

Data Visualization & Design

Week 1

Introductions

Introduction to **data** **visualization**

Data is a set of values of quantitative or qualitative variables.

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The screenshot shows the Microsoft Excel ribbon with the 'Home' tab selected. The ribbon includes tabs for Home, Insert, Page Layout, Formulas, Data, Review, and View. Below the ribbon are several groups of tools: Clipboard (Cut, Copy, Format Painter), Font (Font: Helvetica, Size: 10, Bold, Italic, Underline, Alignment: center, Wrap Text), Alignment (Merge & Center), Number (Number format dropdown), Styles (Conditional Formatting, Format as Table, Clear, Sort & Filter, Find & Select), and Editing (AutoSum, Fill, Insert, Delete, Format, Cells, Editing). The 'Font' group is currently active.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
	Operating Income	TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC						
010	Grants (Foundation and Corporate)	103,000	2,500	3,000	5,000	10,000	10,000	15,000	15,000	15,000	10,000	5,000	10,000	2,500						
011	Grant (separate account for one foundation)	25,000	+ 25,000																	
020	Year-End Appeal	19,000	3,000											6,000	10,000					
040	Individual Contributions (Unsolicited)	16,900	100	100	3,000	2,000	2,000	1,000	2,000	2,000	3,000	700	500	500						
041	Individual Contributions (Tributes/Memorial)	900	50	50	50	100	100	50	50	100	50	50	100	150						
050	Fundraising Event #1 Tickets	5,000				2,500	2,500													
051	Fundraising Event #1 Contributions	10,000			3,000	5,000	2,000													
052	Fundraising Event #1 Auction	8,000				8,000														
060	Fundraising Event #2 Tickets	5,000										2,500	2,500							
061	Fundraising Event #2 Contributions	12,000									4,000	5,000	3,000							
070	Fundraising - Newsletters	8,000			2,000	3,000	3,000													
080	Program Income (City/County/State/Fed/F	37,200	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100						
	Total Operating Income	250,000	8,750	6,250	41,150	33,700	22,700	19,150	20,150	24,200	23,650	14,350	19,700	16,250						
	Operating Expenses	TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC						
010	Facility Rent/Mortgage	12,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000						
020	Utilities	7,200	600	600	600	600	600	600	600	600	600	600	600	600						
021	Telephone	2,400	200	200	200	200	200	200	200	200	200	200	200	200						
022	Insurance (Facility and D&O)	6,000		6,000																
023	Security	780	65	65	65	65	65	65	65	65	65	65	65	65						
024	Maintenance (Facility)	2,400	200	200	200	200	200	200	200	200	200	200	200	200						
030	Office Supplies	1,100	50	50	50	300	50	50	50	50	50	300	50	50						
040	Postage & Shipping	1,500	50	50	50	500	50	50	50	50	500	50	50	50						
041	Printing & Copying	3,000				1,500					1,500									
042	Maintenance (Machine/Copier)	4,800	400	400	400	400	400	400	400	400	400	400	400	400						
060	Program Supplies	2,400	200	200	200	200	200	200	200	200	200	200	200	200						
070	Travel/Parking	264	20	20	20	24	20	20	25	25	20	20	25	25						
071	Miscellaneous Expense	120	10	10	10	10	10	10	10	10	10	10	10	10						
072	Bank Card Fees	500	25	25	50	50	50	50	50	50	50	50	25	25	50					
080	Web Hosting & Design/Updates	480	40	40	40	40	40	40	40	40	40	40	40	40						
110	Executive Director	51,600	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300	4,300						
120	Assistant Director	38,400	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200	3,200						

Today:

- [] grocery shop
- [x] clean
- [x] walk dog

Tomorrow:

- [] pick up car
- [x] do laundry
- [] bake cake
- [] fix alarm

Next week:

