Crafting with Data

Reality, Illusions, Truth & the Future

Instructor: Rob Faludi

Brief Introduction

- Data

    - Literacy

    - Ethics

    - Skills & Comprehension

- Rob Faludi

    - Background

    - Motivations for this class

Why This Class

- Students consume, collect, analyze, display and present data

- ITP curriculum supports electronics, UCD, programming, media

- We believe in the need to support skills with data

    - literacy: "competence or knowledge in a specified area"

    - data literacy creates a powerful and enlightening way of thinking about the world

- An experimental addition to the ITP curriculum. This is a second exploration so expect to have fun, try new stuff and provide feedback. Your ideas matter.

Exercise One

- Get some data!

    - You have 10 minutes to collect some data and return with it

    - Use your own definitions of data, we'll talk about that after your return

Plan for Today

- Brief Introduction

- Exercise One: Get some data

- Student Introductions

- Syllabus Review

- Readings & Assignments

Student Introductions

- Name, graduation semester

- Projects from the last year

- What you did this summer

- An alternate summer, from your imagination

- How you ended up in this class, hopes and plans

Syllabus Review

- Syllabus review

    - Class schedule

    - Assignments

    - Documentation

    - Student Presentations

    - Grading
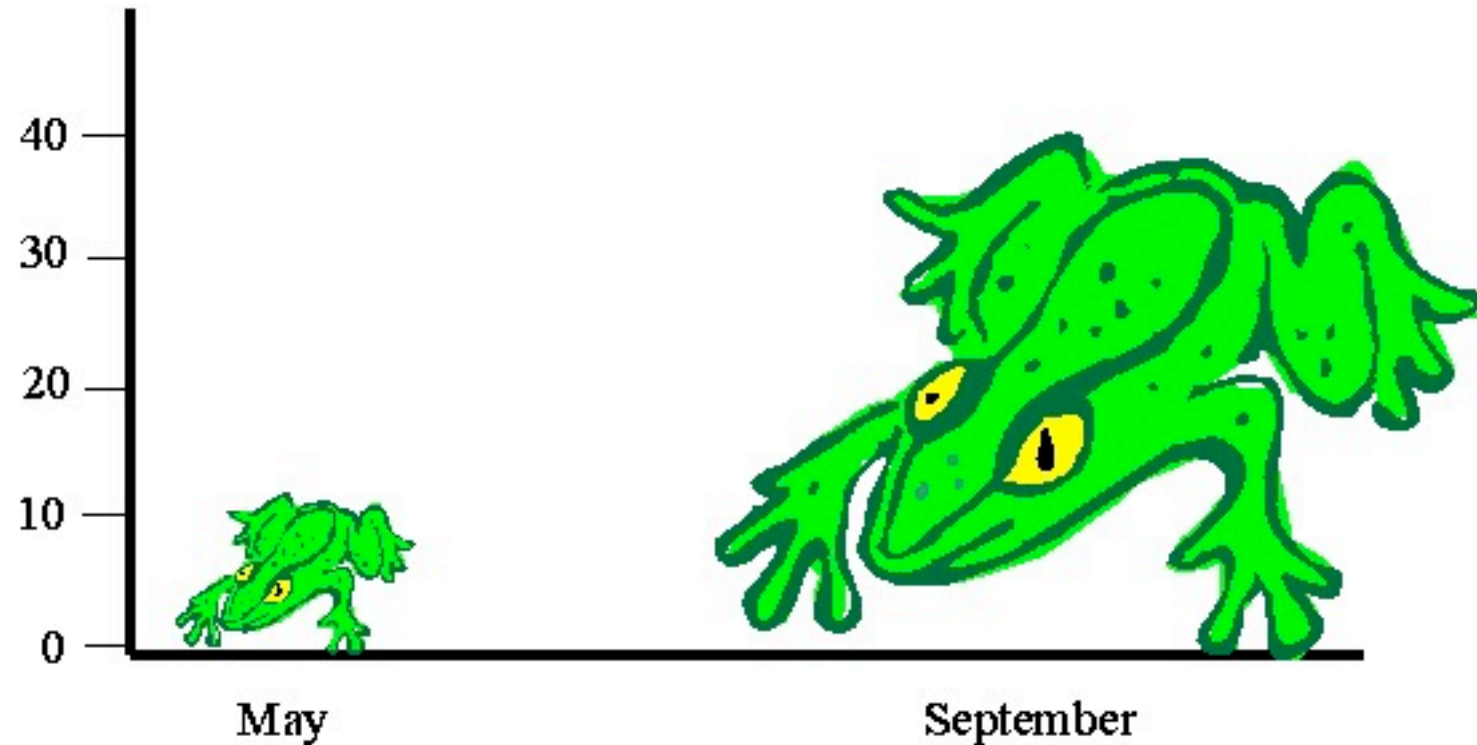
    - Laptops

    - Office Hours

Class Schedule

Ethics and understanding

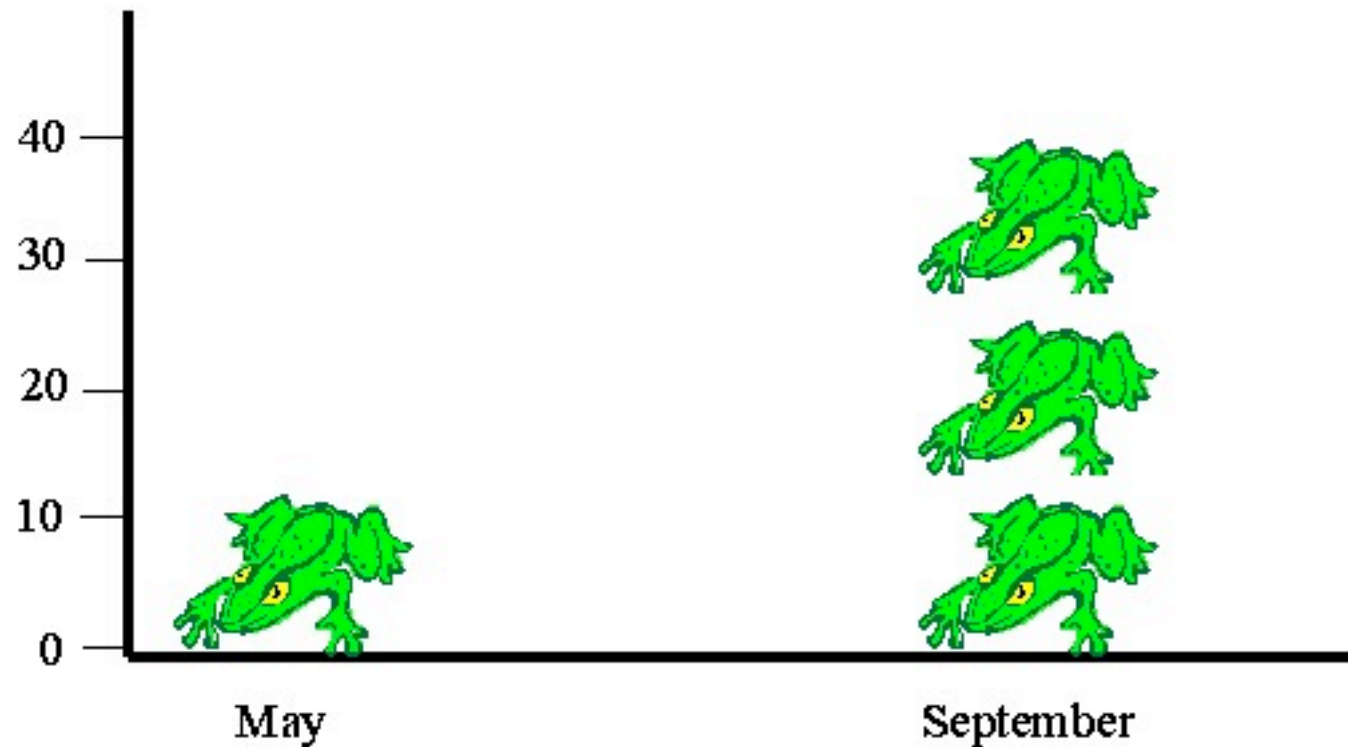- how to lie with statistics

Number of Adult Frogs in South Pond

Ethics and understanding
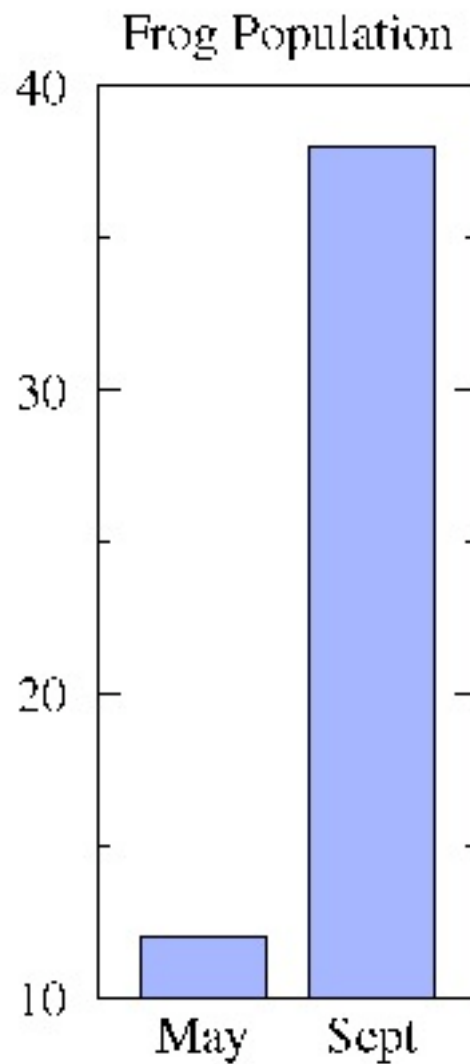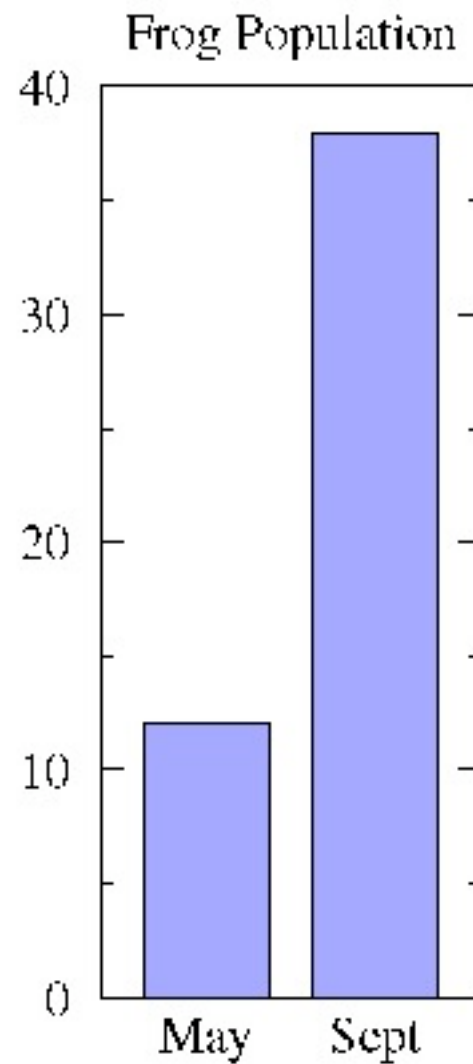

