

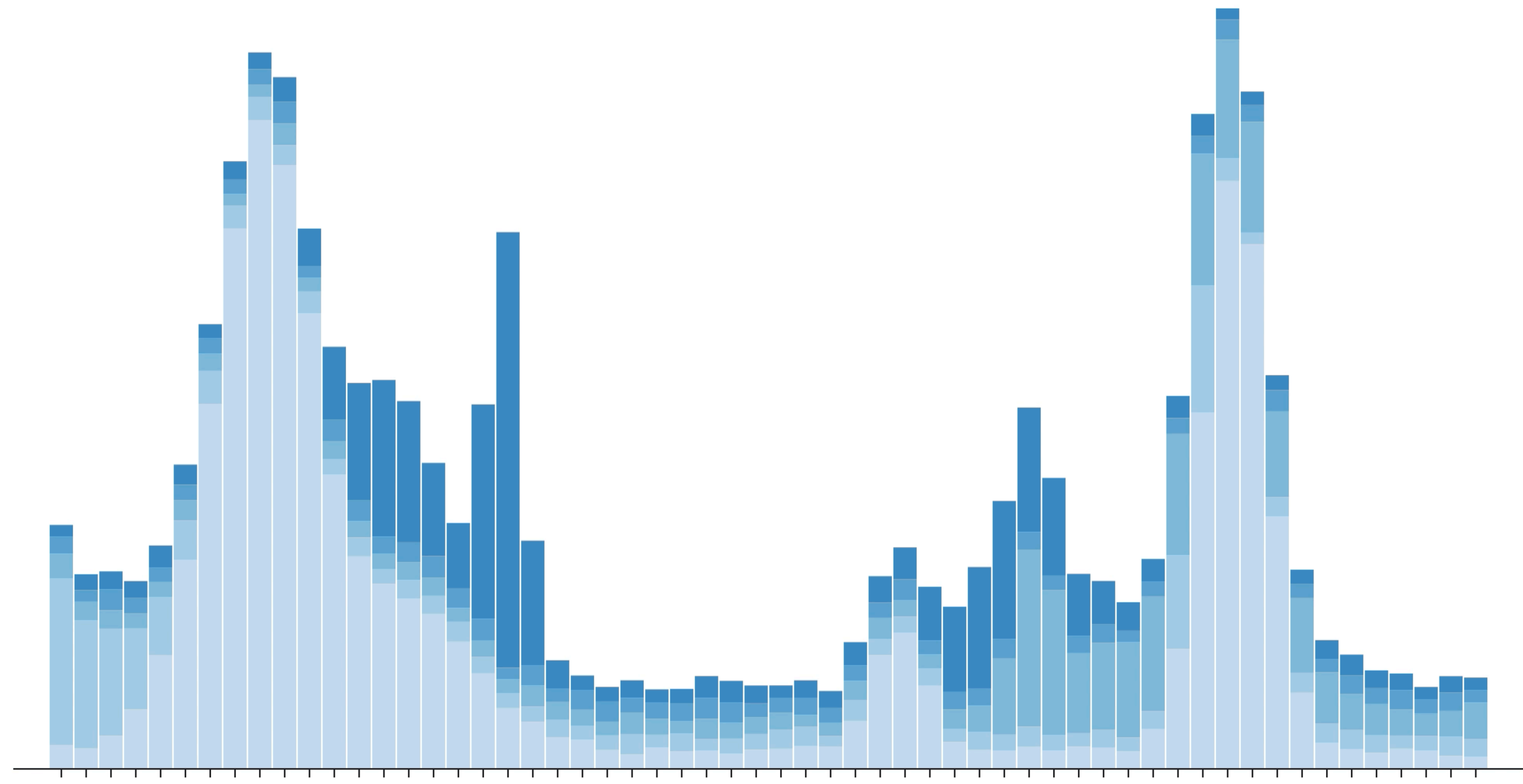
Information Visualization

Reading Visualization Papers

Dr. David Koop

Animated Transitions

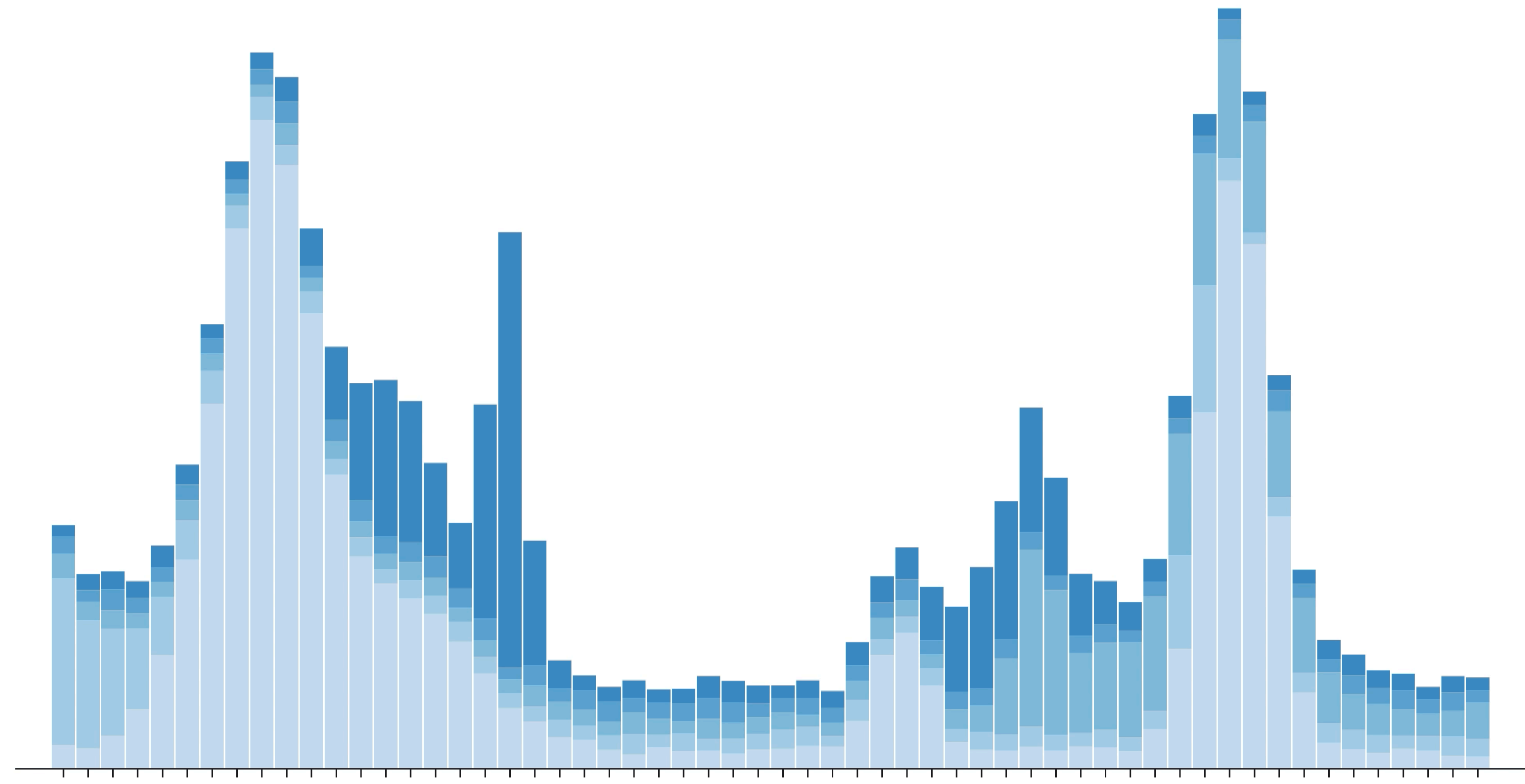
☐ Stacked ☒ Grouped



[M. Bostock]

