

**YFIA205 Basics of Research  
Methodology in Social Sciences  
Lecture 1.  
Science, Knowledge and Theory**

Jyväskylä

3.11.2014

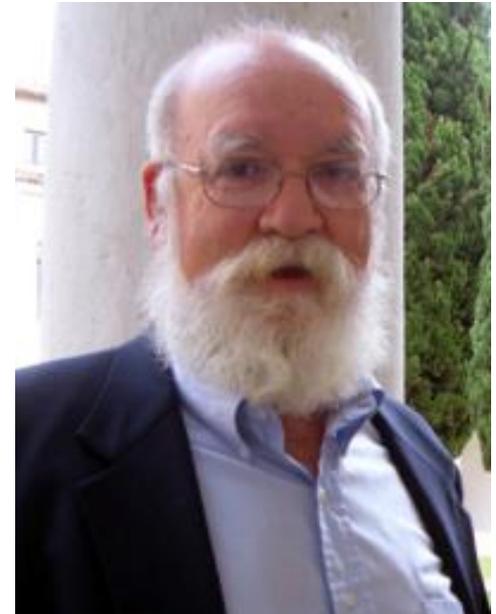
***Petteri Niemi***



# Philosophy of Science

There is no such thing as philosophy-free science; there is only science whose philosophical baggage is taken on board without examination

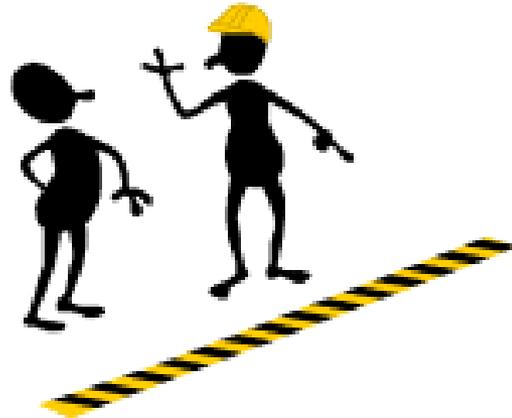
***Daniel Dennett, Darwin's Dangerous Idea, 1995.***



# Science

The demarcation problem:

***We must demarcate science from  
pseudoscience and non-science***

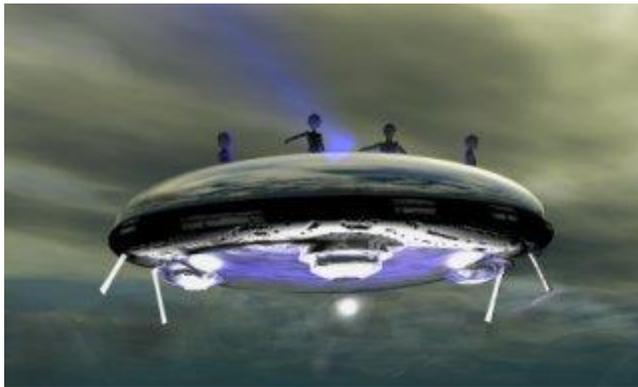


# Science

- ***Pseudoscience***

= presents itself as science but doesn't meet the criteria of science

- Astrology, ufology, scientology, parapsychology etc.



# Science

- ***Non-Science:***

= is not science and doesn't claim to be it

- Art in its various forms, sport, religion etc.



