

# Relativism and the Social Construction of Science: Kuhn, Lakatos, Feyerabend

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Theories as structures: Kuhn and Lakatos

Science and Ideology: Feyerabend

Science and Pseudoscience: Thagaard



## Theories as Structures: Lakatos and Kuhn

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Inductivist and falsificationist accounts of science fail to take account of the complexity of scientific theories and their development



# Kuhn: Paradigms and Scientific Revolutions

- Progression of Science
  - Pre-Science
  - Normal Science
  - Crisis—Revolution
  - New Normal Science
  - New Crisis

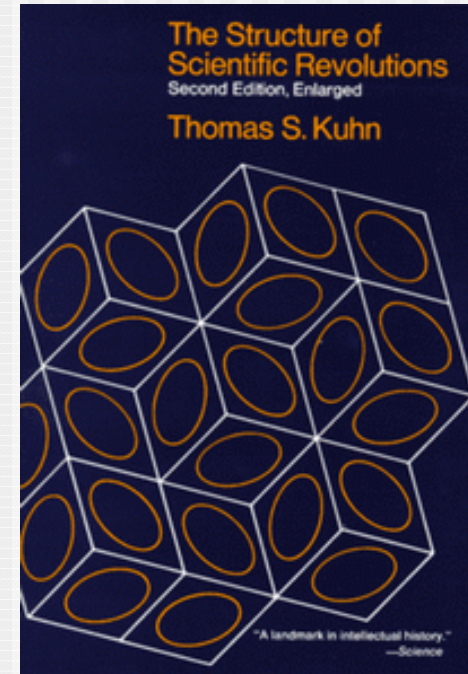


*Credit: Molwick, Scientific American*

Thomas Kuhn: «*The Structure of Scientific Revolutions*»  
(University of Chicago Press: 1962, 1970)

# Paradigms

- Paradigm: *a framework of general theoretical assumptions, laws, and results and techniques for their application*

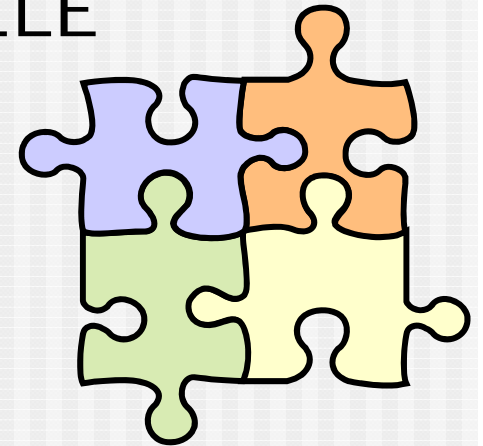


Thomas Kuhn: «*The Structure of Scientific Revolutions*»  
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# Paradigms

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- Framework conformed to by the scientific community
- Open-ended structure enables normal science
- Co-ordinates and directs the PUZZLE SOLVING activity of scientists
- Existence of such a paradigm distinguishes science from non-science
- Have a concrete historical situation



# Scientific Revolution – Paradigm shifts

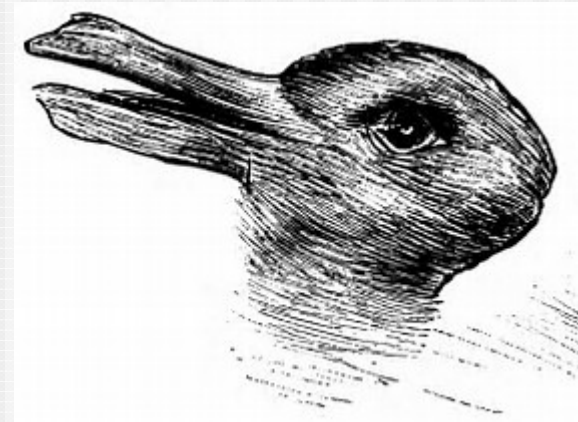
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- Arises in response to the accumulation of anomalies and stresses that cannot be resolved within the framework of the paradigm
- “Incommensurability”