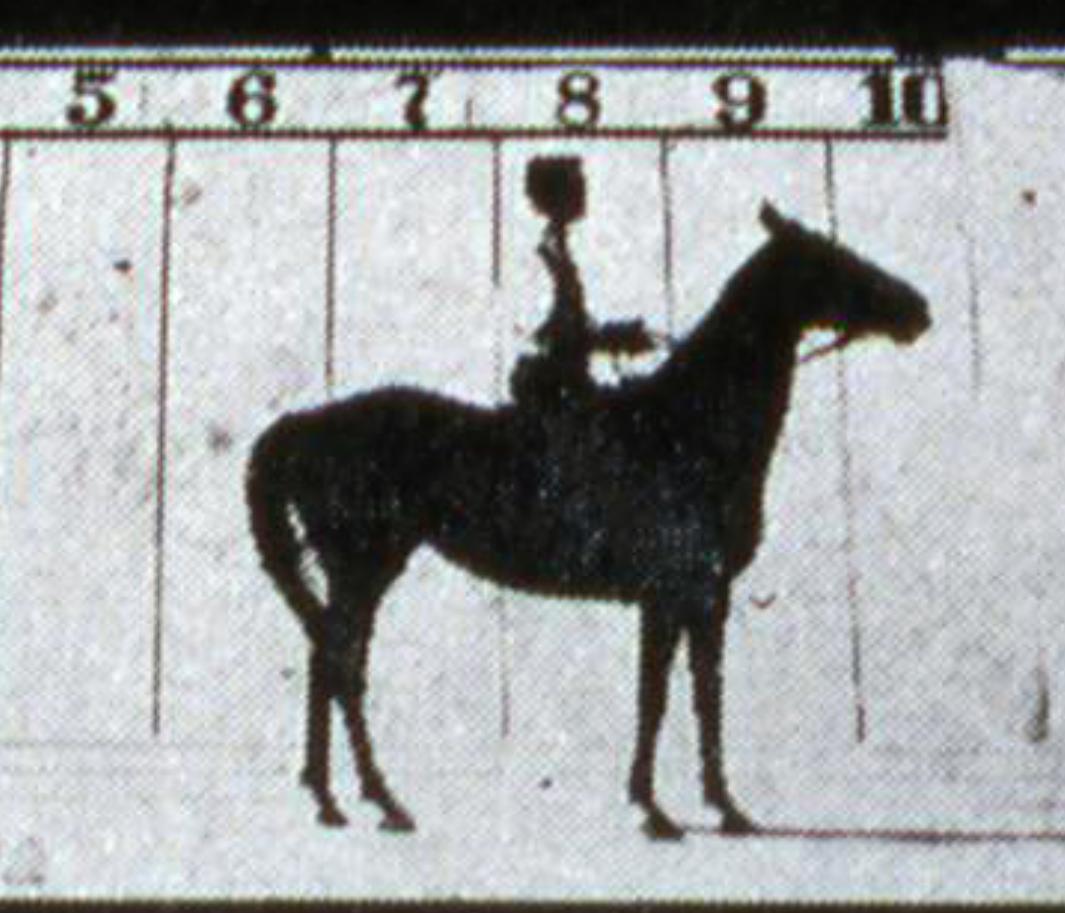
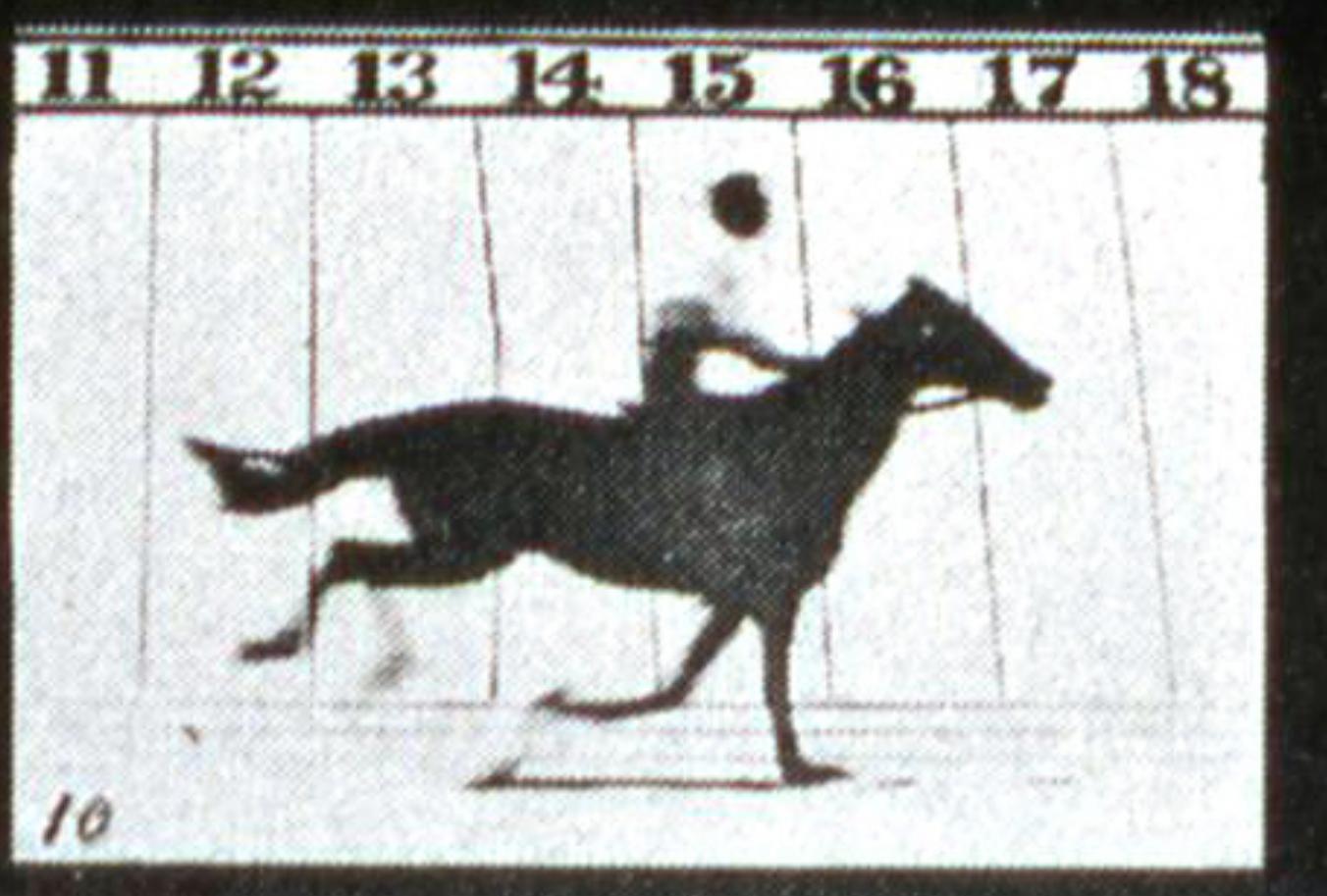
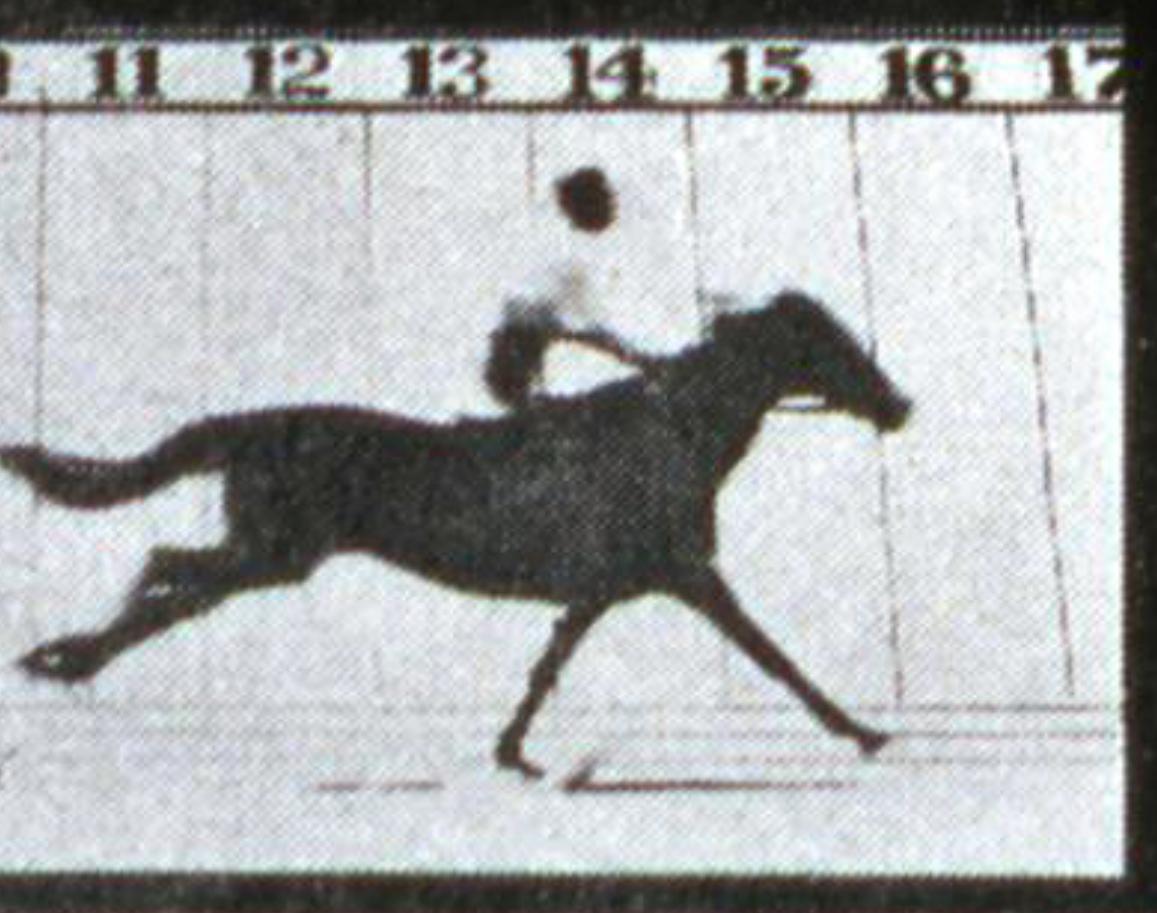
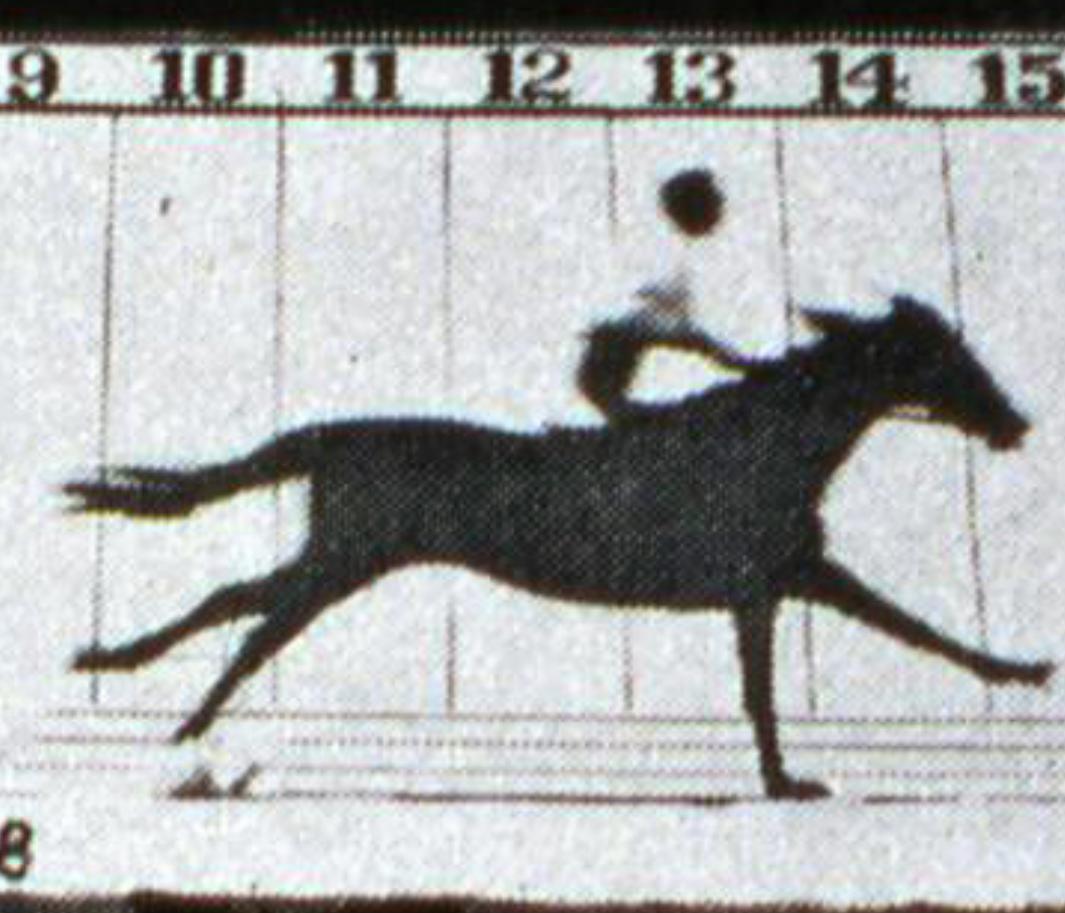
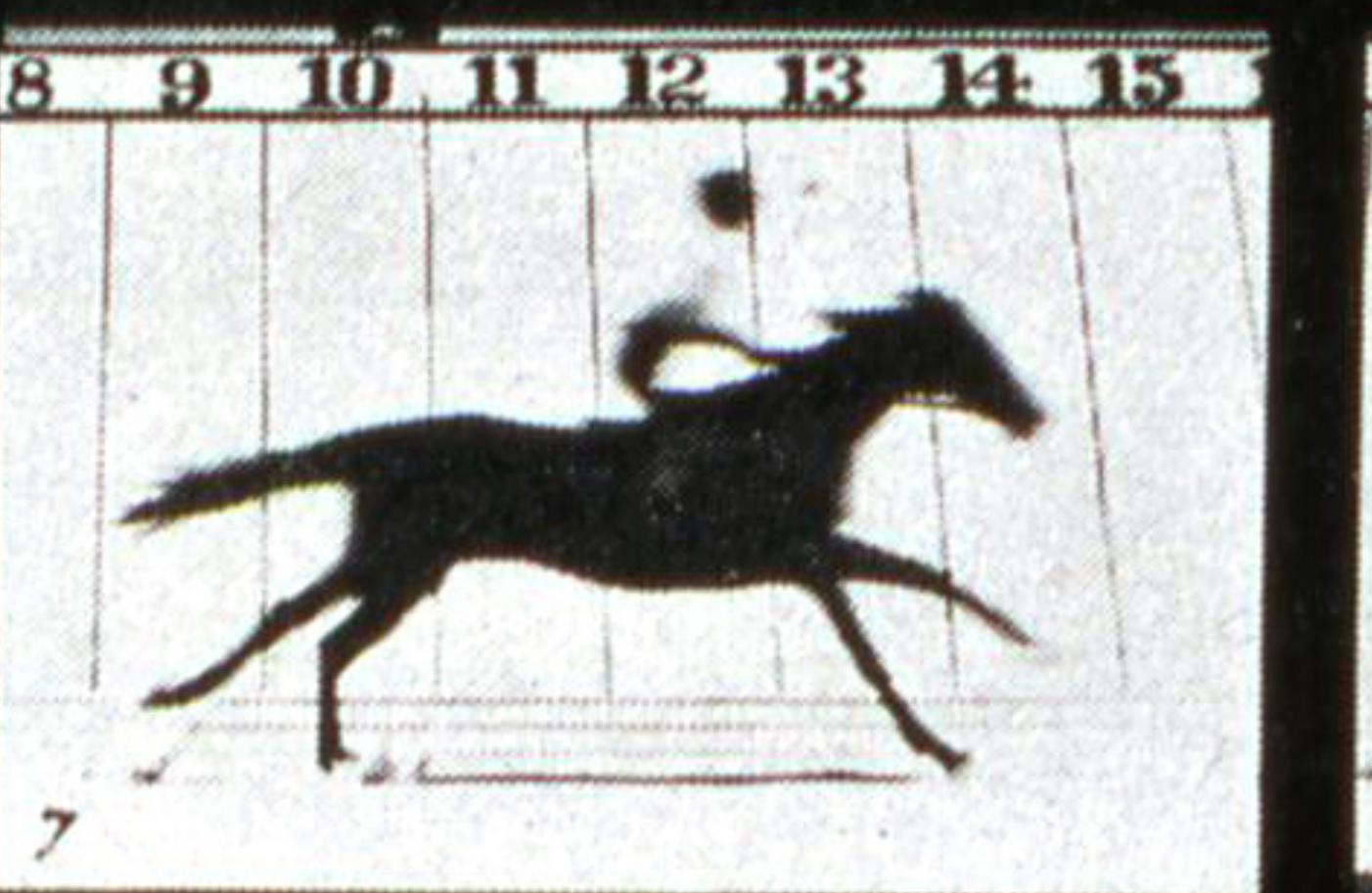
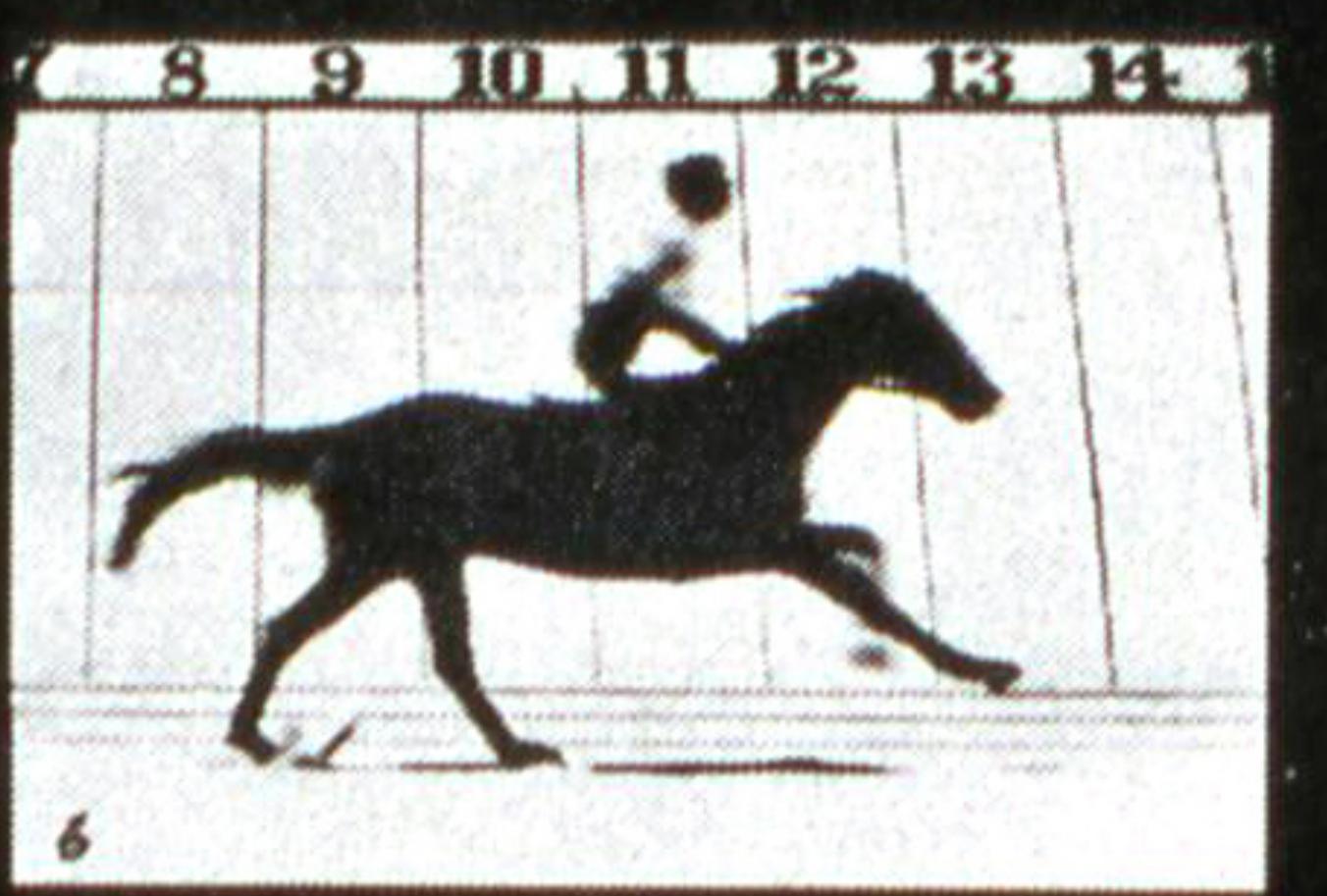
