Selected Topics in History of Science

DEk00W

Lecture 1

29 February 2024

Why history of science for future teachers?

- Scope: ***SELECTED topics in history of science***, mostly from 19th and 20th century
- For literature on earlier times (esp. Ancient times and the Middle Ages), see the Interactive syllabus
- Method: learning about the field of history of science
- Objective: realise different people write about history of science and be able to value the sources for what they are
- Practically: **presentation or essay** plus a **short test** (10 multiple-choice questions; 6 correct answers required to pass the course)
- Grade is based on the quality of the essay or presentation

Varieties of the field of history of science

- Internalist history of science (birth of a theory, first solution,...)
- Externalist history of science (the topic not so important)
- Informed by diplomatic, political, cultural, … history,
- Social history of science / computing / mathematics
- Two specific examples:
  - History of mathematics (a subset of mathematics, or history?)
  - History of computing (a subset of history of technology)

What is history of science?
First, what is science?

- Science is systematic knowledge: observation, reporting, measuring, objective, etc., not jut any knowledge
- In Czech: věda – also for the humanities
- In English: science implies natural science
- **Classification of sciences - current:**
- Life Sciences: Biology, Zoology, Botany
- Exact Sciences: Physics, Chemistry, Mathematics
- Earth Sciences: Geography, Geology

Great change: (early) modern science

- René Descartes (1596 – 1650): „*Cogito, ergo sum.*“
- Appreciation of mathematics – the conclusions are irreversibly true
- Francis Bacon (1561 – 1626): *Instauratio Magna*
- Johannes Kepler : astrology vs. Astronomy
- Tycho Brahe: binoculars, lenses
- Blaise Pascal, Wilhelm Schickard: first calculating machines (early 17th century)
- Jacob Bernoulli (late 17th century: using a different kind of logic – probability, not causality; correspondents: Christiaan Huygens and G. W. Leibniz

Writing on history of science

- Authors of books and articles on history of science:
- Scientist themselves (motivation: learn something about their predecessors)
- Boom: 19th century, hand in hand with emancipation of science
- George Sarton and the founding of HSS
- History of separate disciplines
- Issues crossing the boundaries of the disciplines
- Classics: Thomas Kuhn, Karl Popper, Paul Feyerabend, …
- Novel approaches: Andrew Pickering, David Bloor, Hasok Chang, ...

Branches of science histories

- History of medicine and history of pharmacy: separate fields, taught at faculties of medicine and pharmaceutical faculties
- Interest in old methods, old medicines, etc.
- Christiannus of Prachatitz (15th century)
- History of chemistry – includes history of alchemy
- History of astronomy – includes astrology
- http://darwin-online.org.uk/EditorialIntroductions/vanWyhe_Complete_Photographs_of_Darwin.html
- https://margaretschotte.com/
- https://morelthomas.com/

Possible topics for essays / presentations

- Personality – may also be a part of a biography or an aspect of their life (e.g. the image of Albert Einstein in physics textbooks)
- Dangers of choosing a well-known personality:
  - Your essay may end up looking like a museum flyer
  - Too much information to be digested for the essay
- Topic in Science (reception of relativity theory, Darwin's theory, …)
- History of science and secondary school classes of history: What is in the textbooks? Do students need to know any science to understand history?
- Review of a film, book or drama related to history of science

Grade: what your essay should (not) be like

- Choose a topic close to your interest; does not have to be limited to 19th and 20th century
- Write an essay outline and present it to your fellow students in a colloquium
  - Colloquium dates: to be determined,
- The essay must be written in understandable English, but the level of English is not a part of your grade
- Your grade will be composed of:
  - Quality of your question
  - Choice of your sources
  - Structure of your essay

Sources

- jstor.org – database of journal articles
- *Dějiny věd a techniky*
- *Isis*
- *Osiris*
- Printed encyclopedias
- Internet sources: check the authors and also use your own reasoning
- DO NOT use wikipedia only
- DO NOT copy from poor bachelor or diploma theses (look at the grades!)

Jacob Bernoulli (1654-1705)

- brother of Johann Bernoulli
- his son Nicolas became a painter
- held a chair in Basel
- most famous for *Ars Conjectandi* (only published posthumously)

Bernoullis, famous 1st generation

Jacob Bernoulli (1654–1705), a mathematician;

Nicolaus Bernoulli "the elder" (1662–1716), a portrait painter;

Johann I Bernoulli (1667–1748), a mathematician who succeeded Jacob as professor of mathematics at Basel in 1705; and

Hieronymus (1669–1760), who followed his father into the guild of saffron and became a druggist (*Materialist*).[4]

Johann Bernoulli (1667 – 1748)

- held the chair after his brother Jacob
- Father of Nicolas Bernoulli

G. W. Leibniz and Ch. Huygens

Why Ars coniectandi*?*

- Why reasoning? To arrive to conclusions
- What can be deduced logically?
- What is a matter of chance?
  - dice and card games, and nothing else
- Conclusions from the game of dice and cards – games of chance
  - Observation, rather than deduction
- Applications of the theory to other kinds of reasoning:
  - Solving „murders“

Why is this work important for the society?

- New kind of reasoning
- On the basis of observation, we can make conclusions
- Scientific name: *Law of Large Numbers*
  - Our conclusions do not hold for small numbers of observations, the number of observations needs to be large, otherwise we cannot make the conclusion in this way
- Statistics: double meaning, both the calculations and the numbers collected
  - derived from the word „state“
- Mathematical statistics, use of statistics in physics, predictions, models, ...
  - and no reasoning about causality is needed..