



Data Fundamentals

Data Visualization and Infographics with D3

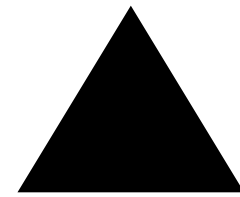
Scott Murray
@alignedleft

What is *information*?

Information is an abstract *concept* or *idea*

three

3



tres

trois

drei

तीन

τρία

три

สาม

三



Ceci n'est pas une pipe.

The Treason of Images
Rene Magritte, 1929

Modes of representation

text

numbers

images

videos

sounds

smells

speech

motion

What is *data*?

Data is a *structured* representation of information

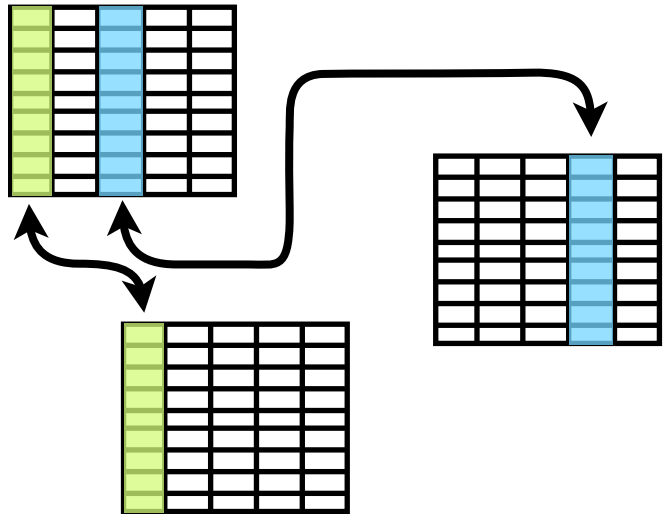
List

3
6
12
25
32
78
124
5,932

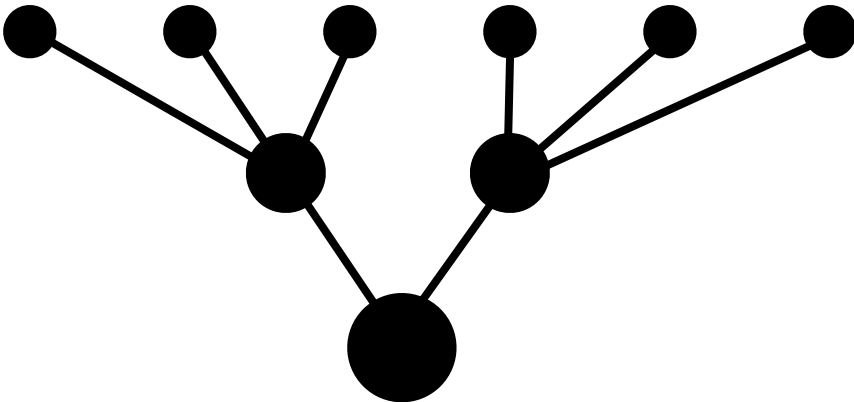
Table

Apples	3
Oranges	6
Bananas	12
Grapes	25
Kiwis	32
Strawberries	78
Raspberries	124
Pineapples	5,932

Relational Tables



Tree



Types of *data*

variable types in data graphics

qualitative { nominal
ordinal

quantitative { interval
ratio

nominal data
unordered categories

apples, oranges

trees, flowers, grasses, ferns

toucans, apartments, doctors

ordinal data

series of ordered categories

grade AA, A, B

freshman, sophomore, junior, senior

puddle, pond, lake, ocean

quantitative data
numeric intervals

*arbitrary zero point,
only relative values are significant*

1, 2, 3, 4, 5...

