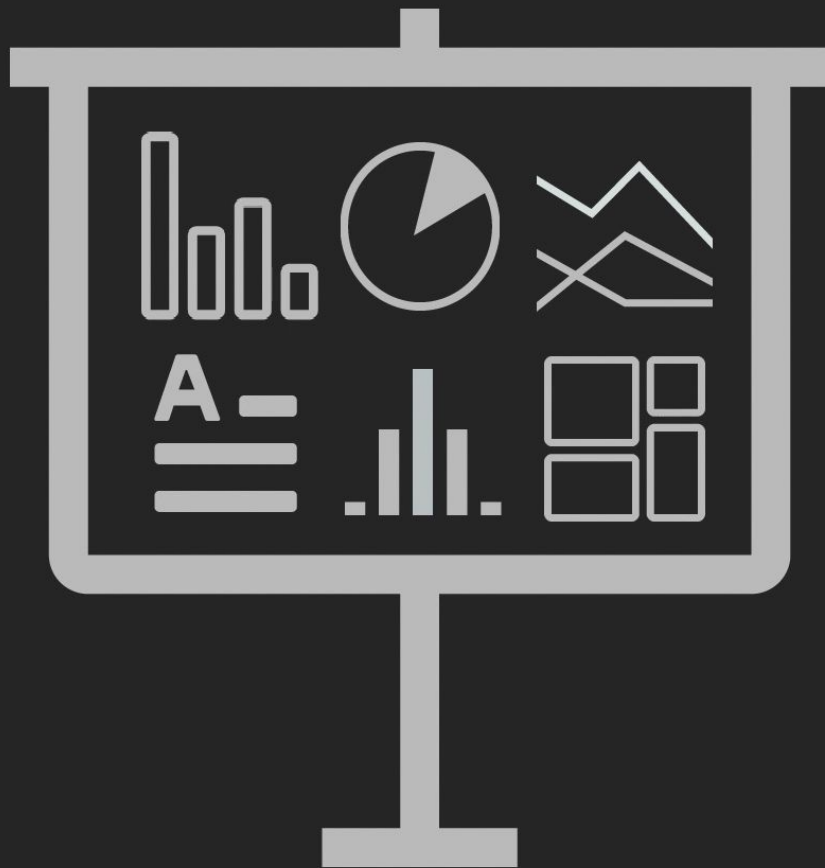


# Interviews

Retrospectives + Design Probes

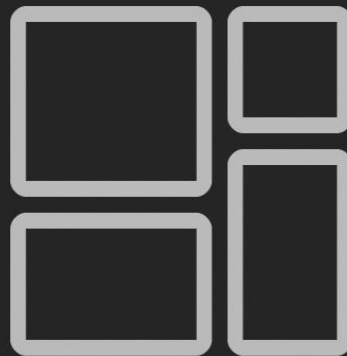
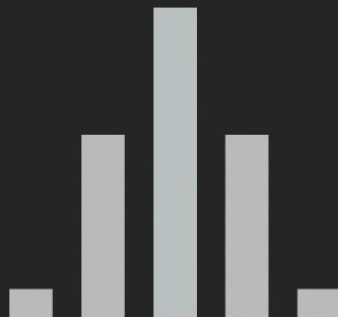
# Design Probes







A =





# 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





A neon sign mounted on a wall. The word "SOCIAL" is in pink, uppercase, sans-serif letters. Below it, the word "Live" is in a light blue, cursive script. Below "Live" is the word "JAZZ" in light blue, uppercase, sans-serif letters. The sign is set against a dark, textured background. A black electrical box with wires is visible on the left side of the sign.

