

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

University of Jyväskylä

31.10.2016

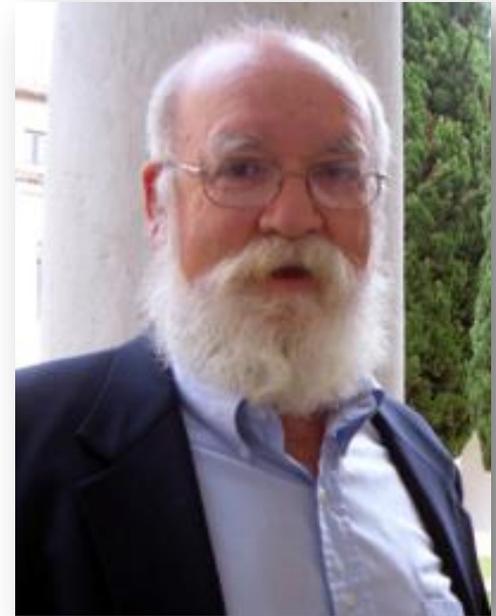
Petteri Niemi



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

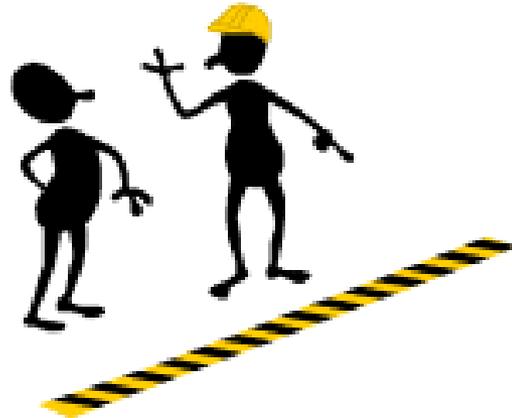
Daniel Dennett, Darwin's Dangerous Idea, 1995



Science

The demarcation problem:

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

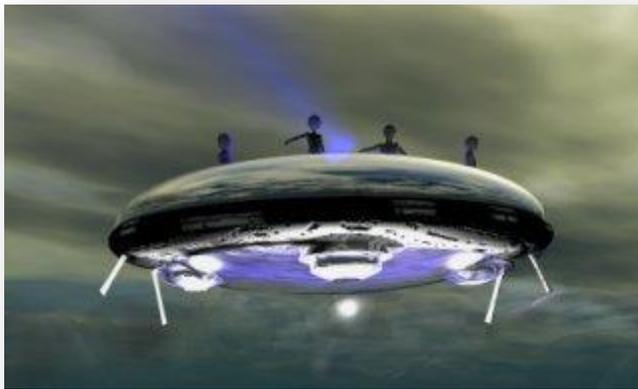


Science

- ***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



The key question: Can we accept as a dissertation a work in which an artist herself reflects her development as an artist, in an artistic way?

Demarcation in business world

- DNA vs. Elisa lawsuit



The key question: Can you say in an advertisement that “The mobile network of operator X is best!” on the basis of certain investigation? Was it scientific?

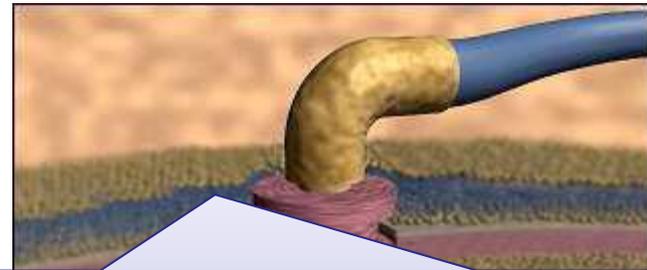
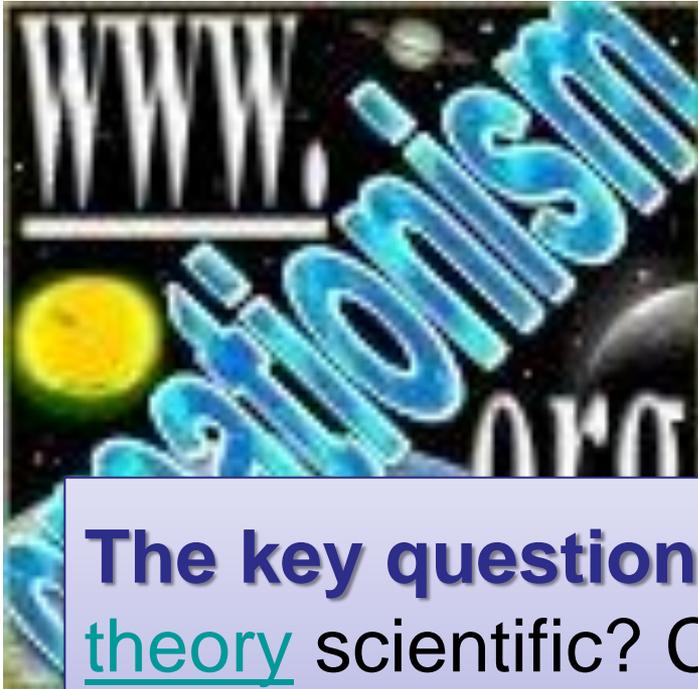
Demarcation in business world