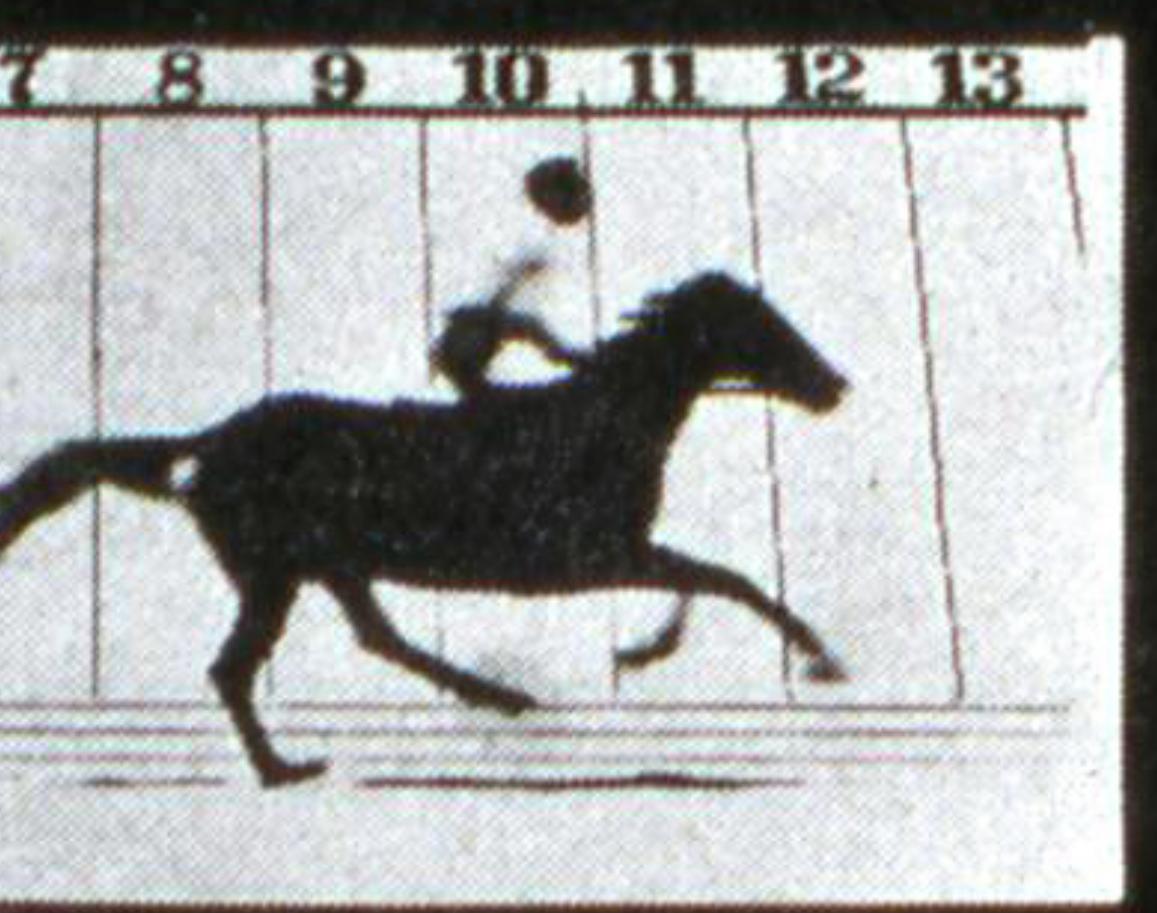
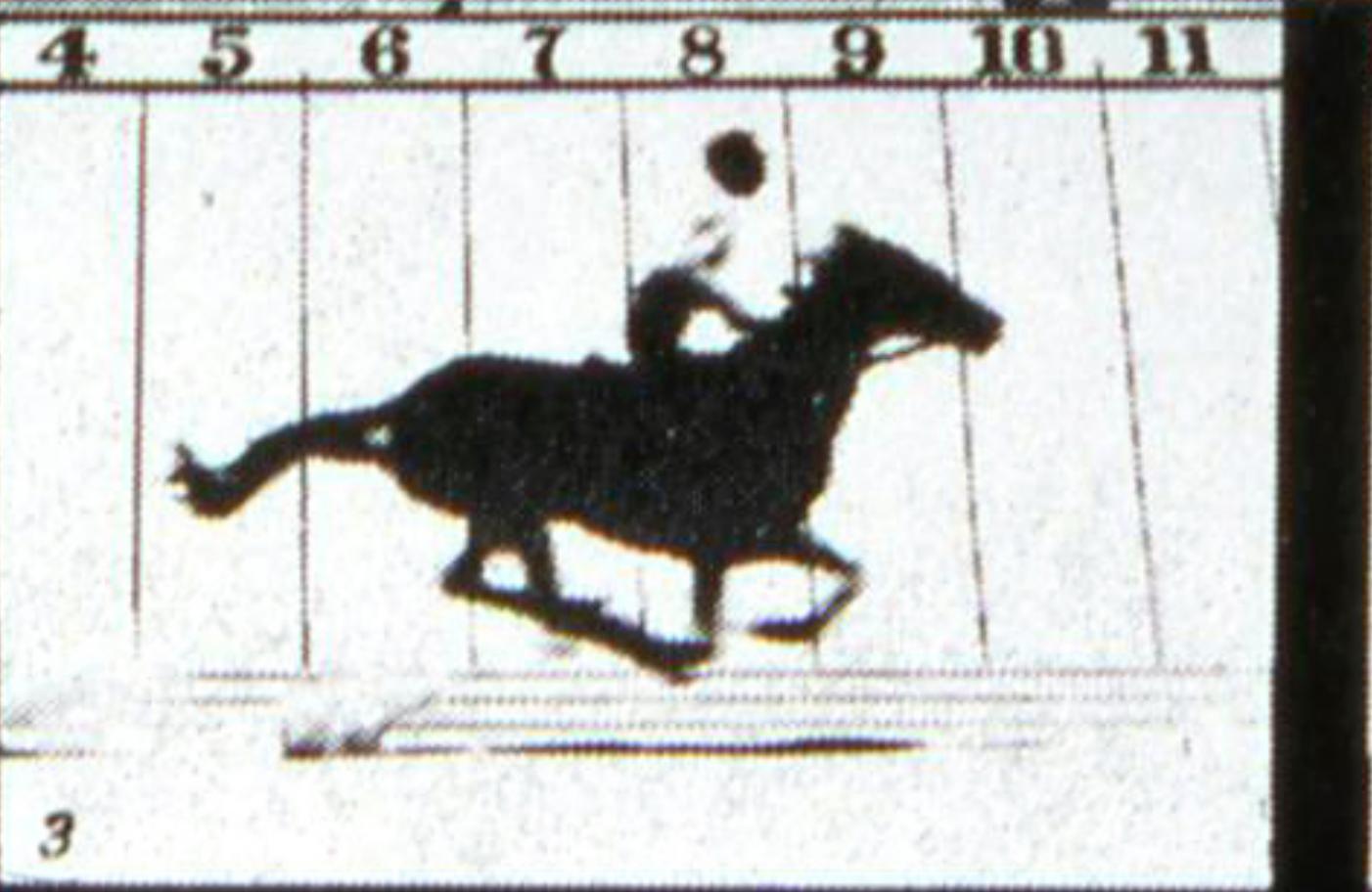
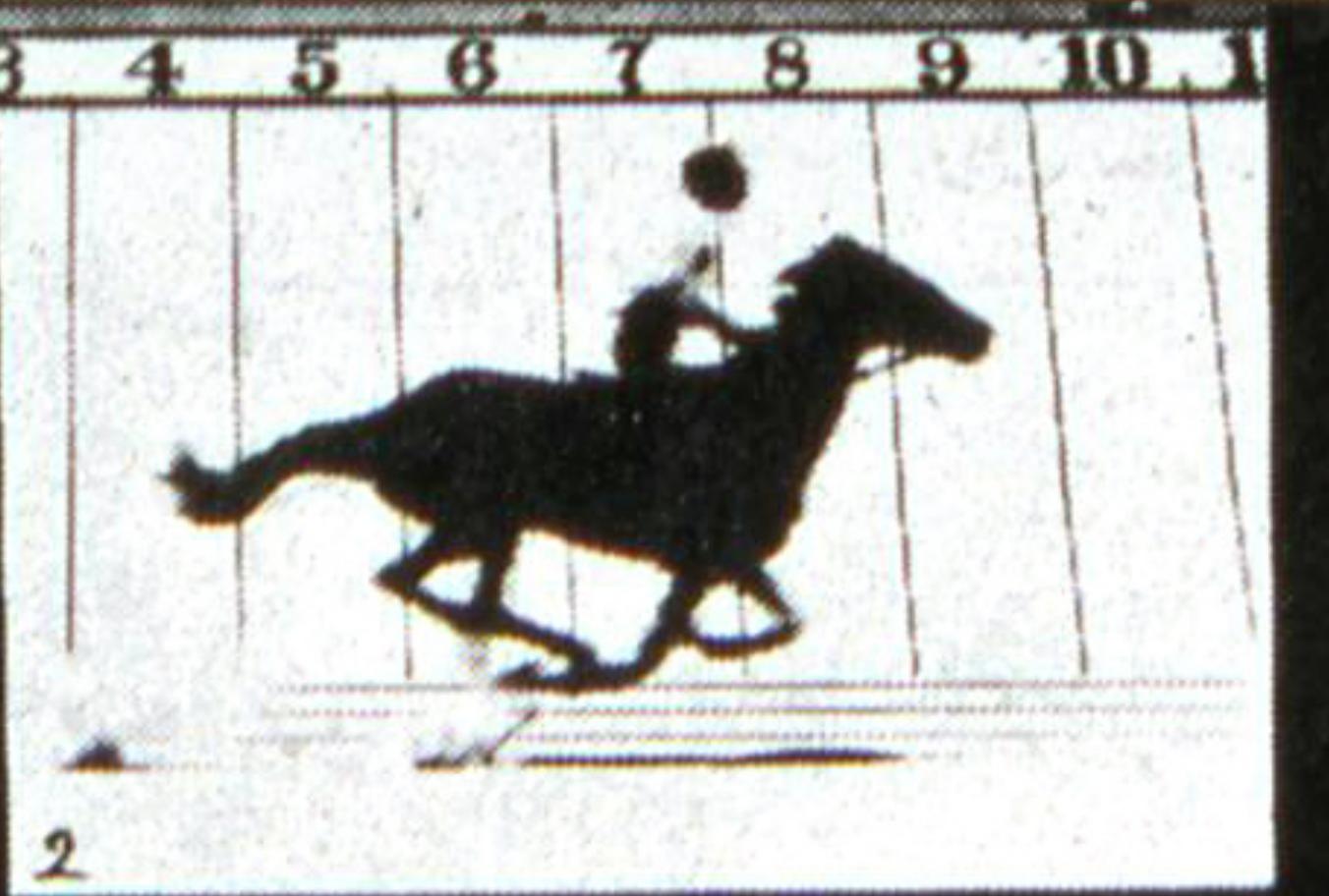
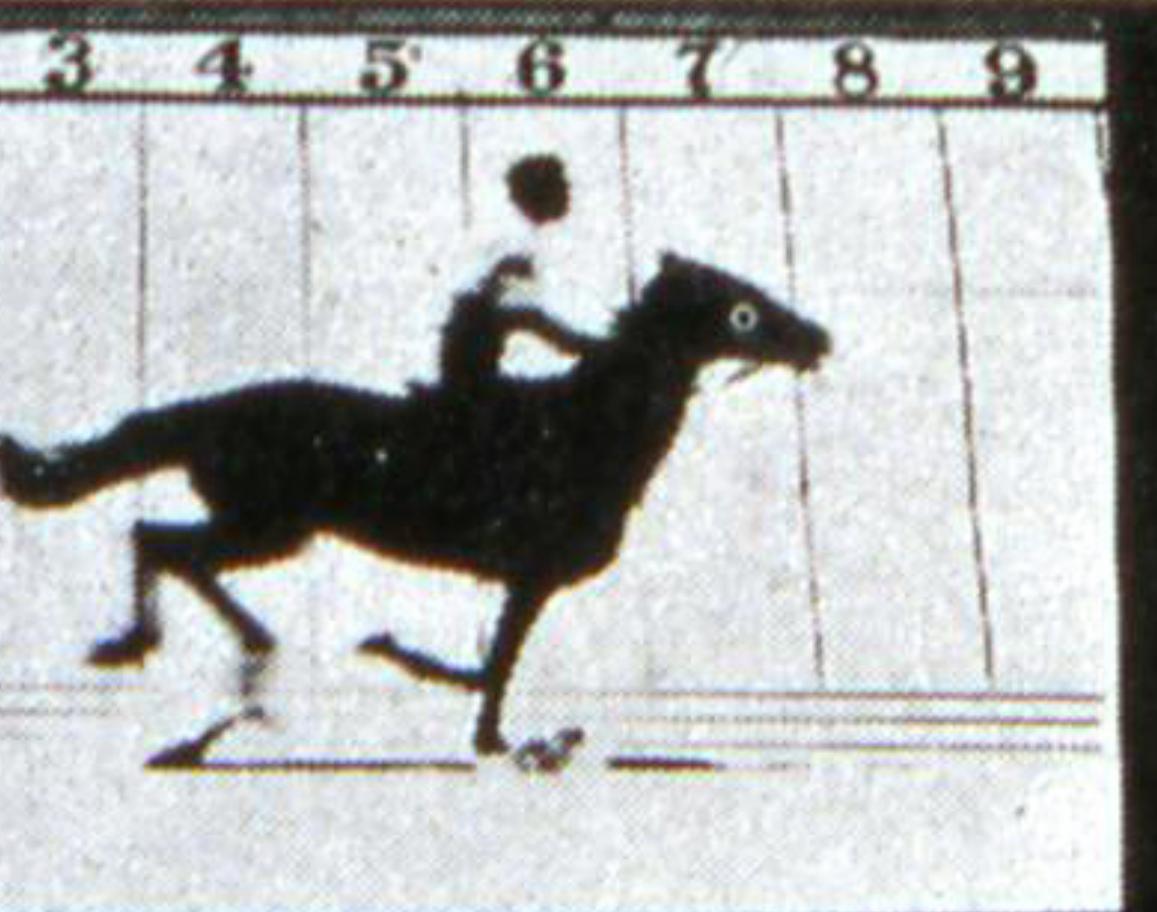
- [] finish report
- [] book meeting
- [] mow lawn