Number of Adult
Frogs in South Pond

Ethics and understanding

Frog Population
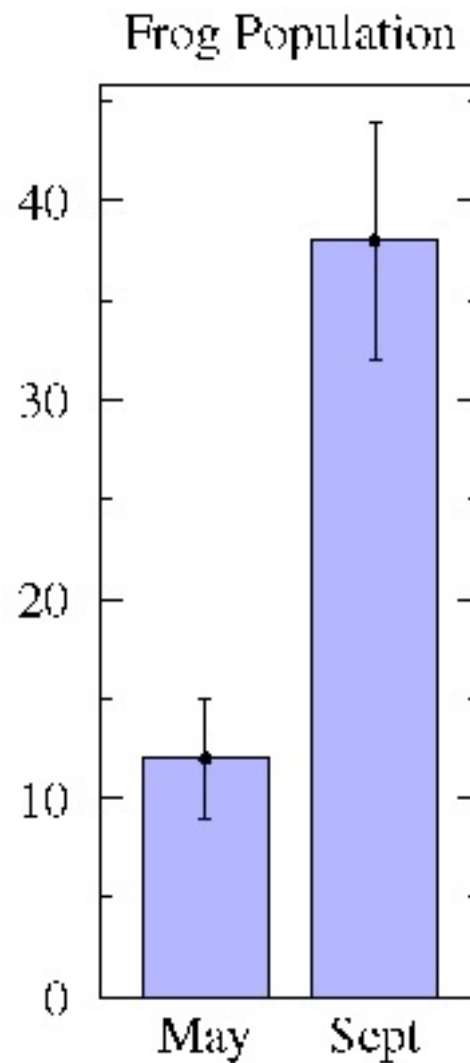
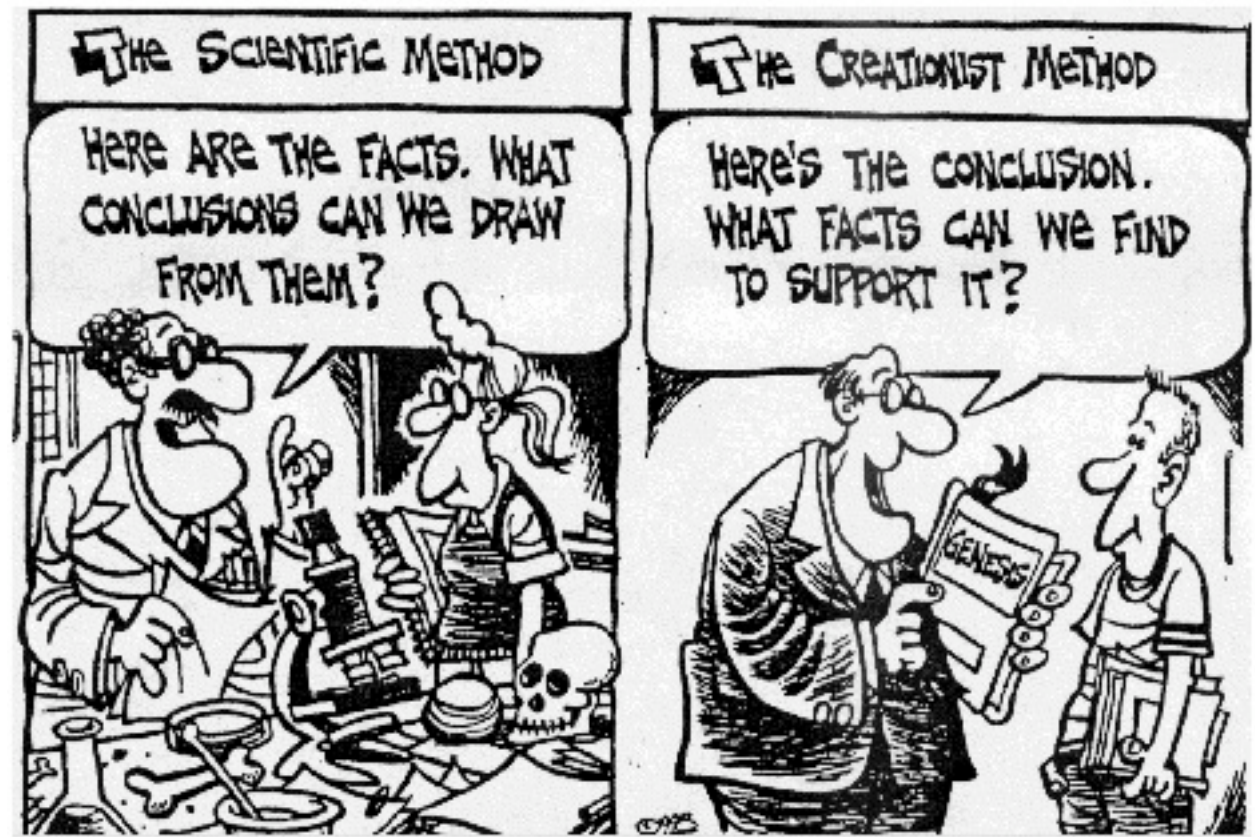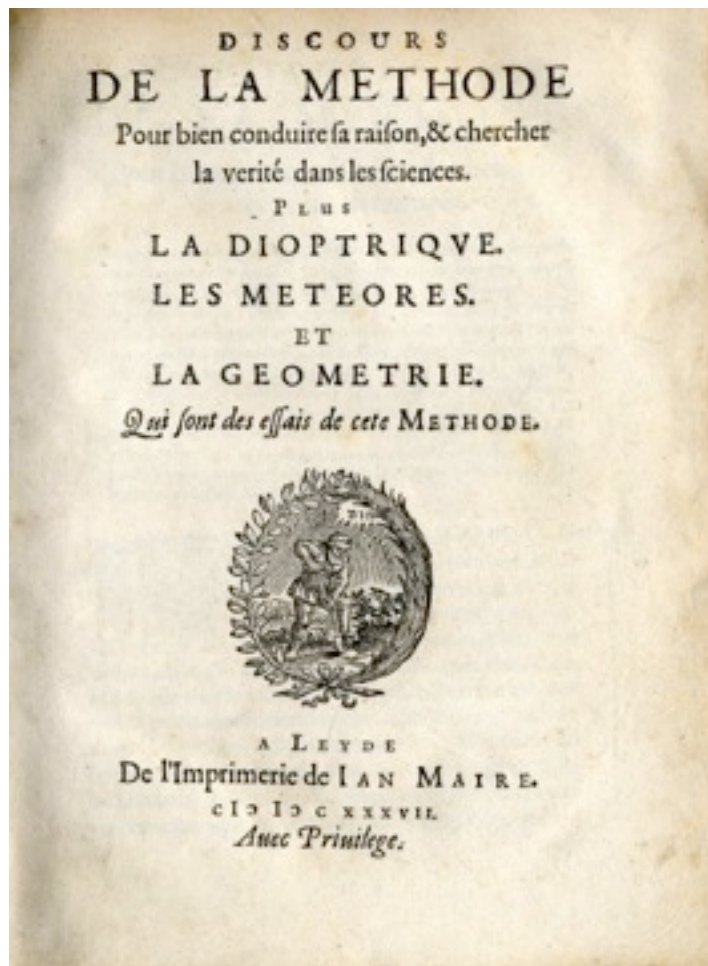# Ethics and understanding

Frog Population

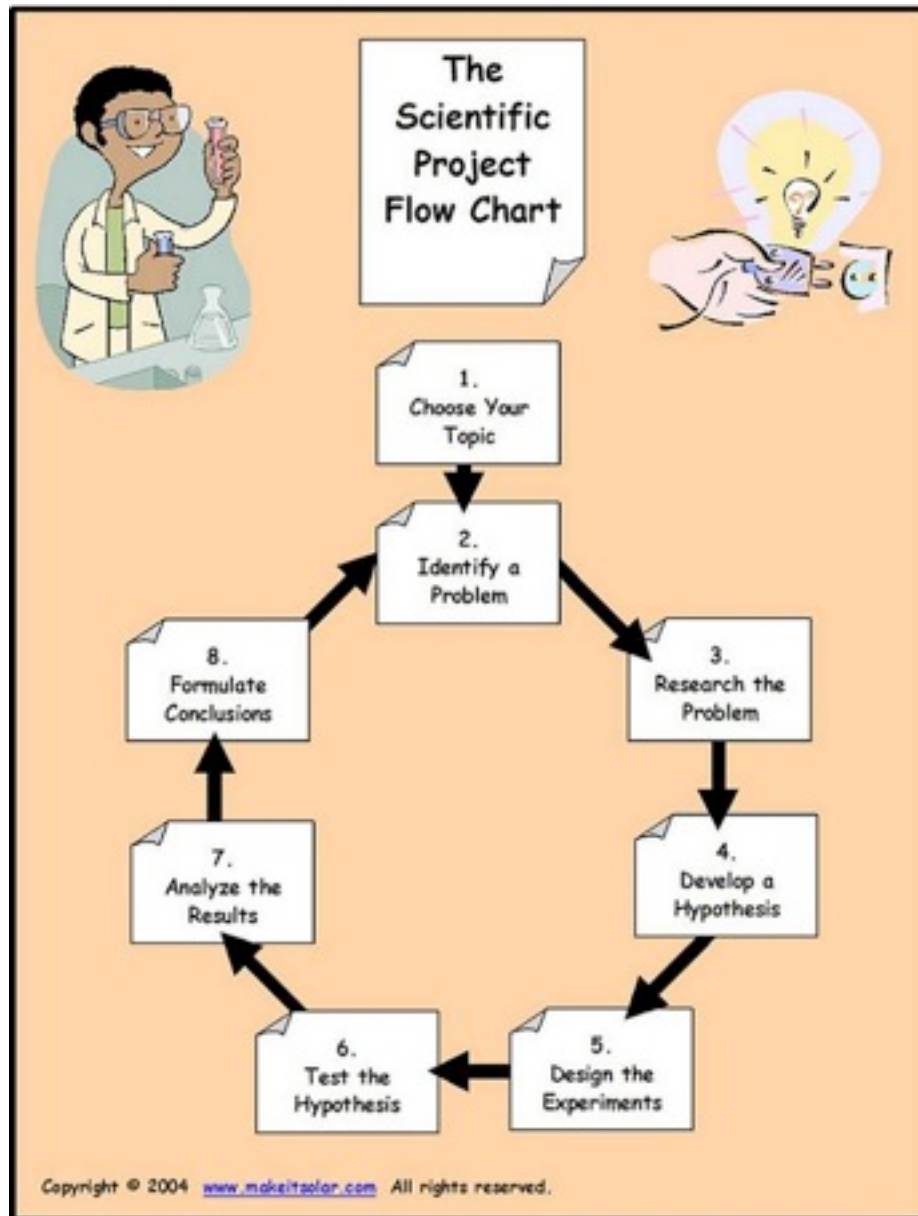# Ethics and understanding

Frog Population

Thinking Scientifically

- creativity, criticism and the way of knowing

Discourse on the Method of Rightly Conducting the Reason, and Searching for Truth in the Sciences

