Course Syllabus PHL-201G / NSC-202E:

History and Philosophy of Science

Contact Details for Professor

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Course Prerequisites (if any): None.

Course Description

In this course, the history and philosophy of science is studied, starting from the origins of science in ancient Mesopotamia, Egypt and Greece to present day science and technology. Key issues from the philosophy of science (such as Popper's falsifiability, Kuhn's paradigm shifts, Gödel's incompleteness and Poincaré's conventionalism) will be illustrated by historical case studies (such as the Copernican revolution, the shift from classical physics to quantum mechanics or the evolution theory). While the focus of this class will be on natural sciences, we will also consider the problem of the scientific method in humane and social sciences.

Course Materials

Lecture notes by the instructor will be available on the PointCarré website.
A list with suggested readings will be available the PointCarré website.
Students are expected to take notes during the lectures.

Course content:

- Origins of science and philosophy in ancient times (Mesopotamia, Egypt, Greece...: Thales, Pythagoras, Aristotle, Euclid, Archimedes, Heron of Alexandria, Ptolemy...)
- Science & philosophy in the Roman Empire & Middle Ages, China, India and the Arab world
- Renaissance, Age of Enlightenment & Scientific Revolution (philosophers: Bacon, Descartes, Hume; scientists: Kepler, Copernicus, Galileo, Vesalius)
- Biology, abiogenesis and evolution (Lamarck, Darwin, Mendel, Crick/Watson + what about creationism/Intelligent Design?)
- Classical physics, including relativity (Newton, Leibniz, Maxwell, Poincaré, Einstein)
- New physics (thermodynamics, quantum physics & string theory: Boltzman, Planck, Schrödinger, Klein/Kaluza...)
- Modern logic and mathematics (Frege, Cantor, Hilbert, Gödel, Turing)
- Scientific method (Popper, Lakatos, Feyerabend, Poincaré)
- What about social/human sciences (such as history, economics, psychology)?
- Principle of Liberal Inquiry (French: "Libre Examen", Dutch: "Vrij Onderzoek")
- Scientific fraud and pseudo-science

Learning Objectives

After this course, you should have an understanding of the scientific method and its problems.

Learning Outcomes:

- General education
- Identify, analyze and solve a problem
- Apply the knowledge on the job
- Being able to critically evaluate existing research, question the status quo, and provide
alternative solution possibilities
- Get acquainted with the academic literature and be able to locate pertinent and relevant information on a specific topic
- Work independently
- Work with others, take on responsibility and show leadership
- Be curious, inquisitive
- Develop an attitude of life-long learning
- Be ethical, professional and self-critical
- Develop to become a well-rounded, critical citizen
- Present and defend an issue orally
- Present the results of an analysis to non-specialists
- Acquire understanding of diversity

Grading Scale of Vesalius College

Vesalius College grading policy, in line with the Flemish Educational norms, is now as stated follows:

A	85%
A-	81%
B+	77%
B	73%
B-	69%
C+	66%
C	62%
C-	58%
D+	54%
D	50%
F	Below 50%

Course Assessment

The students will be evaluated on the basis of their performance as follows:

➢ Paper   30%
➢ Oral presentation of paper   10%
➢ Midterm examination   30%
➢ Final examination   30%
   TOTAL   100%

Further description of assessment activities:

The students will have to read a book or scientific article on the subject. A list with suggested titles will be available, but the students are welcome to read a work outside of the list, provided they ask permission fist. A paper (ten to twernty pages) has to be written about the work read. In this paper, the work has to summarized and situated in its context. Did the author react against some other philosophy? What was the effect of the paper on thinking about science or on the way in which science is being practised? How was the work received? The students have to hand in the paper via TurnItIn. The students will have to give an oral presentation of their paper for the class (about ten to fifteen minutes).

During the exams, the students will get 6 to 8 problems out of the lectures. They are expected to chose 2 out of the given problems and to write a short (one or two pages) essay answering the chosen questions. Students who take the exam at a later date, whatever the reason, will not have a choice on what questions to answer.