Sep 15, Sep 17, Sep 20, Sep 22...

quantitative data

numeric ratios

*absolute/fixed zero point,
relative and absolute values are significant*

5 cm

16 GB

25 years

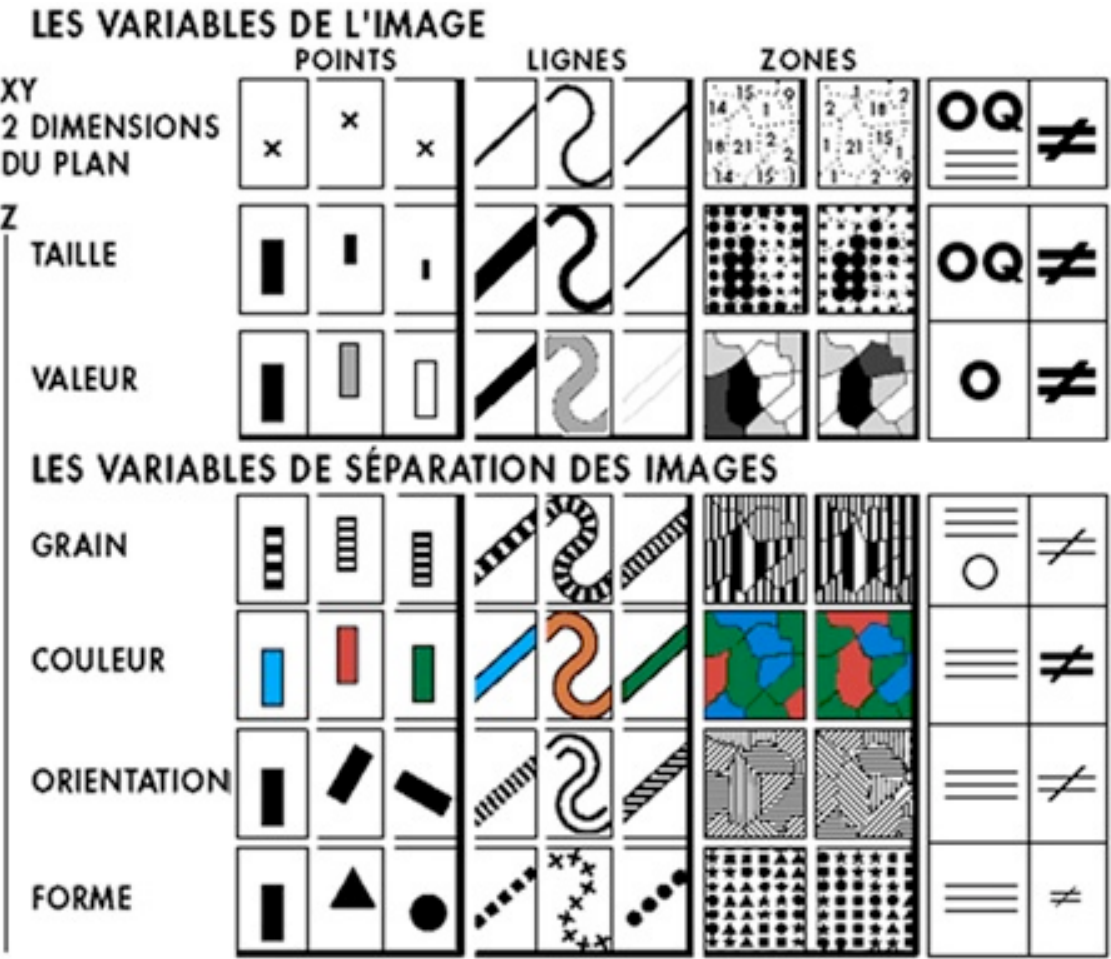
212°F

Properties for visual *encoding*

LES VARIABLES DE L'IMAGE									
POINTS			LIGNES			ZONES			
XY 2 DIMENSIONS DU PLAN									
Z TAILLE									
VALEUR									
LES VARIABLES DE SÉPARATION DES IMAGES									
GRAIN									
COULEUR									
ORIENTATION									
FORME									