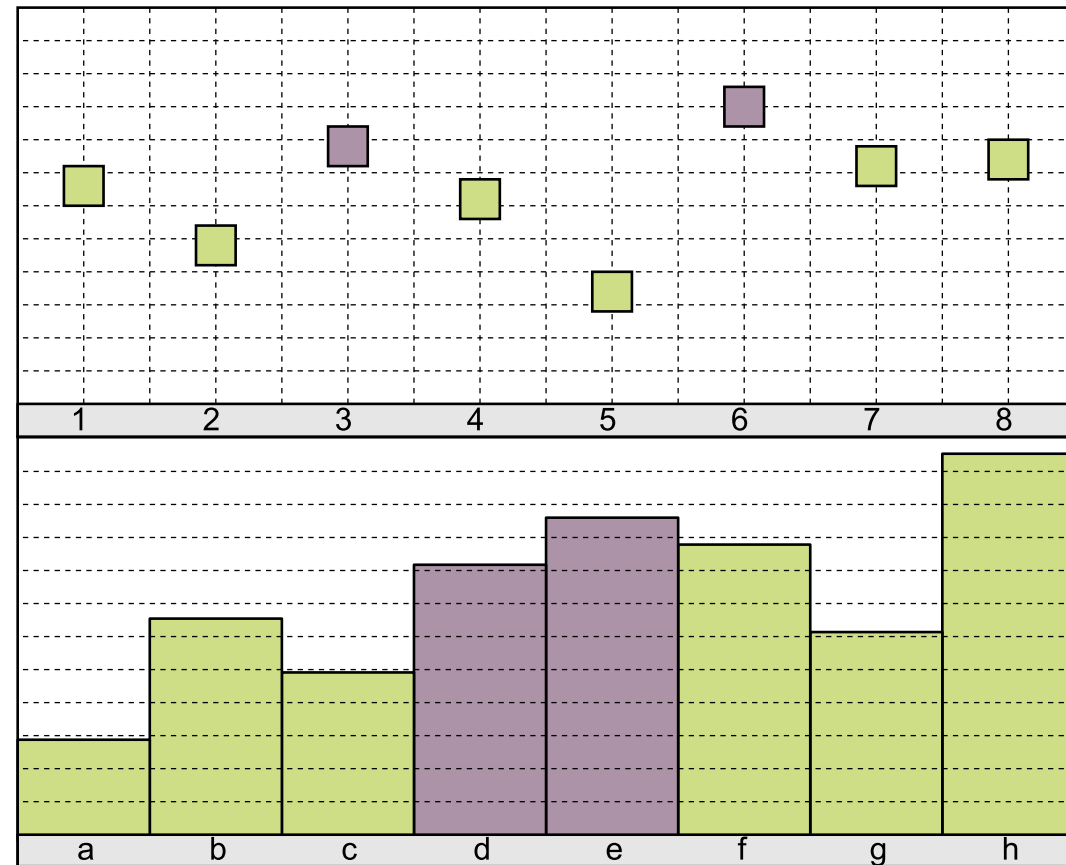
Animated Transitions

☐ Stacked ☒ Grouped

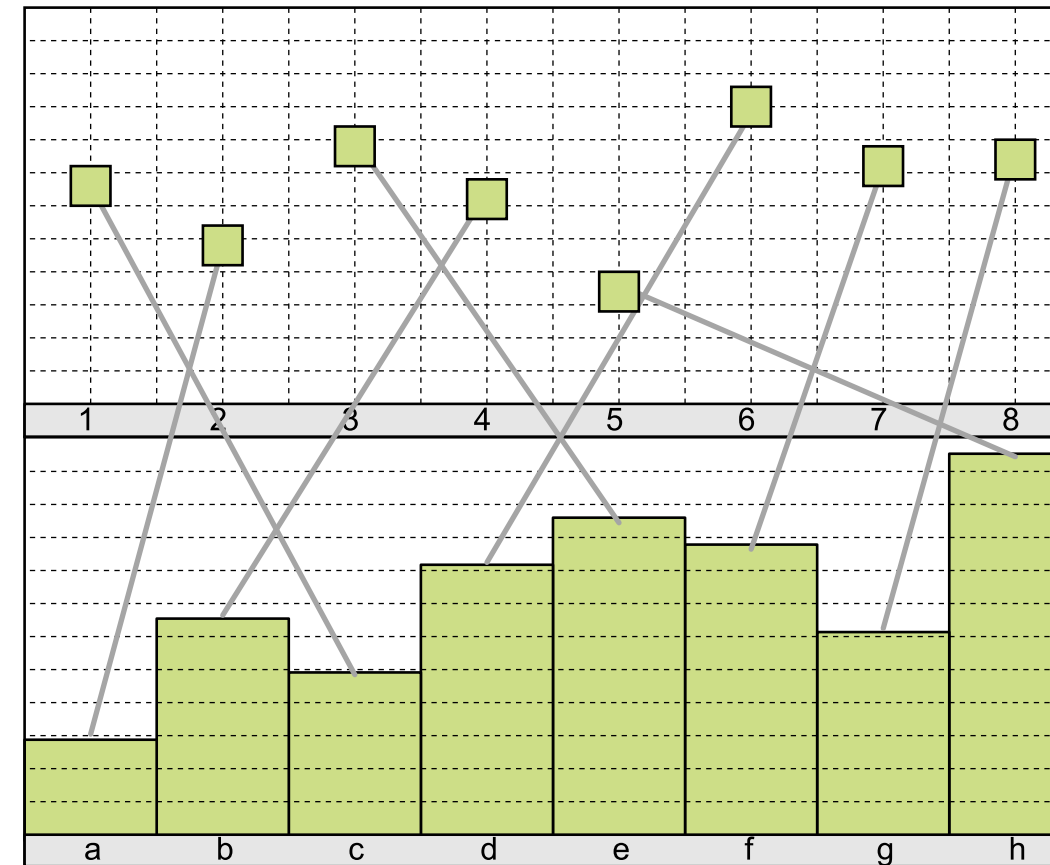


[M. Bostock]