# Scientific Revolution – Paradigm shifts

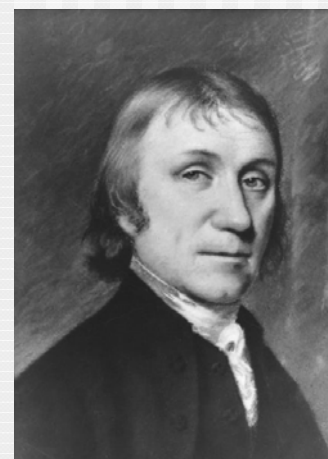
- *Psychological* - Gestalt switch
- *Sociological* - education, publication, shift amongst the community
- *Epistemological, methodological* - scientists regard different questions as important; do different things
- *Ontological* - scientists see the world differently; regard the world as made of different things



# Phlogiston and Oxygen

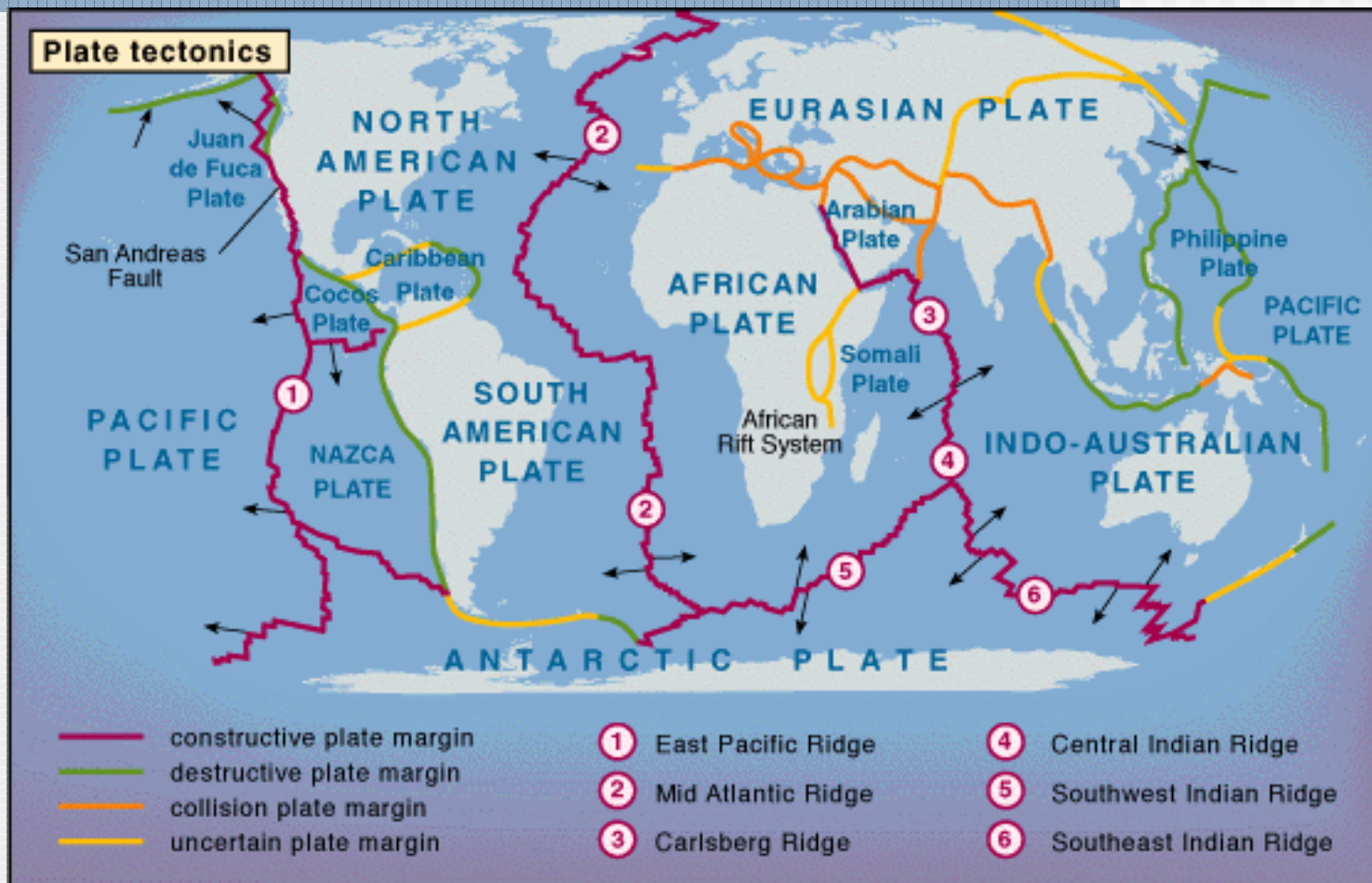
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Priestly and Lavoisier –  
both “discovered”  
oxygen; only Lavoisier  
saw it as oxygen; for  
Priestly it was  
“dephlogistated air”