Semiology of Graphics
Jacques Bertin, 1983

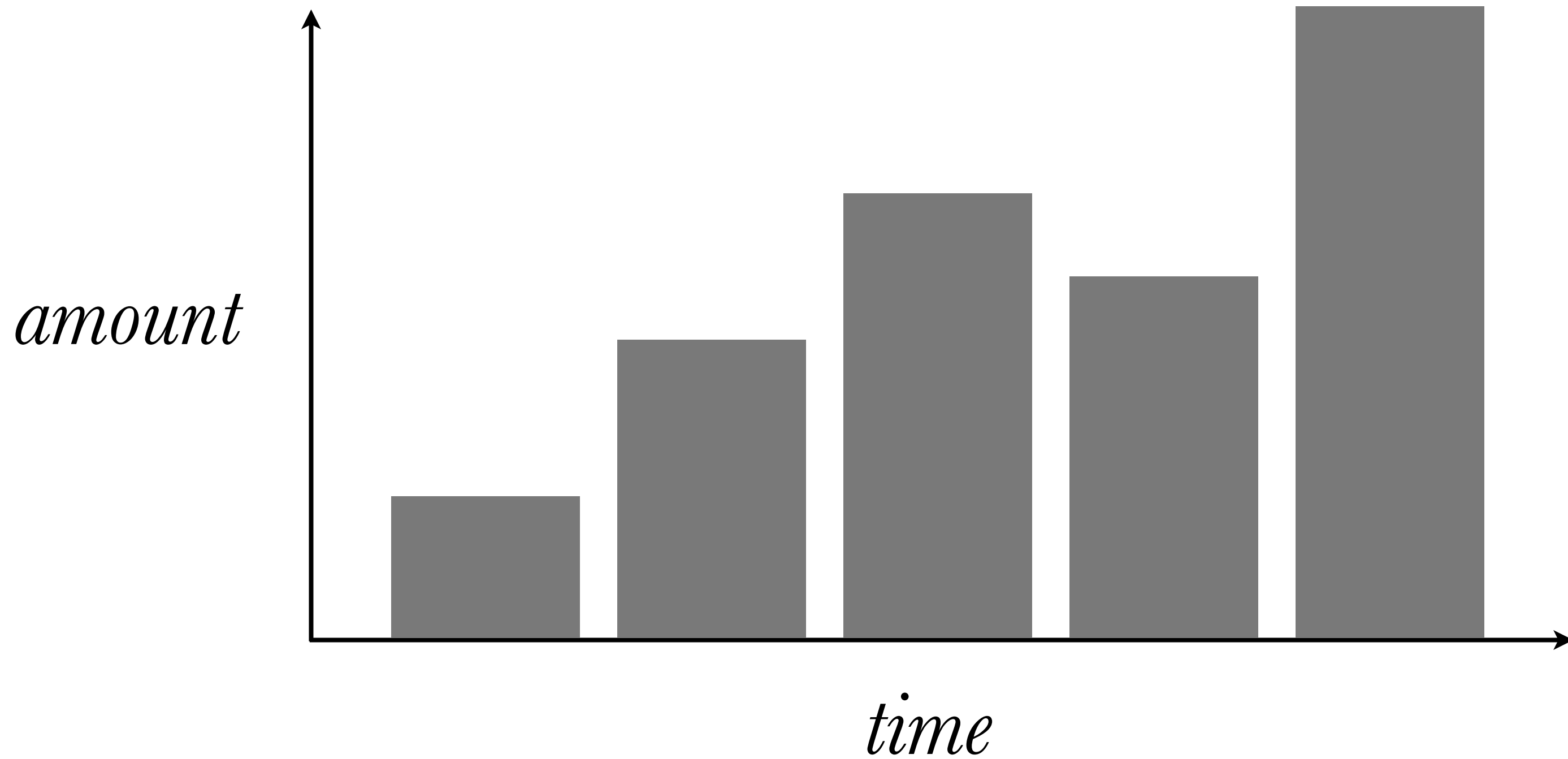
Position	N	0	Q
Size	N	0	Q
Value	N	0	
Texture	N		
Color	N		
Orientation	N		
Shape	N		