Birds at Timor Coopano 1859.

1. *Trochocercus timorensis?* Bill short & thick.
feet dull lead - and the "yellowish" 2. 2
3 - 4 like.
2. *Actites citrinella*. Molt. in brown, bill bl. (lead). 0
at least pale lead..
3. *Micrura rufogularis*. Bill bl. (as above) - 2
4. *Rhipidura albiceps*. Bill bl. (as above) feet black.
5. *Rhipidura albiceps*. Bill bl. (as above) feet black. 1
6. *Pelotes ruficollis*. Bill bl. feet dark but in brown 2. 3
7. *Lanius meridionalis*. Bill short, white at base beneath, rest a little whitish 2. 1
8. *Lanius meridionalis*. Bill short, white at base beneath, rest dull yellow - black 2. 1
9. *Rhipidura ochrogaster* Bls. in grey brown, bill bl. (black) - 3
10. *Tobiamphus collaris*. in dark brown. Bill bl. 1 - 0
at base beneath.
11. *Trochocercus cinereus*. Bill bl. in dark brown 1 - 1
Bill bl. feet pale lead -
12. *Actites sp.* white base bl. in narrow white 1 - 1
Gygites marginatus. Bill even bluish feet purplish -
in few cases a little - *Semirufa*.
13. *Oriolus chinensis*. Bill red - 1 - 0
Molt. very different, but very difficult to another sp.
14. *Hypothymis (leucostoma)*. in bluish red. Bill short. 1 - 1
dusky..
15. *Muscicapa ferruginea*. Bill bl. in dark, bill bluish white 1 - 1
feet reddish pale and
16. *Sarcops calvus*. Bill short bl. in dark 1 - 1
17. *Cittacula jukini*. in pale yellow. 2. 0
18. *Corvinus melanorhynchus*. Wys. 1 - 0
very large - 1 ft. and 1 ft. - 4 ft. wing length
3 - 5 mm. a little shorter - 6 ft. wing length
bill 25 x 6.

