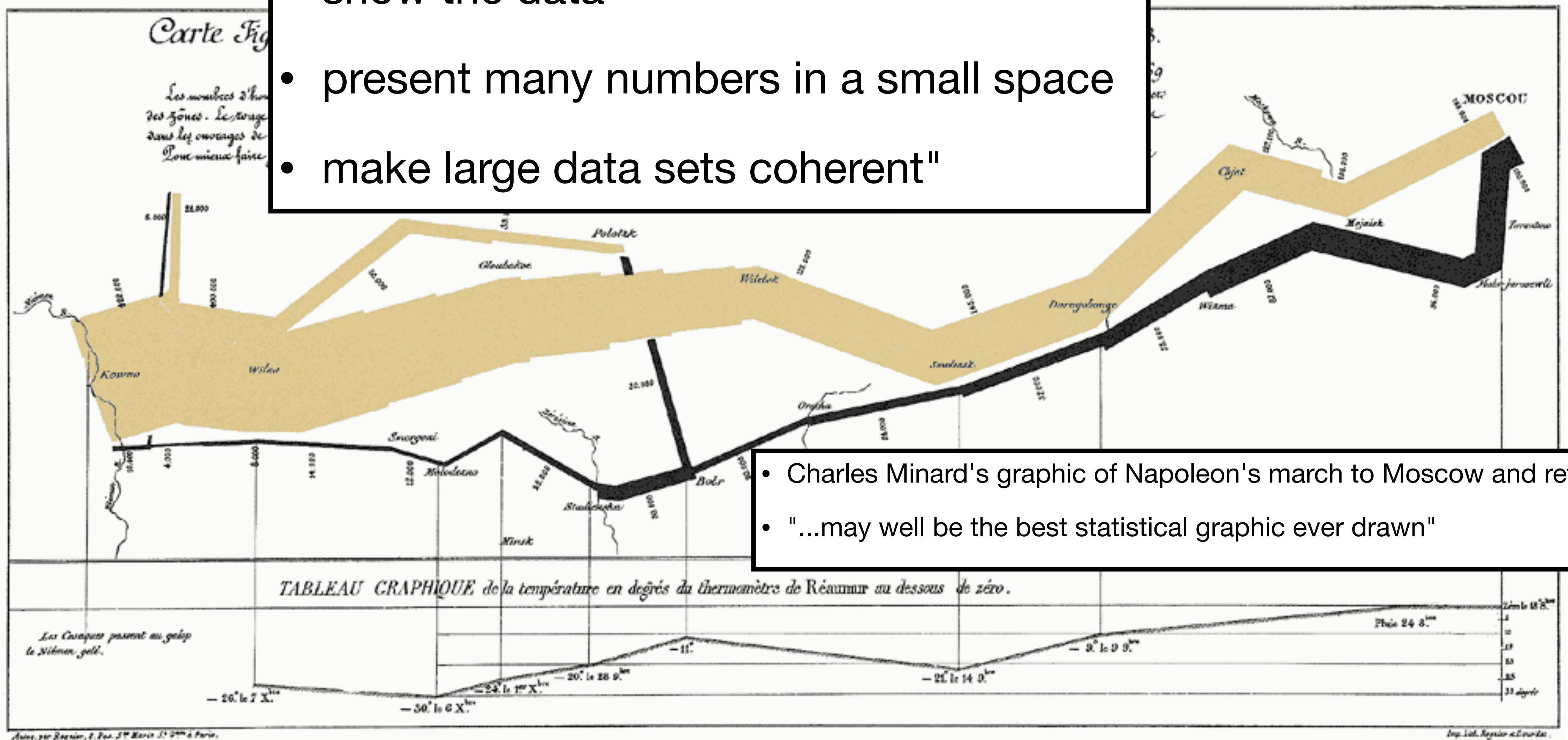# Tufte's *The Visual Display of Quantitative Information*

"Graphical displays should...