# Science vs. Arts

## **SELF PORTRAIT**

**ELISE'S DISSERTATION**  
**VARIATION OF A VARIATION**

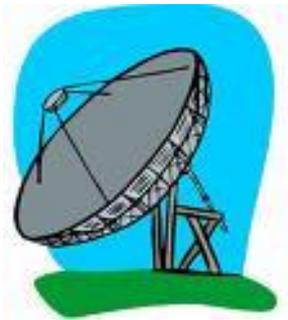


**RIITTA NELIMARKKA**  
**SENECA**

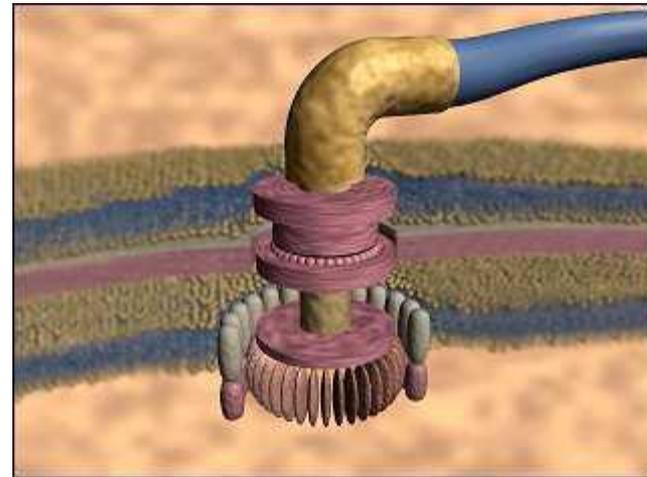


# Demarcation in business world

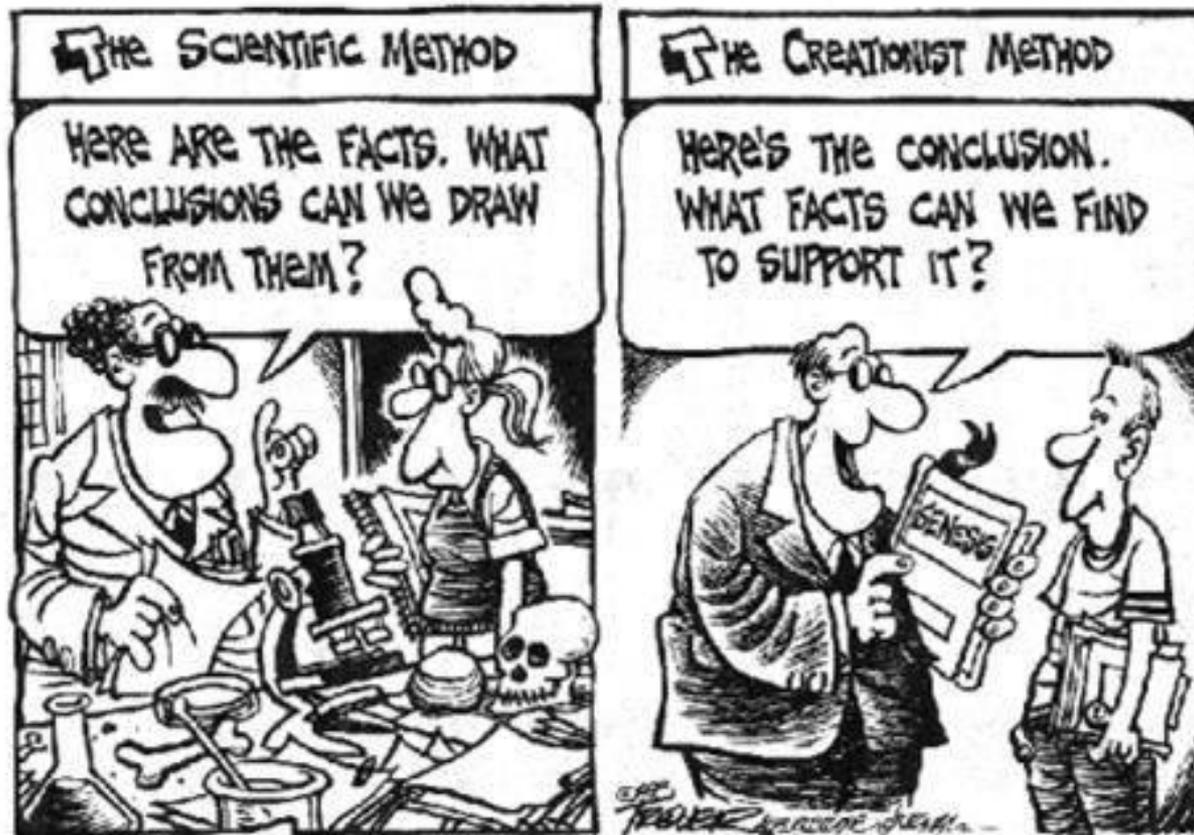
- DNA vs. Elisa lawsuit



# Science vs. Religions



# Science vs. Religions



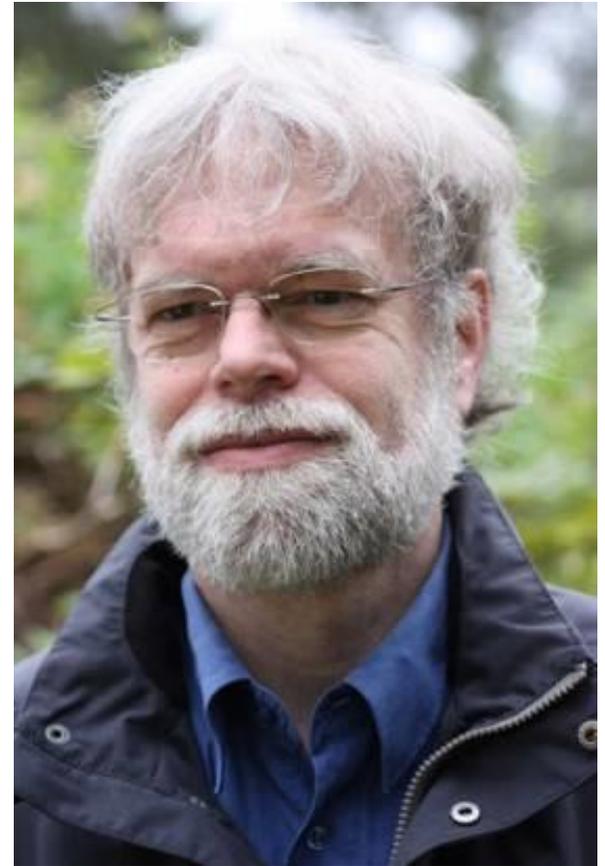
# Science

(Hansson 2012)

- Most recent attempts to solve the demarcation problem are **”multi-criterial”**

***Sven Hansson’s*** (1951-) list:

1. *Belief in authority*
2. *Nonrepeatable experiments*
3. *Handpicked examples*



# Science

(Hansson 2012)

4. *Unwillingness to test*
5. *Disregard of refuting information*
6. *Built-in subterfuge*
7. *Explanations are abandoned without replacement*



# Science

(Hansson 2012)