At Samos December 1859. Light as with figs. 9. 7

1. *Chalcophrys*? in dark bill bl. 1 - 0
2. *Angiopteron totalis*? Tern. 1 - 1
3. *Carpodroma rossica*. Tern. in & outside dark red 1 - 1
bill long, base lower middle whitish black red.
feet dull coral red. & white but smaller.
4. *Ardia sp.* bill white greenish. culmen dusky 1 - 0
base green - in pale yellow - pale green -
5. *Fregata spissa*. Tern.
green, wings & shoulders slate. bill 1 - 2
4. bl. pale greenish bluish at base pale and purplish.
white on tail feathers, wings & tail.
6. *Calonectris*? in dark bill pale bluish green. 1 - 0
7. *Zenaidura*? Bill dusky, red. at base
feet pale yellow. in dark. 1 - 0
8. *Pelomacrus flaviventer*. Sp. Bill olive green, white 1 - 1
base greenish blue, in red orange.
feet pale olive, claws dusky..
9. *Alisterus*? Bill dusky, base pale green - 2. 0
? *Spelaeornis*? yellow green in dark brown - 2. 0
? *Spelaeornis*? white 2. 0
10. *Graculus verreauxi*. Bill & feet bluish - 2. 1
11. *Anas diazi*. Wall.
12. *Anas diazi*. Galla. Bill carmine red, feet reddish 1 - 0
claws dusky.
13. *Cygnis hypoleucos*. Bon. Bill of bl. width 2. 0
14. *Pelotis sp. hindei?* small, bill bl. feet dusky, red. 1 - 0
white inner.
15. *Chlidonias*? in red? base white
cubital white. Bill bl. width yellow. 2. 12
2. 5. feet bluish cl.
16. *Zenaidura*? Bill of bl.. 1 - 4
Pelotis c. capricornis. L.



Data visualization maps **values** to **visual forms**.

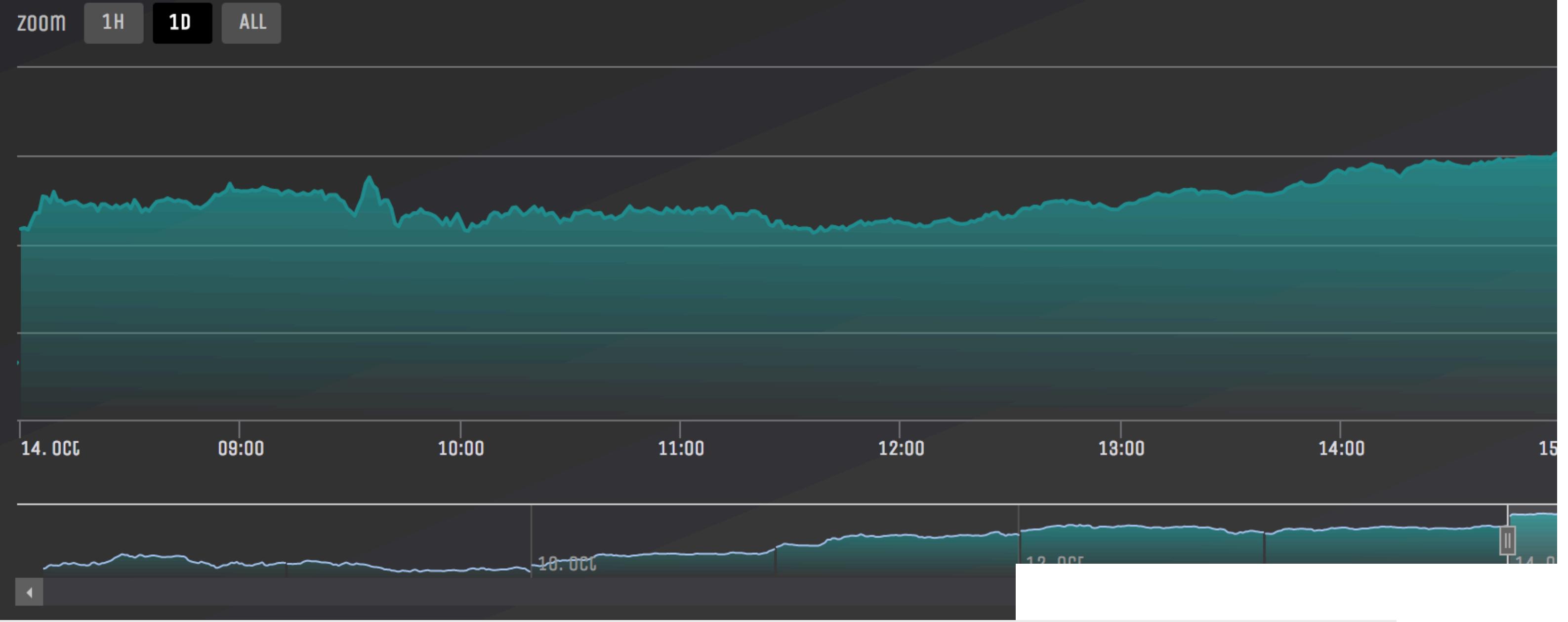
Data visualization for **data exploration and analysis** vs. **communication and persuasion**

Basic forms

- **Charts and Graphs** (statistical data representations)
- **Infographics** (data-driven story-telling)
- **Interactive dashboards** (e.g., Cognos, Tableau)