- show the data

- present many numbers in a small space

- make large data sets coherent"

- Charles Minard's graphic of Napoleon's march to Moscow and retreat

- "...may well be the best statistical graphic ever drawn"

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812–1813.
Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite.
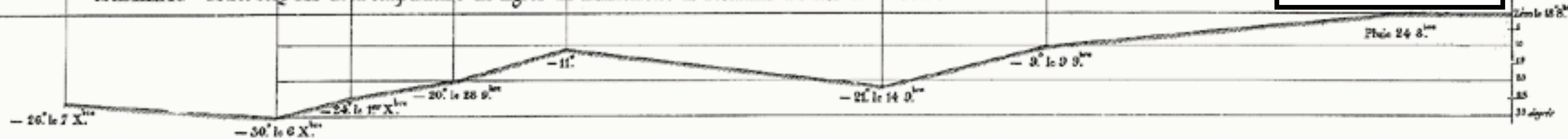Paris, le 20 Novembre 1869

- Arrive with 100,000

- Begin with army of 422,000

- Berezina river crossing disaster

- Temp on retreat

TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

"Graphical displays should...

- encourage the eye to compare different pieces of data
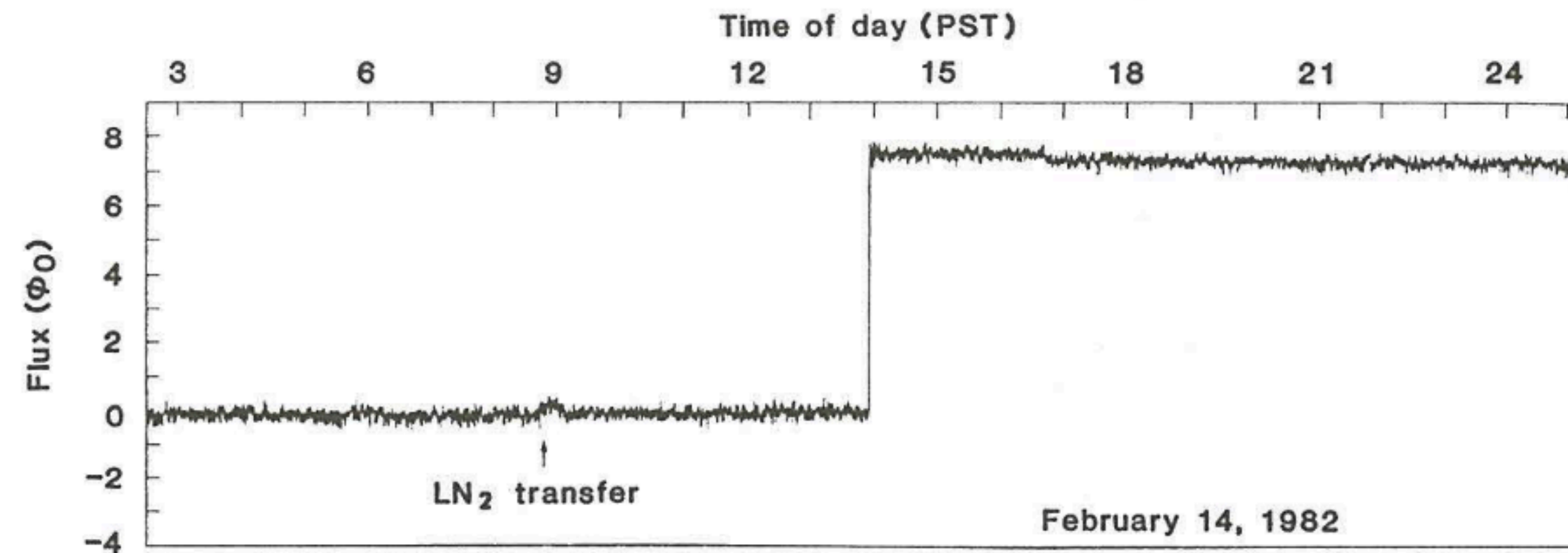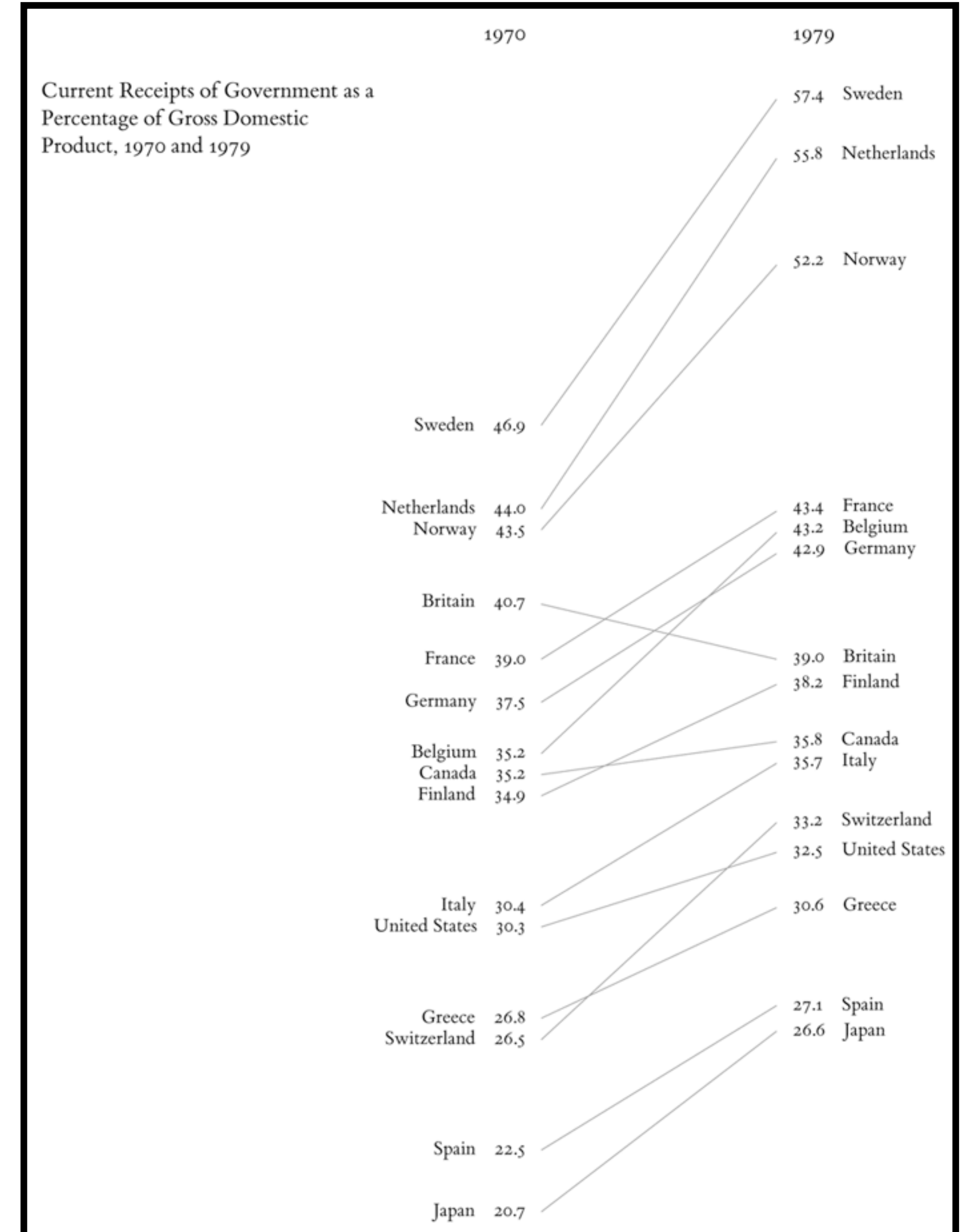