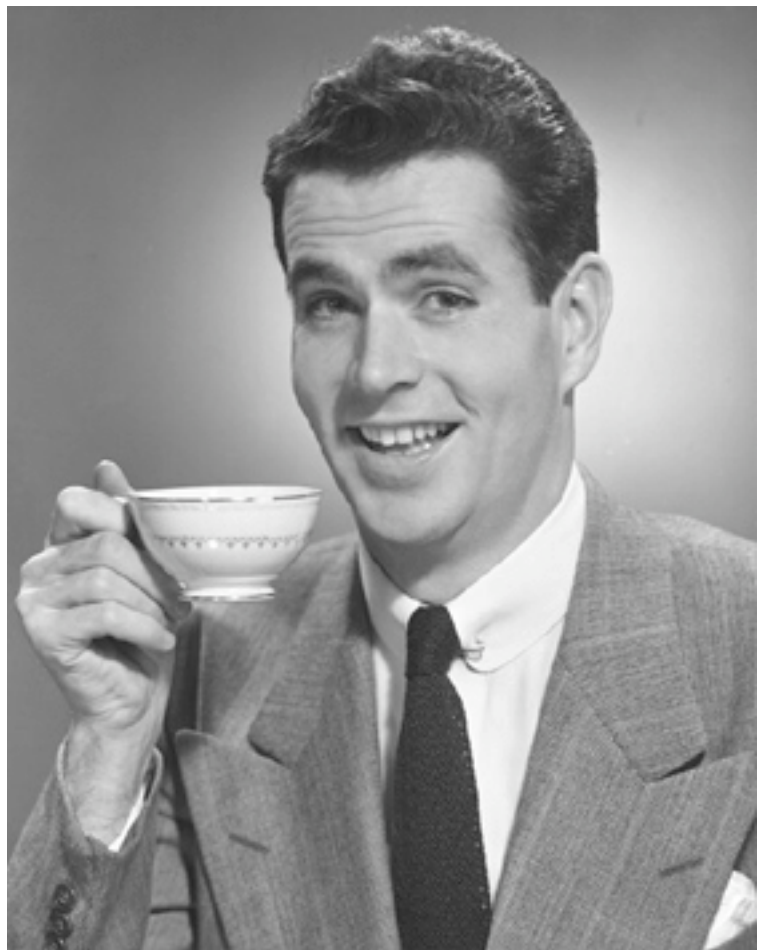# Thinking Scientifically

The Scientific Project Flow Chart

1. Choose Your Topic
2. Identify a Problem
3. Research the Problem
4. Develop a Hypothesis
5. Design the Experiments
6. Test the Hypothesis
7. Analyze the Results
8. Formulate Conclusions

Thinking Scientifically

Thinking Scientifically

The Modern Science of Measuring
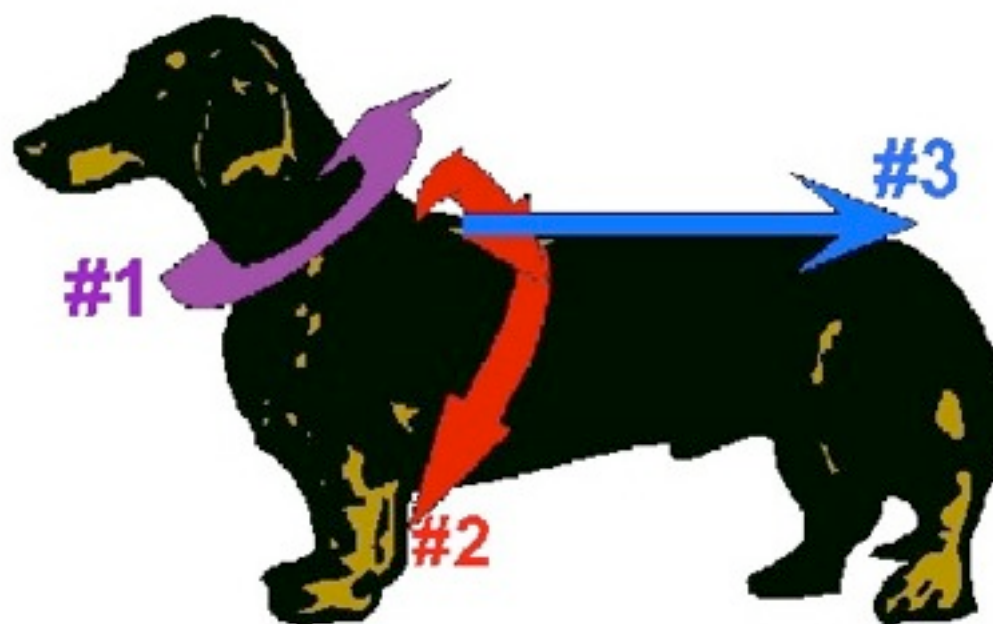
- a world of parameters. Scientific method, gathering data, ethics and IRB, informed consent

The Modern Science of Measuring

The Modern Science of Measuring

Diagram A: Place thumb or finger beneath tape measure when taking bust measurement.

The Modern Science of Measuring

Looking at Data

- exploratory data analysis and descriptive statistics

	A	B	C	D	E	F	G	H	I	J	K	A L
1	Site	Longitude	Latitude	Elevation	Annual Me	Mean Diur	Isothermali	Temperatu	Max Temp	Min Tempe	Temperatu	Mean T
2	O0002258	149.3833	-19.9167	0	23.8	4.5	0.39	0.9	29.4	17.8	11.6	2
3	O0000469	144.2483	-17.4283	10	25.8	14	0.61	0.98	36.2	13.1	23.1	2
4	O0000181	144.85	-15.5167	600	21	8.3	0.53	0.91	28.7	13	15.7	2
5	O0000409	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
6	O0001066	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
7	O0001064	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
8	O0000387	153.9	-14.6	165	24.8	-3.3	-41.25	0.33	25.7	25.7	0.1	2
9	O0000405	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
10	O0001065	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
11	O0001092	153.9	-14.6	150	24.9	-3.2	-38.27	0.33	25.8	25.7	0.1	2
12	O0000368	152.9667	-14.5	1200	19	-4.1	-4.28	0.4	20.8	19.8	1	2
13	O0000382	153.9	-14.6	165	24.8	-3.3	-41.25	0.33	25.7	25.7	0.1	2
14	O0000392	152.95	-14.45	1800	15.7	-4.9	-4.05	0.44	17.8	16.6	1.2	1
15	O0001048	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
16	O0001081	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
17	O0000369	152.9667	-14.5	1200	19	-4.1	-4.28	0.4	20.8	19.8	1	2
18	O0000399	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
19	O0001054	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
20	O0001055	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
21	O0000400	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
22	O0001056	152.9833	-14.5667	260	24.2	-2.8	-3.97	0.35	25.5	24.9	0.7	2
23	O0000371	152.9667	-14.5	1200	19	-4.1	-4.28	0.4	20.8	19.8	1	2