- The list represents seven common ways to deviate from a minimal (necessary but not sufficient) criterion of science:

*Science is a systematic search for knowledge whose validity does not depend on the particular individual but is open for anyone to check or rediscover*



# Science

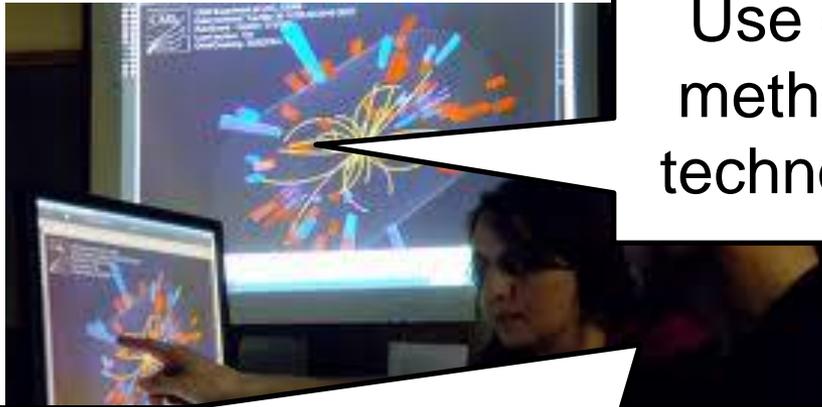
**The Scientific Method** according to  
*Charles Peirce* (1836-1914):

Science is:

- 1. Objective**
- 2. Public**
- 3. Self-correcting**

# Objectivity in natural sciences

- Physicists doing research ...



Use of mathematics, statistical methods, information and other technology improves **objectivity**

However, there are number of factors that are more or less **subjective**: operationalization of concepts, curve fitting, theoretical interpretation of data, estimations of reliability and validity of measuring equipment and methods ...

