



Statistics, why do we need it?
– and if we do,
How should it be taught?

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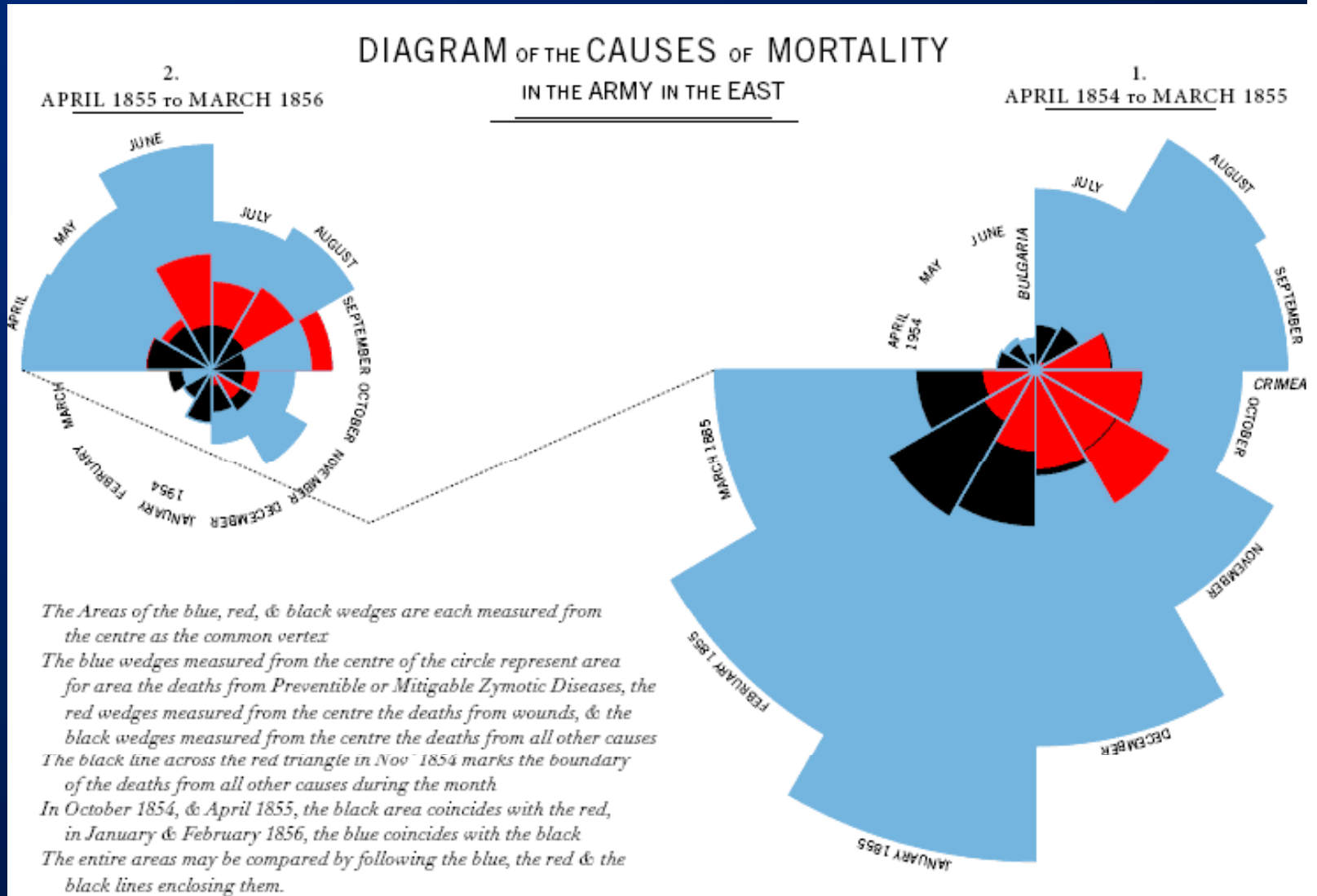
Statistics starts in Social Science