# Case Study: Plate Tectonics



# History

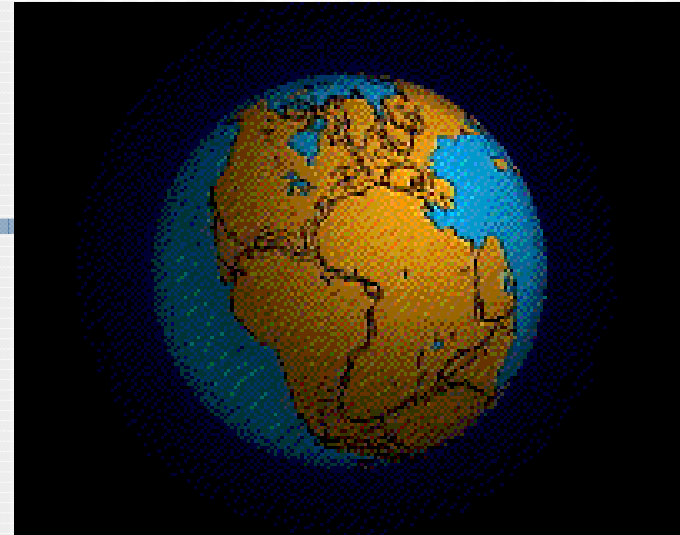
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- 1915 - Alfred Wegener argued that the continents have «drifted» to their present positions from some other super continent Pangaea
- 1937 - Alexander du Toit published own version of Wegener's thesis (Laurasia and Gondwana)



# History

- 1962 - Harry H. Hess tectonic plate theory of continents moving around the globe
- 1963 - Fred Vine and Drummond Matthews magnetism of rocks
- Mid 1960s - adopted by the geological community



# Is the Revolution Kuhnian? (Michael Ruse)

## *Sociological and Psychological Factors*

- Greeted with hostility; textbooks rewritten; young age of revolutionists (apart from Hess); many geologists seemed to have a “conversion experience”

## *Epistemological and Ontological Factors*

- Did the geological revolution cause a change in rules and methods of geology?
- Did the data in some way change (or it's interpretation)?

Evolution or Revolution ??

# Lakatos: Research Programmes

- *Hard Core*: Basic assumptions underlying a research programme
- *Protective Belt*: auxiliary hypothesis, initial conditions, etc. Protects the *Hard Core* from falsification
- *Negative Heuristic*: the hard core must not be modified or rejected
- *Positive Heuristic*: rough guidelines as to how the research programme might be developed

Imre Lakatos: «Falsification and the Methodology of Scientific Research», in: *Criticism and Growth of Knowledge* (Lakatos and Musgrave) CUP:1974



# Problems

- How to choose between different research programmes?
- How to know when a research programme has degenerated?
- Assumes that science is superior rather than proves it

Lakatos' methodology -- "*a verbal ornament, as a memorial to happier times when it was still thought possible to run a complex and often catastrophic business like science by following a few simple and 'rational' rules*" (Feyerabend)

# Rationalism and Relativism

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Rationalist/Realist - believes there is some universal criterion by which a good scientific theory can be judged (e.g. inductivism, falsificationist, coherence and progression of a research programme)

Relativist - denies this; any criterion will be relative to both the individual and the community

# The slippery slope...

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*"Lakatos aimed to give a rationalist account of science; Kuhn denied that he aimed to give a relativist account of science but gave one nevertheless"* Chalmers



# Consequences of Relativism

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- " If 'science' (the relativist might well be inclined to use quotation marks) is highly regarded in our society, then this is to be understood by analysing our society, and not simply by analysing the nature of science" (Chalmers)*
- " Man is the measure of all things" Protagoras*
- " There is no standard higher than the assent of the scientific community" Kuhn*

# Science, Pseudoscience and Ideology

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Cases: Creationism, Astrology,  
Alternative medicine, Climate change  
debate

■ Literature: Thagard; Feyerabend, Lakatos; Kitcher,

# Ny undersøkelse: Nesten halvparten av nordmenn stoler ikke på forskning

ERLEND TRO KLETTE | THEA STORØY ELNAN

OPPDATERT: 04.OKT.2017 13:07 | PUBLISERT: 17.SEP.2017 21:30

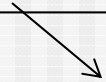


Aftenposten

Illustrasjon: 46 prosent av respondentene i Forskningsrådets nye undersøkelse er enige i at forskningsresultater ofte er kjøpt av industri eller myndigheter, og dermed ikke er til å stole på.