# Objectivity in qualitative research

- A researcher is doing a research interview



# Objectivity in qualitative research

Belief "A, B and C" doesn't seem to be entirely independent of the researcher's opinions as objectivity requires but the researcher still tries to be **as objective as possible**

ew

Well..  
Yes!



I try to summarize. You believe that A, B and C. Is this correct?

# Self-correctiveness of science

(Haaparanta & Niiniluoto 1991, 14)

The mistakes which have been made in the investigation are gradually discovered and corrected so that the scientific method doesn't permanently mislead researchers



In the end,  
nothing does!  
This is just a  
pragmatic  
presupposition



What guarantees that  
this happens in the  
case of every research  
subject?

# Science

- Even if the ideals of rationality, objectivity, publicity etc. are sometimes violated, this doesn't mean that such ideals are no good and should be abandoned!



# Knowledge

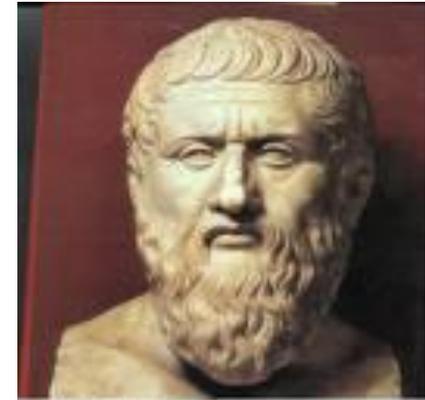
- The classical definition:  
(From Plato's *Theaetetus* dialog)

S knows that p if and only if

- 1)  $p$  is true,
- 2) S believes that  $p$  is true
- 3) S is justified in believing that  $P$  is true

i.e. knowledge is

***Justified True Belief (JTB)***



# Knowledge

- Questions and distinctions that are related to the **origins** of knowledge:
  - Does knowledge stem from reasoning or from experience? (rationalism vs. empiricism)
  - What kind of inferences are used / should be used in science? (deduction vs. induction)



# Deduction

*The conclusion is a direct consequent of the premises*

For example:

All humans are mortals

Petteri is a human

→ Petteri is a mortal

# Induction

*The conclusion is not a direct consequent but possibly increases our knowledge*

For example:

Swan a is white,

...

Swan n is white

→ All swans are white



# Deduction

*The conclusion is a direct consequent of the premises*

For example:

All humans are mortals

Petteri is a human

→ Petteri is a mortal

# Induction

## **Hypothetico-deductive**

model of scientific inference is based on deduction:

A researcher tests her theoretical hypothesis by checking whether its logically deduced and supposedly observable consequences come true

# Deduction

*The conclusion is a*

**Inductivist** model of scientific inference is based on induction: Scientists gather facts and make generalizations

*Petteri is a human*

→ *Petteri is a mortal*

# Induction

*The conclusion is not a direct consequent but possibly increases our knowledge*

For example:

Swan a is white,

...

Swan n is white

→ All swans are white

# The **possibility** and **certainty** of knowledge

- Do you believe that absolutely certain knowledge is possible?
  - If you do, you are a ***dogmatist!***
  - If you believe that science produces absolutely certain knowledge, you are a ***scientisist***, a believer in science



# The **possibility** and **certainty** of knowledge

- Do you question everything?
  - If you do, you are a ***sceptic!***
- Do you believe that every community (culture etc.) has its own truth?
  - If you do, you are a ***relativist!***



# The **possibility** and **certainty** of knowledge

- Do you believe that we cannot have knowledge of some things (e.g. God)?  
→ If you do, you are an ***agnosticist!*** in regard to those things
- Do you believe that knowledge is about what is useful and works in practice?  
→ If you do, you are a ***pragmatist!***



# Knowledge



## **Critical realism:**

*Science that is practised in the right and critical way takes us gradually closer to the truth but still we can never be sure that the final truth has been reached*