SOCIAL  
*Live*  
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

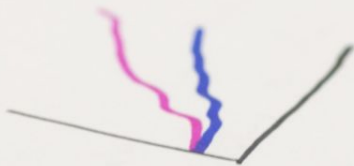
*“I want to break up an otherwise boring series of charts [...].”*

*“I hate bar charts [...].”*

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

– P09, marketing manager





1. 6000  
 2. 4320  
 3. 2700  
 4. 1440  
 5. 720  
 6. 360  
 7. 180  
 8. 90  
 9. 45  
 10. 22.5  
 11. 11.25  
 12. 5.625  
 13. 2.8125  
 14. 1.40625  
 15. 0.703125  
 16. 0.3515625  
 17. 0.17578125  
 18. 0.087890625  
 19. 0.0439453125  
 20. 0.02197265625  
 21. 0.010986328125  
 22. 0.0054931640625  
 23. 0.00274658203125  
 24. 0.001373291015625  
 25. 0.0006866455078125  
 26. 0.00034332275390625  
 27. 0.000171661376953125  
 28. 0.0000858306884765625  
 29. 0.00004291534423828125  
 30. 0.000021457672119140625  
 31. 0.0000107288360595703125  
 32. 0.00000536441802978515625  
 33. 0.000002682209014892578125  
 34. 0.0000013411045074462890625  
 35. 0.00000067055225372314453125  
 36. 0.000000335276126861572265625  
 37. 0.0000001676380634307861328125  
 38. 0.00000008381903171539306640625  
 39. 0.000000041909515857696533203125  
 40. 0.0000000209547579288482666015625  
 41. 0.00000001047737896442413330078125  
 42. 0.000000005238689482212066650390625  
 43. 0.0000000026193447411060333251953125  
 44. 0.00000000130967237055301666259765625  
 45. 0.000000000654836185276508331298828125  
 46. 0.0000000003274180926382541656494140625  
 47. 0.00000000016370904631912708282470703125  
 48. 0.000000000081854523159563541412353515625  
 49. 0.0000000000409272615797817707061767578125  
 50. 0.00000000002046363078989088535308837890625  
 51. 0.000000000010231815394945442676544189453125  
 52. 0.0000000000051159076974727213382720947265625  
 53. 0.00000000000255795384873636066913604736328125  
 54. 0.000000000001278976924368180334568023681640625  
 55. 0.0000000000006394884621840901672840118408203125  
 56. 0.00000000000031974423109204508364200592041015625  
 57. 0.000000000000159872115546022541821002960205078125  
 58. 0.0000000000000799360577730112709105014801025390625  
 59. 0.00000000000003996802888650563545525074005126953125  
 60. 0.000000000000019984014443252817727625370025634765625  
 61. 0.00000000000000999200722162640886381268500128173828125  
 62. 0.000000000000004996003610813204431906342500640869140625  
 63. 0.0000000000000024980018054066022159531712503204345703125  
 64. 0.00000000000000124900090270330110797658562516021728515625  
 65. 0.000000000000000624500451351650553988292812580108642578125  
 66. 0.0000000000000003122502256758252769941464062900543212890625  
 67. 0.00000000000000015612511283791263849707320314502716064453125  
 68. 0.000000000000000078062556418956319248536601572513580322265625  
 69. 0.0000000000000000390312782094781596242683007862567901611328125  
 70. 0.00000000000000001951563910473907981213415039312839508056640625  
 71. 0.00000000000000000975781955236953990606707519656419754028203125  
 72. 0.000000000000000004878909776184769953033537598282098770141015625  
 73. 0.0000000000000000024394548880923849765167687991410493850705078125  
 74. 0.00000000000000000121972744404619248825838439957052469253525390625  
 75. 0.000000000000000000609863722023096244129167199785262346267626953125  
 76. 0.0000000000000000003049318610115481220645835998926311731338134765625  
 77. 0.00000000000000000015246593050577406103229179994631558656690673828125  
 78. 0.000000000000000000076232965252887030516115899973157793283453369140625  
 79. 0.0000000000000000000381164826264435152580579499865788966417266845703125  
 80. 0.00000000000000000001905824131322175762902897499328944832086334228515625  
 81. 0.0000000000000000000095291206566108788145114874996644724104316711428125  
 82. 0.00000000000000000000476456032830543940725574374983223620521583557140625  
 83. 0.000000000000000000002382280164152719703627871874916118102607917785703125  
 84. 0.0000000000000000000011911400820763598518139359374580590513039588928515625  
 85. 0.000000000000000000000595570041038179925906967968729029525651979446428125  
 86. 0.0000000000000000000002977850205190899629534839843645147628259897232140625  
 87. 0.00000000000000000000014889251025954498147674199218225738141299486160703125  
 88. 0.00000000000000000000007444625512977249073837099609112

Accessible presentation / attention mgmt.