A monopole?

Cabrera's candidate monopole signal looms over a disturbance caused by a liquid nitrogen transfer earlier in the day. The jump in magnetic flux through the superconducting detector loop (or equivalently, the jump in the loop's supercurrent) is just the right magnitude to be a monopole. Moreover, the current remained stable for many hours afterward.

"Graphical displays should...

- reveal the data at several levels of detail, from a broad overview to the fine structure

Current Receipts of Government as a Percentage of Gross Domestic Product, 1970 and 1979

1970		1979	
		57.4	Sweden
		55.8	Netherlands
		52.2	Norway
Sweden	46.9		
Netherlands	44.0	43.4	France
Norway	43.5	43.2	Belgium
		42.9	Germany
Britain	40.7		
France	39.0	39.0	Britain
		38.2	Finland
Germany	37.5		
Belgium	35.2	35.8	Canada
Canada	35.2	35.7	Italy
Finland	34.9		
		33.2	Switzerland
		32.5	United States
Italy	30.4	30.6	Greece
United States	30.3		
Greece	26.8	27.1	Spain
Switzerland	26.5	26.6	Japan
Spain	22.5		
Japan	20.7		

"Graphical displays should...

- serve a reasonably clear purpose: description, exploration, tabulation, or decoration

- be closely integrated with the statistical and verbal descriptions of the data set"

John Snow's cholera case graphic (Sep 1854)

- Circles are cases

- Crosses are pumps

- Can you find the Broad Street pump?