Looking at Data
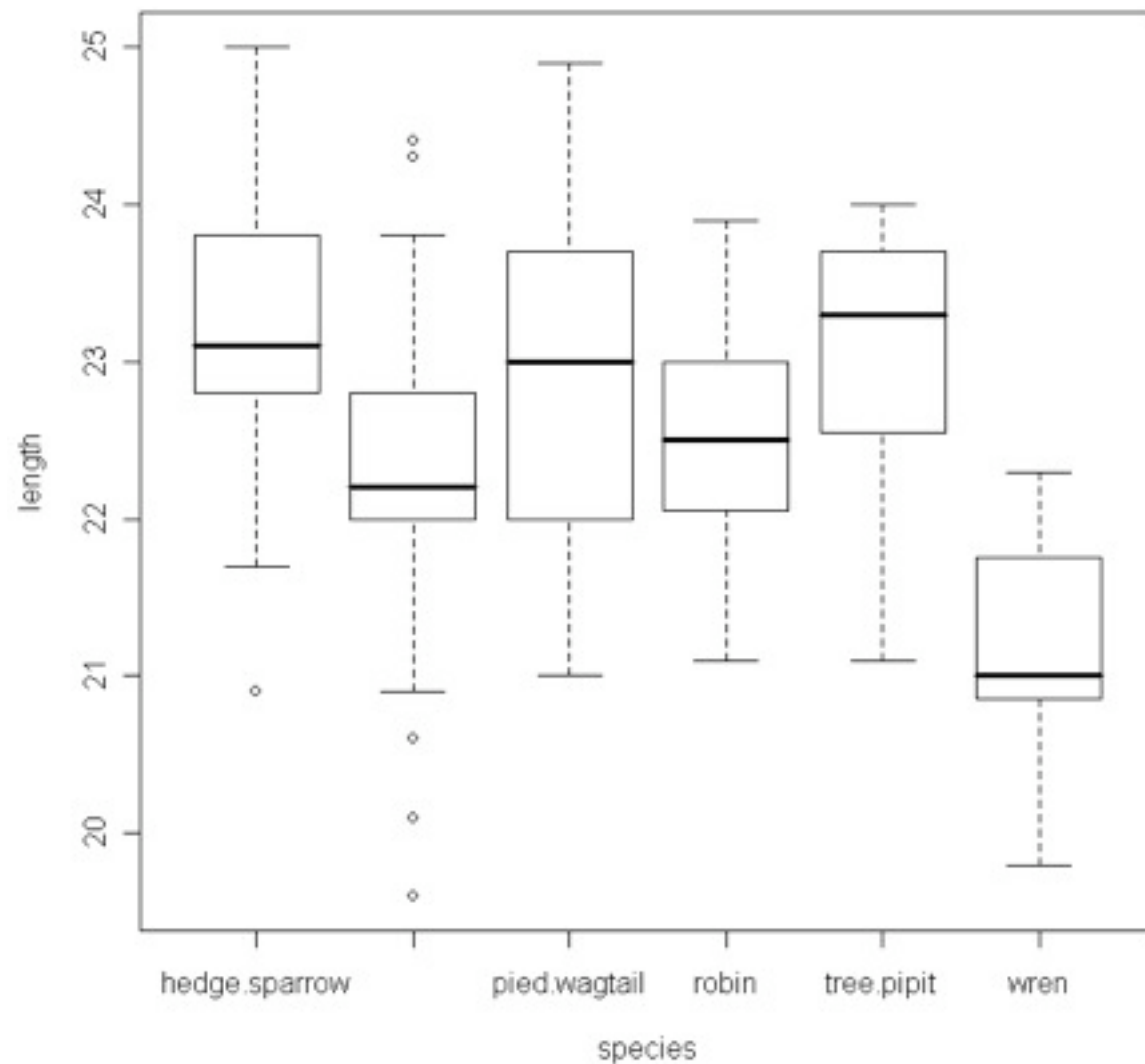

```
Stem-and-leaf of Weight    N  = 92
Leaf Unit = 1.0

 1       9 5
 2      10 2
 4      10 88
 7      11 002
13      11 556688
19      12 000123
24      12 55555
31      13 0000013
37      13 555688
42      14 00002
(6)     14 555558
44      15 00000000003
33      15 55555555557
22      16 00004
17      16 5
16      17 0000
12      17 55
10      18 000
 7      18 5
 6      19 0000
 2      19 5
 1      20
 1      20
 1      21
 1      21 5
```
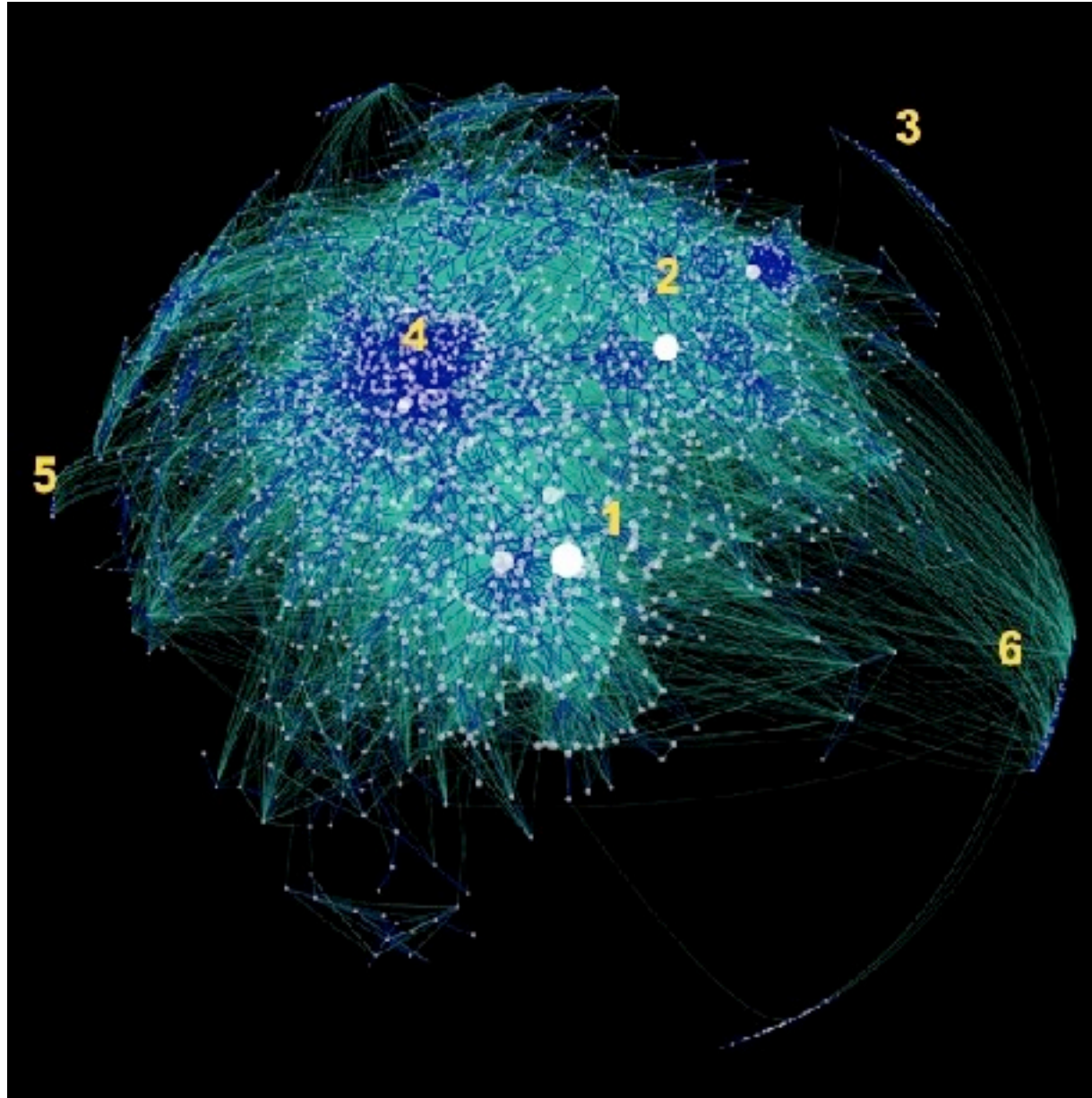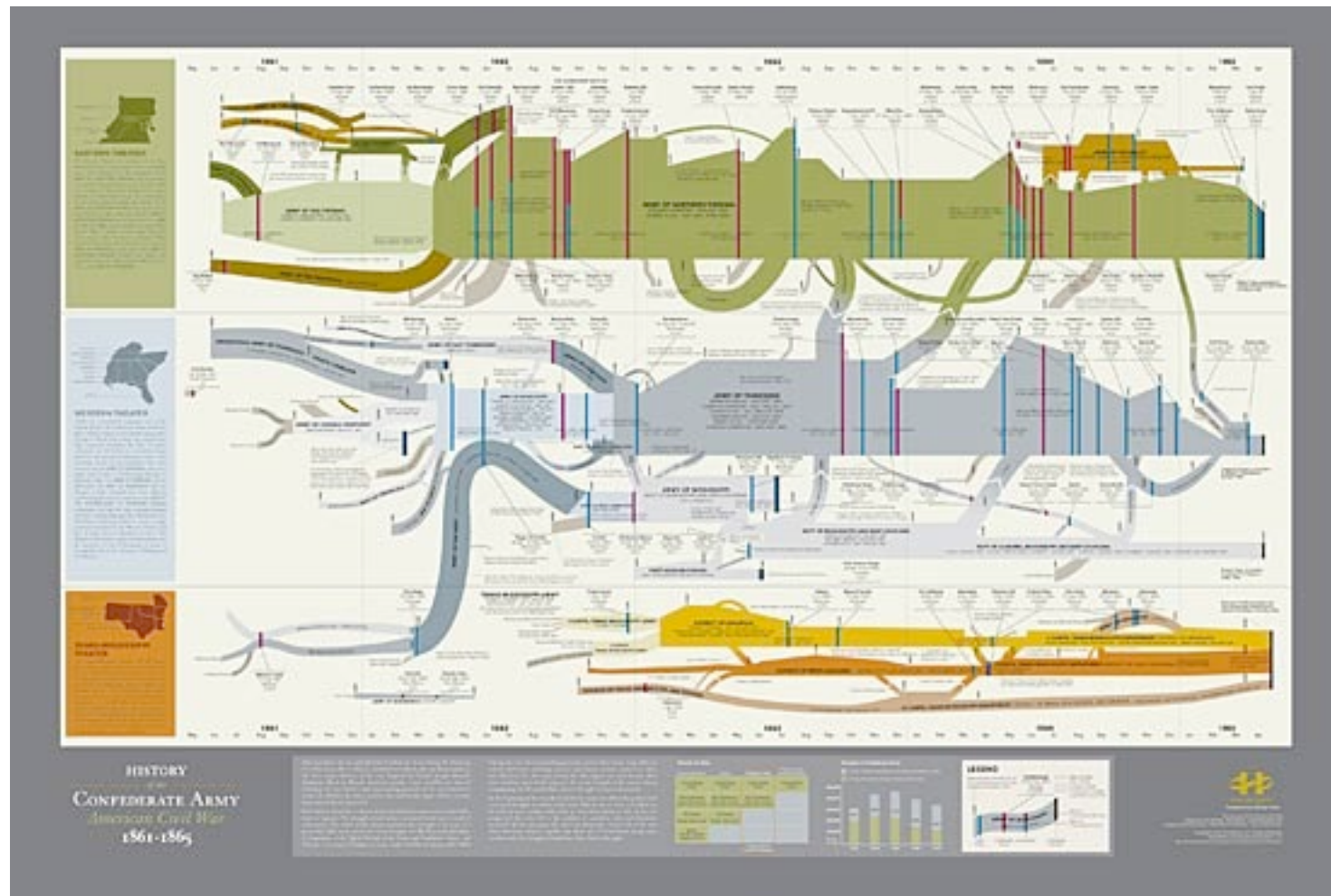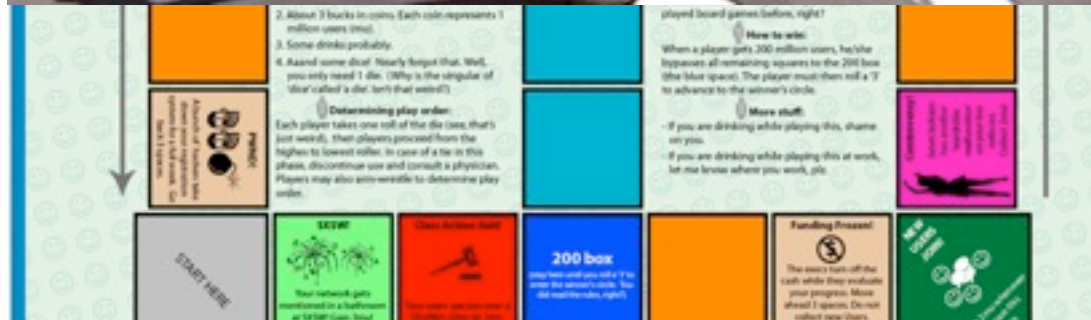
Looking at Data

Looking at Data

Knowing Uncertainty

- Games, Probability and Conditional Probability

Knowing Uncertainty

Knowing Uncertainty
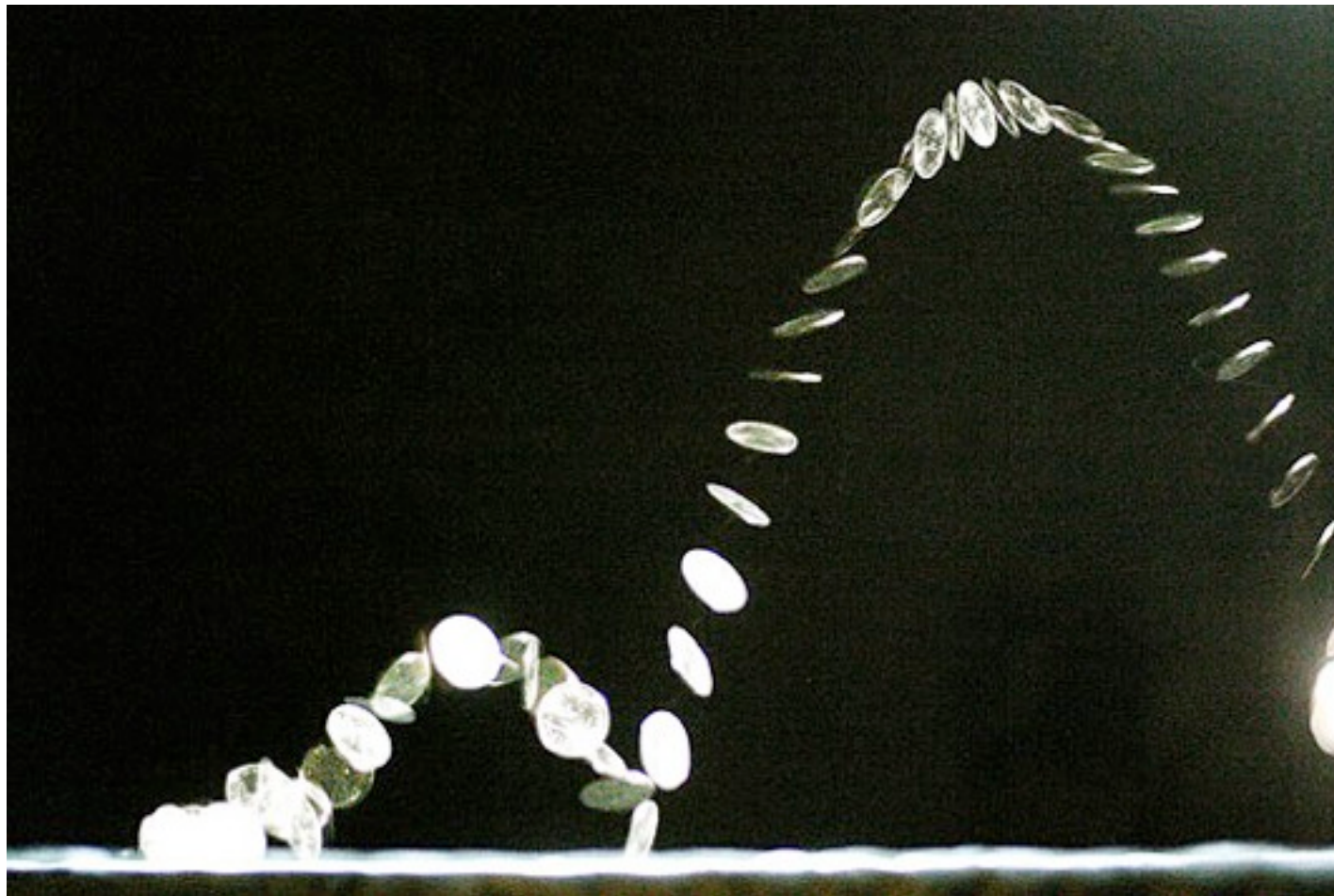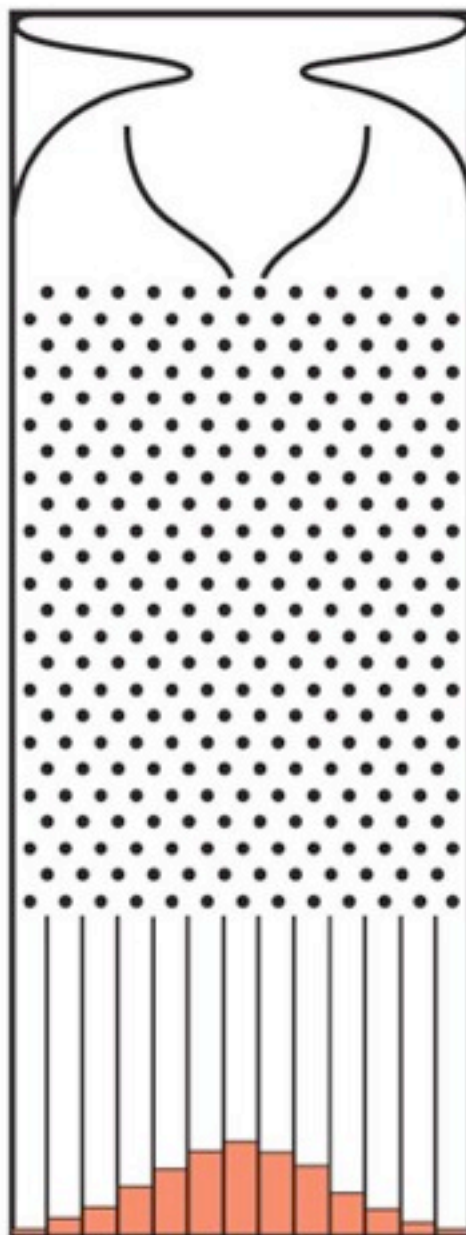
Hands-on Statistics