FOTO: Billion Photos / Shutterstock

A set of ideas and beliefs: generally referring to political or social theory



# Science and Ideology

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Feyerabend's  
anarchistic view of  
science

Creationism debate

Literature:

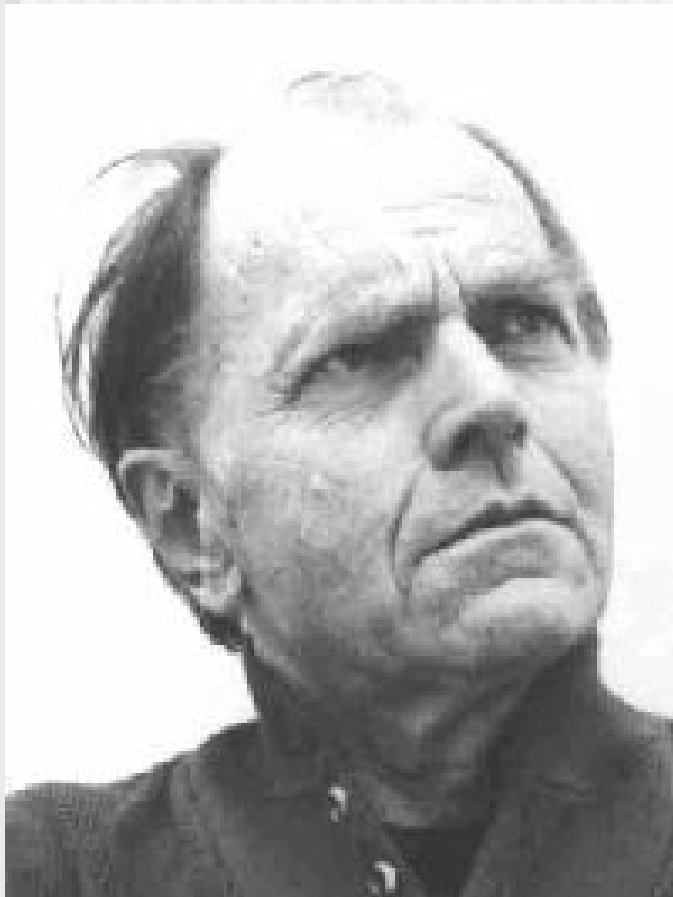
Feyerabend; *"How to defend society against science"*

Kitchner, *"Believing where we cannot prove"*

Chalmers

# Paul Feyerabend

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*"Against Method:  
Outline of an  
Anarchistic Theory of  
Knowledge"* London  
New Left Books,  
1975

# Against Method (1975)

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- Wants to defend society against ideologies
- Suggests that 17<sup>th</sup> and 18<sup>th</sup> century science was an instrument of liberation (breaks hold the comprehensive system of thought) and enlightenment (made man question inherited beliefs)
- Claims that modern science has deteriorated into a «stupid religion»  
«*Science, with all its reductionism and materialism, has deprived man of his special status—only an idea of culture that excludes science can restore man's dignity*» (Nietsche)

# Feyerabend's Argument

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Two common arguments to defend the exceptionalist position that science has in society today:

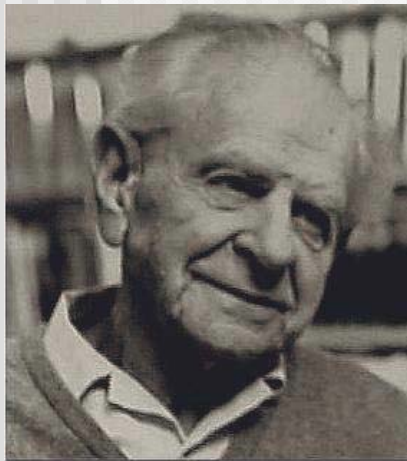
- 1) That science has found the correct *method* for achieving results
- 2) That there are many *results* to prove the excellence of the method