"Data-ink ratio"

- As a rule, the area of ink on the page used for data should be as close to the total ink on the page as possible

- In other words, the ratio (data-ink)/(total ink) should be close to 1

- Underlying philosophy is to let the data speak for itself as much as possible, avoid distractions from other ink
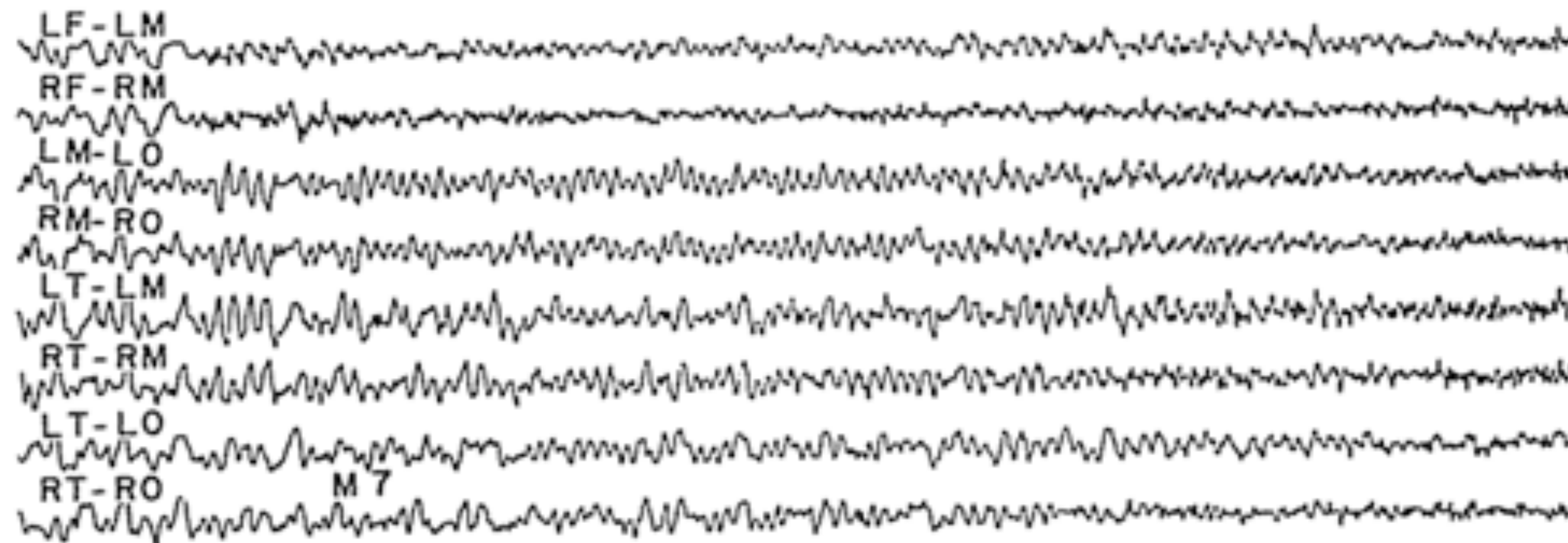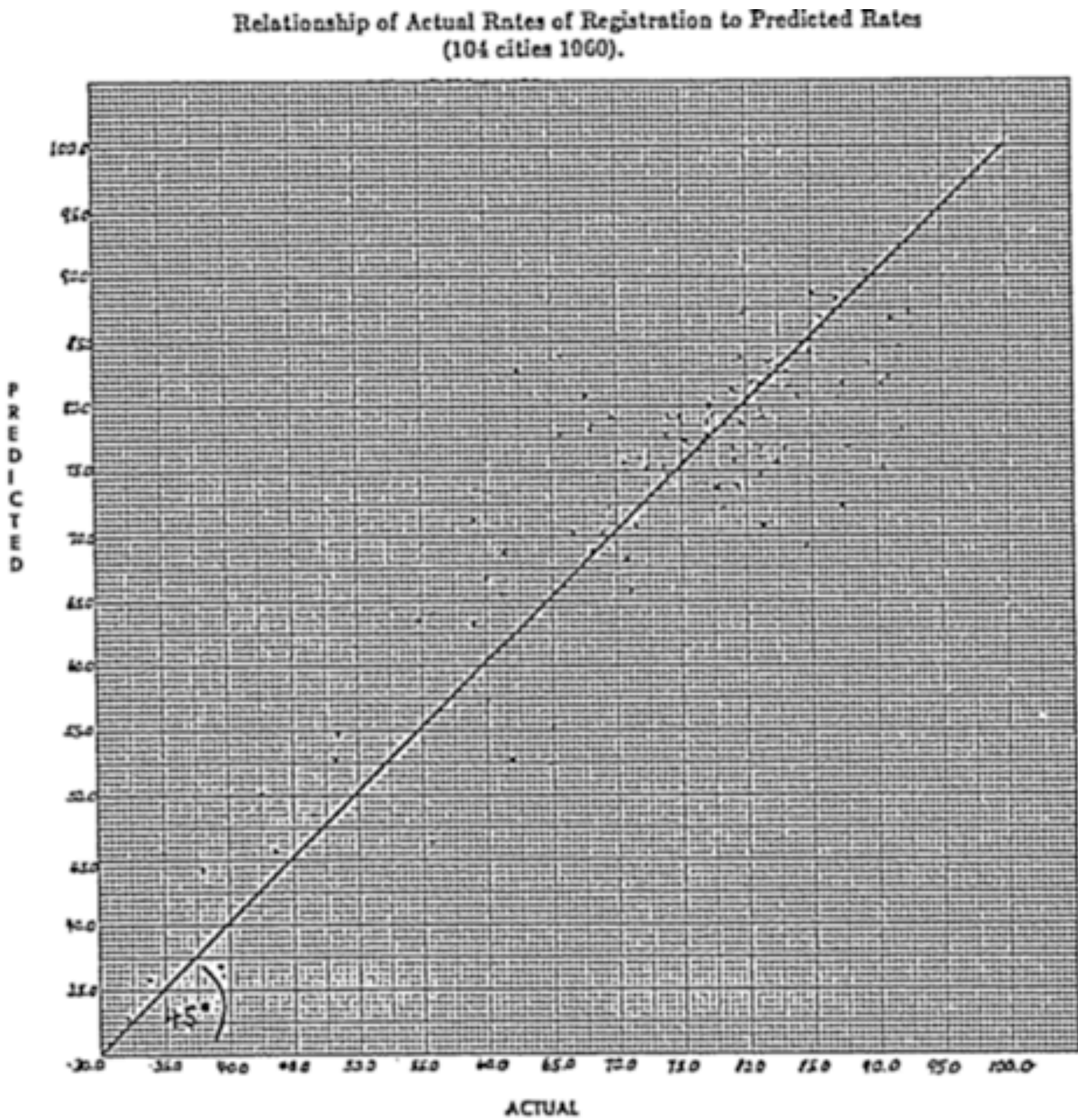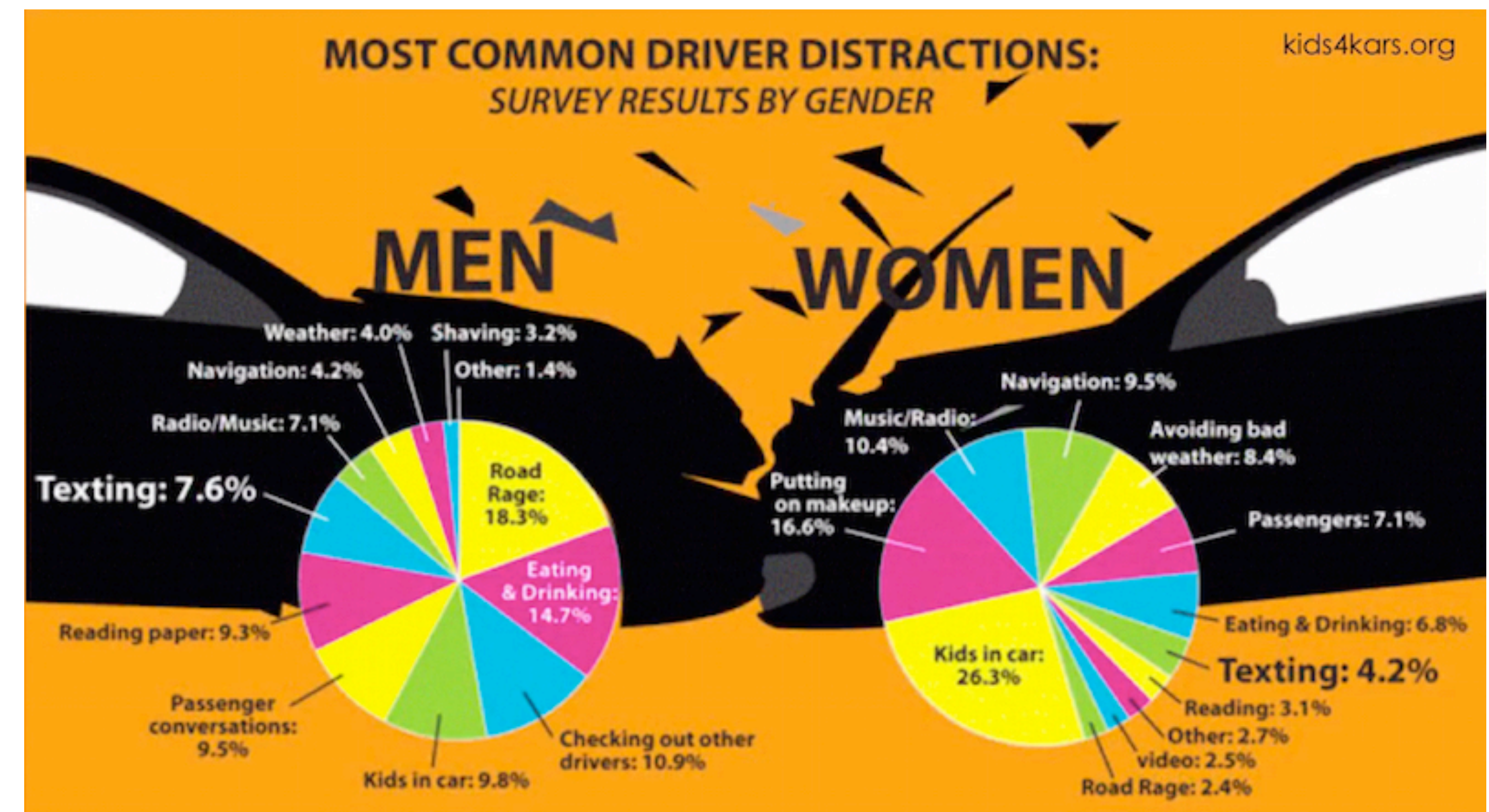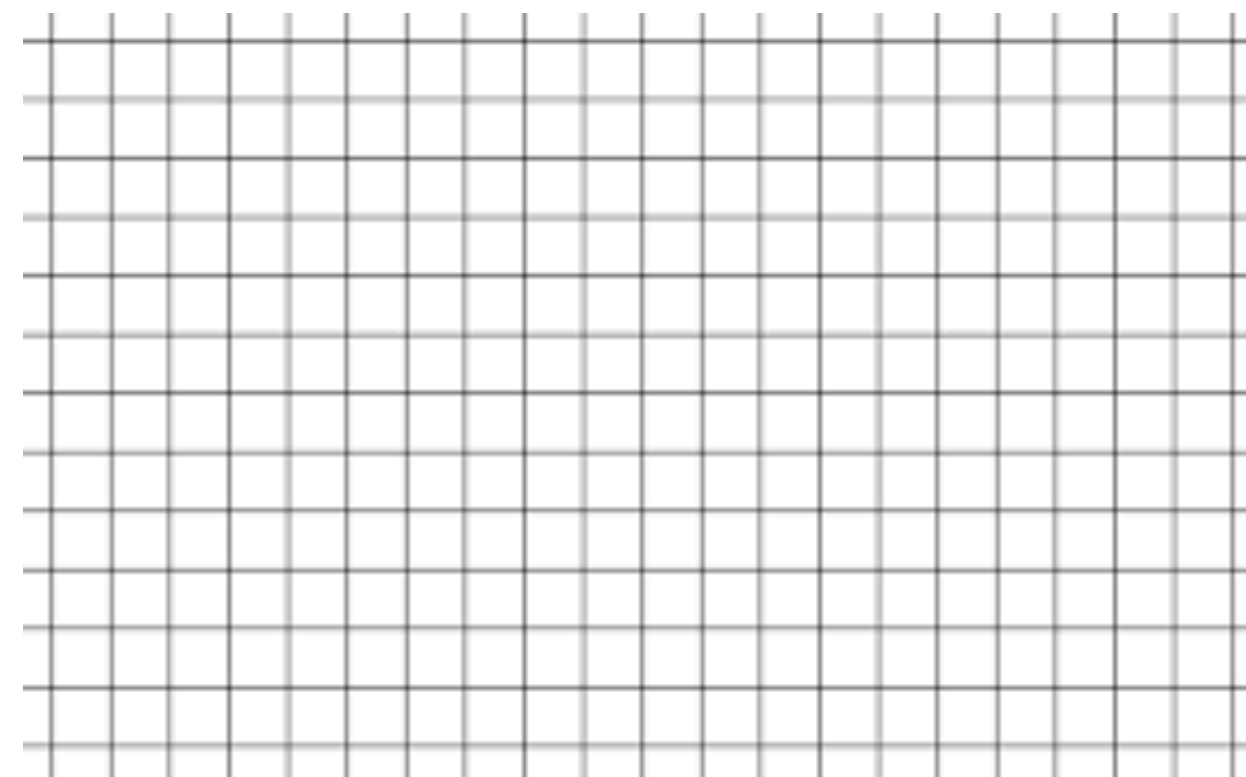