- central tendency and variance
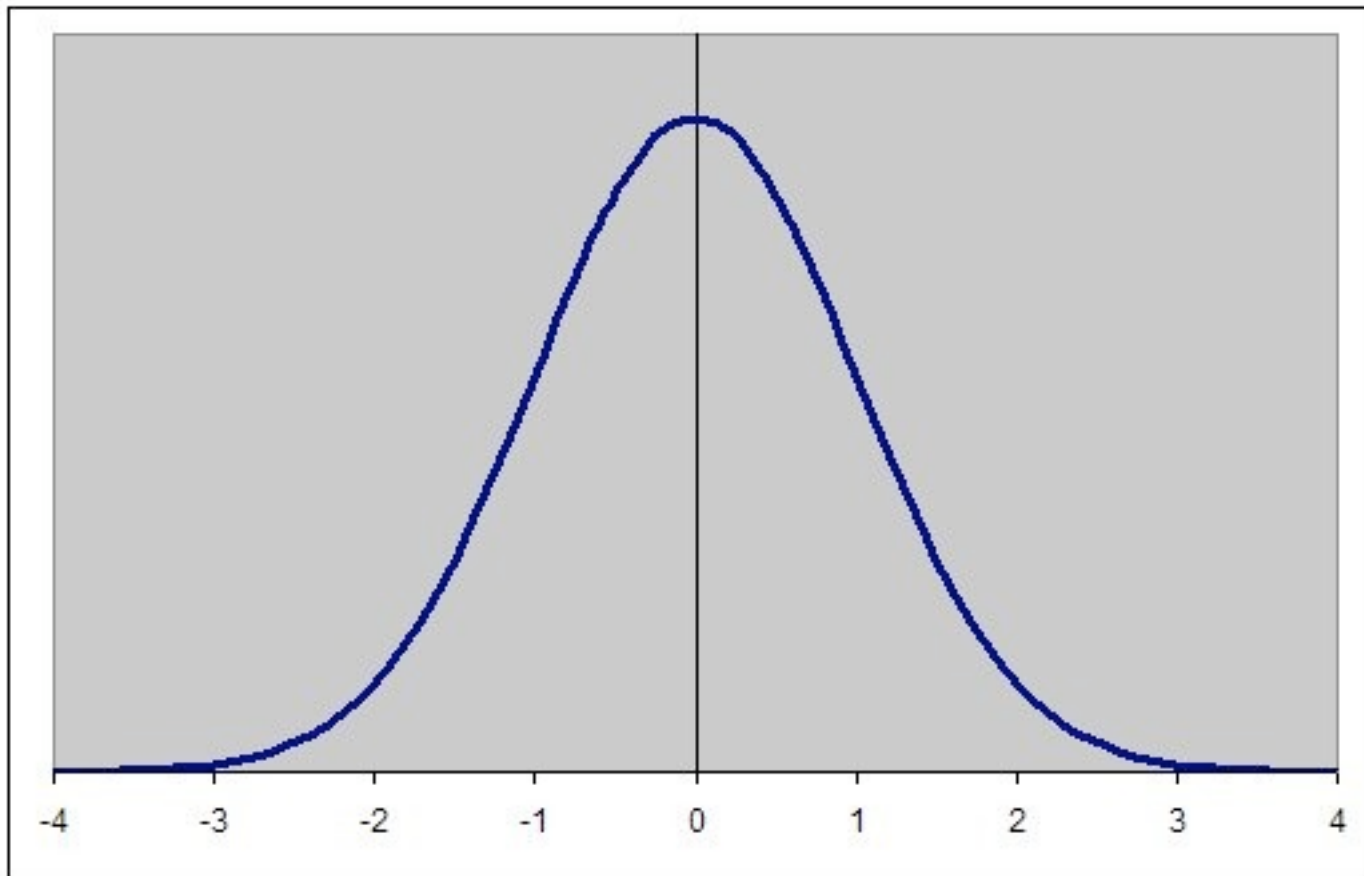
Hands-on Statistics

Hands-on Statistics

Testing for Truth

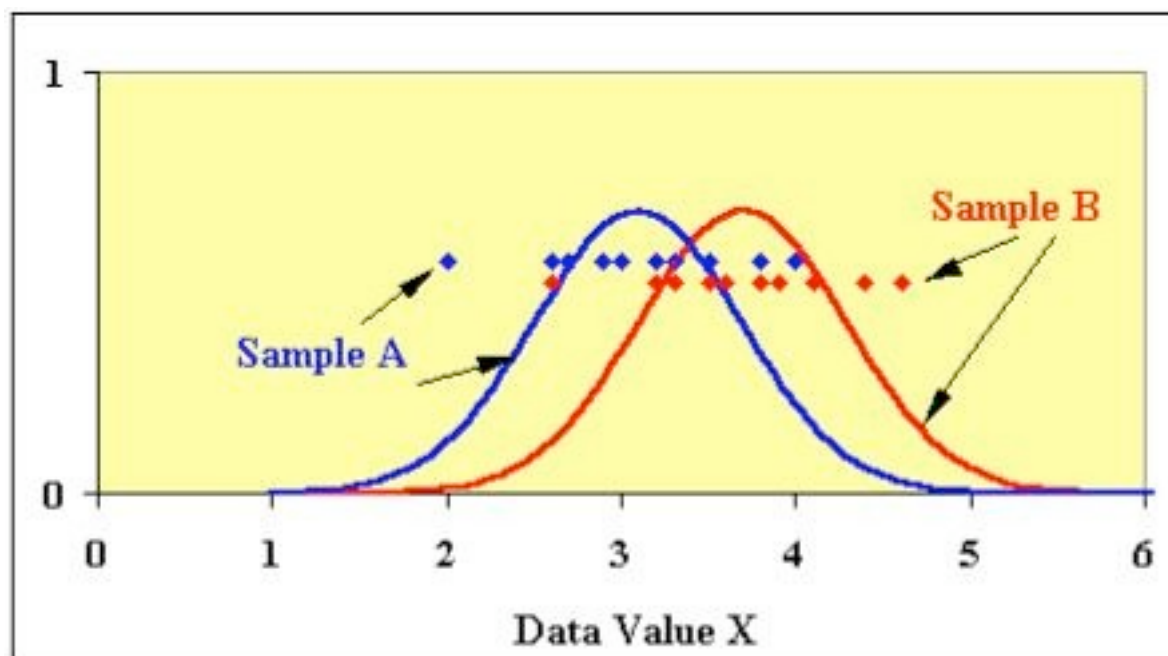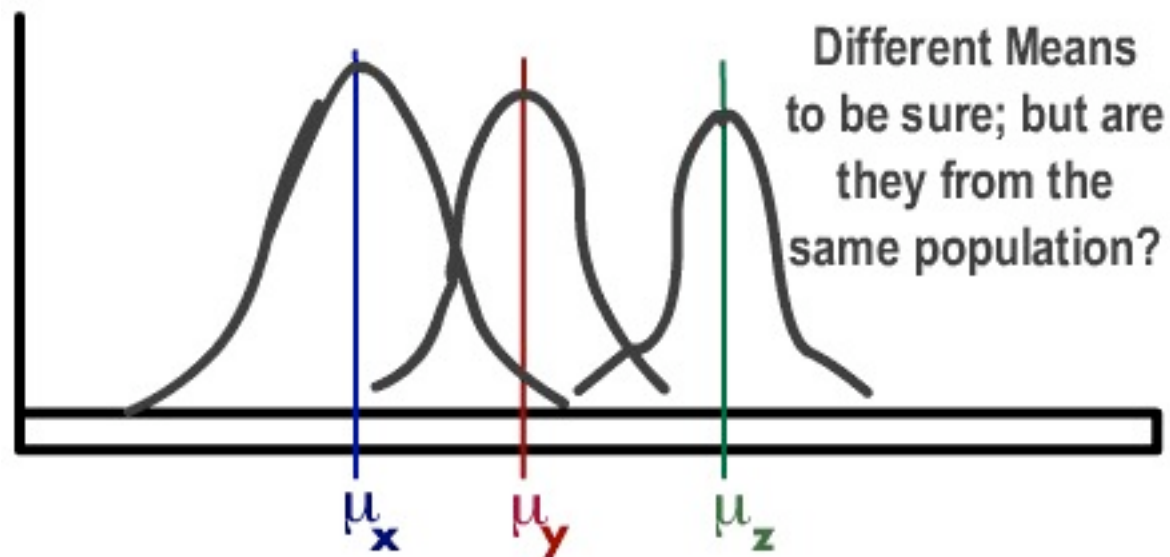- confirmatory stats and your favorite spreadsheet

Testing for Truth

Testing for Truth

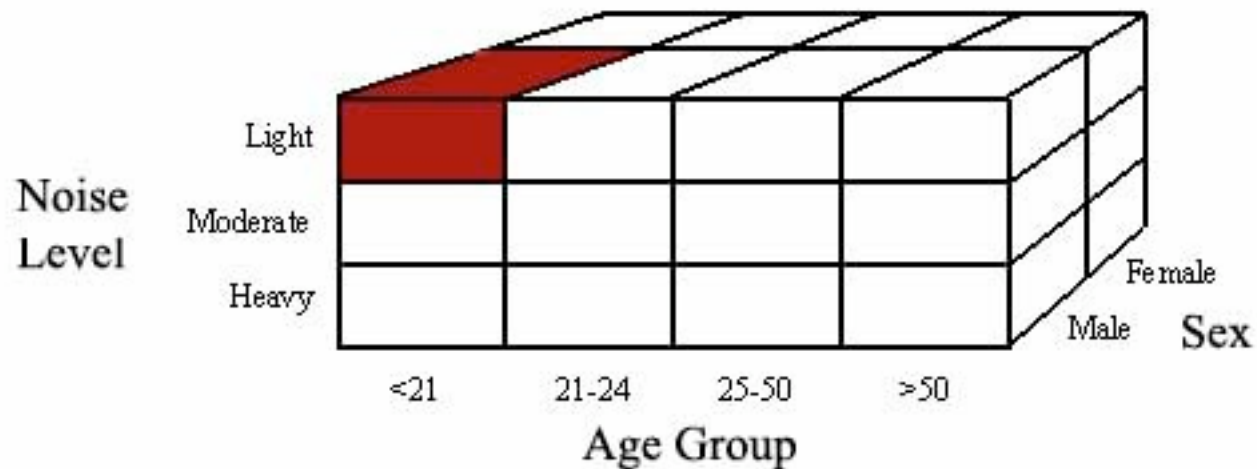Different Means to be sure; but are they from the same population?