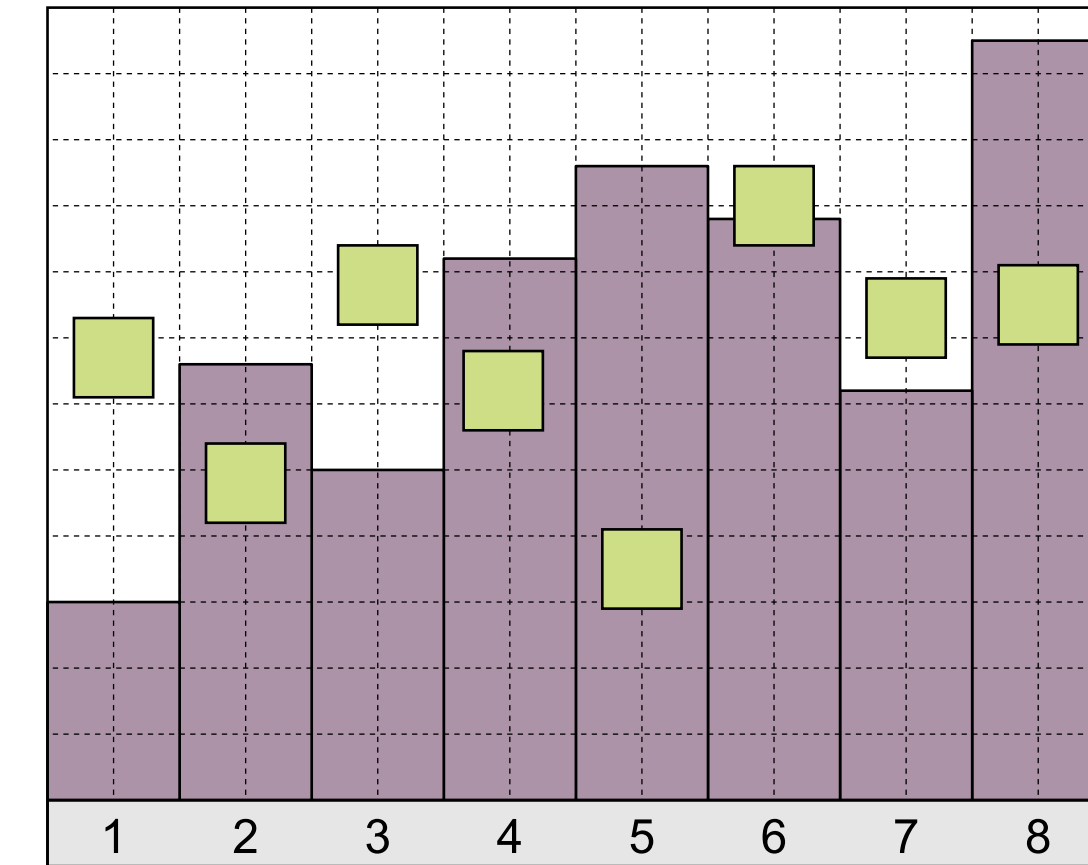
Composite Visualization Techniques



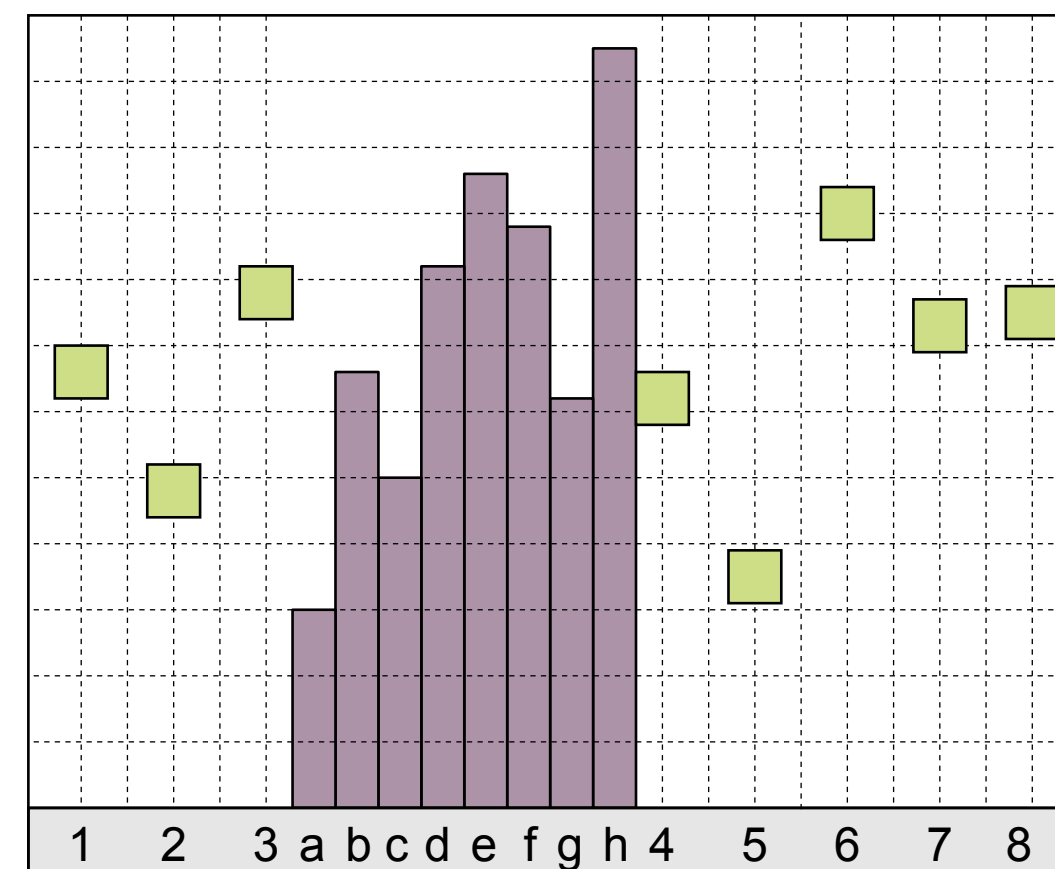
(a) Juxtaposed views.



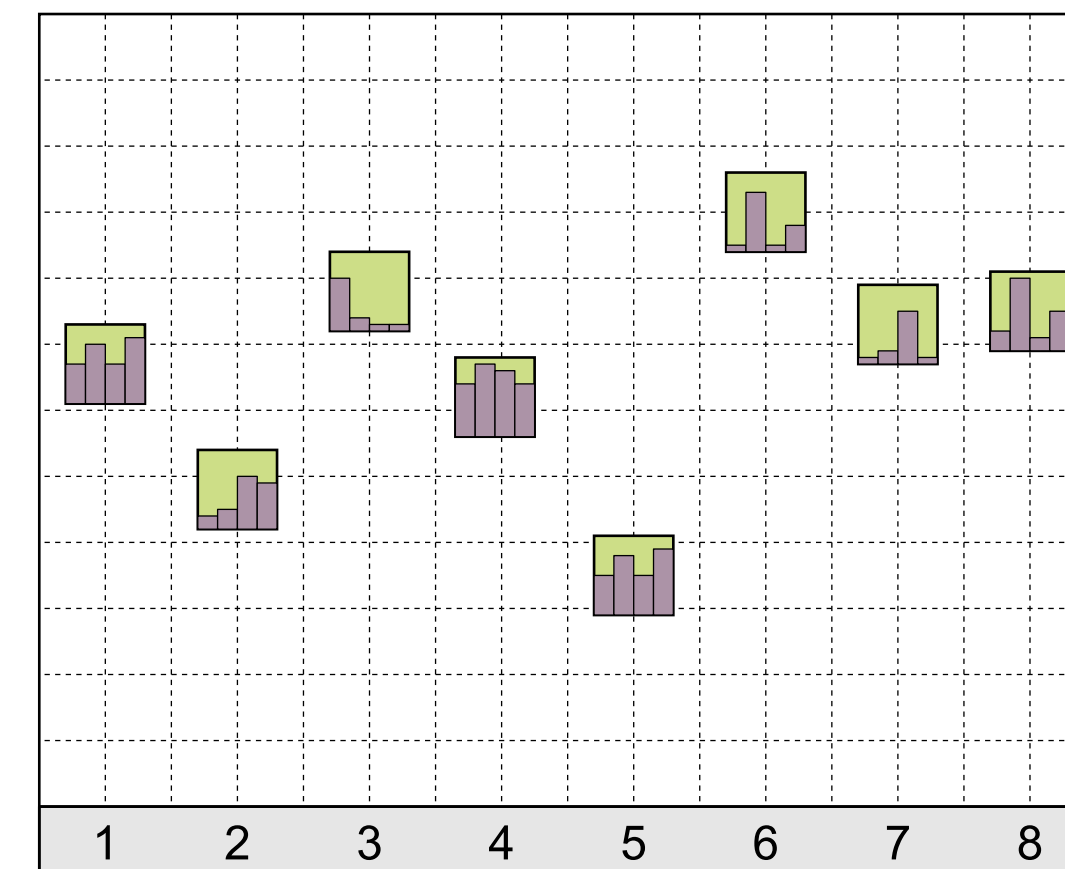
(b) Integrated views.



(c) Superimposed views.