Royal Statistical
Society 1834



Early exemplars

- Florence Nightingale

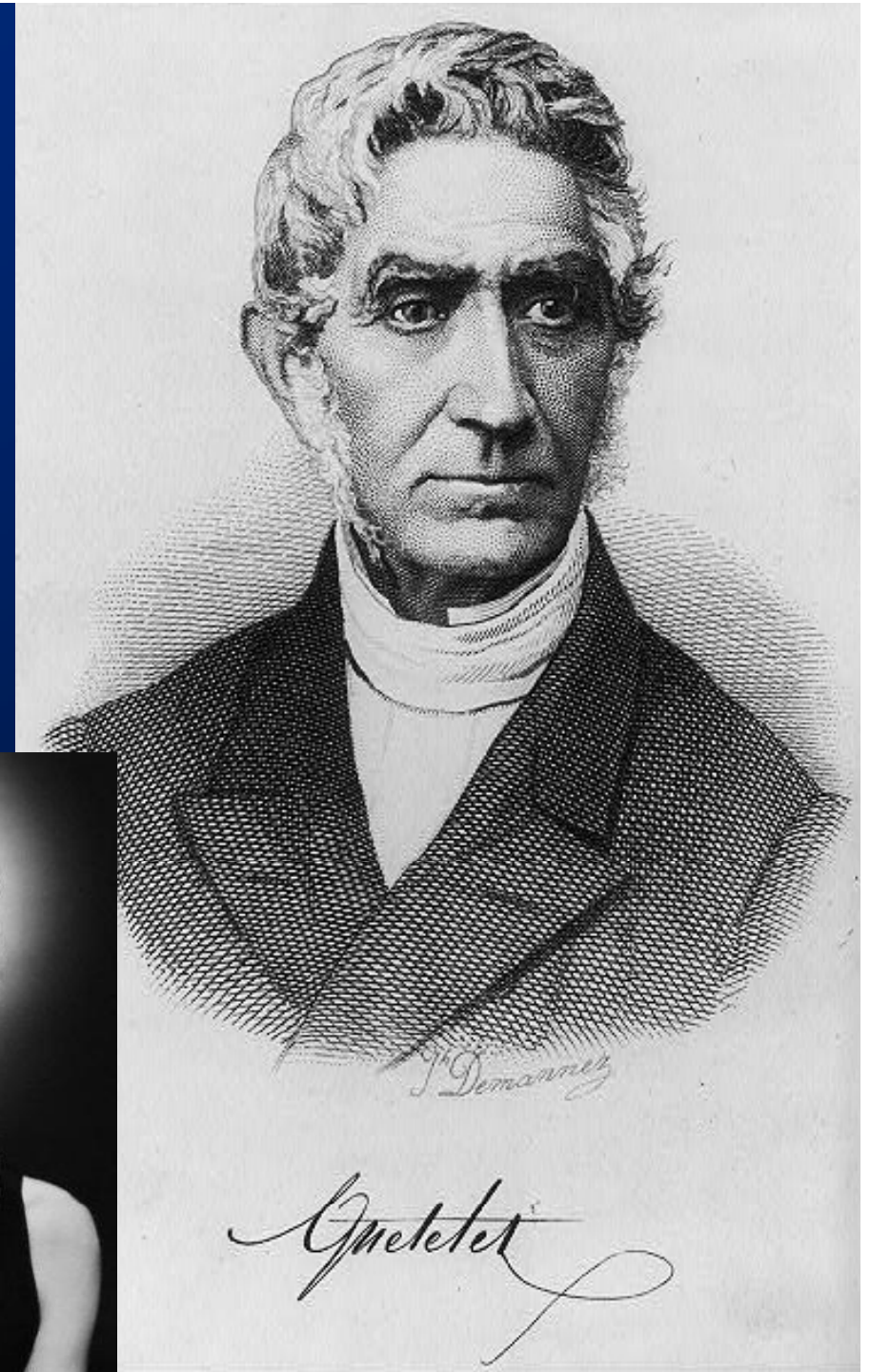


Quetelet (1796 – 1874)

- The only famous Belgian



discovered that Quetelet
term 'social physics',
originally introduced, Comte
invented the term
) because he disagreed
of statist