μ_x μ_y μ_z

Testing for Truth

Between-Groups Design

Seeing the Future

- predictive stats and how to code them

Height vs. Age Linear Regression (simulated data)
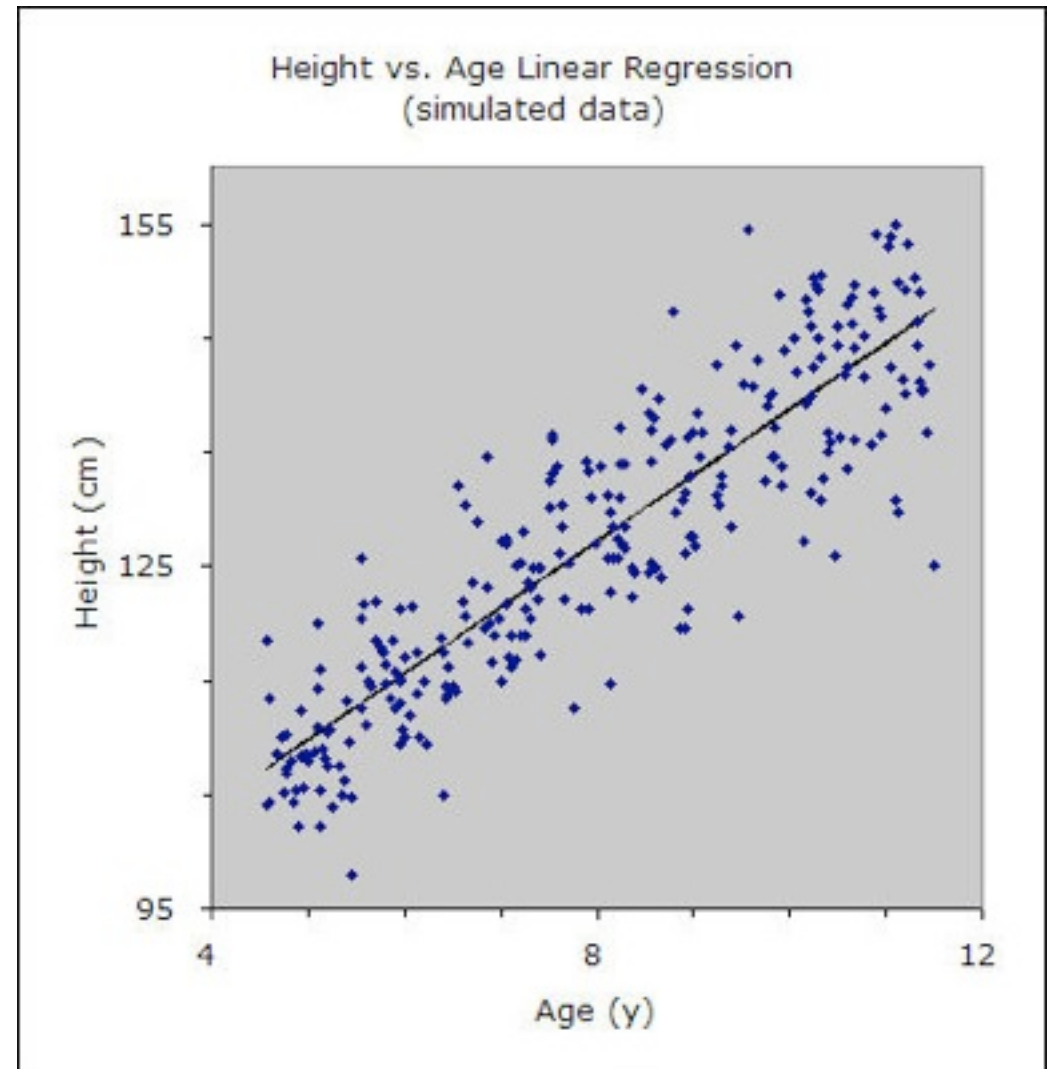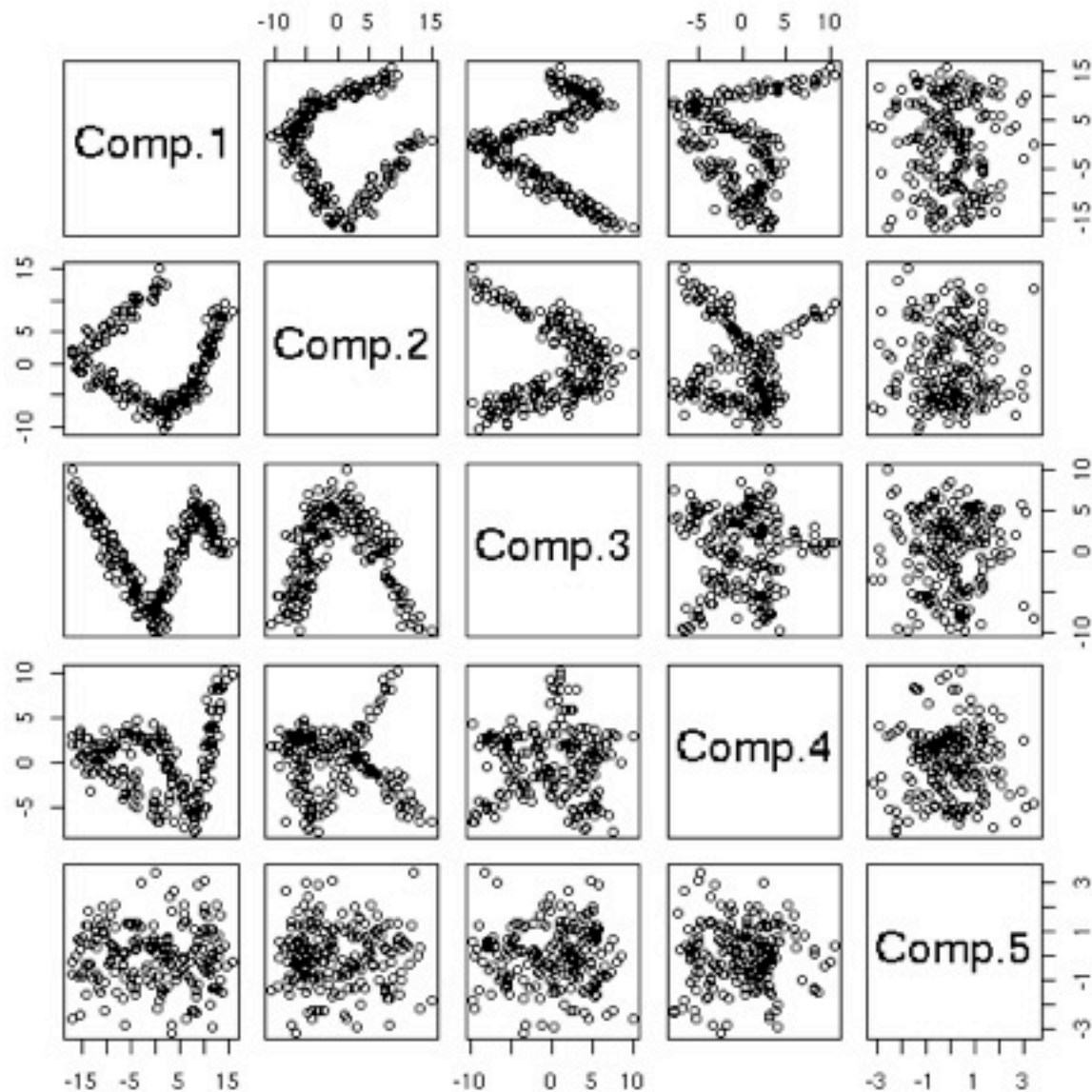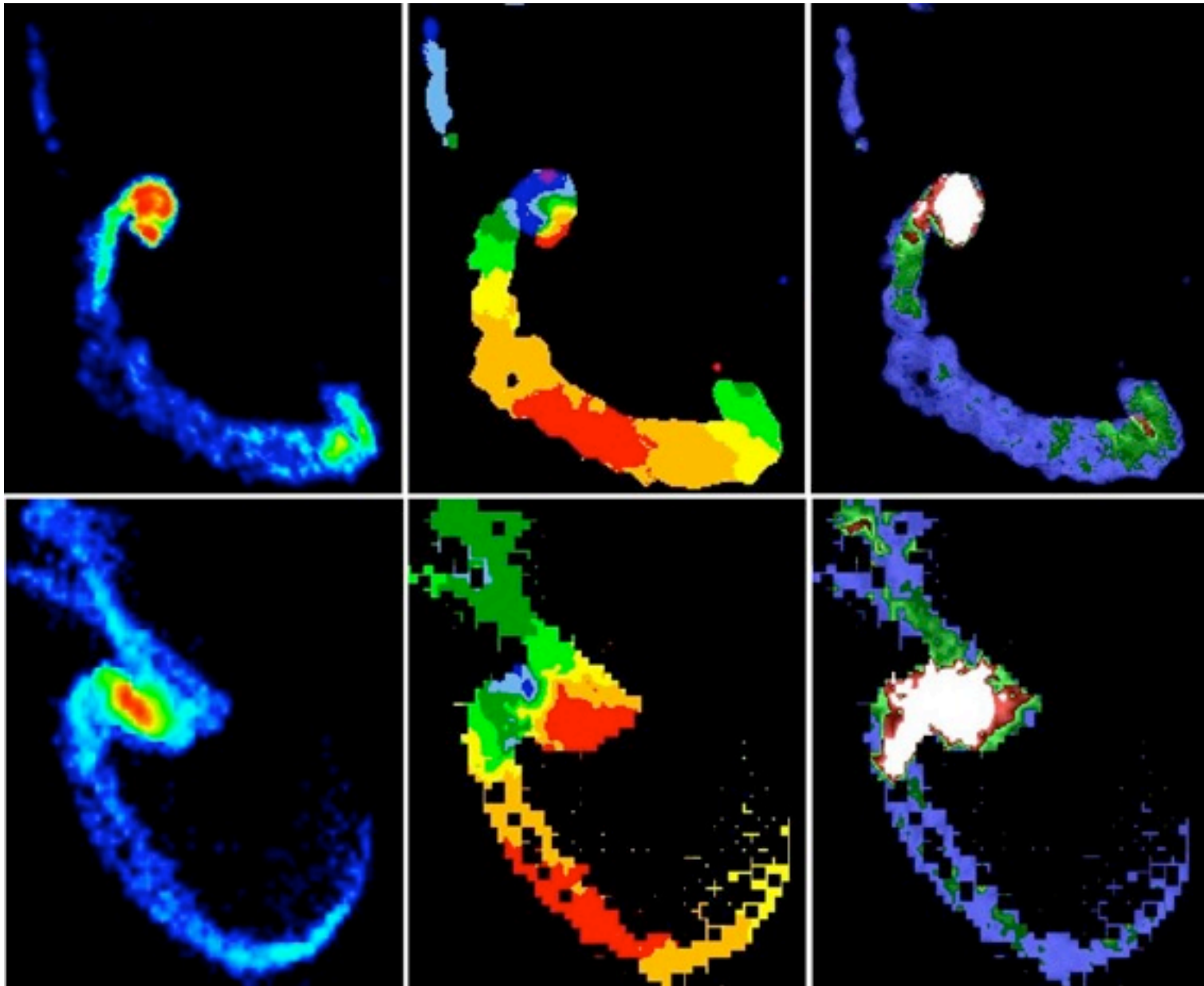
Virtual Statistics