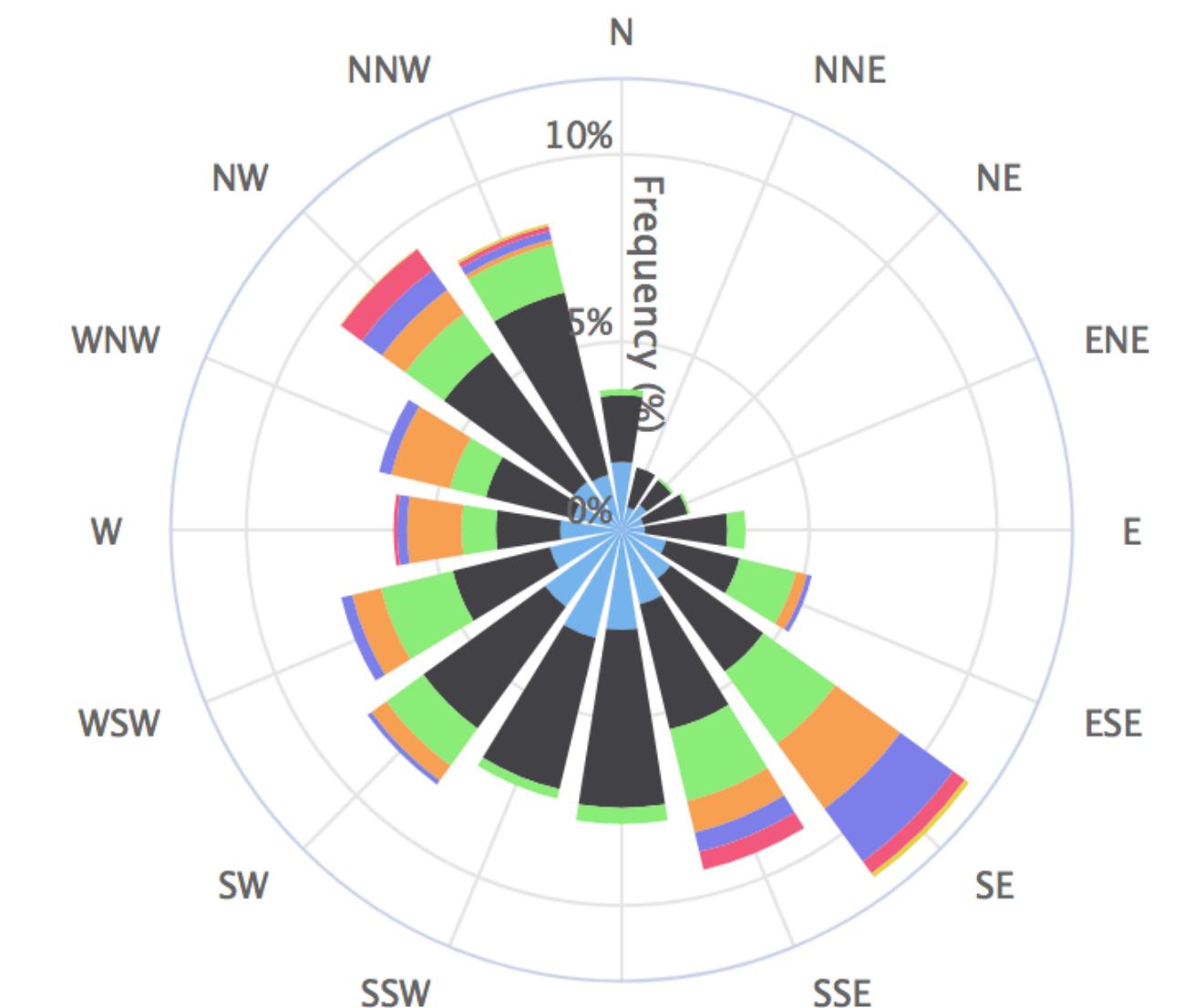
AAPL STOCK PRICE BY MINUTE

USING ORDINAL X AXIS



Wind rose for South Shore Met Station, Oregon

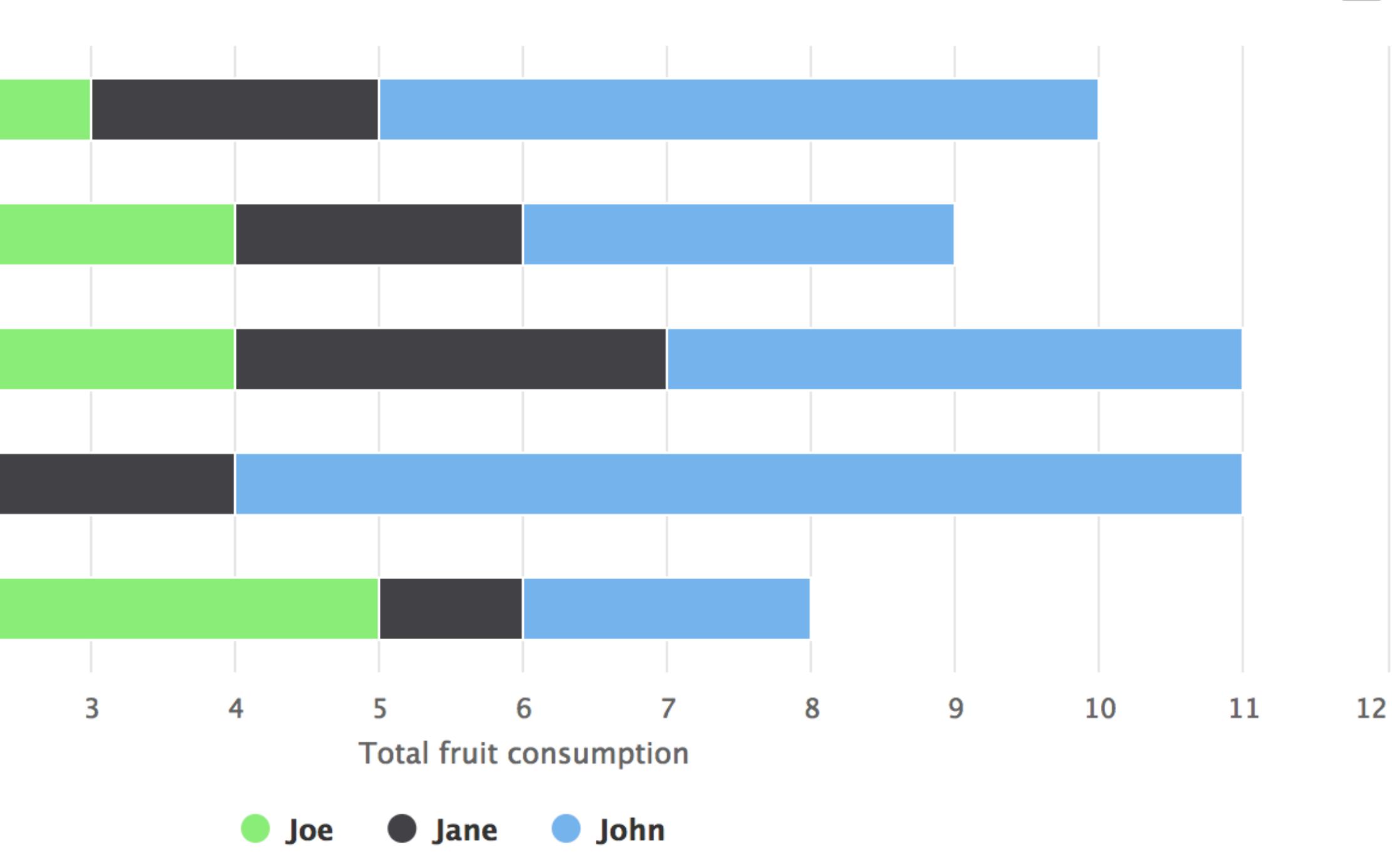
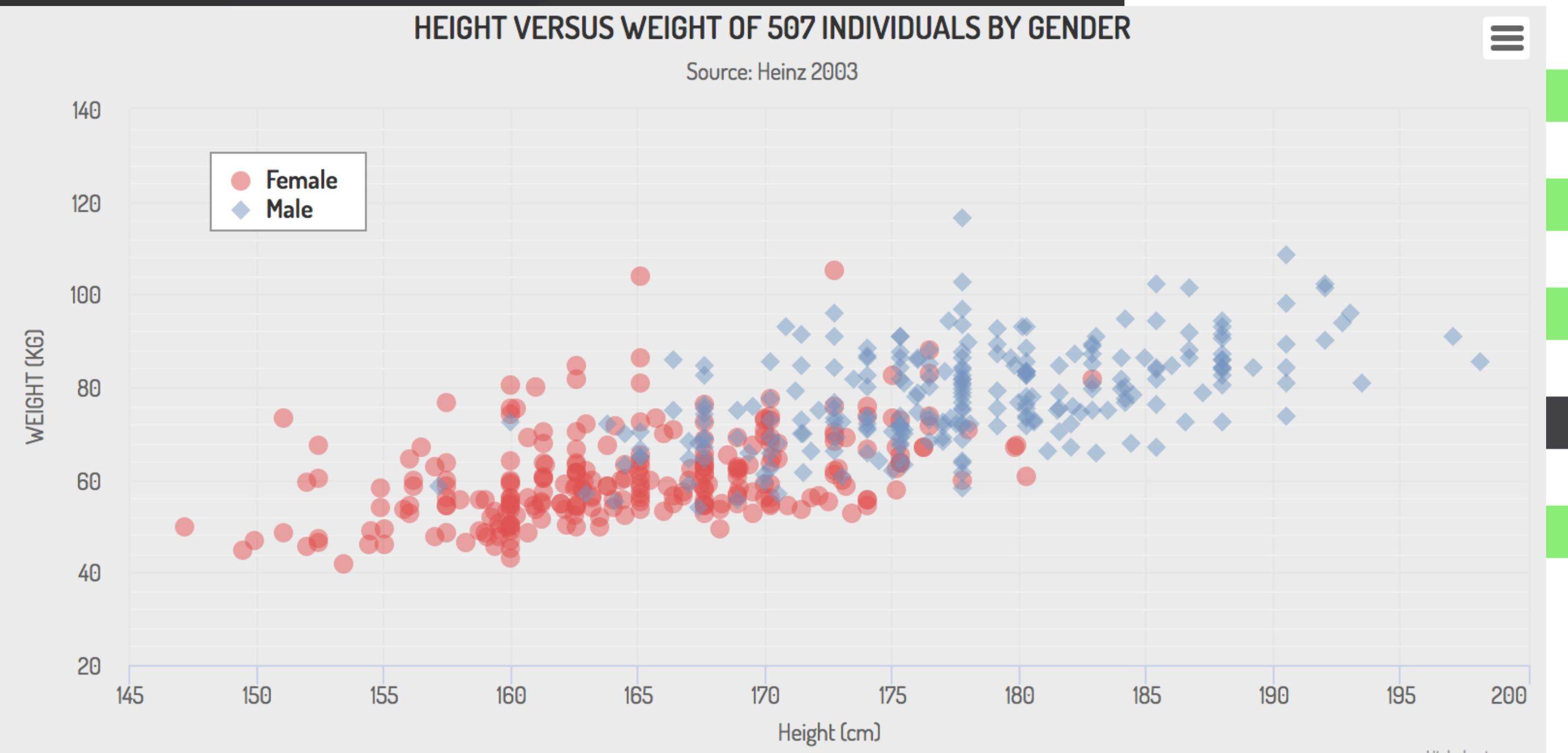
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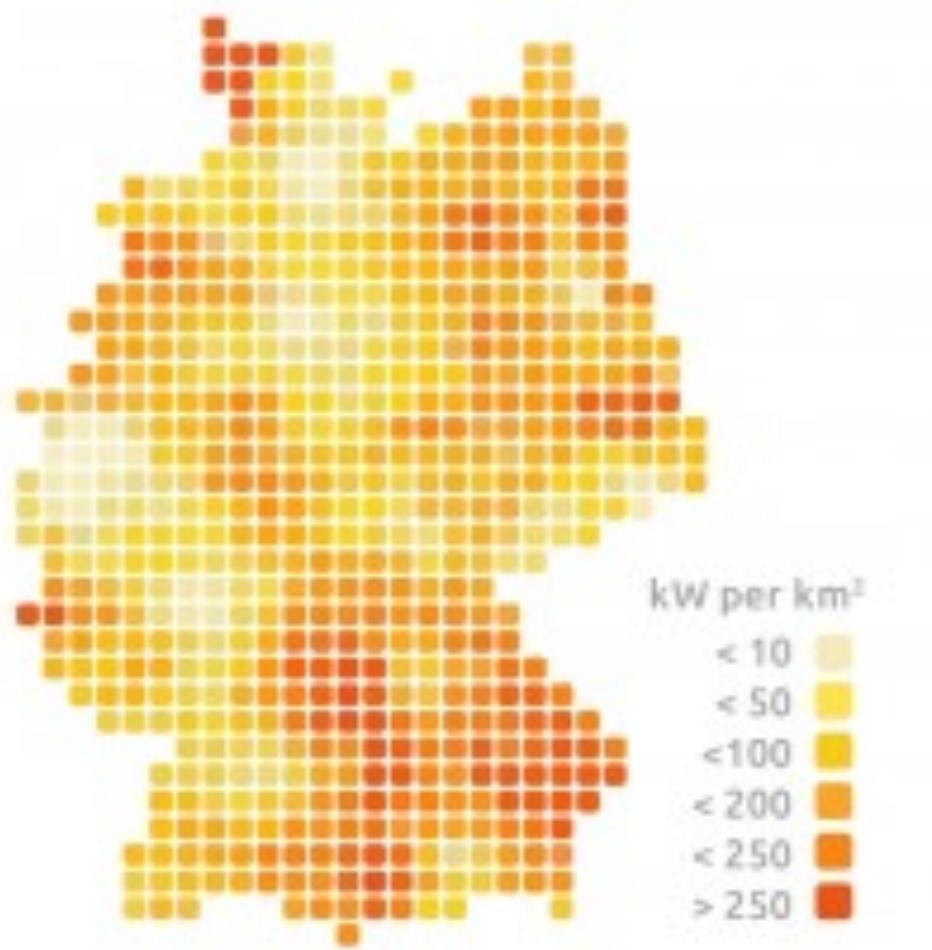
Stacked bar chart

HEIGHT VERSUS WEIGHT OF 507 INDIVIDUALS BY GENDER

Source: Heinz 2003



INSTALLED CAPACITY PER KM²



Acceptance of solar farms
in the neighborhood



SOLAR ENERGY GENERATION 2014

billion kilowatt hours (bn kWh)



FIT PAYMENTS & INVESTMENTS

in cents per kilowatt-hour



in billion euro

INVESTMENTS

↓ 87%

FEED-IN TARIFFS
↓ 79%

JOB



2015

Sports Clubs

CAMPUS RECREATION
STAY ACTIVE

TOTAL MEMBERS ACTIVE:

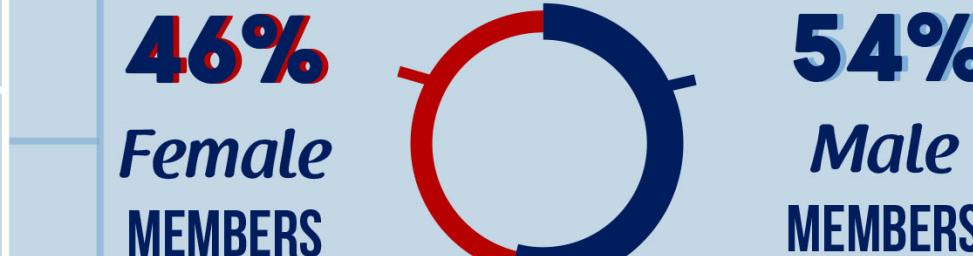
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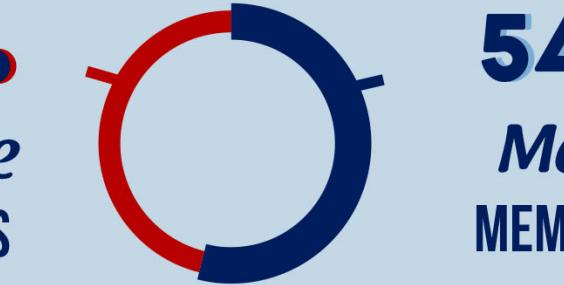
49 SPORTS CLUB Teams