- DNA vs. Elisa lawsuit



The court decision: The investigation was scientific but showed only that the coverage is best. It didn't measure overall quality. So, X shouldn't use formulation “.. is best”

Science vs. Religions



The key question: Is the Intelligent design theory scientific? Can we allow it to be taught in schools?

Demarcation disputes



There was an intergalactic alien ruler named
XENU

The key question: Is scientology a scientific discipline, religion or hoax?



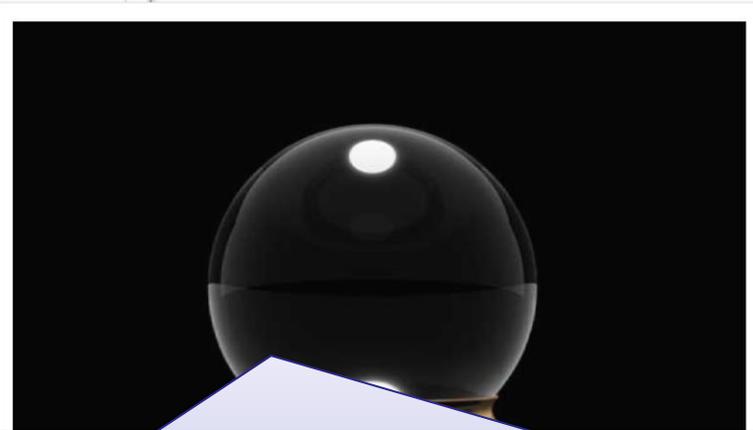
Demarcation disputes:

RS episode #53: Parapsychology

JANUARY 29, 2012 5 COMMENTS



In [Episode 53](#) of the Rationally Speaking Podcast, Massimo and I take on parapsychology, the study of phenomena such as extrasensory perception, precognition, and remote viewing. We discuss the type of studies parapsychologists conduct, the evidence they've found, and how we should interpret that evidence. The field is mostly not taken seriously by mainstream scientists, which parapsychologists argue is unfair, given the significant research evidence that tells us

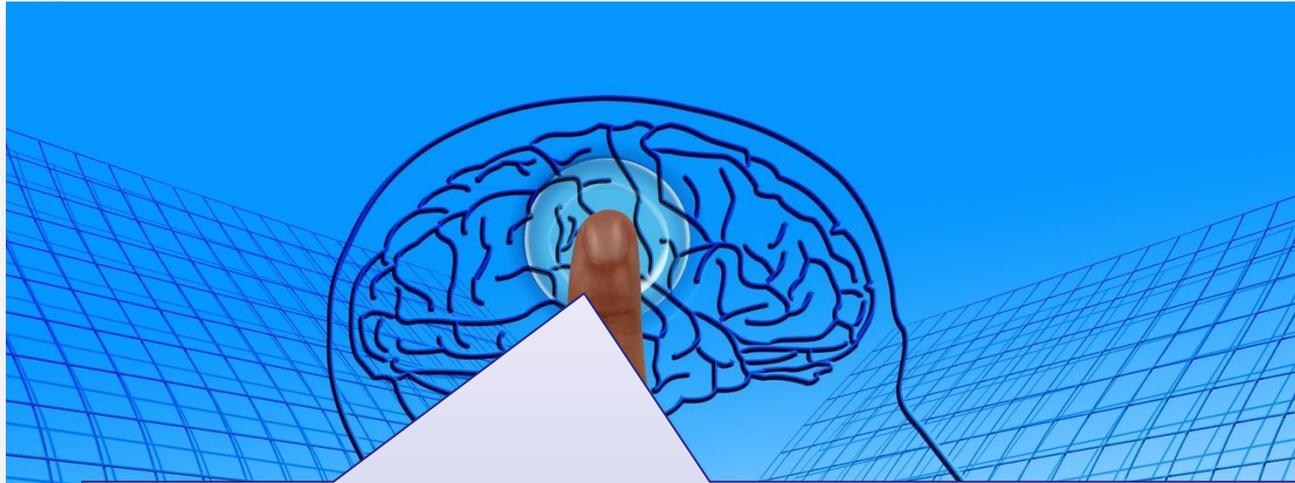


The key question: Can investigation of subjects like parapsychology ever be scientific?

precognition (conscious cognitive awareness) and *premonition* (intuitive sensation) of a future event that could not otherwise be anticipated through any known inferential process. Precognition and premonition are themselves special cases of a more general phenomenon: the anomalous retroactive influence of



Pseudomedicine?



