EPFL Master course
Philosophical perspectives on the exact sciences and their history

Introduction & Descartes on modern science

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What you are expected to do

- **submit an essay plan, defend your plan in November-December and work out the essay by 1 May**
- **essay plan (ca. 3 pages): a brief introduction to your topic & situating the topic in the field of philosophy of science, a clear statement of your research question, an outline of how you intend to address that question**
- **final essay:**

a) **an introduction in which you spell out your research question, tell the reader why this question is interesting and put it into a general framework**

b) **a main part in which you develop your argument, give examples, discuss possible objections**

c) **a conclusion that sums up your results and contains an assessment**

Teaching staff

- Professor

Michael Esfeld, michael.esfeld@unil.ch

- Assistant
- Amine Rusi, amine.rusielhassani@unil.ch
- Postdoc

Cristian Lopez, cristian.lopez@unil.ch

Schedule autumn

- **Wed 9 Sept.: Michael Esfeld:** Descartes on modern science & **Cristian Lopez:** Physics and philosophy
- **Wed 16 Sept.: Michael Esfeld:** Newton on natural philosophy & **Amine Rusi:** Philosophy of space and time
- **Wed 23 sept.: Michael Esfeld:** Quantum physics: non-locality and the measurement problem & the ontology of quantum physics
- **Wed 30 Sept.: Amine Rusi:** Philosophy of artificial intelligence and consciousness & **Michael Esfeld:** Mind and free will
- **Wed 7 Oct.: Cristian Lopez:** Mathematical structure and ontology & **Amine Rusi:** How to write an essay
- **Wed 14 Oct.: Michael Esfeld:** What is a law of nature & The scientific and the manifest image of the world
- **by Mon 19 Oct.:** definite fixing of the groups and essay subjects

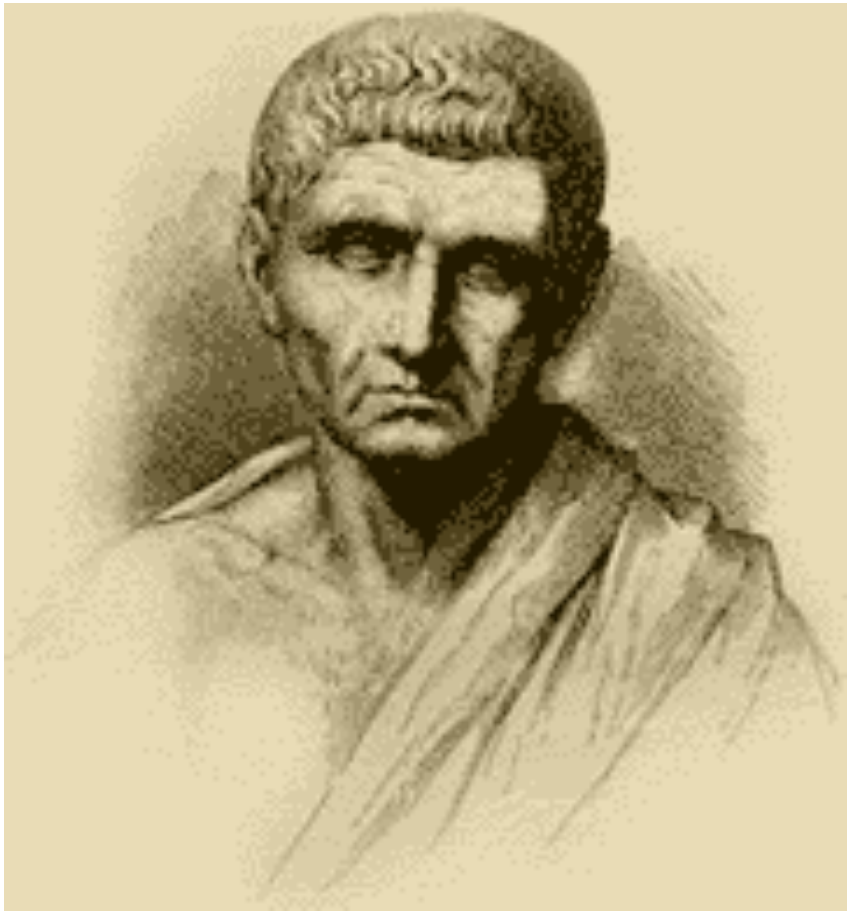
Schedule autumn

- **Work on essay plan, at least one meeting with supervising assistant (scheduled via moodle); submit essay plan to supervising assistant one week before the oral discussion**
- **Wed 25 Nov., 2, 9, 16 Dec.: discussion of essay plan in class, 15 minutes presentation, 15 minutes discussion**