Francis Galton – Biometry

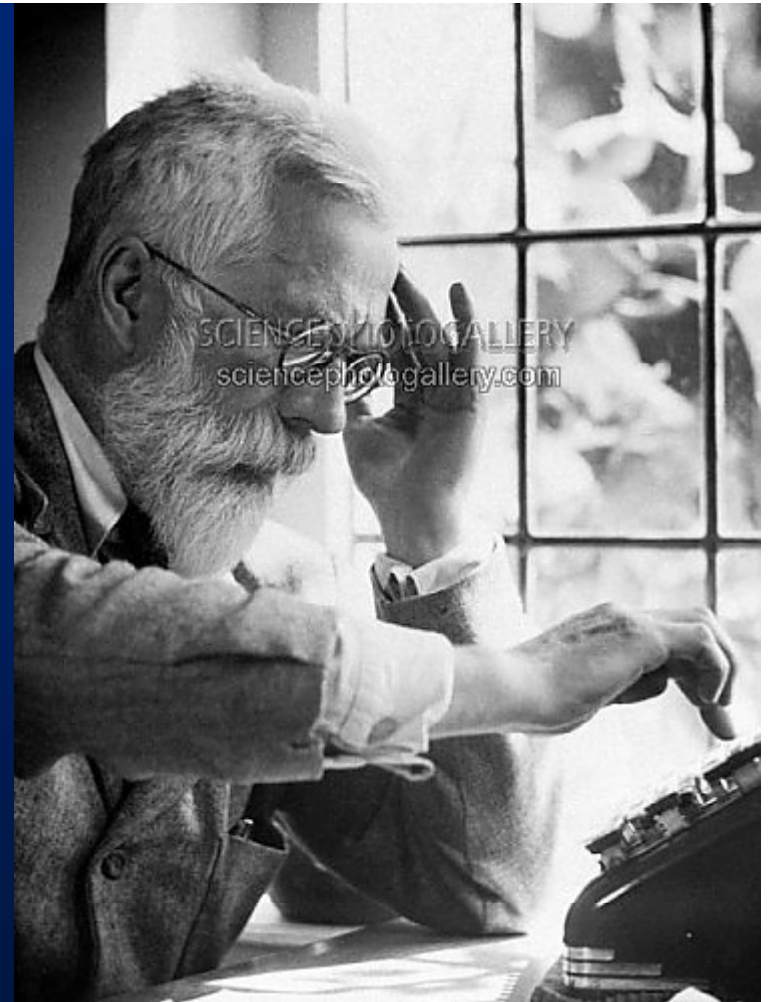
- Heroic data collectors

FAMILY HEIGHTS. from R.F.F.
(add 60 inches to every entry in the Table)

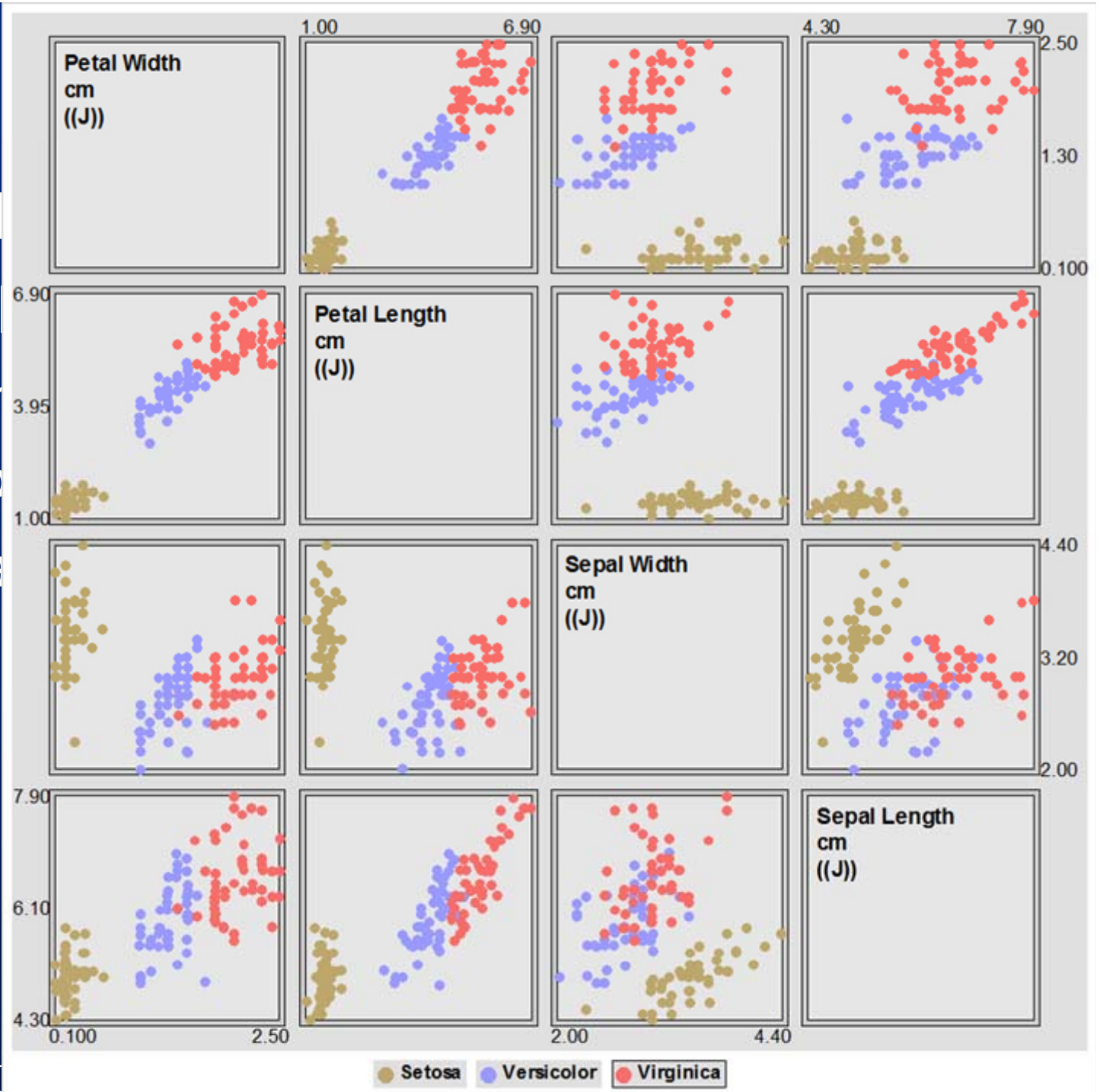
	Father	Mother	Sons in order of height	Daughters in order of height.
1	18.5	7.0	13.2	9.2, 9.0, 9.0
2	15.5	6.5	13.5, 12.5	5.5, 5.5
3	15.0	about 4.0	11.0	8.0
4	15.0	4.0	10.5, 8.5	7.0, 4.5, 3.0
5	15.0	-1.5	12.0, 9.0, 8.0	6.5, 2.5, 2.5
6	14.0	8.0		9.5
7	14.0	8.0	16.5, 14.0, 13.0, 13.0	10.5, 4.0
8	14.0	6.5		10.5, 8.0, 6.0
9	14.5	6.0		6.0
10	14.0	5.5		5.5
11	14.0	2.0	14.0, 10.0	8.0, 7.0, 7.0, 6.0, 3.5, 3.0
12	14.0	1.0		5.0