Flexibility and scope of reveals.

Presenter tools beyond filters and notes.

No concern for changes behind the curtain.

Timely yet unexpected presentation tools.

Presenter tool templates.

Reveal for suspense and drama.

Tool-switching / material unrelated to data.

Presentations, not tool demonstrations.

Simple loop-based audience experience.

Analytical onboarding presentations.

Presentation authoring complexity.

Accessible presentation / attention mgmt.

Flexibility and scope of reveals.

Presenter tools beyond filters and notes.

No concern for changes behind the curtain.

Timely yet unexpected presentation tools.

Presenter tool templates.

**Reveal for suspense and drama.**

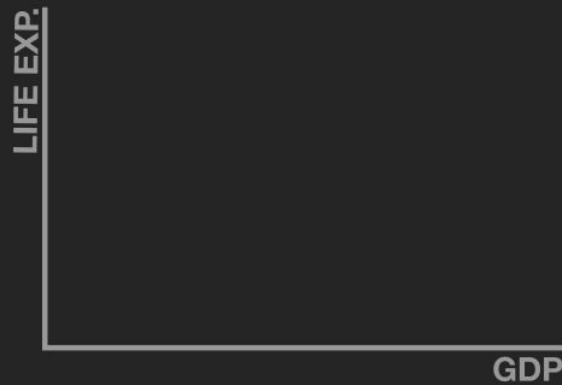
Tool-switching / material unrelated to data.

**Presentations, not tool demonstrations.**

Simple loop-based audience experience.

**Analytical onboarding presentations.**

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 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**

# 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

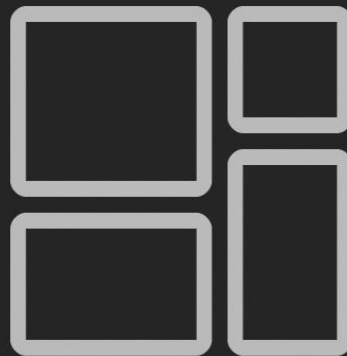
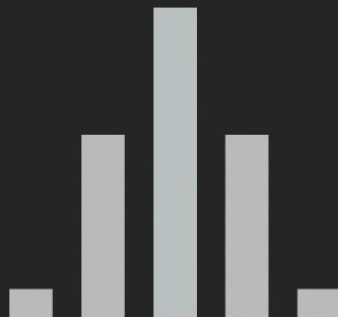
- **IEEE VIS 2021**: *From Jam Session to Recital: Synchronous Communication and Collaboration Around Data in Organizations*
- **Information+ 2021**: *The Information in Our Hands*

# The Information in Our Hands

Information+ 2021 - Matthew Brehmer



A =











12% 21% 30%  
Percentage of gradu

EXIT POLL

ALLIANCE GAIN DOWN NORTH FROM IND

TARGET

326 TO WIN

CONSERVATIVE WIN  
MAJORITY 86

CON HOLD HARLOW

CON GAIN LEIGH FROM LAB

20

23

0

0

3

2

+5

-7

0

0

+2

0

# TRAJECTORIES Confirmed



Data courtesy Johns Hopkins University

HOME  
MAP  
GLOBAL TOTALS  
COUNTRIES  
TRAJECTORIES  
AUSTRALIAN TYPE  
AUSTRALIAN CASES  
AUSTRALIAN TOTALS  
MAIN POINTS  
EXTRA



