

Stat 431

An Introduction to Modern Statistics

thompson

What Is Statistics?

- ◆ Statistics is not a subset of mathematics.
- ◆ Therefore, statistics is not a part of applied mathematics either.

Statistics Is The Dialectical Paradigm Known As The Scientific Method

- ◆ Make a conjecture.
- ◆ Test the conjecture based on data.
- ◆ Make an improved conjecture.
- ◆ Probably should be called the
“Engineering Method.”

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Thucydides As First Statistician

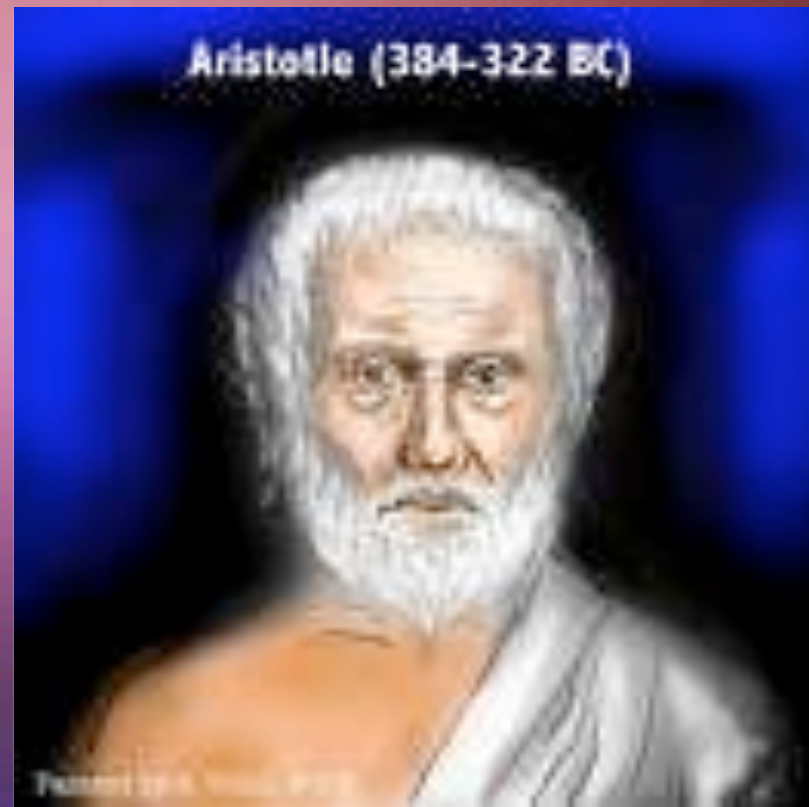
- ◆ Developed a non-magical time-indexed progression of events in *The Peloponesian War*.
- ◆ Logical conclusions based on facts.



Aristotle and Stationarity

Events occur in a sufficiently stationary fashion that repeated experimentation makes sense.

(Weak Law of Large Numbers)



Thomas Aquinas

- ◆ Formally introduced Aristotelian logic into Western culture.
- ◆ No double truths.



William of Ockham (Prince of Nominalists)

Eschewed search for exact truth.

Searched for the simplest model which more or less explains the data.

Father of the “Engineering Method.”



Thomas Cromwell and The Plague in London

- ◆ As a favor to the merchants of London, he undertook to find out whether the plague persisted in epidemic intensity in the environs of London
- ◆ See chapter on Graunt



John Graunt

- ◆ Captain in the Army of Charles II
- ◆ Wrote *An Essay on the Bills of Mortality*
- ◆ Enabled us to see the forest instead of the trees



William Petty (not the discoverer of life tables)

Made a fortune
auctioning off the
lands of Irish royalists

Saved his neck by
founding the Royal
Society of London and
making Charles II its
patron

Thanks to Pepys, Graunt
rightly gets the credit



Thomas Bayes

Gave us a logical way to make inferences from data (you have to have info which is prior to the data; i.e., you need to have an estimate of the probability of an event prior to the experiment.