Schedule spring

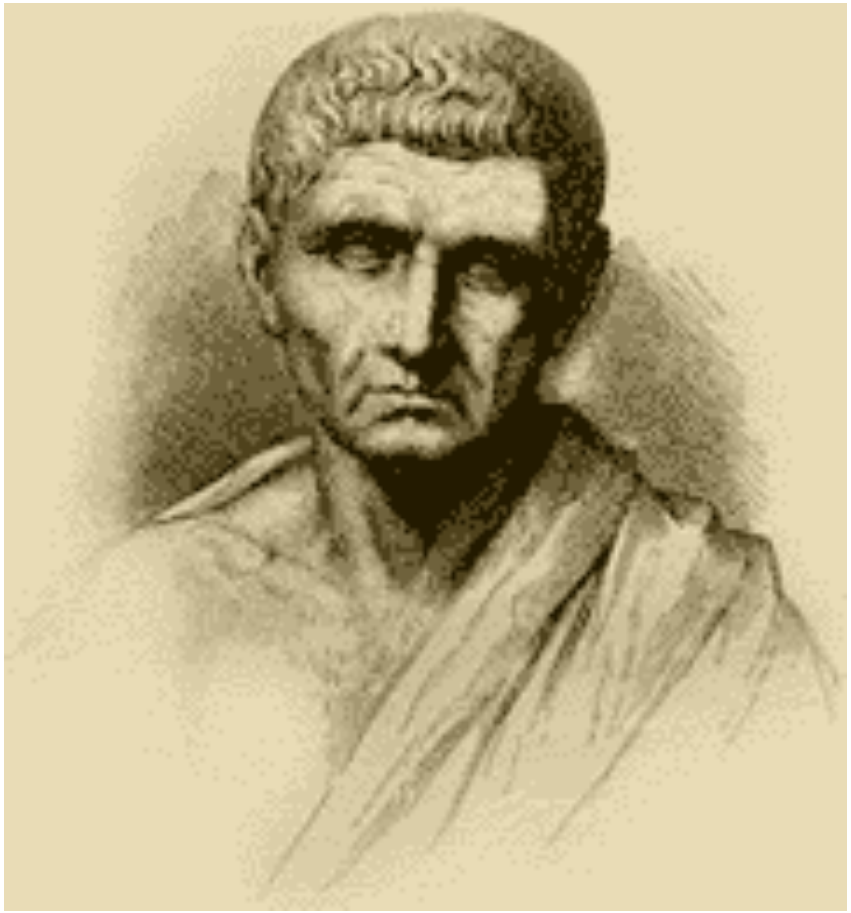
- **Work on essay, at least one meeting with supervising assistant in February**
- **by 1 May: submit essay**
- **by 1 June: submit final version of essay, if changes requested**

Aristotle (384-322 B.C.)
Metaphysics



- observation
- memory
- experience
- laws
- knowledge: science (epistémé)
- philosophy (théoria)

Aristotle (384-322 B.C.)
Metaphysics



- *physis*: the domain of what exists in itself, by contrast to *techné* = the artefacts created by us
- physics: the science of that domain
- metaphysics: what comes after physics, general principles of being
- epistémé / théoria: contemplation of being

René Descartes (1596-1650)
Discours de la méthode (1637)

"nous rendre comme maîtres et possesseurs de la nature"