Then came trouble

- “A convenient way of arranging the arithmetic” Fisher, 1931
- Since he had to carry out calculations by hand....
- Methods derived under
 - Restrictive assumptions
 - which led via mathematical complexity to
 - simply computable answers



- Captured by
- If taught at all
 - In schools and
 - Real men do
- Reason for, a



“Informal statistical inference”

- important new element of the new curriculum

What is it?

- plain old statistical inference, but ...
 - *operated simply* enough for young students

“Informal statistical inference”

We will ...

- Start with the big ideas of stat. inference
- Describe simple methods for students to apply *when looking at their own data*
 - Minimise steps that lead students to take their eyes off the data
 - “*Exploit the power of the visual sense*”

Comparing heights of boys and girls at age 12

Heights of boys and girls aged 12
from samples of size 30



Comparing heights of boys and girls at age 12

Heights of boys and girls aged 12
from samples of size 30

Boys

Girls

80 100 120 140 160 180 200

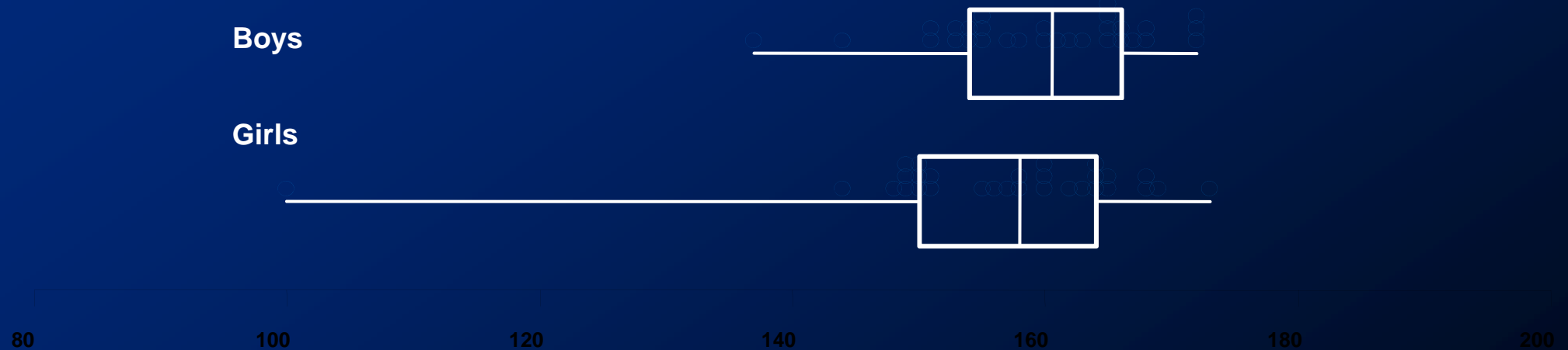


Comparing heights of boys and girls at age 12

Heights of boys and girls aged 12
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Boys