See chapter on probability.



Laplace

Popularized the work of Bayes.

Developed asymptotic approximations of the distribution of the mean.

Developed stochastic model for laminar flow.

Orderly definition of probability.



Karl Friederich Gauss

- ◆ Developed least squares
- ◆ Asymptotic distribution of the sample mean



Charles Darwin

- ◆ Theory of Evolution
- ◆ Sloppy data analyst
- ◆ Social Darwinism
- ◆ Icon of the Victorian Enlightenment



Francis Galton

- ◆ Helped his cousin Charles Darwin with his data analysis
- ◆ Believed the normal distribution was all-pervasive
- ◆ Invented IQ test
- ◆ Founded the London Society for Eugenics



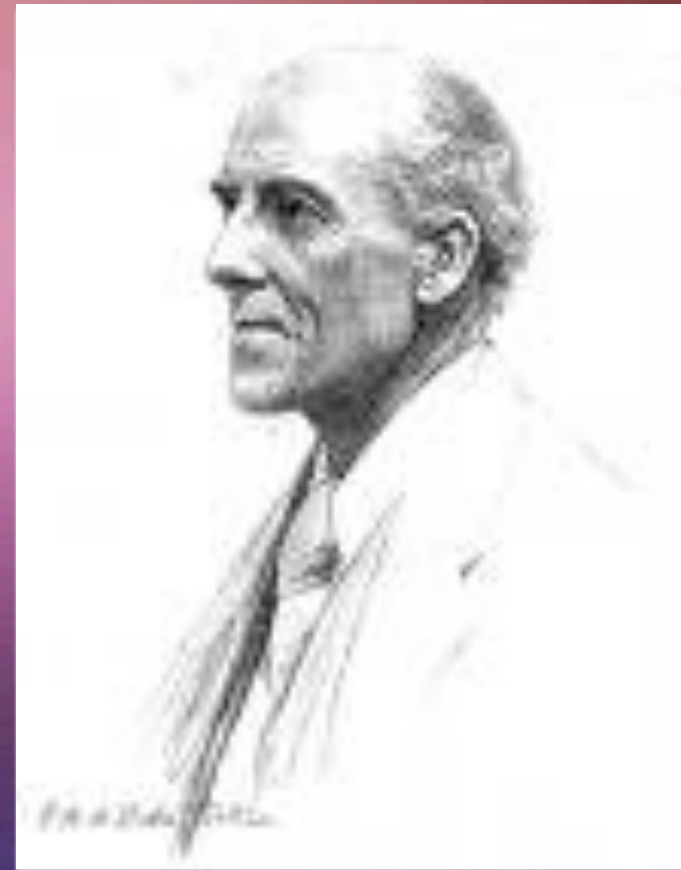
Alfred Rosenberg

- ◆ Chief scientific apologist for National Socialism
- ◆ Took eugenics to its logical conclusion



Karl Pearson

- ◆ Formalized correlation as an empirical surrogate for causation
- ◆ Invented Method of Moments
- ◆ Pearson Family of Distributions
- ◆ Goodness of Fit



Vilfredo Pareto

- ◆ Statistician,
economist,
sociologist,
political scientist
- ◆ “Pareto’s Maxim”



Ronald A. Fisher

- ◆ Discovered the likelihood function.
- ◆ Maximum likelihood.
- ◆ Dominant figure in Statistics for 30 years.



John W. Tukey

One of the fathers of
computer science.

Father of time series
analysis.

Advocated Robustness over
Optimality.

Advocated Exploratory Data
Analysis as opposed to
Confirmatory Data
Analysis.

Advocated computationally
intensive and graphical
procedures.

Founder of Modern Statistics



Tukey's Maxim

Far better an approximate answer to the right question, which is often vague, than an exact answer to the wrong question, which can always be made precise.