# Theories

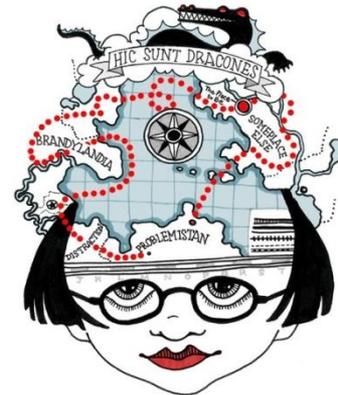
- ***Kurt Lewin*** (1890–1947):  
*There is nothing so  
practical as a good theory!*

*(Field Theory in Social Science, 1951)*



# Theories

- The word "theory" has its origin in the Greek word "*theoria*" which means "contemplation, speculation, **a looking at**, things looked at"
- In its modern guise, theory seems to mean a kind of **mental looking at** on some things



# Theories

(Niiniluoto 1999, 193)

- ***C. G. Hempel*** (1905-1997) about theories:
  - Theories consist of sets of **laws** which systemize the regularities observed in some sphere of phenomena



# Theories

(Niiniluoto 1999, 193)

- A theory should have both **explanatory** and **predictive** power
- A theory should give us a **deeper** and **better** understanding about the phenomena by using **theoretical** concepts that exceed the immediate perceptions



# Theories

(Haaparanta & Niiniluoto 1991, 25; Niiniluoto 1999, 193-194)

- Theory can mean:
  - a) a general conception** that results from rational or intellectual activity,
    - e.g. a theory of music, a theory of physics
  - b) a whole research area or doctrine,**
    - e.g. the game theory, the function theory, the information theory



# Theories

(Haaparanta & Niiniluoto 1991, 25; Niiniluoto 1999, 194)

**c) an information system** that is developed within some branch of science

➤ e.g. Einstein's theory of relativity

**d) a single hypothesis** about an individual case

➤ e.g. a theory about the birthplace of Kalevala's poems

➤ "That's only a theory. You cannot prove it"

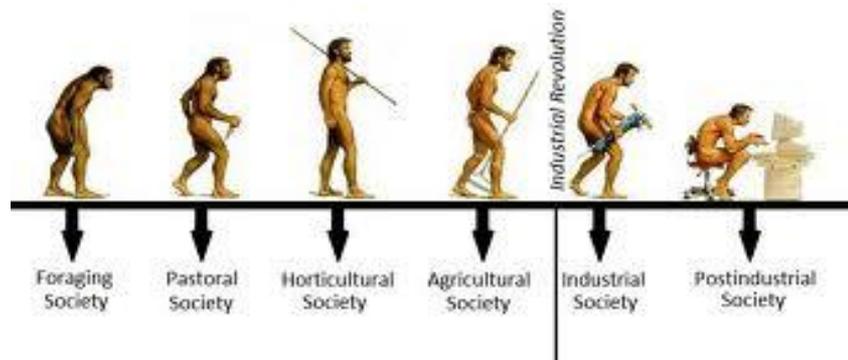
➤ "Your idea is only a theory. It has nothing to do with reality"



# Theories

(Haaparanta & Niiniluoto 1991, 25)

- e) a research program which makes it possible to form partial theories
  - e.g. the theory of cultural evolution



# Theories

(Haaparanta & Niiniluoto 1991, 25)

- Theories contain theoretical **terms** referring to theoretical **entities** which are not immediately perceivable
  - E.g. fundamental particle, social pressure, collective subconsciousness or superego
  - But do theoretical entities really exist?



# Three attitudes to theory

(Haaparanta & Niiniluoto 1991, 26)

1. Theoretical terms have meaning only if they can be reduced to perceptual contents
2. Theoretical terms refer to real things in the world (**Methodological realism**)
3. Theoretical terms are needed and useful but at the bottom, they are just fictive human constructions (**Methodological instrumentalism**)



# Functions of theories in science

(Kiiikeri & Ylikoski 2004)

- Theories shape our presuppositions and the presuppositions in their turn direct our attention
- Theoretical assumptions direct the choice of research subject, the gathering of perceptual data and the question setting of the research
- Perceptual data is scientifically interesting only if it is interpreted theoretically



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- Haaparanta, Leila & Ilkka Niiniluoto (1991). *Johdatus tieteelliseen ajatteluun*. Helsingin yliopiston filosofian laitoksen julkaisuja. Helsinki: Hakapaino Oy.
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