- The simulation revolution
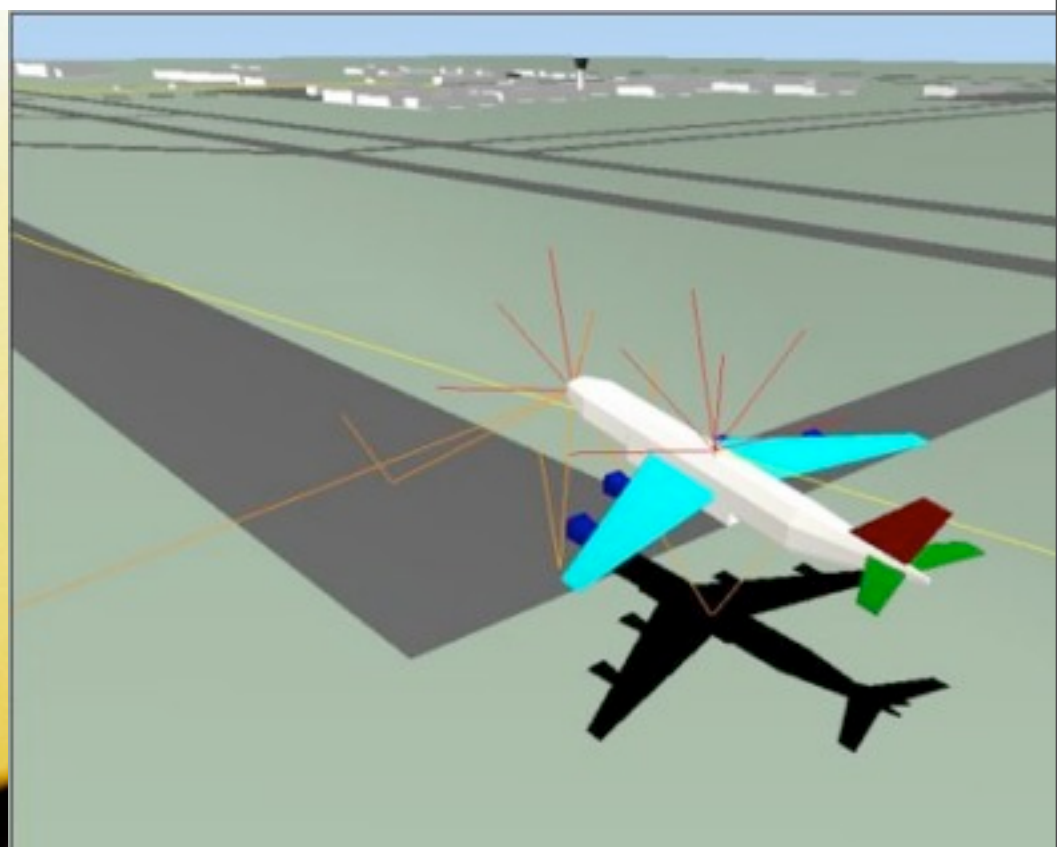
Virtual Statistics
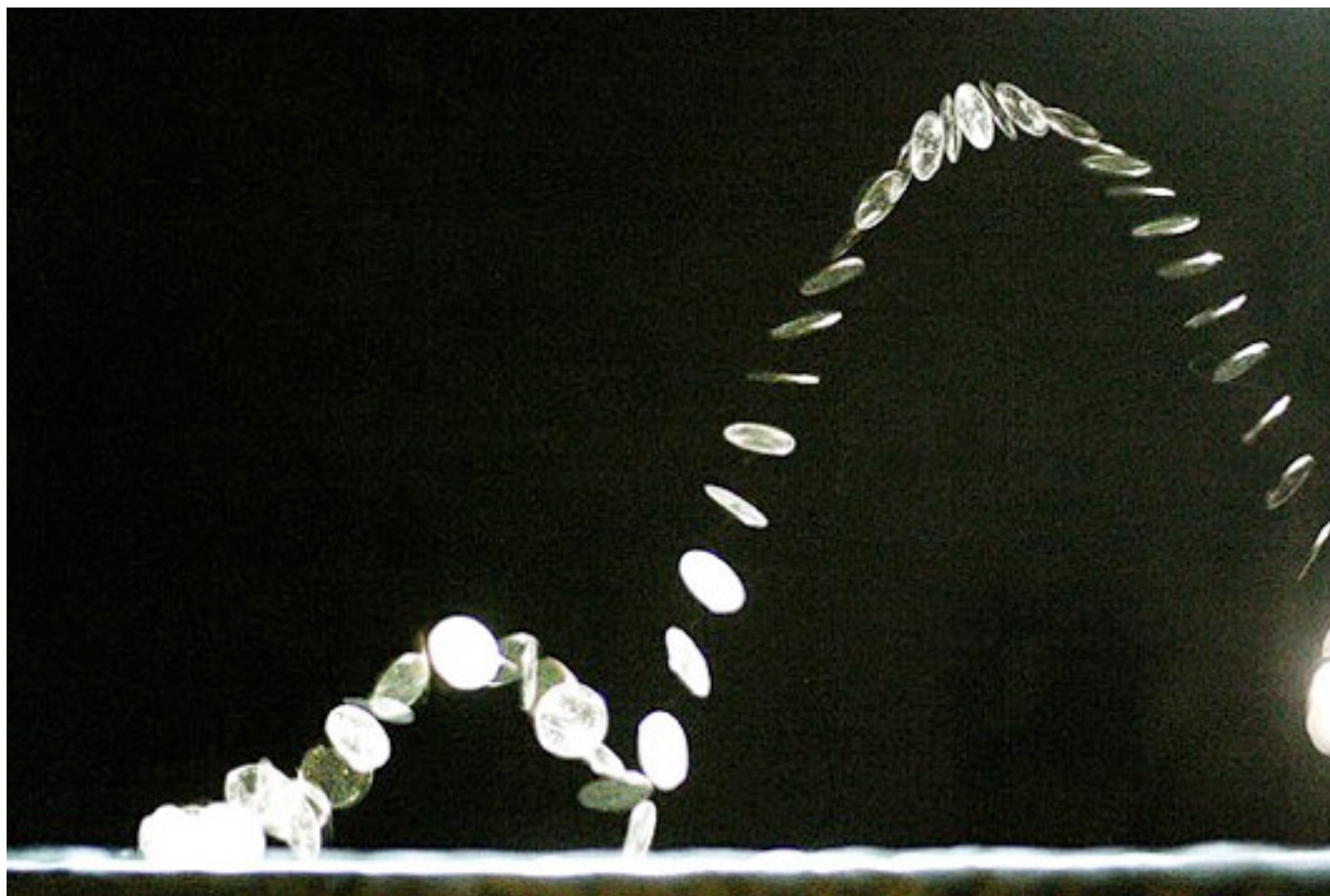
Virtual Statistics

Virtual Statistics

Getting it Right

- sample size, effect size and power. Z scores

Getting it Right

Getting it Right

- sample size, effect size and power. Z scores

Graphical Persuasion

- how to lie with maps

Graphical Persuasion

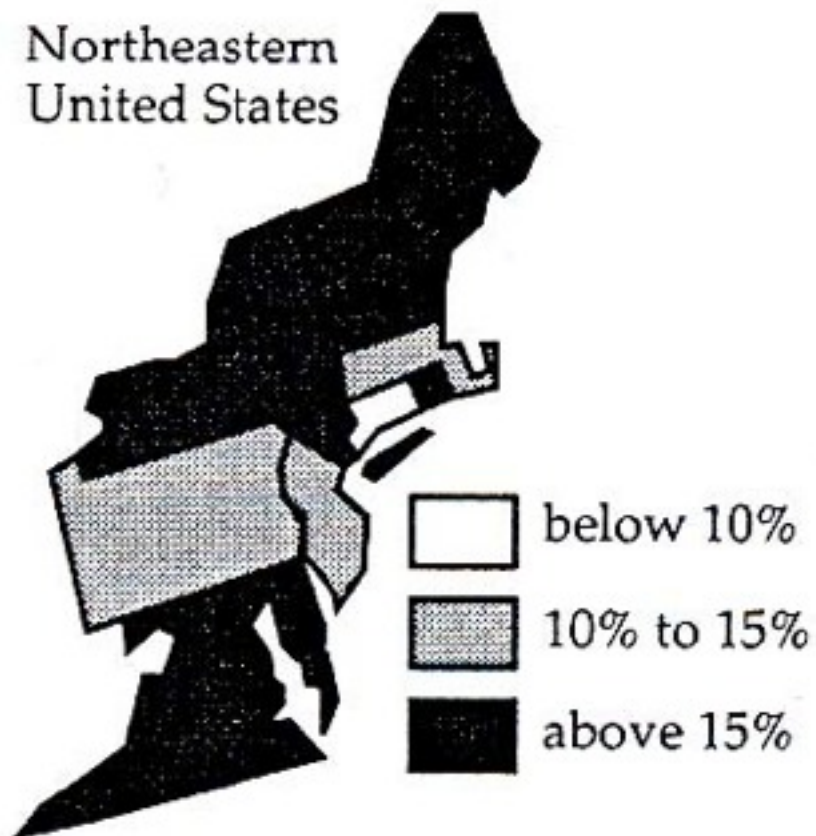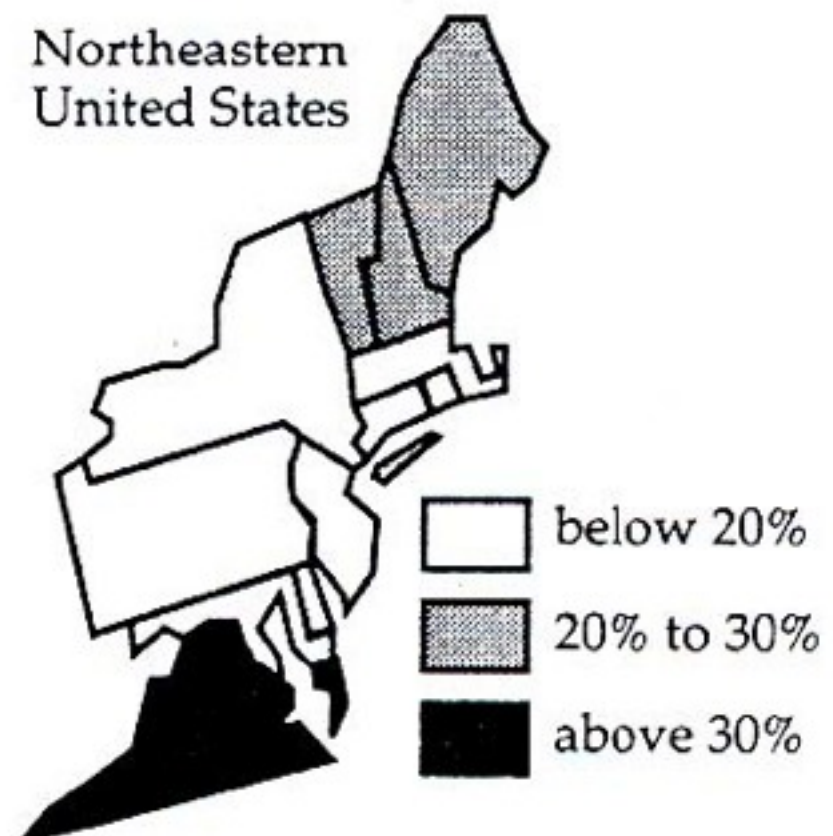• how to lie with maps