The key question: There are new treatments like **neurofeedback** for which there is not much scientific evidence yet. Is it ok to sell such treatments with relatively expensive prices to people who have real psychological problems?

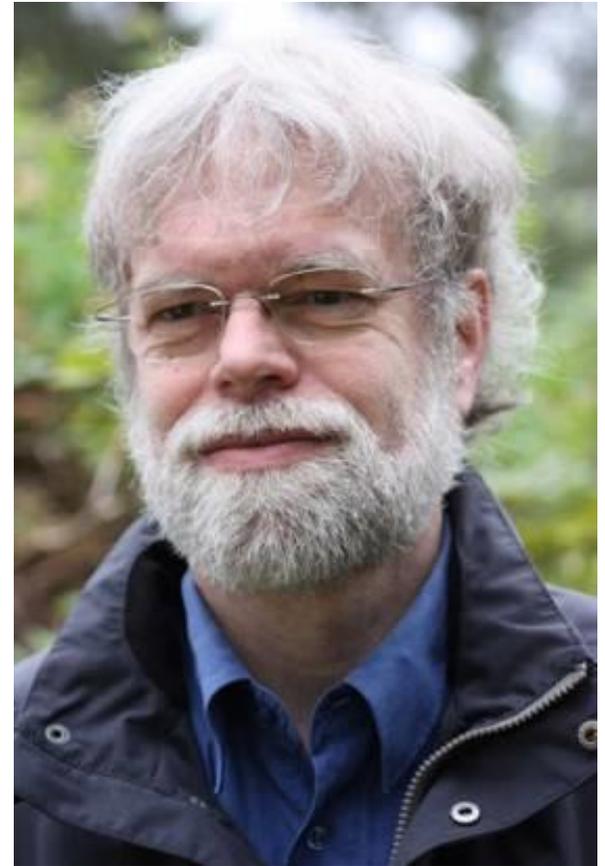
Science

(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

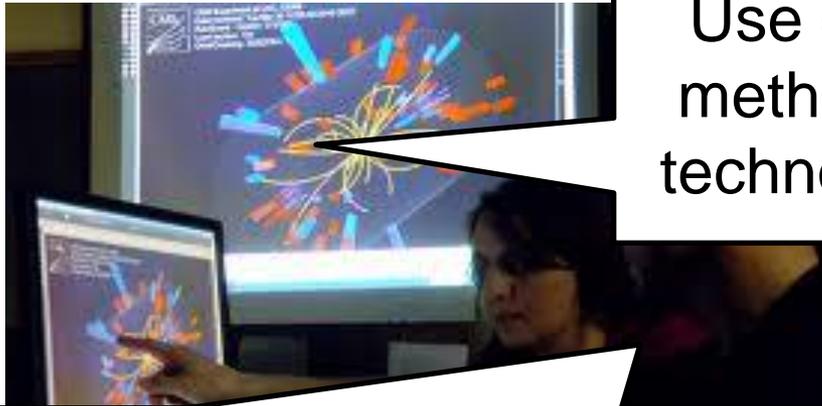
The Scientific Method according to
Charles Peirce (1836-1914):

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!