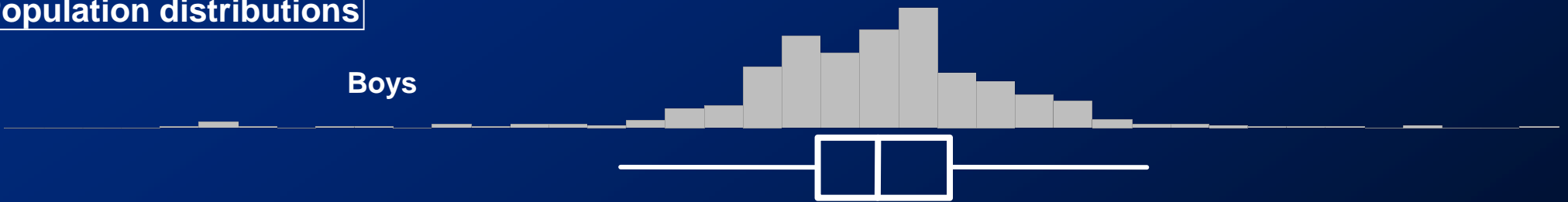
Girls



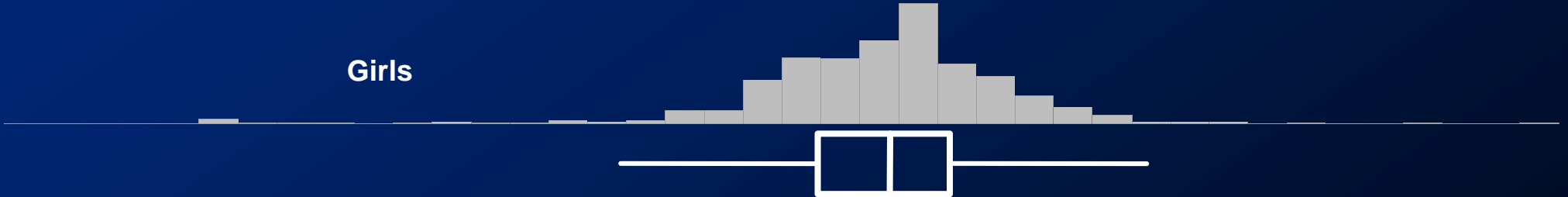
Heights of boys and girls aged 12

Population distributions

Boys



Girls

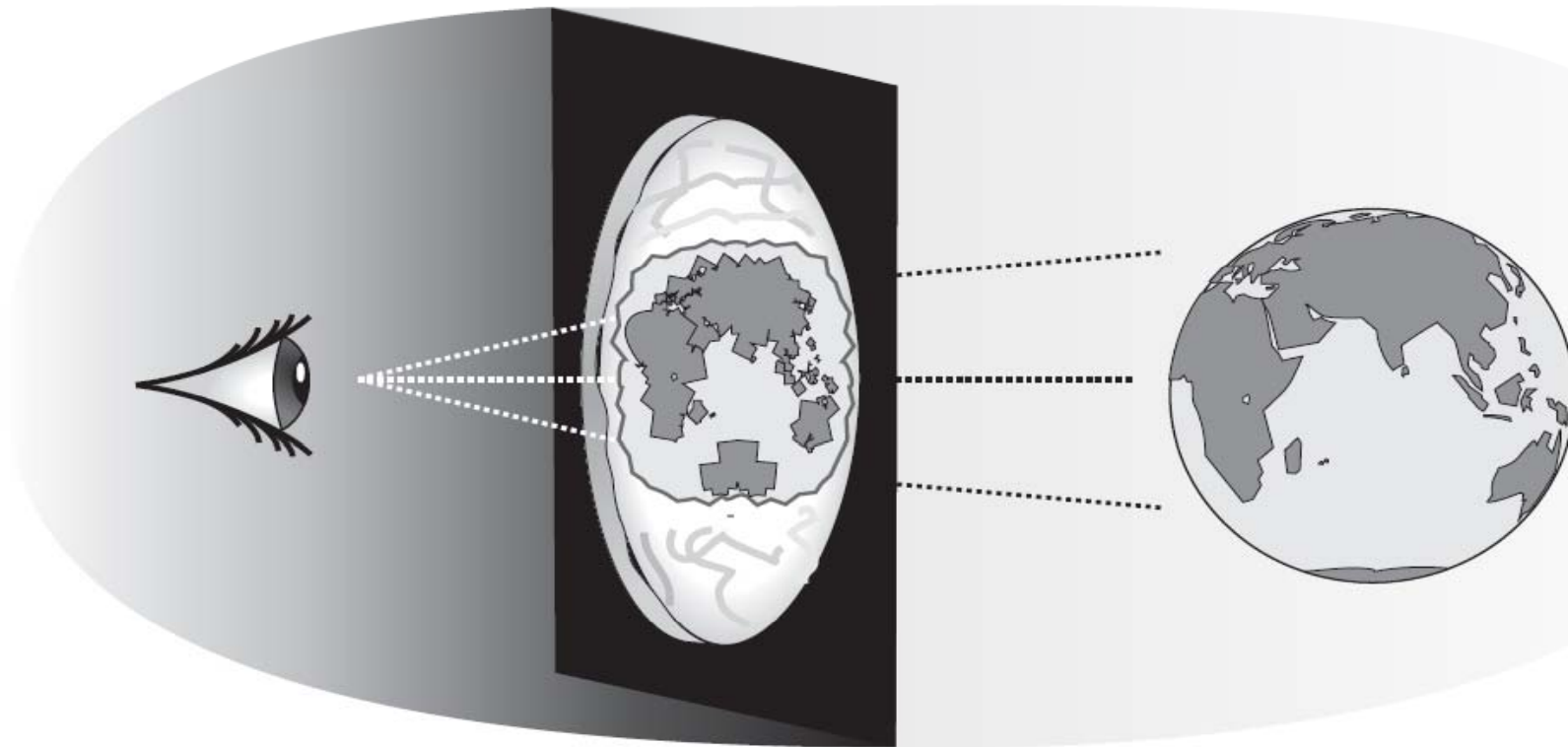


Description versus inference

- ***Description*** is *what I see* in the data in hand
 - Theme: “*Right here, right now*” – Fat Boy Slim
- ***Inference*** is what I think is likely to be happening ***back in the populations,***