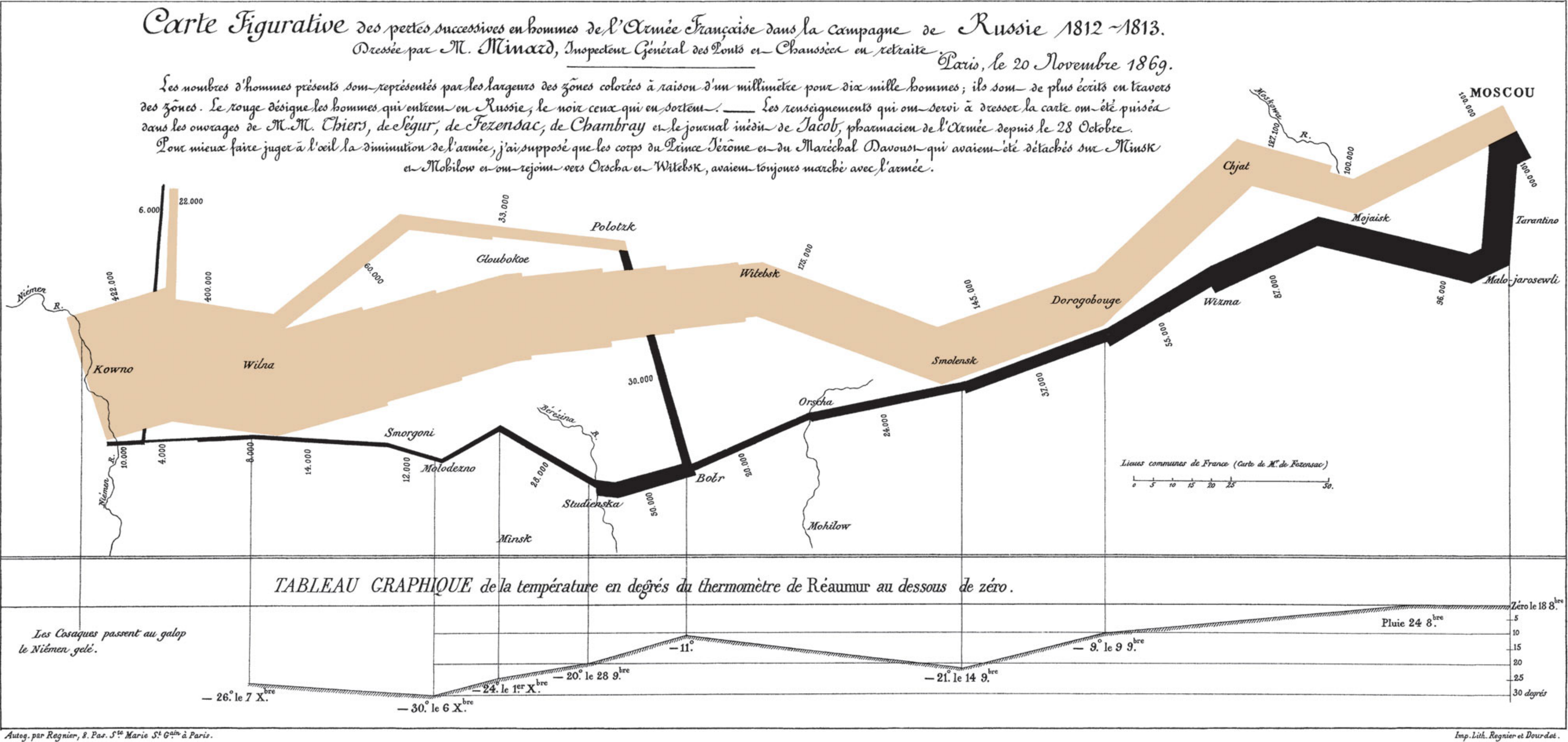
(d) Overloaded views.



(e) Nested views.

[W. Javed and N. Elmqvist, 2012]

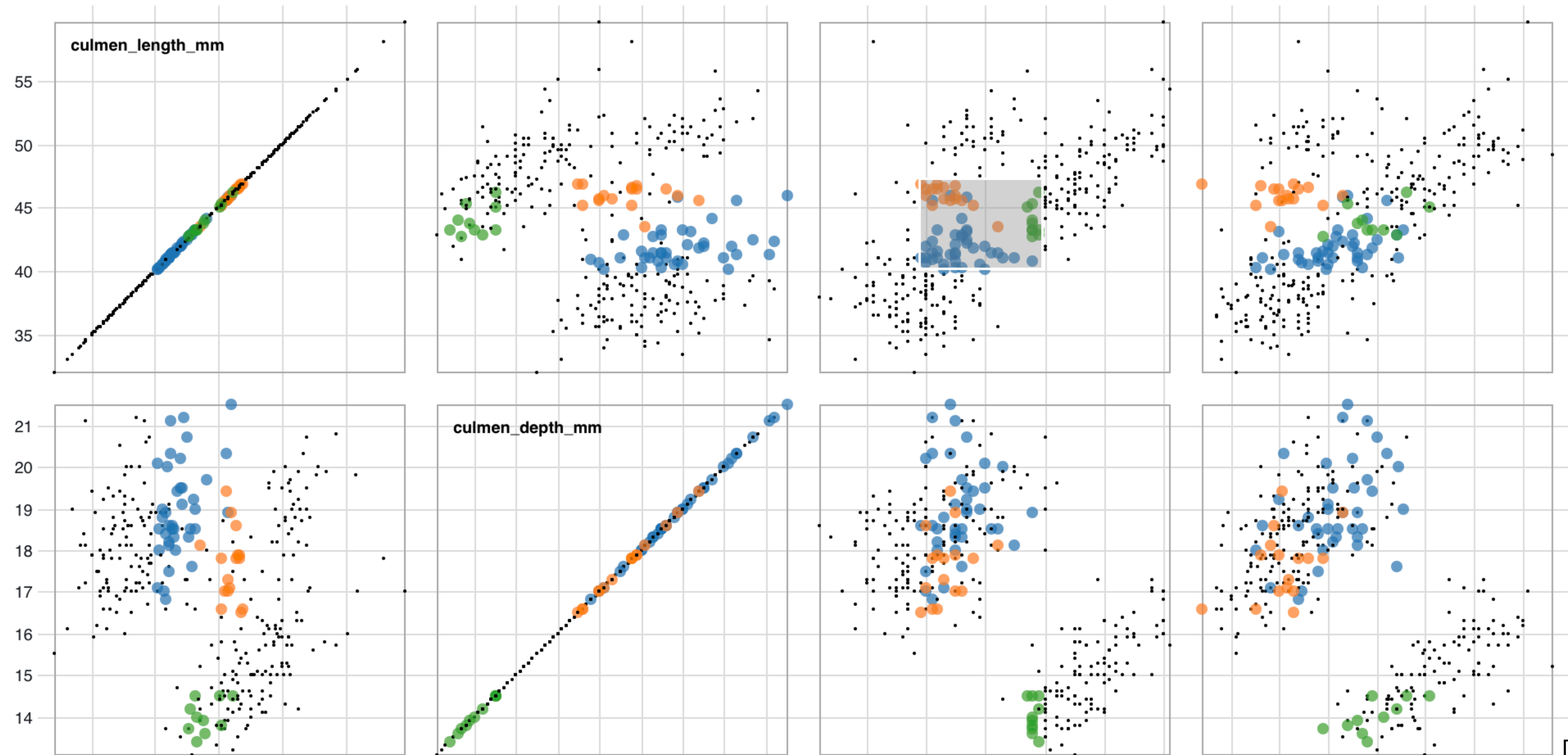
Integration



[Napoleon's March to Moscow, C. J. Minard, 1869]