Graphical Persuasion

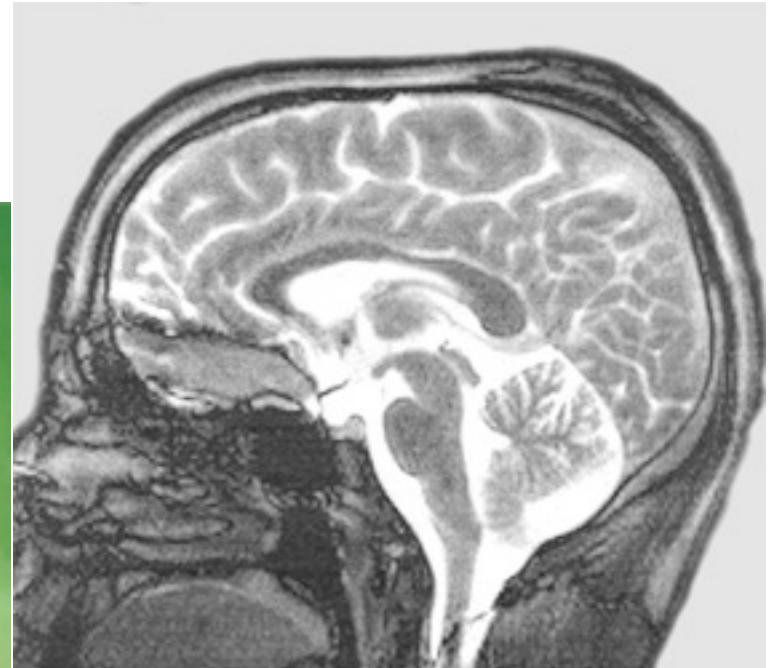Occupied Housing Units Lacking a Telephone, 1960

Northeastern United States

below 10%
10% to 15%
above 15%

Occupied Housing Units Lacking a Telephone, 1960

Northeastern United States

below 20%
20% to 30%
above 30%

Judgment

- designing attraction

Visual Display of Quantitative Information

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.

TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro
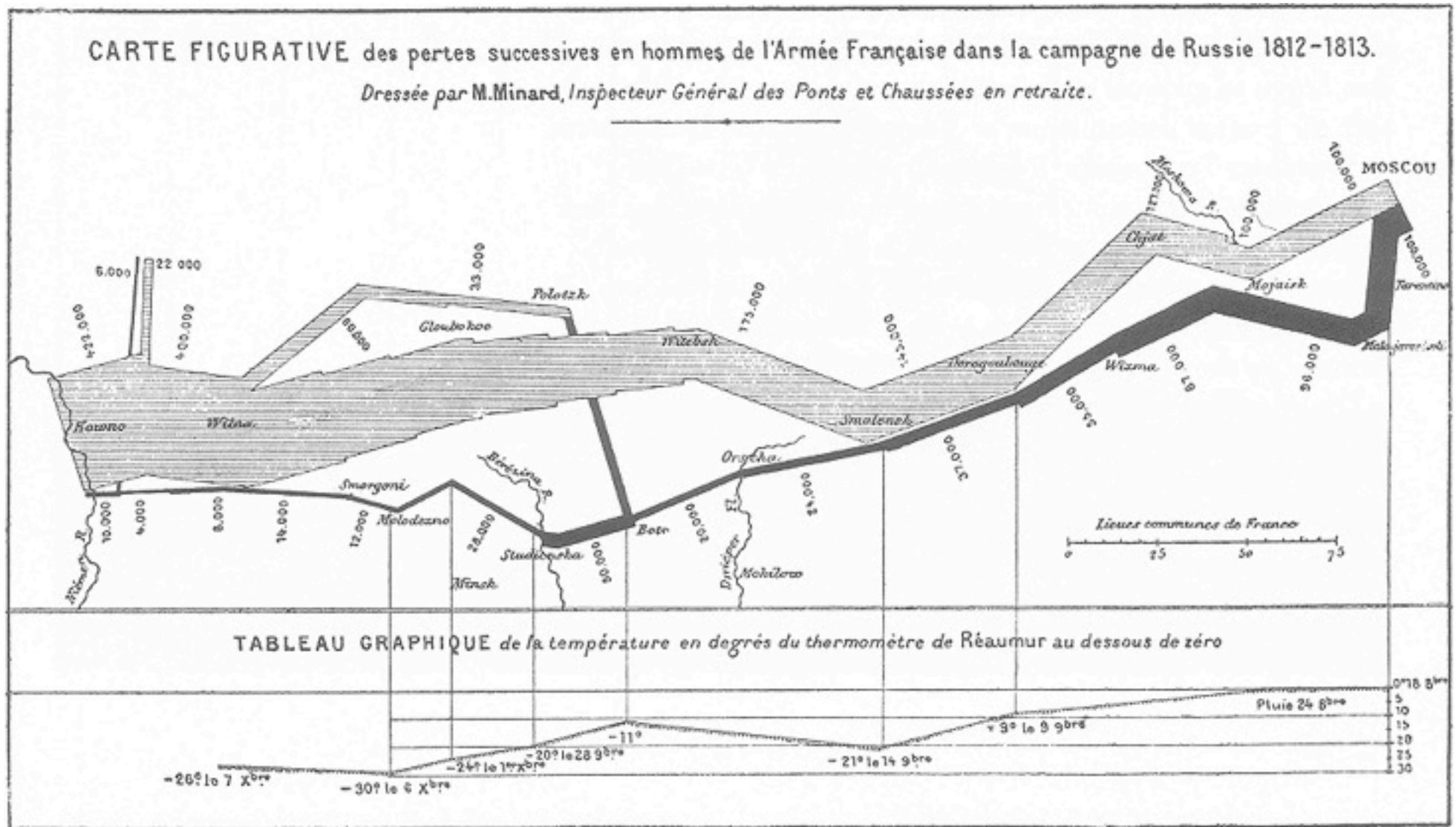
Visual Display of Quantitative Information
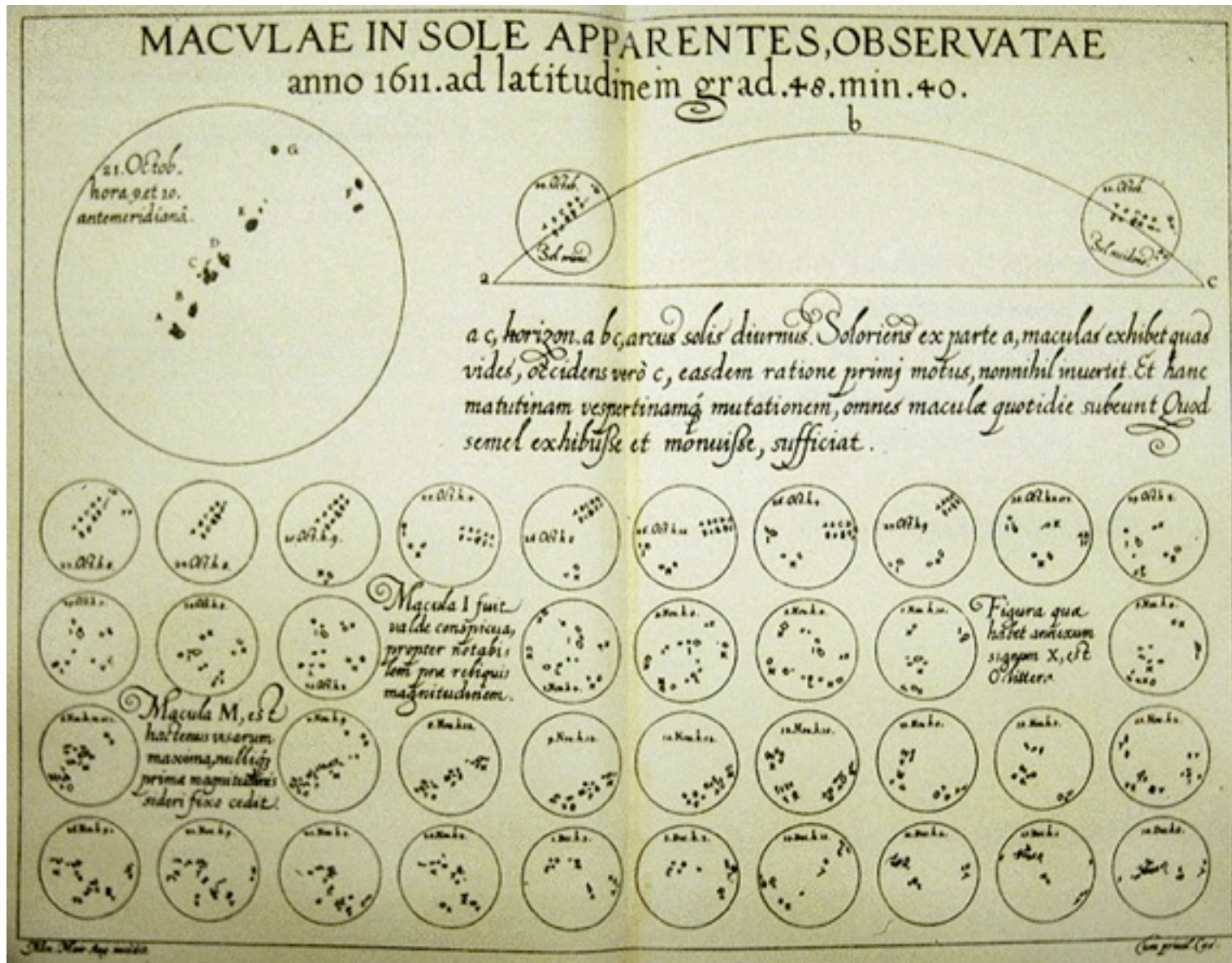
Visual Display of Quantitative Information

Summary and Farewells

- The ethics of data

Syllabus Review

- Syllabus review

    - Class schedule

    - Assignments

    - Documentation

    - Student Presentations

    - Grading

    - Laptops

    - Office Hours

Readings and Assignments

- Readings

  - How to Lie with Statistics, Darrell Huff and Irving Geis

- Assignment

  - Locate an article that apparently uses data or statistics well, and one that appears to be misleading. Note your thoughts on each so you can quickly present them to your group in class next week.

Exercise Two

- Let's present our data sets

  - Quickly make a presentation about the data

  - Pictures, charts, graphs, however it can be presented