46% Female MEMBERS

70% OF OFFICERS HAVE ENHANCED THEIR ABILITY TO THINK CRITICALLY THROUGH SPORTS CLUBS PARTICIPATION



54% Male MEMBERS



2 NATIONAL INDIVIDUAL CHAMPIONS

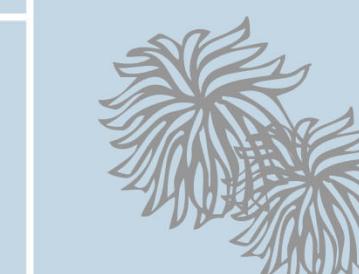
Sydney Boukedes
BALLROOM
LATIN DANCE
CHA CHA & RUMBA

Luke Vrouwenvelder
CYCLING MEN'S COLLEGIATE
MOUNTAIN BIKE DIVISION I

3 NATIONAL TEAM CHAMPIONS



FIELD HOCKEY



ALL-GIRL CHEER



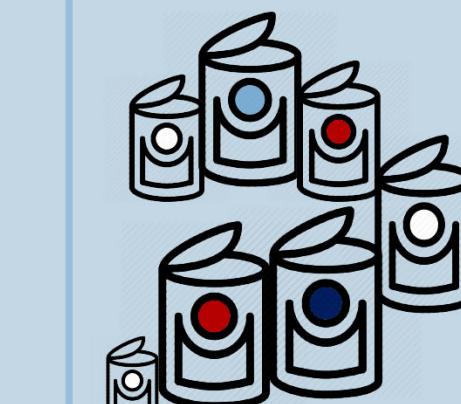
MEN'S ULTIMATE

PARTICIPANTS DONATED

MORE THAN

5,676

CANS OF FOOD TO THE FOOD BANK OF CENTRAL AND EASTERN NORTH CAROLINA



BLOOD PLATELET DONATIONS FROM SPORTS CLUBS

PARTICIPANTS:

204

SPORTS MEDICINE HELD

802 CLINIC VISITS FOR SPORT CLUB ATHLETES



71 SPORTS CLUBS PARTICIPATED IN THE RAMSES RECycles PROGRAM FOR FALL '14

COFFEE FACTS

TOP 5 COFFEE PRODUCERS

1. BRAZIL
2. VIETNAM
3. COLOMBIA
4. INDONESIA
5. ETHIOPIA

TOP 5 COFFEE CONSUMERS

1. UNITED STATES
2. GERMANY
3. ITALY
4. JAPAN
5. FRANCE

33% OF THE WORLD'S COFFEE IS PRODUCED IN BRAZIL

56% OF ADULTS IN THE UNITED STATES DRINK COFFEE
NONE OF THE ABOVE COUNTRIES ARE LOCATED IN THE BEAN BELT

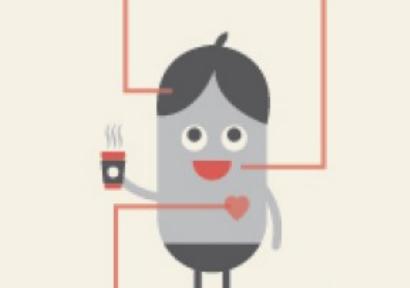


2ND MOST TRADED COMMODITY IN THE WORLD SECOND TO OIL

COFFEE BEANS CONTAIN CAFFEINE
A WHITE CRYSTALLINE XANTHINE ALKALOID THAT ACTS AS A STIMULANT DRUG

WHICH HELPS
(WHEN TAKEN IN MODERATION)

INCREASES ATTENTION & MEMORY PERFORMANCE
INCREASES DOPAMINE LEVEL, MAKING YOU FEEL HAPPIER



DECREASES RISK OF HEART DISEASES
INCREASES PHYSICAL PERFORMANCE & MUSCULAR RECOVERY

CAFFINE CONSUMPTION ABOVE 80MG, ABOUT 8 TO 9 CUPS OF COFFEE A DAY CAN CAUSE LONG TERM EFFECTS LIKE CHRONIC INSOMNIA, PERSISTENT ANXIETY, DEPRESSION AND STOMACH ULCERS.

SEPT

29

SEPTEMBER 29TH IS NATIONAL COFFEE DAY IN THE UNITED STATES

65%

OF COFFEE CONSUMPTION TAKES PLACE DURING BREAKFAST HOURS

MOST EXPENSIVE COFFEE IN THE WORLD "KOPI LUWAK"

COUNTRY OF ORIGIN: INDONESIA

MADE FROM COFFEE BEANS EATEN, PARTLY DIGESTED AND THEN EXCRETED BY THE COMMON PALM CIVET, A WEASEL-LIKE ANIMAL

EATEN & PARTLY DIGESTED
EXCRETED

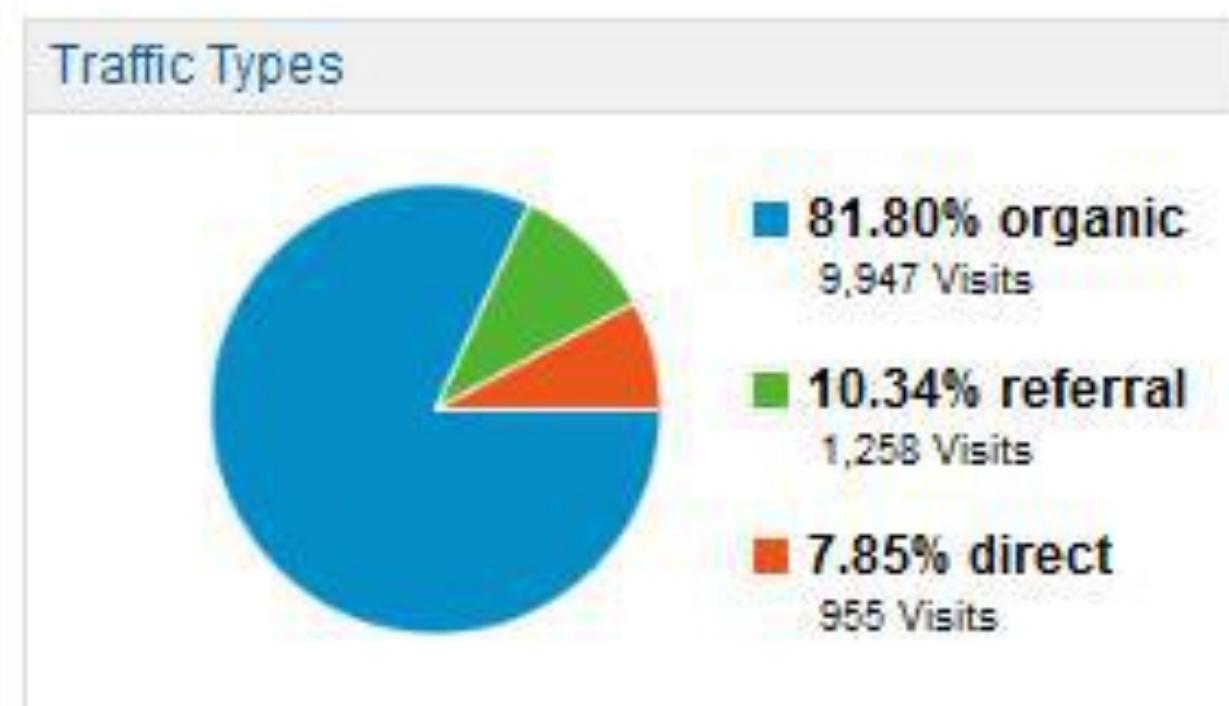
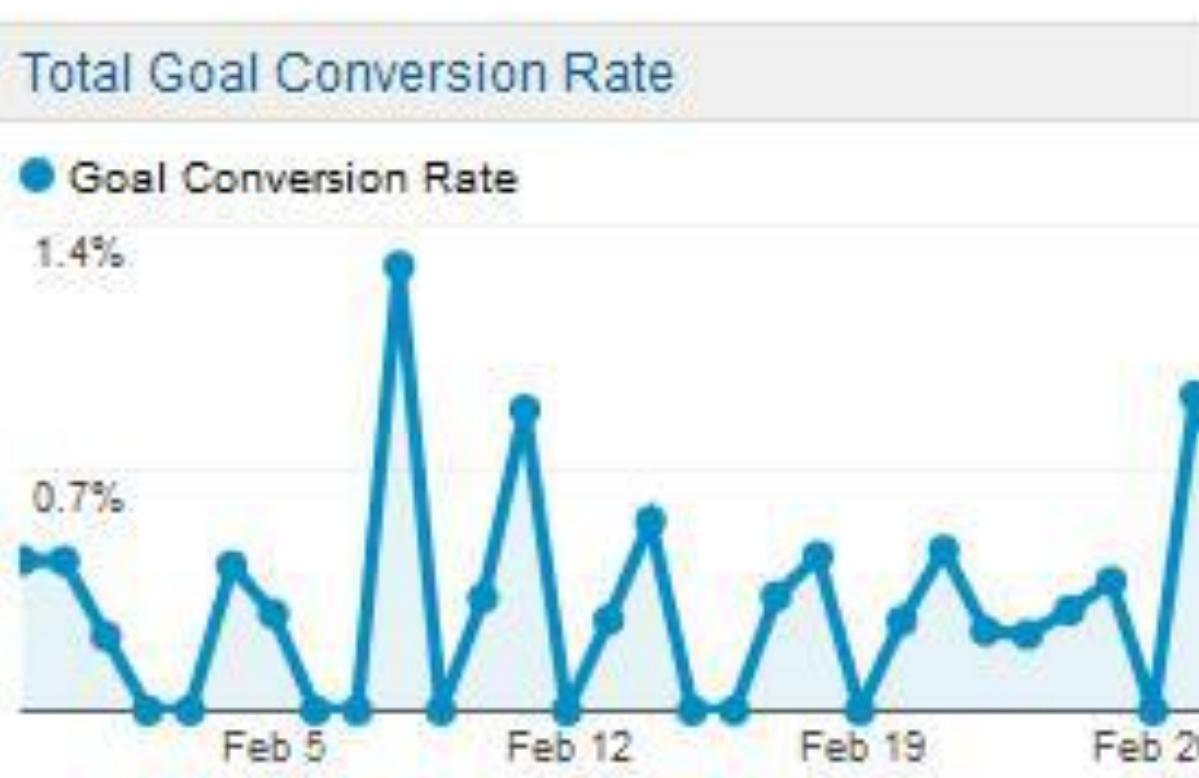
IT SELLS FOR MORE THAN \$600 A POUND
AVERAGING \$50 A CUP OF COFFEE

Real-Time (bets)

+ ADD WIDGET

My Dashboard

Jan 30, 2012 - Feb 29, 2012



Mobile Visits		
Mobile	Visits	Pageviews
No	11,620	18,742
Yes	540	911

Country/Territory	Visits	Avg. Time on Site
United States	8,342	00:01:05
United Kingdom	791	00:00:56
Canada	398	00:01:22
Philippines	231	00:01:05
Australia	228	00:00:51
India	157	00:01:23
Spain	100	00:00:56
Turkey	89	00:00:26
France	86	00:01:05
Malaysia	72	00:01:32

Source	Goal Completions	Conversion Rate (%)
google	13	0
(direct)	11	1
bing	4	0
yahoo	3	0
comcast	1	7
ehow.com	1	4
forums.prosperotechnologies.com	1	5
google.com	1	0
hadeninteractive.com	1	33
maestroclassics.com	1	50

Data visualization is **not new**.