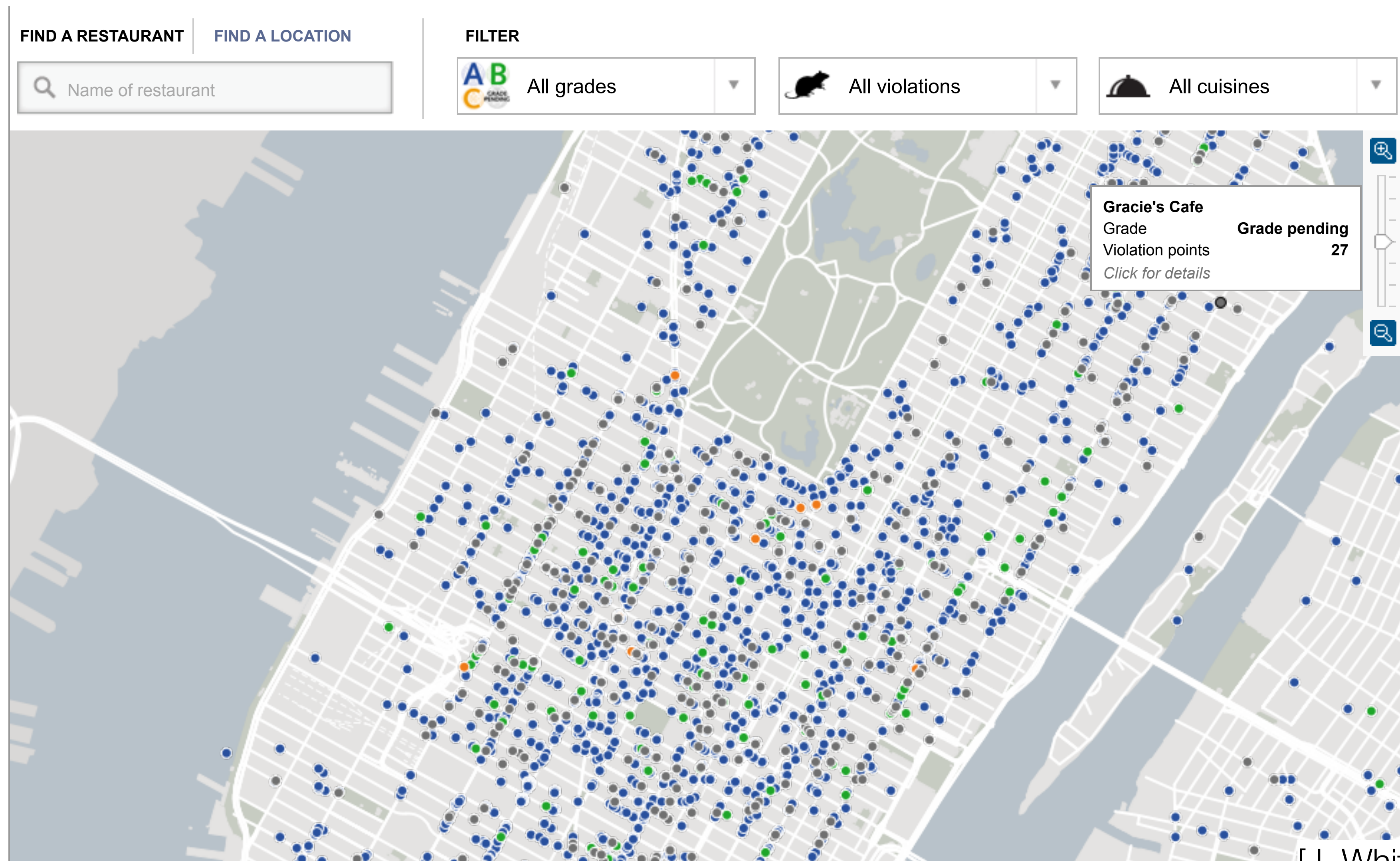
Brushing

■ Adelie ■ Chinstrap ■ Gentoo



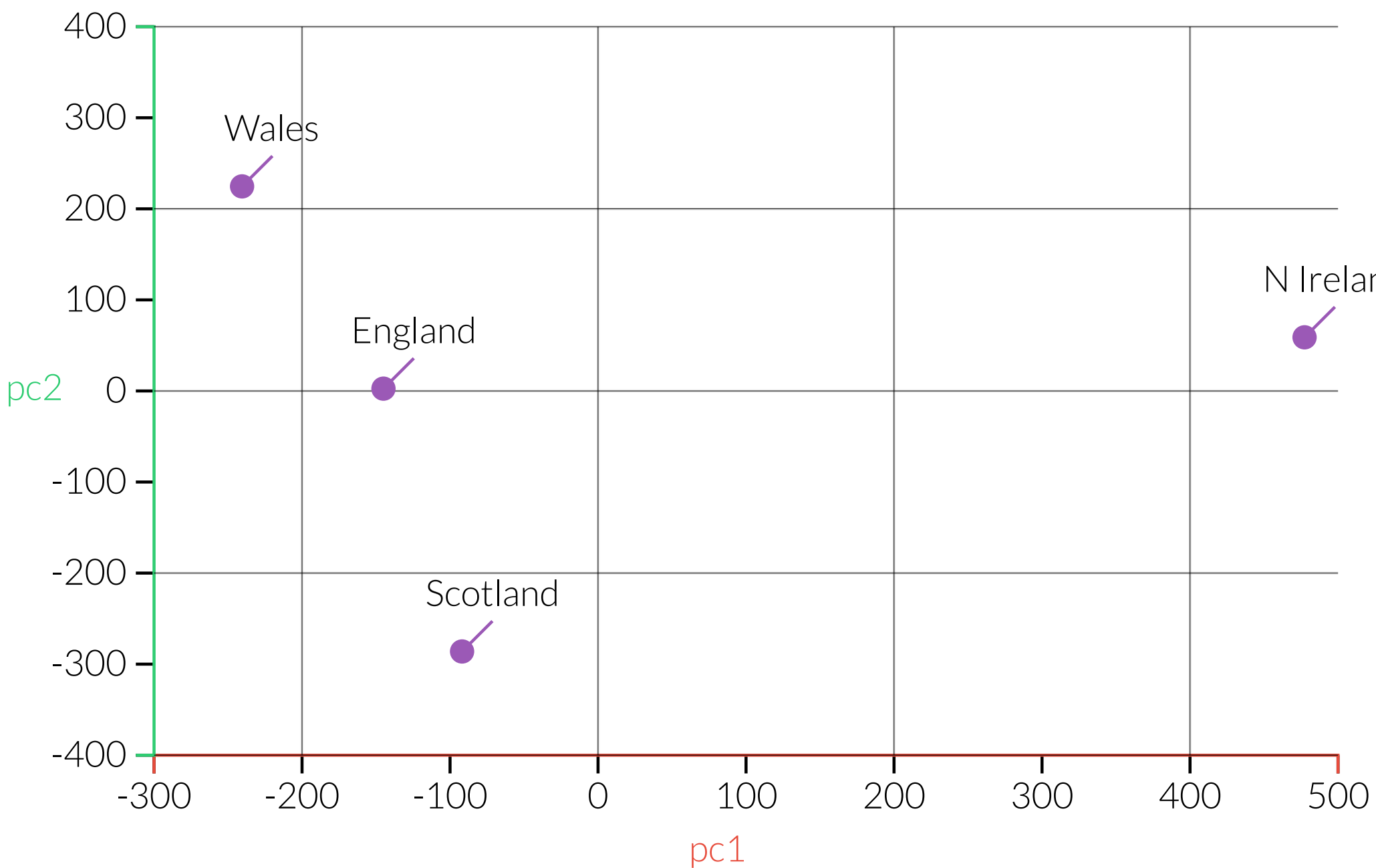
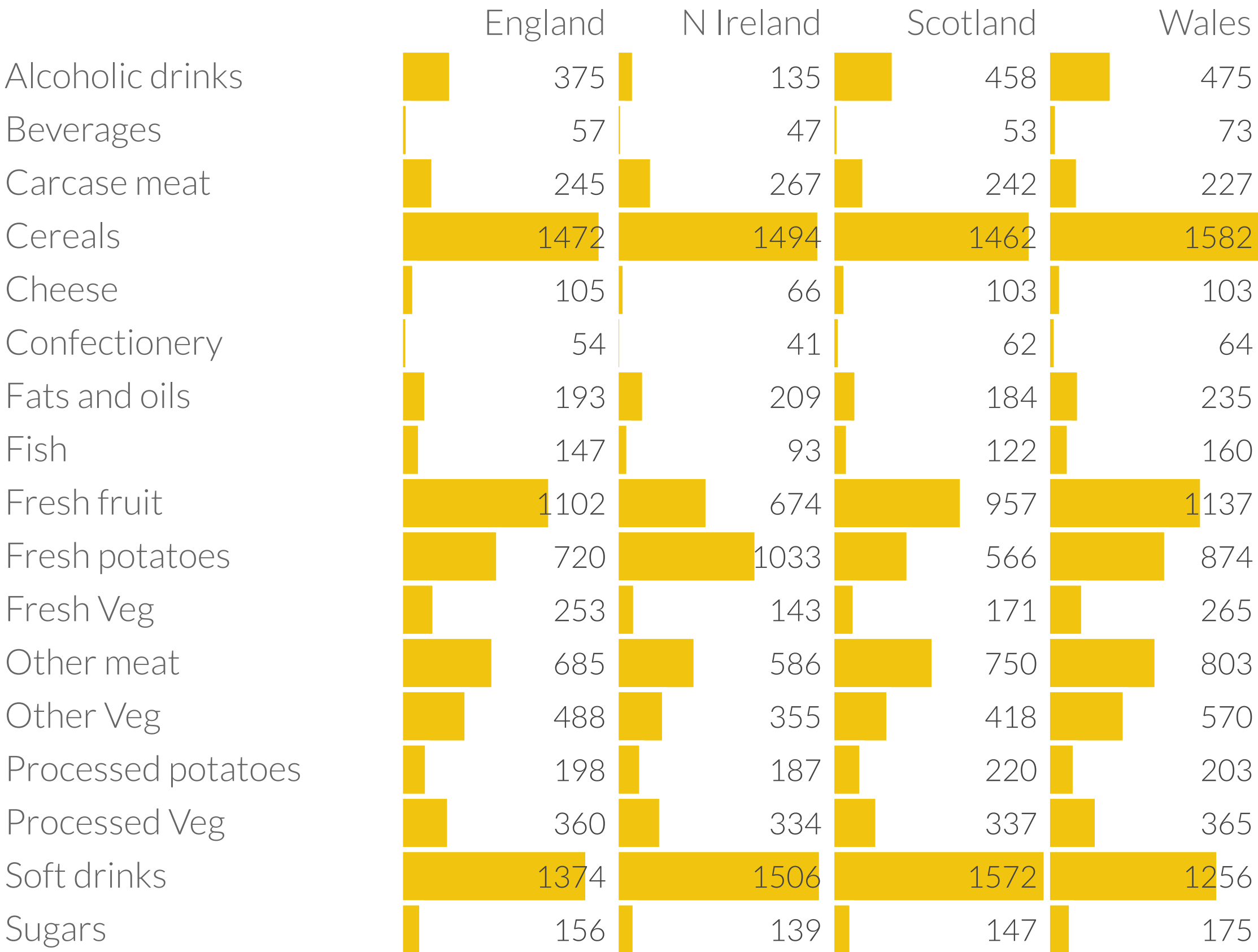
[M. Bostock]