# SWING BY REGION

Con-Lab



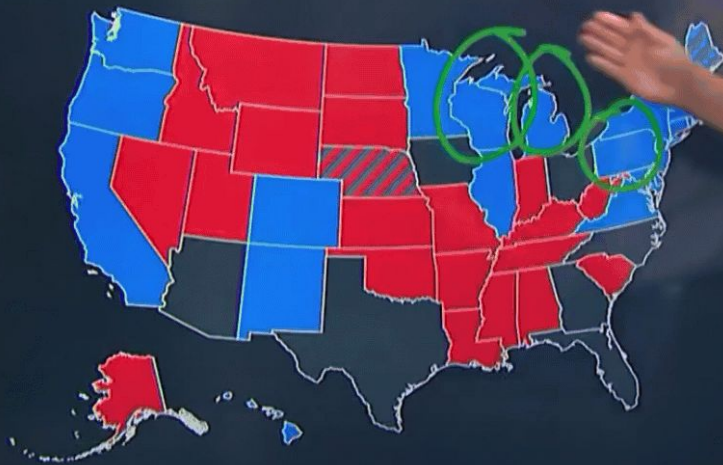
# ROAD TO 270 WHAT IF



**BIDEN WIN**

**272**

**131**



CLEAR



MAP

CART

GAME

NBC


PATHS

2016

BAT

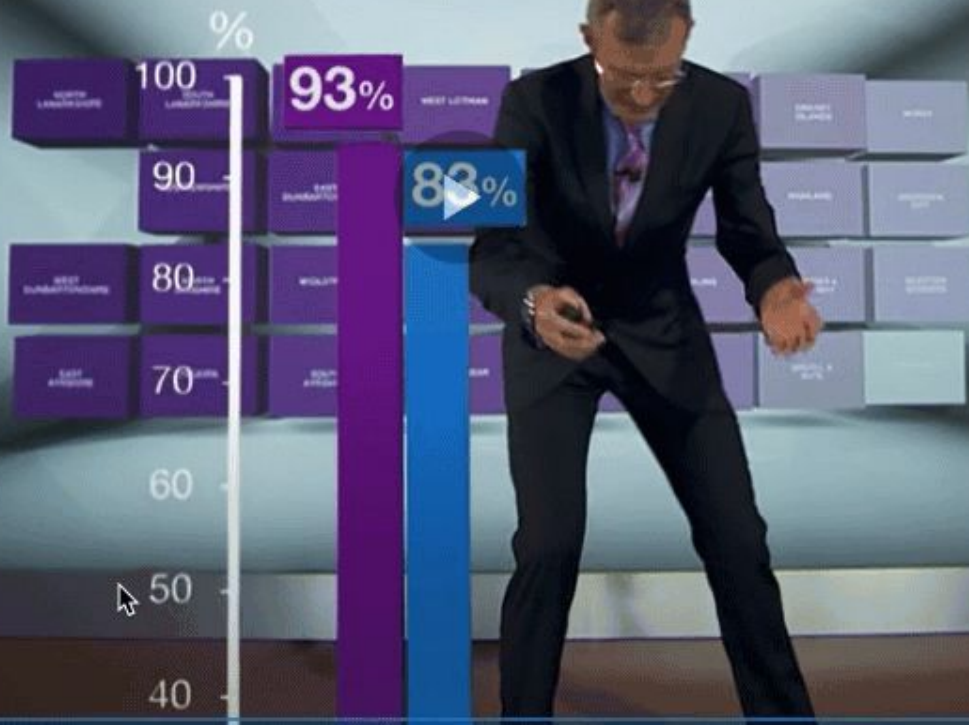
**BREAKING NEWS**

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