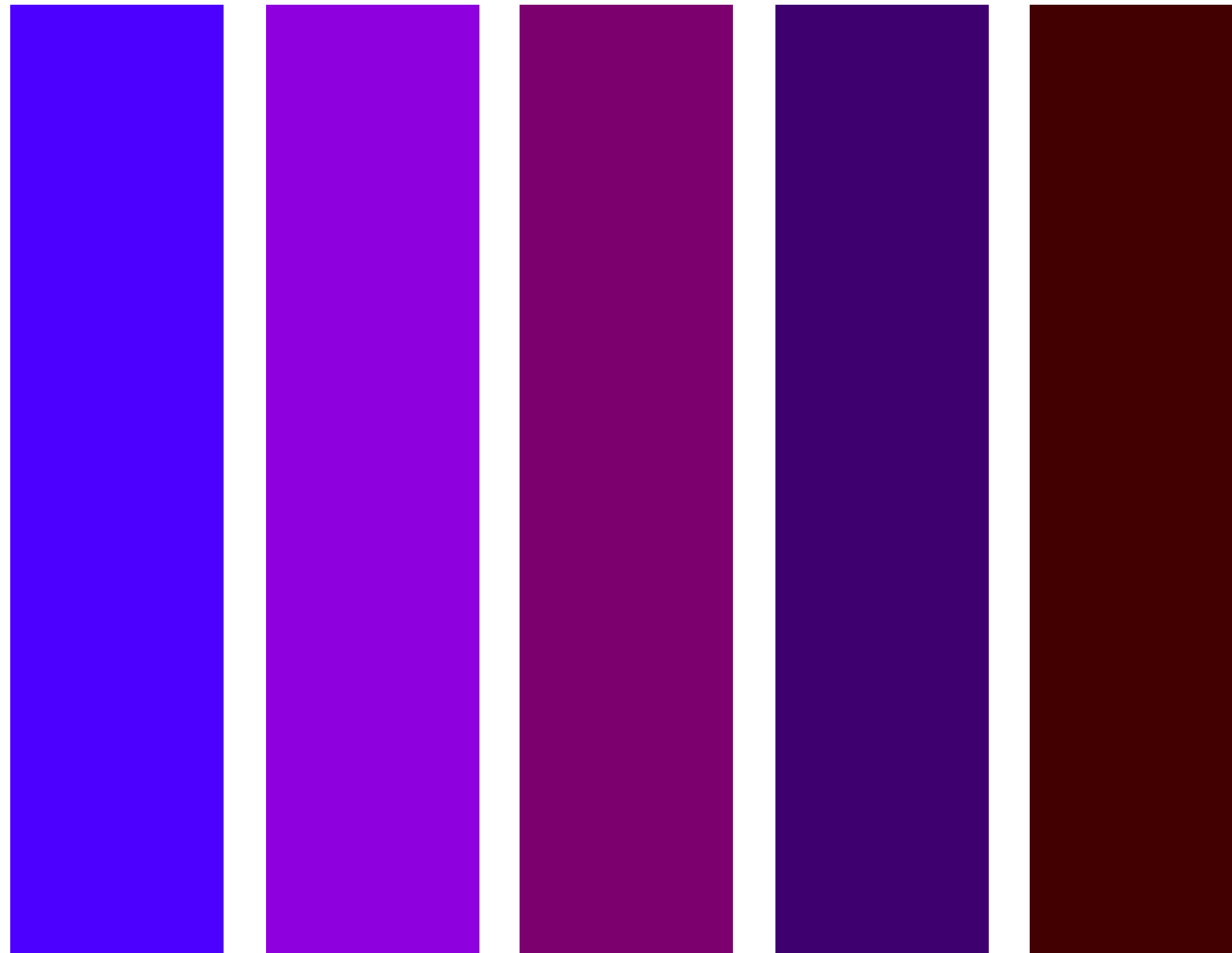
Semiology of Graphics

Jacques Bertin, 1983

quantitative values encoded with position



quantitative values encoded with value and color



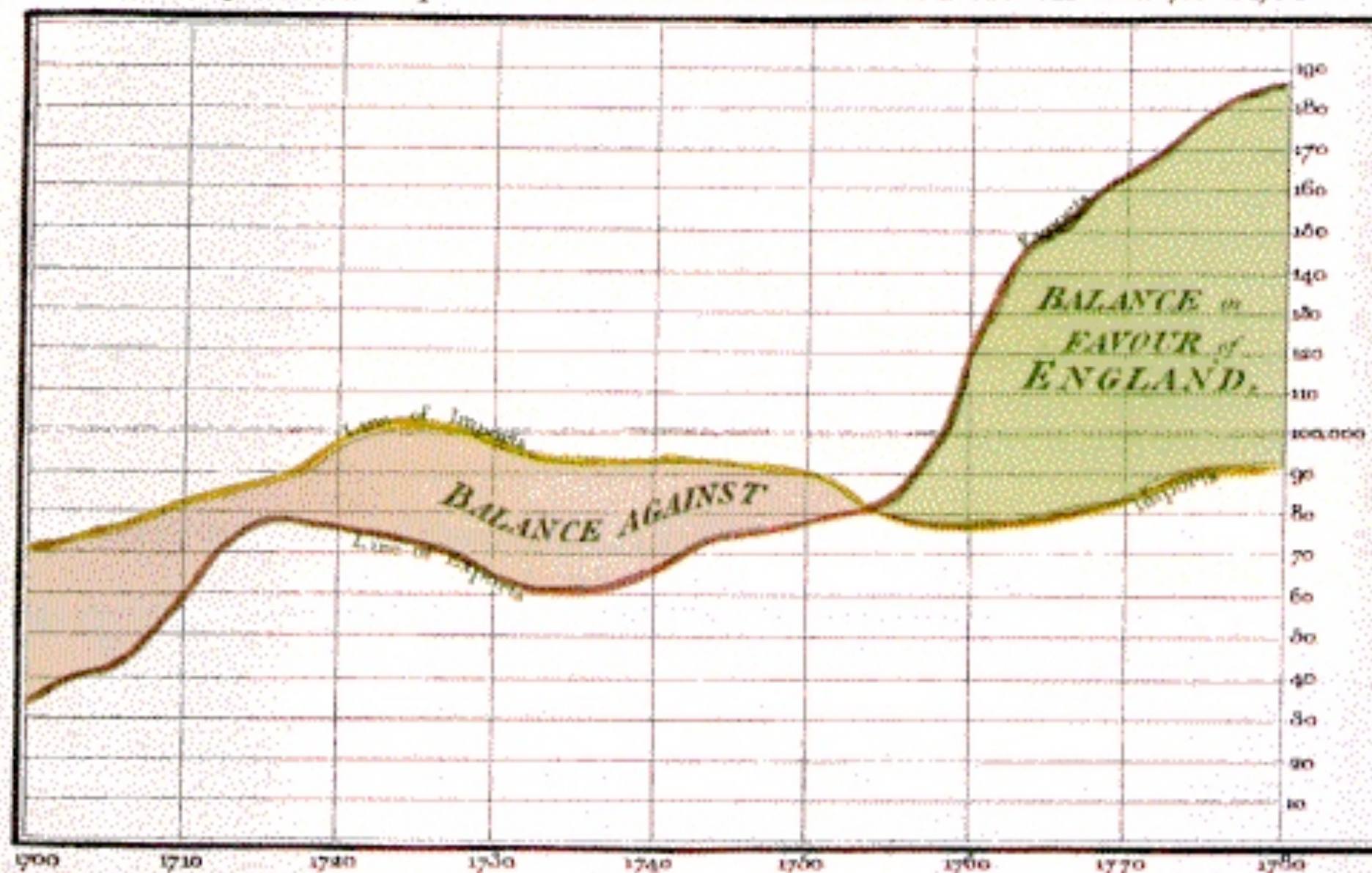
amount