Good ratio: Electroencephalograms
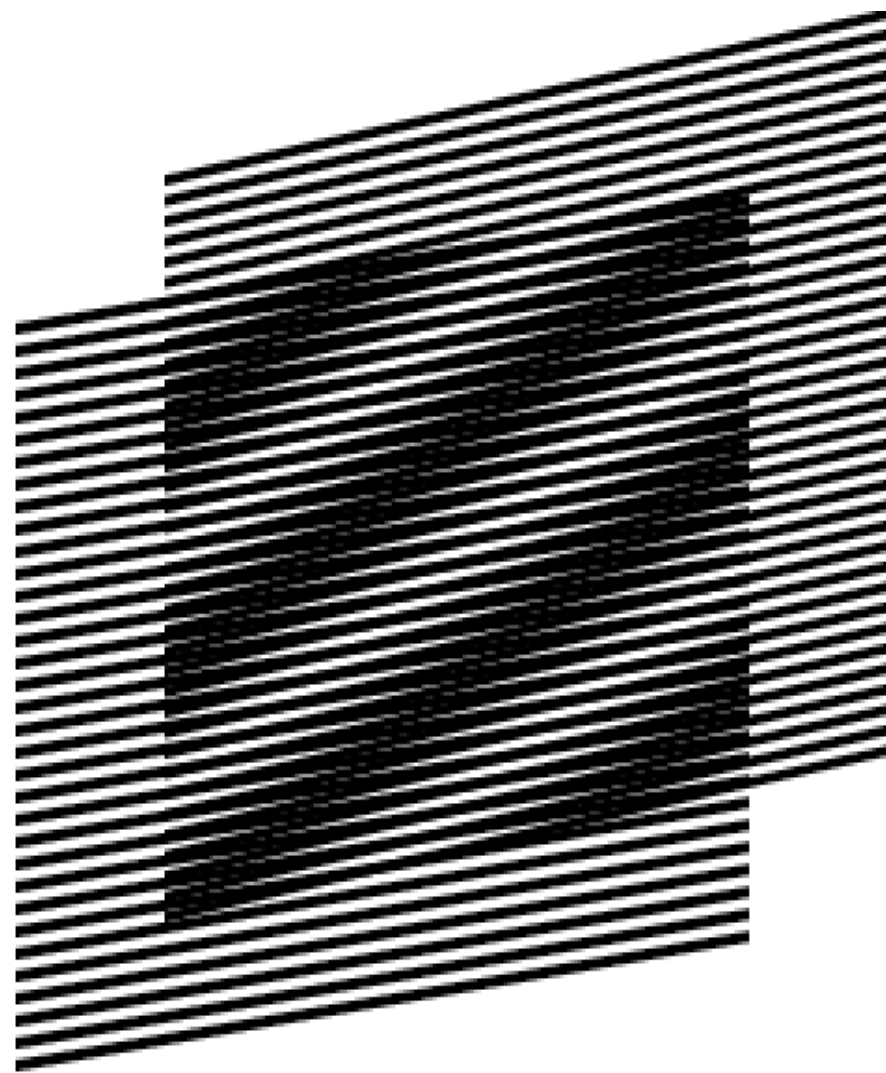
"Data-ink ratio"
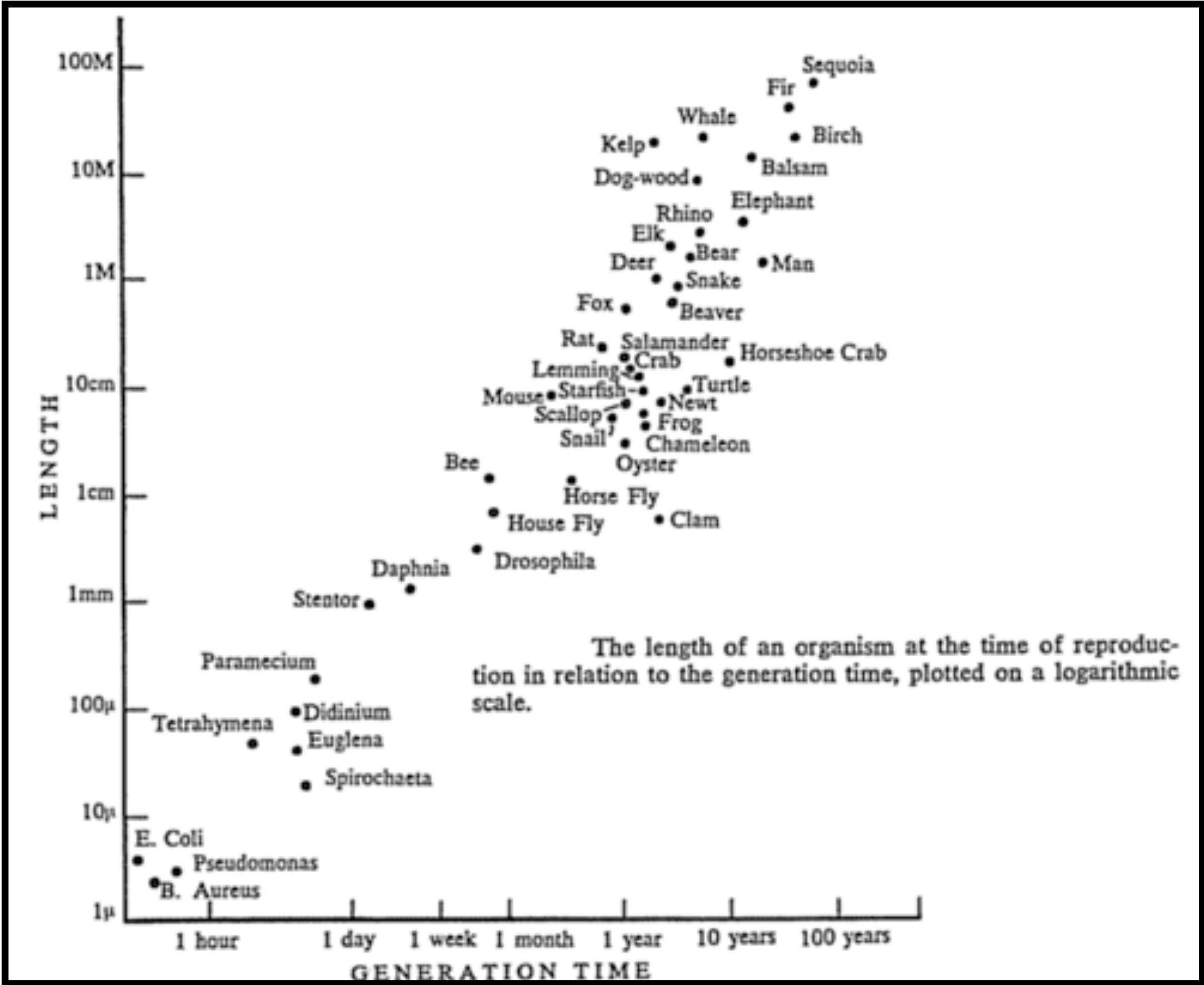
Good ratio

Very bad ratio

"Chartjunk" types

- Art: Unintentionally eye-catching patterns

- Grid: Often just distracting

- Duck: self-promoting, distracting graphics

Summary of Tufte's *Visual Display of Quantitative Information*

- The first responsibility is to be honest - no "lie factors" or other misdirection

- But try to tell a story with the data - the presentation should have a point

- Choose a presentation that invites the reader to explore on their own

- Remove distractions and extra "ink" and let the data tell the story