# Feyerabend's Argument

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Feyerabend:

1) There is no such method



*Sir Karl Popper (1902-1994)*

Popper: rigid standards..  
"would eliminate science"



Lakatos: "offers *words* that *sound* like a methodology: he does not offer a methodology"

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Kuhn: "too vague to give rise to anything but hot air"

MNSES9100



# Feyerabend's Argument

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Feyerabend:

- 1) There is no such method
- 2) Only holds if it can be taken for granted that nothing else has produced results



Chinese astronomy

*"Science is just one of many ideologies that propel society and it should be treated as such"*

# Against Method

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" Anything goes "

" ... *or everything stays* "  
(*Chalmers*)

# "Anything Goes"

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*"Three cheers to the fundamentalists of California who succeeded in having a dogmatic formulation of evolution removed from the textbooks and an account of Genesis included"*

# Kansas State Science Standards

- August 1999, the Kansas State Board of Education voted 6-4 in favour of state science standards from which several topics, including virtually all references to evolution had been deleted. Students will no longer be tested on these topics
- Also deleted were the Big Bang theory, environmental science concept and any mention of geologic time



Figure 1 The bizarre climax of the sensational Scopes trial occurred on the afternoon of 20 July 1925 when Clarence Darrow (right) questioned William Jennings Bryan (left) about the literal truth of the Bible. The Scopes trial remains the most famous event in the evolution-creationism controversy. Photograph courtesy of Bryan College.

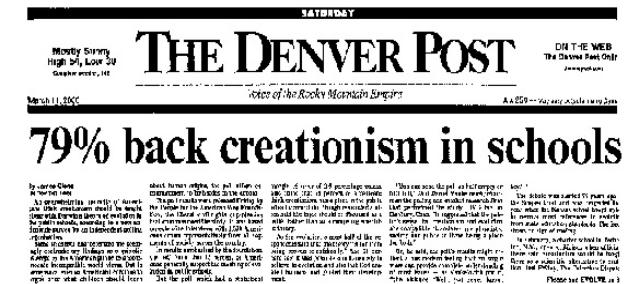


Figure 2 This front-page headline on the 11 March 2000 issue of The Denver Post announced Americans' continuing and overwhelming desire to have creationism taught in public schools.

## Decades after monkey trial, debate hasn't evolved much

Theory's detractors say 'popular revolt' under way

By TODD ACKERMAN  
Houston Chronicle

Even before he became a Clatsop, Jeff Farmer was an opponent of evolution.

His interest in such matters was twofold: As a wildlife artist, Farmer studied animal anatomy and as a biology classroom teacher, he could occasionally find time to teach the science he loved.

But when he was asked to teach evolution, he grew up, like most people, in learning evolution was "true," said Farmer, a 1987 University of Houston

graduate who wrote an opinion column for the Chronicle earlier this month calling evolution a "pseudoscience."

"But ultimately, scientists in most high school science are just hesitant to answer the question: 'Why can't we easily and convincingly see it in the fossil record?'"

Three-quarters of a century after the Scopes monkey trial, Americans still have a hard time talking about evolution. Since the Kansas Board of Education in August de-emphasized teaching that man descended from a common ancestor, supporters around the country have been inundated with supportive

letters to the editor, presidential candidates have taken notice, and polls show an uneasy middle ground on evolution as science.

"It's gotten to the point that leading creationist opponents are warning that a 'popular revolt' is under way."

The state of affairs is raising its eyebrows, who believe that evolution is as well documented as Darwin's revelation about the sun. To deny evolution means believing that Earth is less than 10,000 years old, that carbon dating is false, that the universe once grew from a point at the beginning of time. No wonder.

See EVOLUTION on Page 16A.

Figure 3 Decades after the Scopes trial, the evolution-creationism debate rages on in the United States. This article appeared on the front page of the Houston Chronicle on 18 September 1999.

# Challenges

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- Impact of ideology on scientific objectivity
- Impact of ideology on how science is taught
- Demarcation of science, pseudoscience and political ideology
- Group Discussion Case: Teaching about climate change in schools