back where these data came from
 - Theme: “*Back in the USSR*” – Beatles
 - We have a natural propensity to move early to inference
 - Many unclear in their thinking & communication when they are describing and when inferring

“What I see is not quite the way it really is”

Looking at the world using data



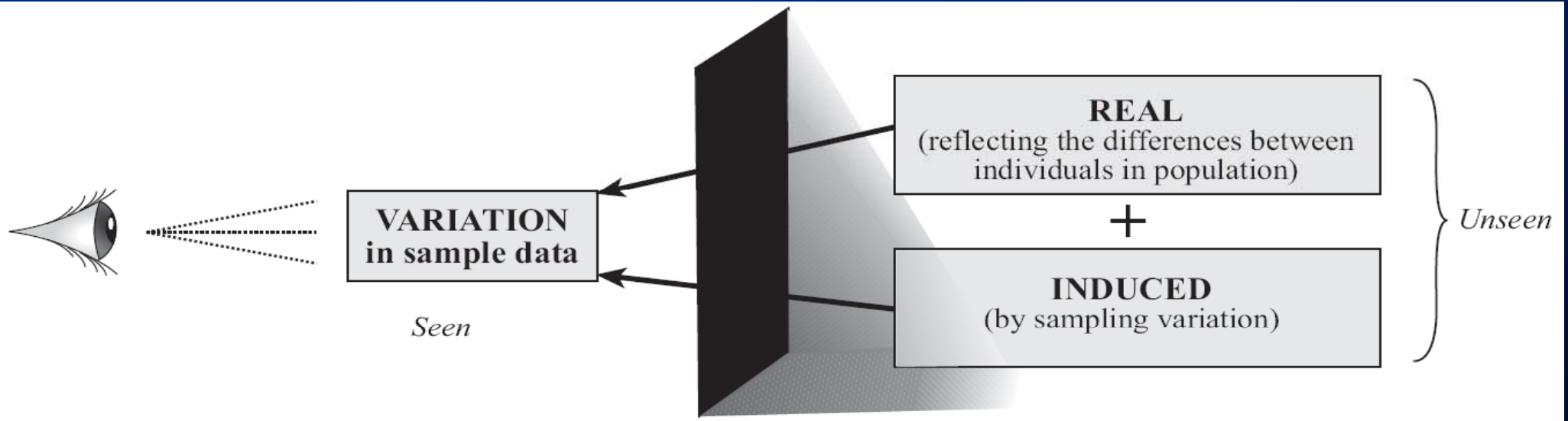
is like looking through a window with ripples in the glass