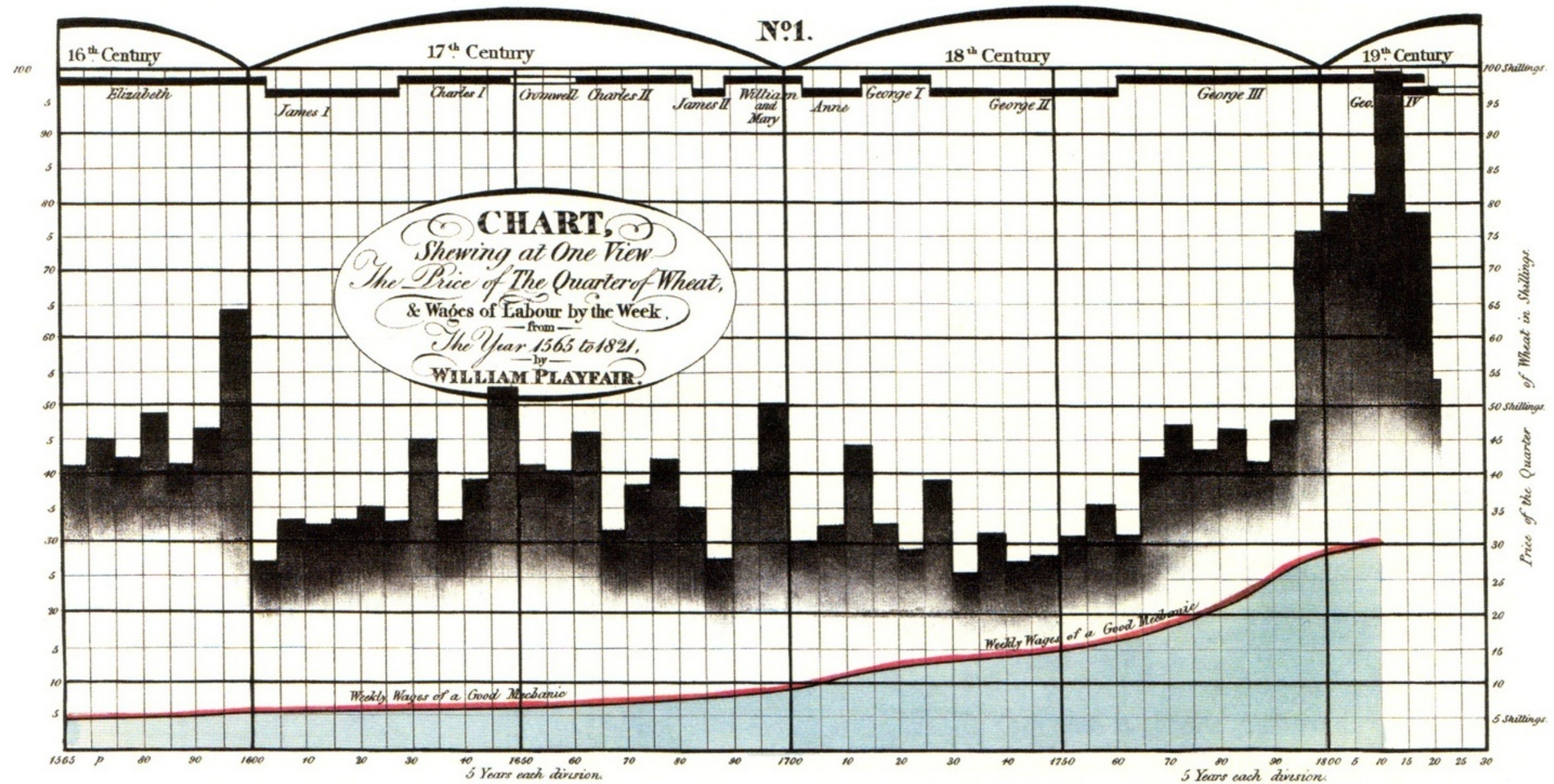
time



Exports and Imports to and from DENMARK & NORWAY from 1700 to 1780



The Bottom line is divided into Years, the Right hand line into £10,000 each.
 Published at the Art Library, 10, St. Martin's Lane, by W. Playfair.
 No. 10, St. Martin's Lane, London.





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.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout qui avaient été détachés sur Minsk et Mohilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.