Filtering using Widgets



[J. White, New York Times]

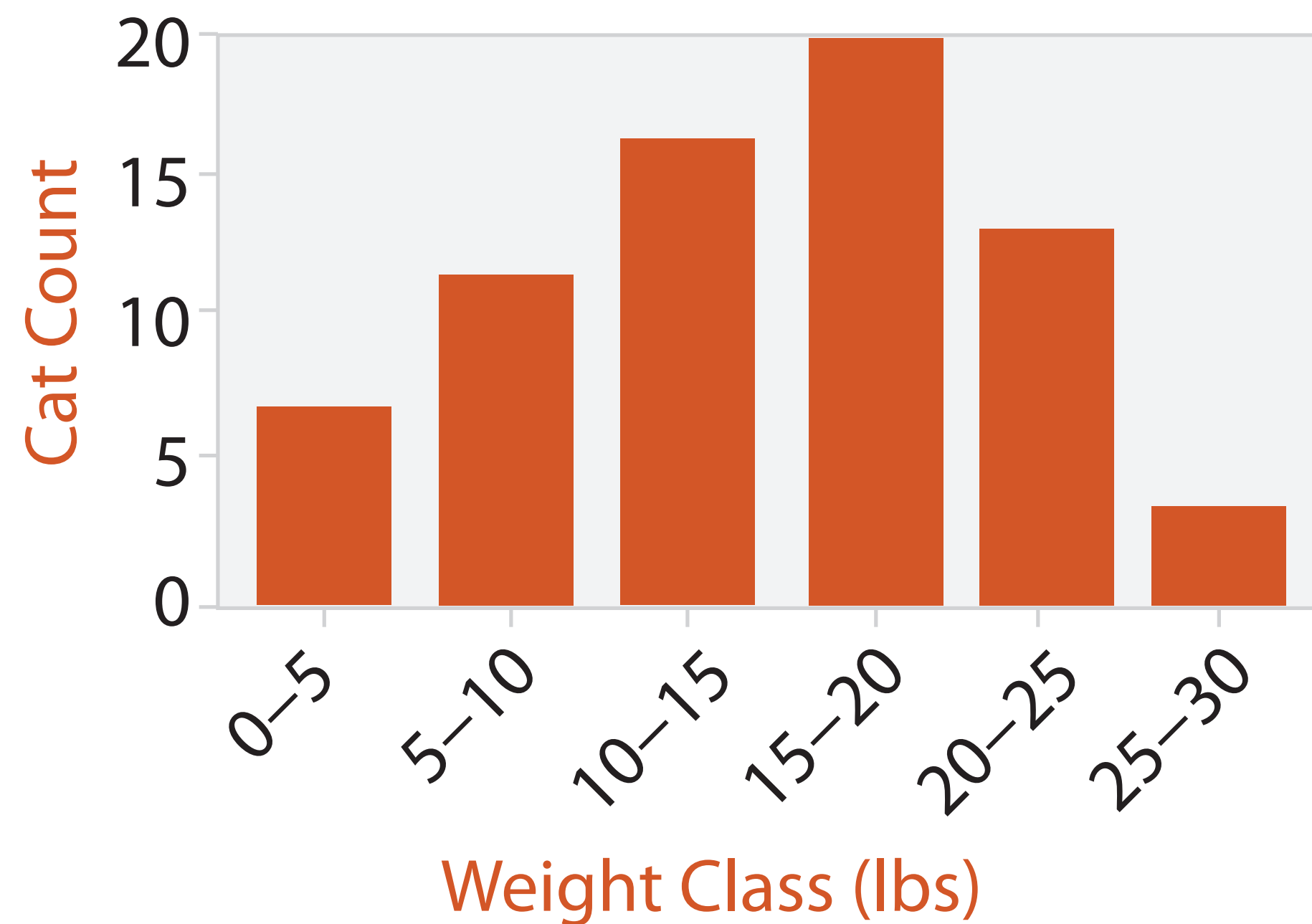
Dimensionality Reduction: PCA



[Principle Component Analysis Explained, Explained Visually, V. Powell & L. Lehe, 2015]