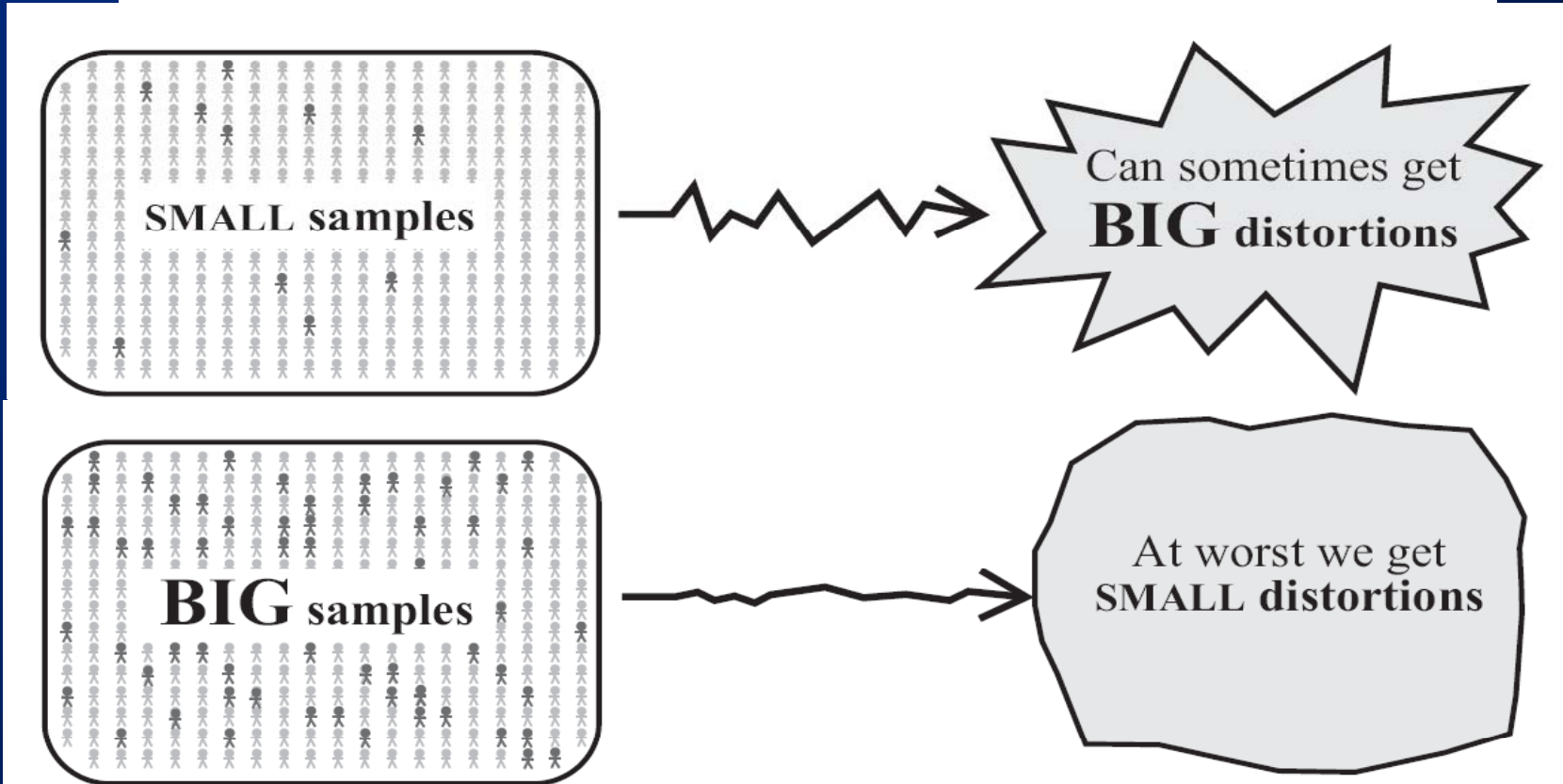
“What I see is not quite the way it really is”



“What I see is not quite the way it really is”



“What I see is not quite the way it really is”



Bigger sample size → *More information* → *Allows me to make more precise claims about what is happening back in the population*



University of Auckland

Maiden – Hood – Bellamy era

- Staff – Student ratio?
 - 25 (EFTS) :1
 - Each student takes 8 papers, 200 student-paper enrolments
- Standard teaching load
 - 2 (full) courses,
 - Therefore break-even enrolment ~ 100 students / paper
- Implications?