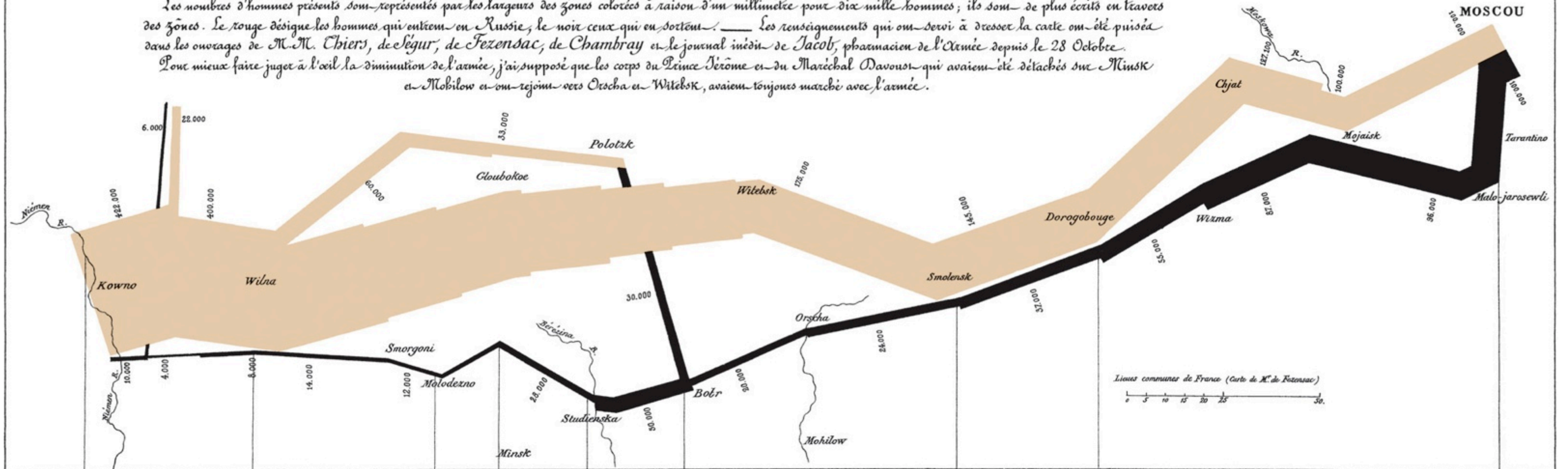
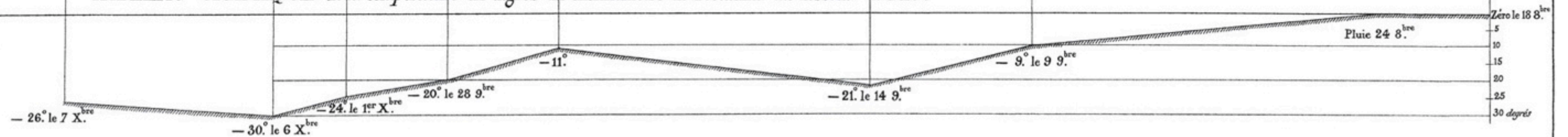


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.