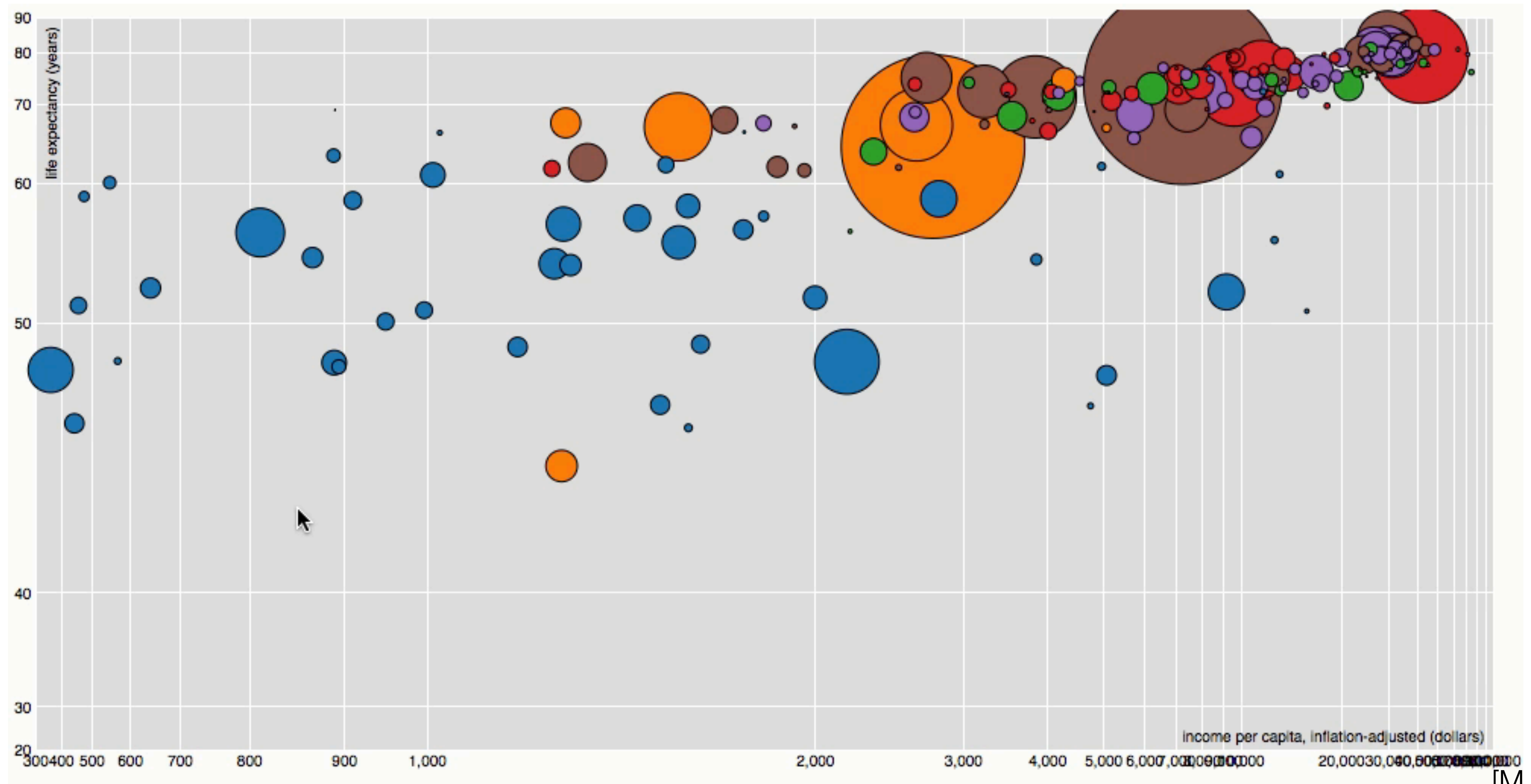
Aggregation: Histograms



- Very similar to bar charts
- Often shown without space between (continuity)
- Choice of number of bins
 - Important!
 - Viewers may infer different trends based on the layout

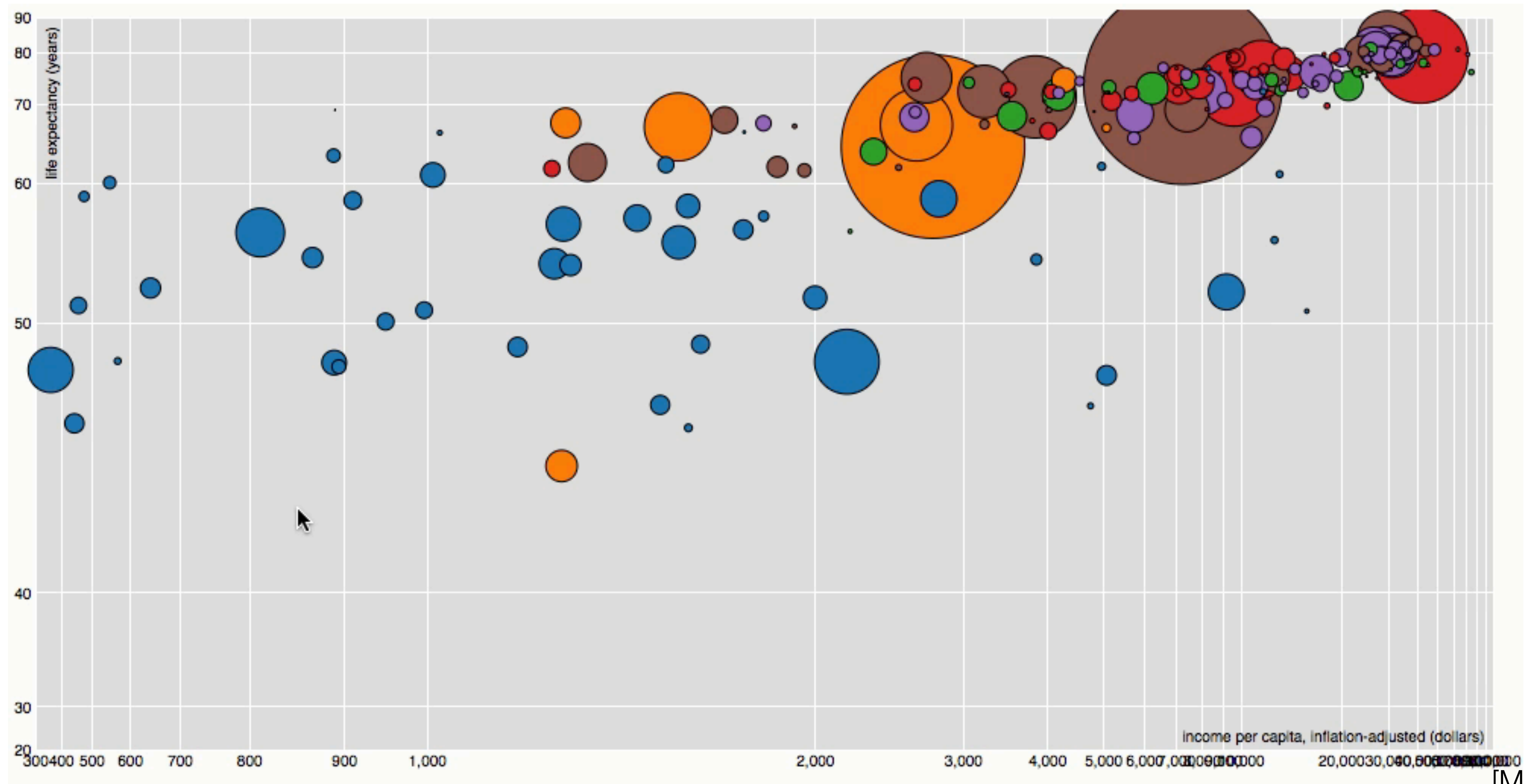
[Munzner (ill. Maguire), 2014]

Focus+Context



[M. Bostock]

Focus+Context



[M. Bostock]

Visualization Research

- General Goals: "New visual displays, control panels, features, and workflows that improve the capabilities of users."
- Perceptual and Cognitive Theories: help accomplish goals, guide design, aid in development of new tools."
- Evaluation Methods:
 - Quantitative and Qualitative
 - Validate hypotheses, refine theories.