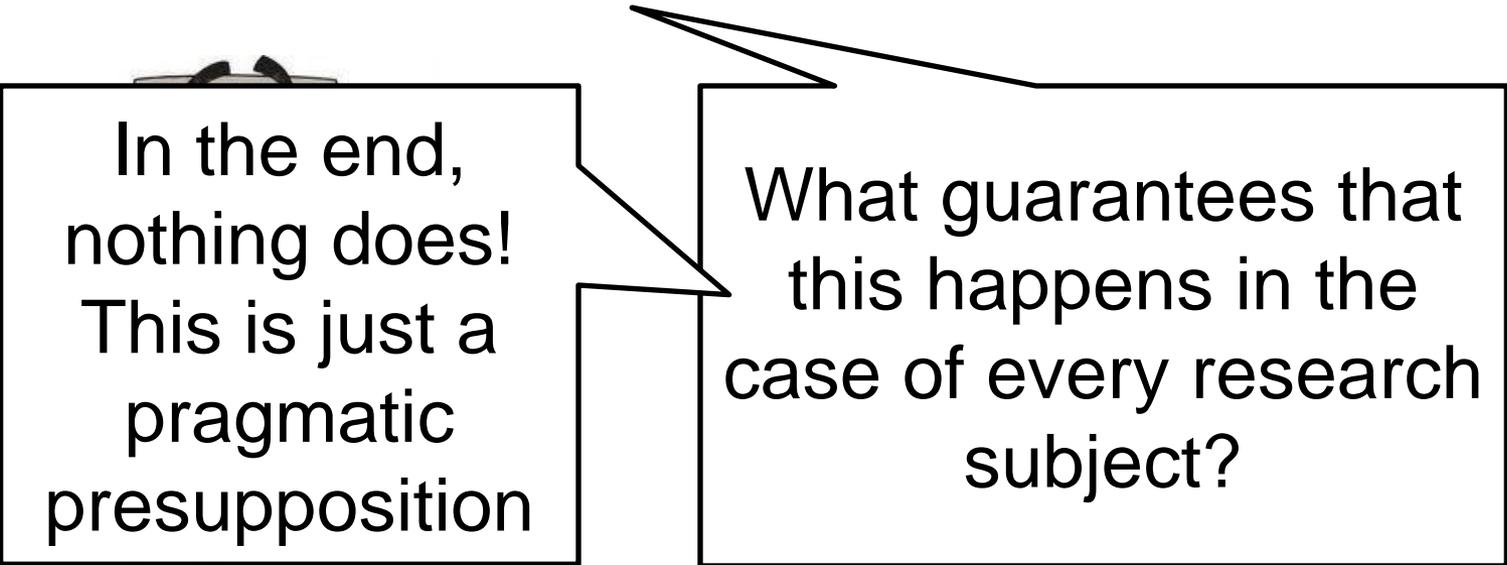


I try to summarize. You believe that A, B and C. Is this correct?

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?

Knowledge

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

S knows that p if and only if

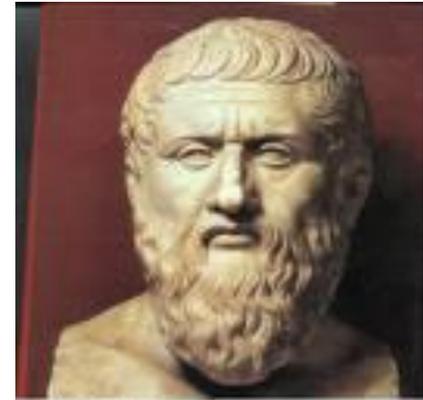
1) p is true,

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)



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"

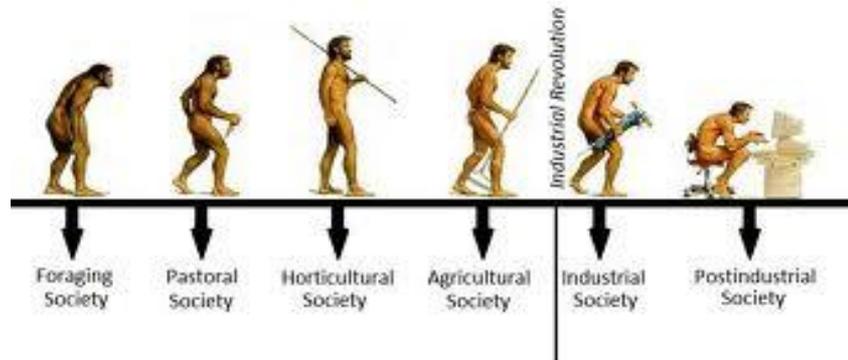
➤ "Your idea is only a theory. It has nothing to do with reality"



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



References:

- Chalmers, A.F.(1982). *What is this thing called Science*. Maidenhead: Open University Press.
- Haaparanta, Leila & Ilkka Niiniluoto (1991). *Johdatus tieteelliseen ajatteluun*. Helsingin yliopiston filosofian laitoksen julkaisuja. Helsinki: Hakapaino Oy.
- Hansson, Sven Ove (2012). "Science and Pseudo-Science". In: Zalta, Edward (Ed.) *The Stanford Encyclopedia of Philosophy*, Winter 2012 edition <http://plato.stanford.edu/archives/win2012/entries/pseudo-science/>
- Kiiikeri, Mika & Petri Ylikoski (2004). *Tiede tutkimuskohteena. Filosofinen johdatus tieteen tutkimukseen*. Helsinki: Gaudeamus