 **MSNBC**



# COUNCILS BY BIRTH PLACE: SCOTLAND



POWERED BY



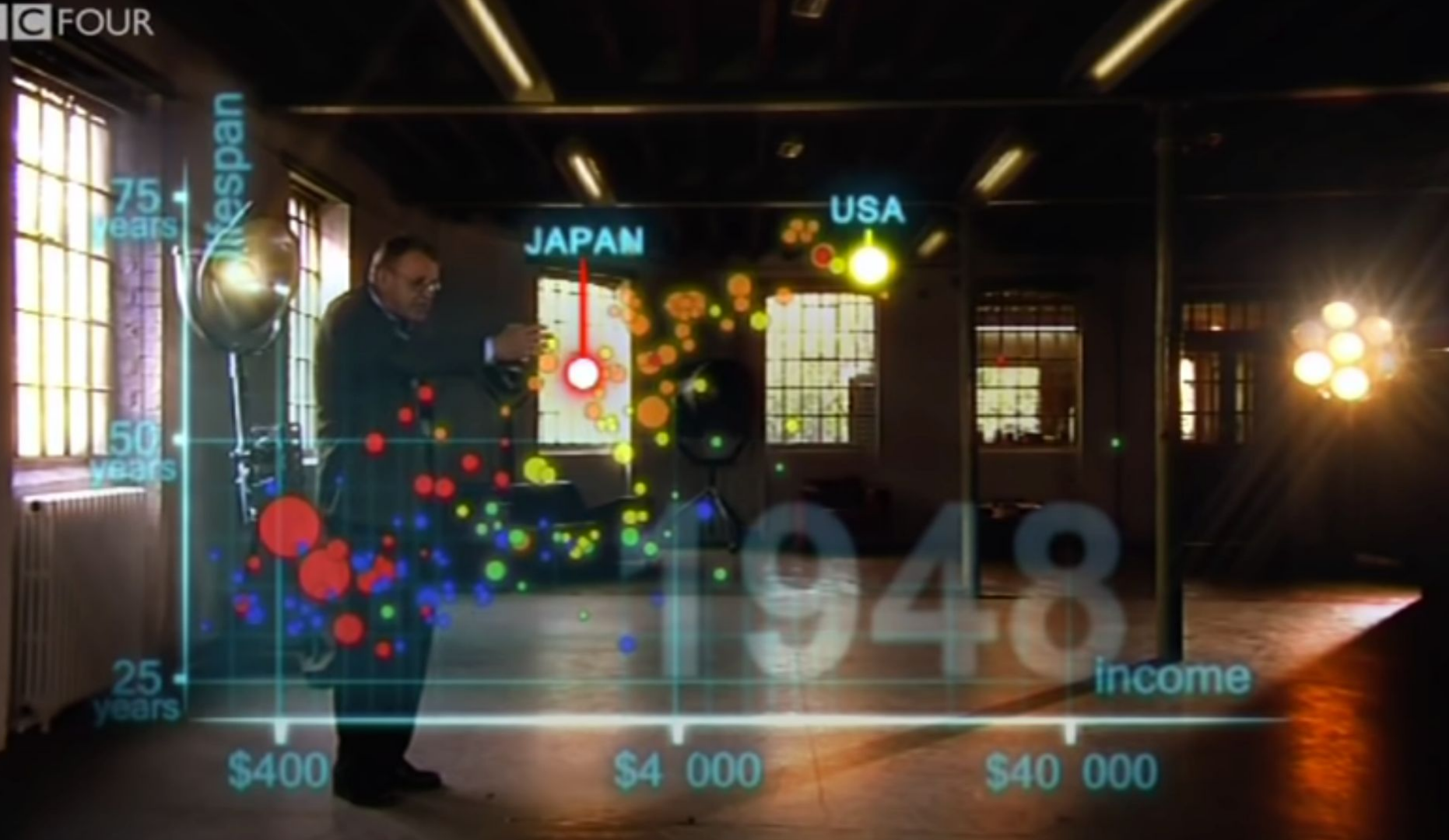
vizrt

SUB











# 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





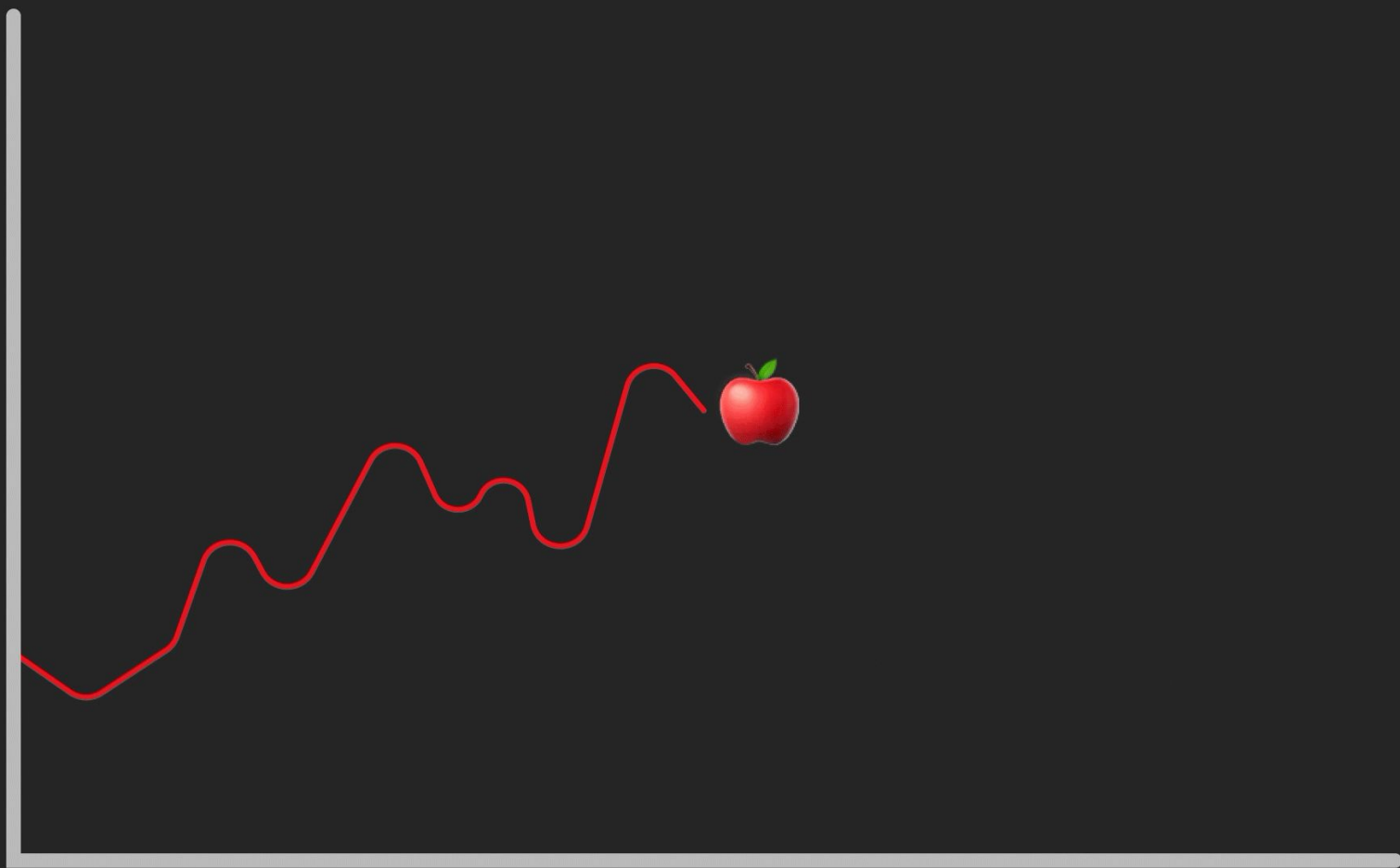




SALES



Sales



Time →













Life Exp.



# The Information in Our Hands

Information+ 2021 - Matthew Brehmer

# 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*



# 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

[research.tableau.com](https://research.tableau.com) | [@mattbrehmer](https://twitter.com/mattbrehmer) | [mbrehmer \[at\] tableau.com](mailto:mbrehmer@tableau.com)