[B. Shneiderman, 2019]

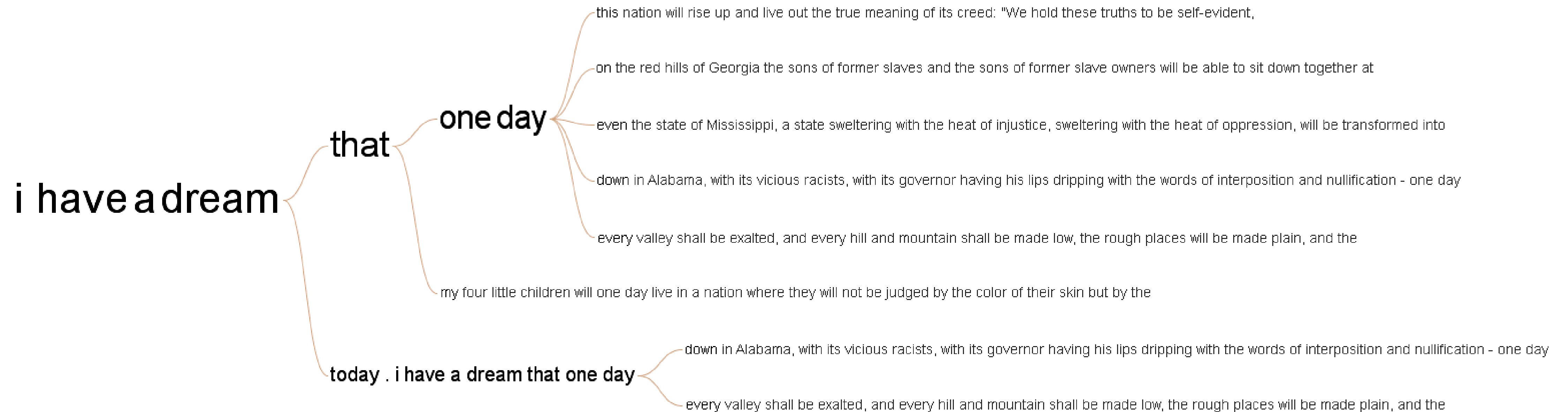
Areas of Visualization Research

- Tools that make it easier to create visualizations
- New encodings
- Knowledge from controlled studies of visualization effectiveness
- Visualization-based communication
- Studies of visualization use in the world (Design Studies)
- Formal theories of visualization
- + Applications
-

[J. Hullman, 2018]

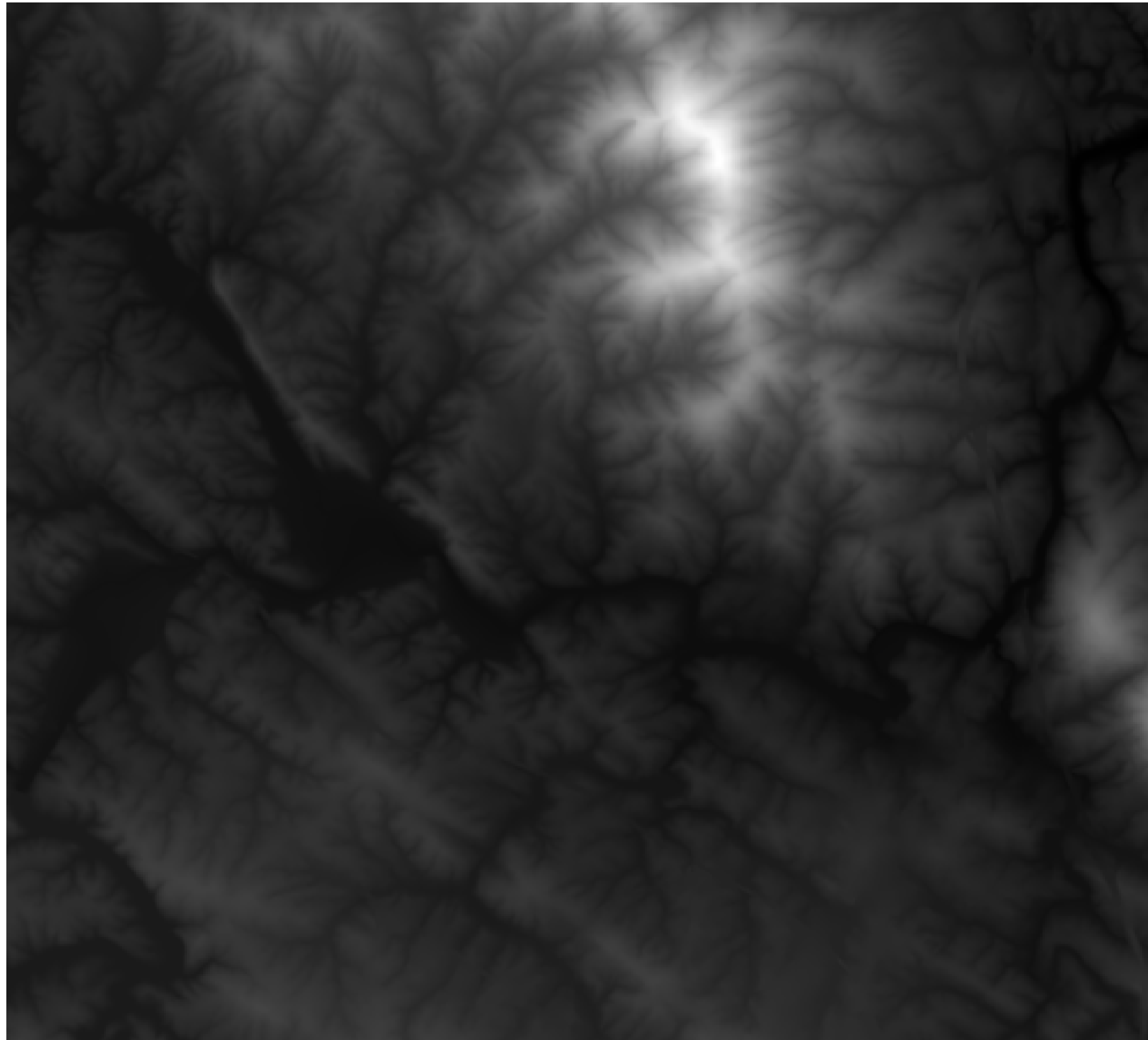
New Encodings

- Determine what cannot currently be done
- Think about how new designs can show new, interesting patterns



[[J. Hullman, 2018], Image: [Wattenberg & Viegas, 2007]]

Knowledge from studies of visualization effectiveness



[Padilla et al., 2017]

What should Visualization Research be about?

- "[V]isualization is a method for contextualizing data, enabling people to apply their prior experiences and perceptual and cognitive abilities to draw conclusions about phenomena in the real world" — J. Hullman
- Perception and cognition
- Not only that Vis A is better than Vis B, but why

[J. Hullman, 2018]

Visualization Research Boundaries?

- Interactive illustration
- Satellite imagery
- Sketching and analogical reasoning
- Understanding aesthetics independent of analytical utility
- Tables
- Uncertainty Vis: Worse than Nothing?

[[J. Hullman](#), 2018]

Topics for the Remainder of the Semester

Progress Reports

- Focus Area
- Problem Statement
- Ideas

Reading Visualization Papers

Reading Visualization Papers

- To understand an area, need to see what has already been done
- Sometimes requires reading tens if not hundreds of papers
- **Cannot** remember all of the details!
- "By 'read' we mean extracting the essential, most important information from a (previously) published scientific conference or journal paper." [R. S. Laramée, 2009]
- Goal: Read research papers for a literature review
 - Can be used to write a survey paper

[R. S. Laramée, 2009]

Concept vs. Implementation

- Concept is the idea, more abstract
 - Example: Writing utensil
- Implementation is the realization of a concept, a concept brought into reality
 - Example: Pencil
 - Many other examples: pen, marker
 - Many different implementations

[R. S. Laramée, 2009]

Important Pieces to Extract from a Vis Paper

- Concept: what is the main goal/idea?
- Implementation: how is this realized?
- Related Work: what previous work does this build on or relate to?
- Data Characteristics: what is the type of data (items & attributes)?
- Visualization Techniques: what classes of techniques are used?
- Application Domain: where can this research be applied?

[R. S. Laramée, 2009]