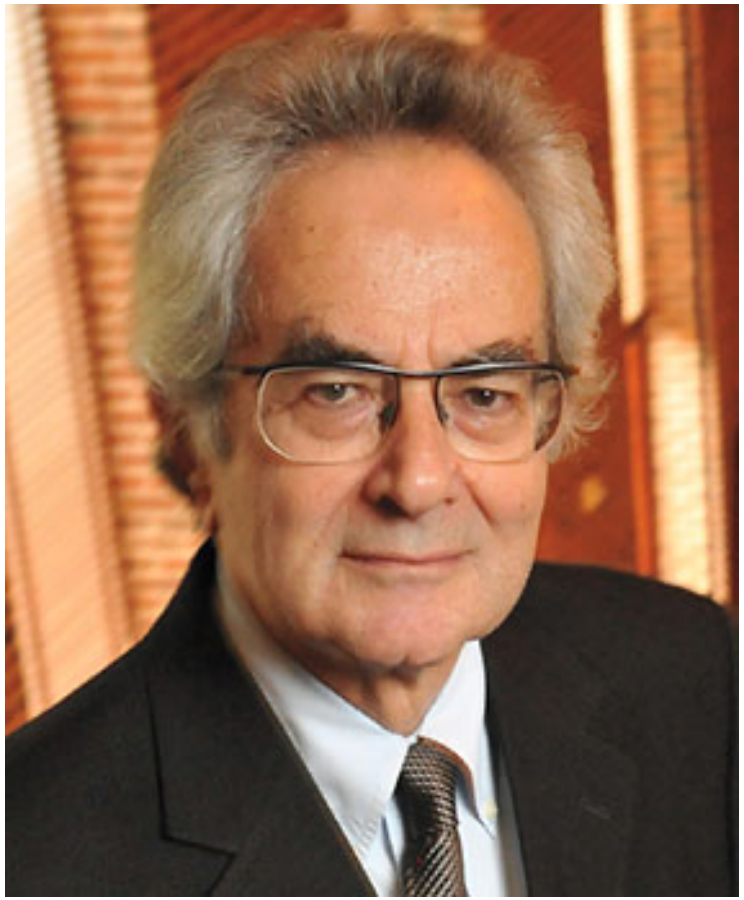
➔ **modern science not *théoria;* in the service of improving human living conditions**

objectivity

methodological scepticism

principled limit in persons

Objectivity
Thomas Nagel (*1937)



point of view from nowhere (1986)

➔ abstract from all subjective features

Descartes: extension and motion

discover laws of motion

all measurement records: position records

two theories / worlds that agree on position distribution of matter throughout space-time indiscernible

laws: representation of patterns of motion that is simple & informative: systematicity, mathematical expression

science universal: genesis in European culture, but universal validity: only evidence and argument

Methodological scepticism
Karl Popper (1902-1994)

point of view from nowhere impossible; regulative idea

➔ submit all knowledge claims to rigorous scrutiny

experiment: repetition

Popper (1934): asymmetry: scientific claims can be shown to be false (demarcation criterion), but their truth cannot be established; endorsed insofar as resist attempts of falsification

Richard Feynman
"The value of science" (1955)

"Scientific knowledge is a body of statements of varying degrees of certainty—some most unsure, some nearly sure, none *absolutely* certain. Now, we scientists are used to this, and we take it for granted that it is perfectly consistent to be unsure–that it is possible to live and *not* know."

The value of science: "Of all its many values, the greatest must be the freedom to doubt."

Underdetermination

classical, Newtonian mechanics: inertial motion & acceleration absolute ➔ absolute space & time	Leibnizian relationalism, only relational quantities
Maxwell-Lorentz electro-dynamics with fields	Wheeler-Feynman electro-dynamics without fields
general relativity: absolute scale: space-time intervals, relative simultaneity	shape dynamics: instantaneous configurations, only relational quantities: scale invariance
QM with wave-function collapse, indeterminism	QM without wave-function collapse determinism, probabilities as in SM

positivist fallacy to infer ontology from formalism

Objectivity / limits
Descartes (1596-1650)

- abstract from all subjective features

→ strict separation between facts and norms

→ principled limit in subjective perspective on the world: consciousness, thought and action

Envoi

- **Aristotle's distinction between experience and knowledge / *théoria***
- **modern science: practical focus: improve human living conditions**
- **objectivity: view from nowhere; laws, mathematical expression, systematicity**
- **methodological scepticism**
- **principled limit in subjectivity: consciousness, thought, action: norms**