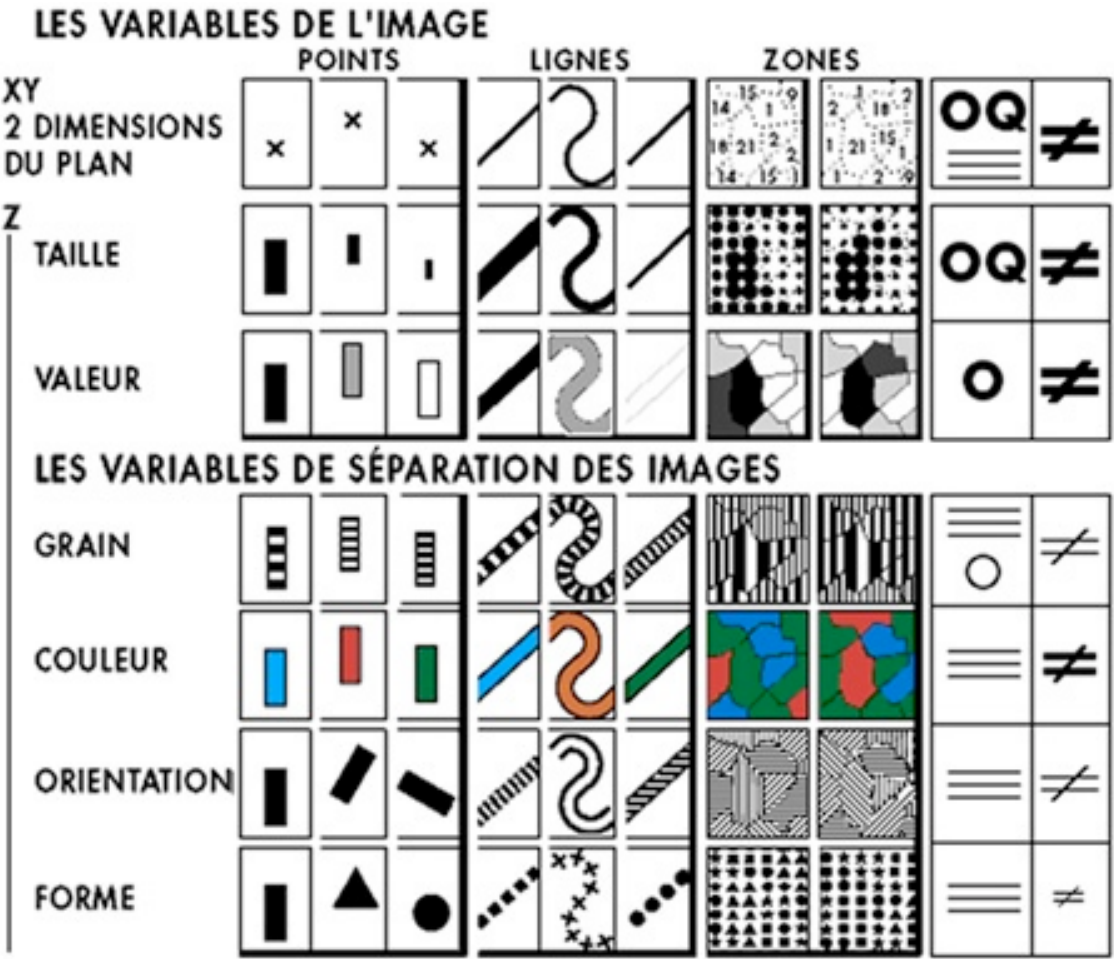
Les Cosaques passent au galop le Niémen gelé.



Autog. par Regnier, 8. Par. S^{te} Marie S^{te} G^{ne} à Paris.

Imp. Lith. Regnier et Dourdet.

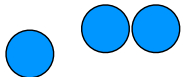

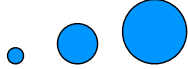


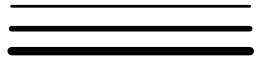


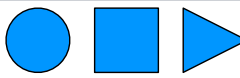

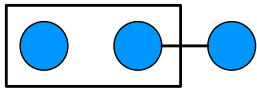

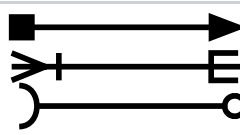
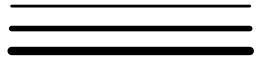
Position	N	0	Q
Size	N	0	Q
Value	N	0	
Texture	N		
Color	N		
Orientation	N		
Shape	N		



Semiology of Graphics

Jacques Bertin, 1983

Properties and Best Uses of Visual Encodings

<u>Example</u>	<u>Encoding</u>	<u>Ordered</u>	<u>Useful values</u>	<u>Quantitative</u>	<u>Ordinal</u>	<u>Categorical</u>	<u>Relational</u>
	position, placement	yes	infinite	Good	Good	Good	Good
1, 2, 3; A, B, C	text labels	optional (alphabetical or numbered)	infinite	Good	Good	Good	Good
	length	yes	many	Good	Good		
	size, area	yes	many	Good	Good		
	angle	yes	medium/few	Good	Good		
	pattern density	yes	few	Good	Good		
	weight, boldness	yes	few		Good		
	saturation, brightness	yes	few		Good		
	color	no	few (< 20)			Good	
	shape, icon	no	medium			Good	
	pattern texture	no	medium			Good	
	enclosure, connection	no	infinite			Good	Good
	line pattern	no	few				Good
	line endings	no	few				Good
	line weight	yes	few		Good		