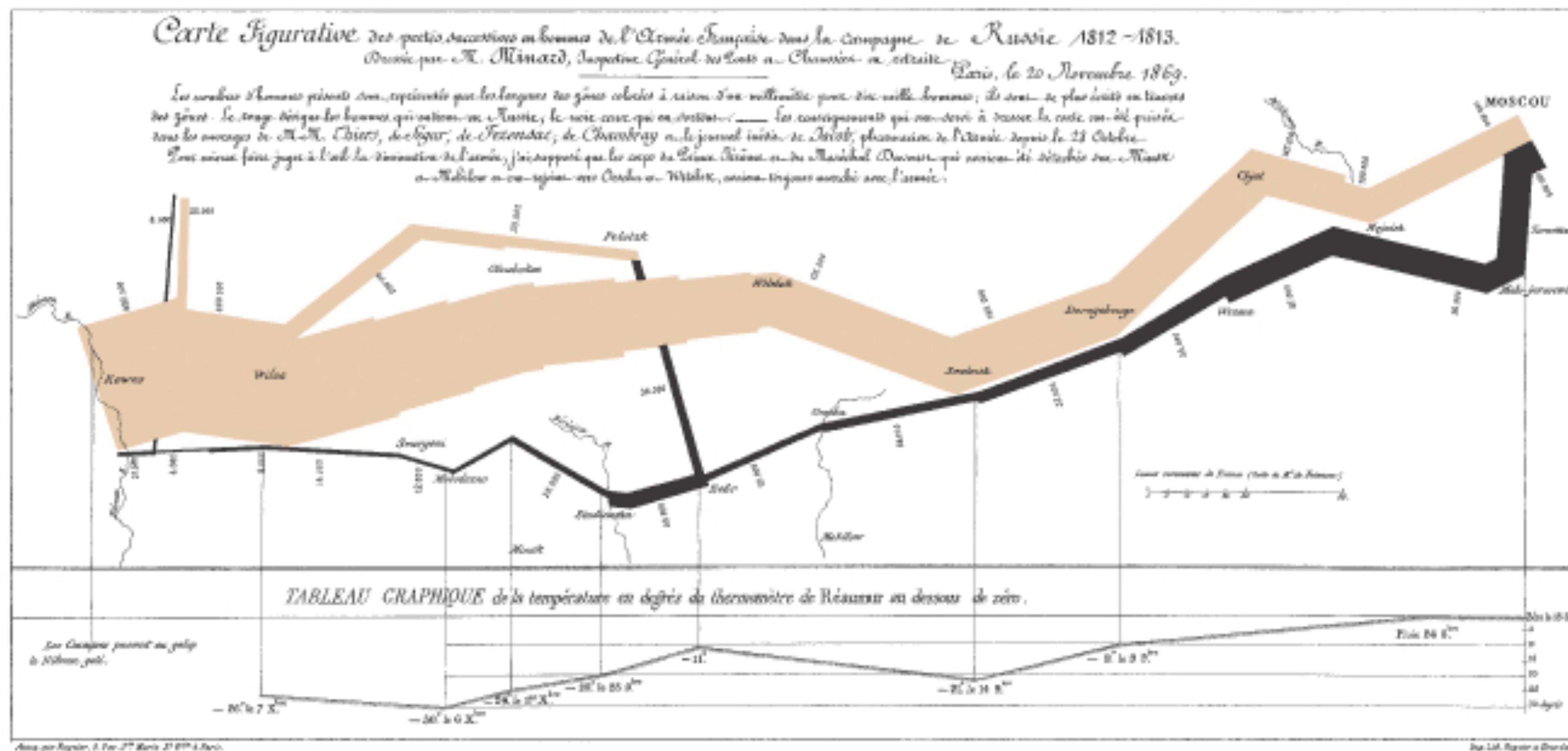
Thematic map — **Map of Catal Huyuk (6200 BC)**



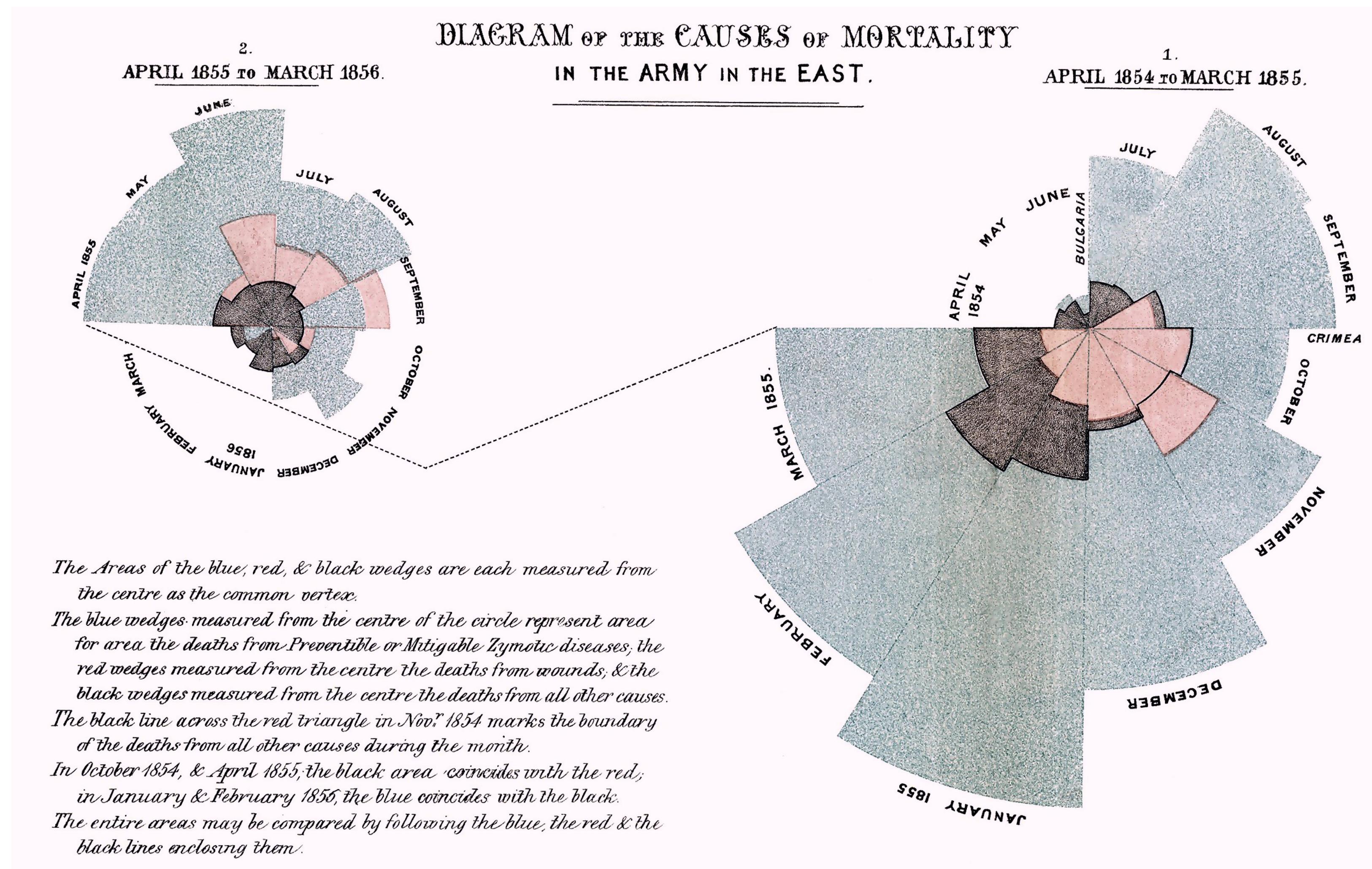
Thematic map — Star map and European observatories (early 18th cen.)



Statistical graphic – *Napoleon's March, Charles Joseph Minard (1869)*



Statistical graphic — Mortality in the British Army, Florence Nightingale (1858)



Introduction to **data types**

Data types — Qualitative

1. Nominal —

Nominal scales are used to ***name***, or label, variables without any quantitative value.

What is your gender?

- M – Male
- F – Female

What is your hair color?

- 1 – Brown
- 2 – Black
- 3 – Blonde
- 4 – Gray
- 5 – Other

Where do you live?

- A – North of the equator
- B – South of the equator
- C – Neither: In the international space station

Data types — Qualitative

2. Ordinal —

For ordinal scales, **order** is significant, even though the differences between values may not really be known.

How do you feel today?

- 1 – Very Unhappy
- 2 – Unhappy
- 3 – OK
- 4 – Happy
- 5 – Very Happy

How satisfied are you with our service?

- 1 – Very Unsatisfied
- 2 – Somewhat Unsatisfied
- 3 – Neutral
- 4 – Somewhat Satisfied
- 5 – Very Satisfied

Data types — **Quantitative**

1. Interval —

Interval scales give us the **order** as well as the **exact differences** between values. However, there is **no “true zero.”**

Examples: temperature, dates

Data types — **Quantitative**

2. Ratio —

Ratio scales tell us about the **order**, the **exact value between units**, and **do have a “true zero,”** allowing us to apply descriptive and inferential statistics to the data.

Examples: height, weight

Qualitative

- Nominal
- Ordinal

Quantitative

- Interval
- Ratio

-