University of Auckland

McCutcheon – TEC – Grant Guilford era

- Undergraduate enrolment capped
- Only growth at post-graduate level
- Strategic Plan
 - “double number of PG students by 2012”
- Implication?
 - Huge demand for PG statistics courses

Awful warning

- ... Explains statistics for students who have had very little prior exposure and are struggling with concepts of means, standard deviations, correlations etc.
- ... We have students [from various disciplines] who need to use statistical testing in their courses of studies ...

What have others done?

- Maths at Auckland and Otago
 - 700 level course taught jointly at both institutions
- National Certificate in Official Statistics
 - Statistics New Zealand initiative
 - Modules taught (and examined) by various universities
 - Coordinated VuW
- 2011, 700 level paper in Official Statistics
 - Taught jointly by UoA Statistics, VuW School of Government, U Canterbury

- Australian Biostatistics Consortium
- School of Biological Science BIOSCI 734.
- NZSSN
 - Separate modules
- University of Melbourne
 - Statistics Consulting Centre
 - Regular program of courses, e.g.
Statistical Methods for Research Workers

What works?

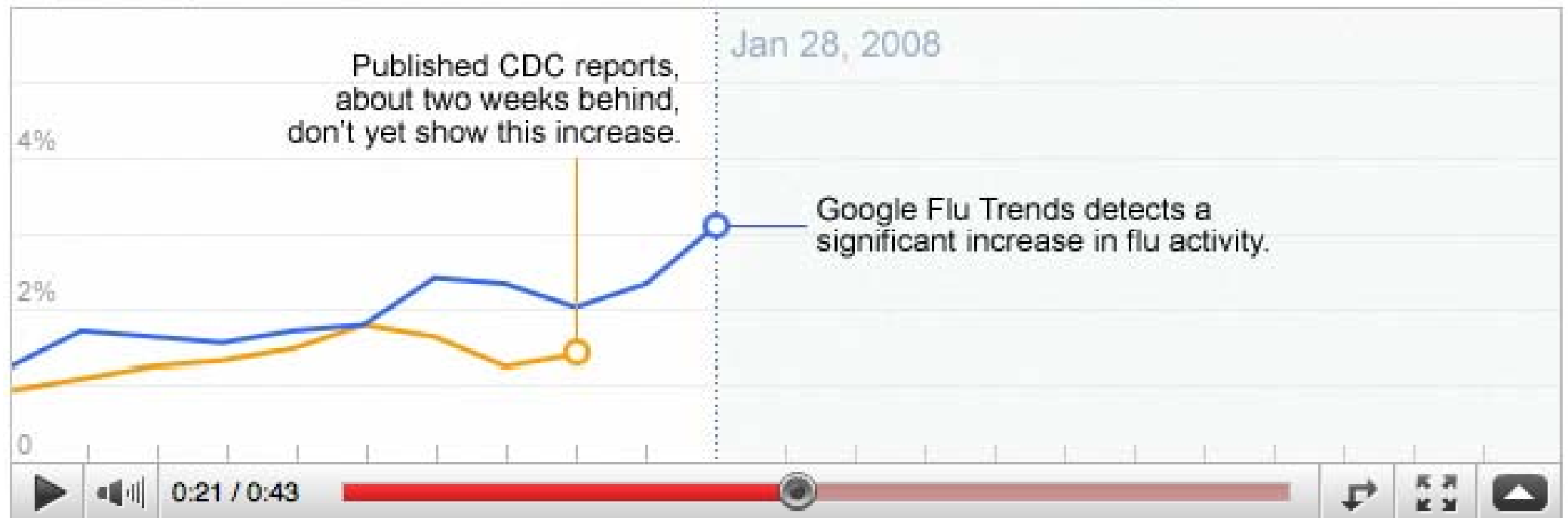
- Block courses
- Grounded in users' needs
- Case study / Clinic approach
 - *Bring out your dead*
- Software

For Today's Graduate, Just One Word: *Statistics* NY Times August 5, 2009

2007–2008 U.S. Flu Activity - Mid-Atlantic Region

ILI percentage

● Google Flu Trends ● CDC Data



COMPASS, June 2010