Grading Criteria

The following criteria will be applied in assessing your written work:

➢ Evidence of understanding of the concepts, theories and ideas developed in the course.

Paper:

	Grade Range (0-1/20) FAIL	Grade Range (2-3/20)	Grade Range (4-5/20) – B to A
completeness and pertinence	*incomplete*	*Some important ideas covered*	*All main ideas covered*
mastering of the literature	*Does not show understanding what the work is about + no or bad bibliography*	*Shows some understanding + half-baked bibliography*	*Thorough understanding + good bibliography*
critical thinking	*Not critical*	*Somewhat critical*	*Very critical*
structure	No structure	Some structure	Very structured
Total			X/20

Exams:

	Grade Range (e.g. 0-1/20) FAIL	Grade Range (e.g. 2-3/20)	Grade Range (e.g. 4-5/20) – B to A
completeness and pertinence	*incomplete*	*Some important ideas covered*	*All main ideas covered*
Logic	*Does not show understanding*	*Shows some understanding*	*Thorough understanding*
critical thinking	*Not critical*	*Somewhat critical*	*Very critical*
e.g. structure	No structure	Some structure	Very structured
Total			X/20

Academic Honesty Statement

Academic dishonesty is **NOT** tolerated in this course.

Academic honesty is not only an ethical issue but also the foundation of scholarship. Cheating and plagiarism are therefore serious breaches of academic integrity.

Following the College policy, cheating and plagiarism cases will be communicated in writing to the Associate Dean for Students and submitted to the Student Conduct Committee for disciplinary action.

If you refer to someone else's work, appropriate references and citations must be provided. Grammar, spelling and punctuation count, so use the tools necessary to correct before handing in assignments.

Protocol for Conducting Exams at Vesalius College

1. Students must store their cell phones and any other electronic devices (iPods, MP3 Players, tablets etc.) in their bags or coat pockets, outside of their reach. Possession of any such item on the student's person or place will be considered as evidence of cheating.

2. Students must leave their coats, hat, and bags in front or around the periphery of the classroom.

3. Students may have only the material designated by the instructor on their desk. The instructor has the right to inspect this material. You are not allowed to pass any material to other students during the exam.

4. Students are not allowed to leave the classroom during the exam. (If an emergency occurs, another faculty or administration member must escort the student out of the classroom.)

5. Students must remain seated during the last 15 minutes of the exam and wait until the completion of the exam session. If students finish the exam before the final 15 minutes, they will be permitted to leave.

6. If a student is found cheating, the result is an immediate F, and the instructor is required to report the student to the Student Conduct Committee.

Book list: History and Philosophy of Science

An updated book list will be posted on the PointCarré website.

You do not have to take a book out of this list, please contact me if you want to read something else.

Some of these books are very difficult, others are easy-reading. Make sure you select a book which fits with your level of understanding.

Classics in science:

Galileo Galilei: *Dialogues Concerning Two New Sciences*, Dover, ISBN 0-486-60099-8

Charles Darwin: *The Origin of Species*, Penguin, ISBN 0-14-043205-1

Jean Baptiste de Lamarck: *Philosophie Zoologique*, Libraire Dentu 1809

Philosophy of Science:

Thomas Kuhn: *The Structure of Scientific Revolutions*, University of Chicago Press, ISBN 0-226-45804-0

Henri Poincaré: *Science and Method*, Dover, ISBN 0-486-43269-6

Henri Poincaré: *La valeur de la science*, Champs/Flammarion, ISBN 2-08-081230-0

Henri Poincaré: *La science et l'hypothése*

Paul Feyerabend: *Against Method*, New Left Books 1975

Paul Feyerabend: *Science in a Free Society*, New Left Books 1978

Karl Popper: *The Logic of Scientific Discovery*, Hutchinson London 1959

Karl Popper: *The Open Universe. An Argument for Indeterminism*, Hutchinson London 1982

Imre Lakatos: *Proofs and Refutations. The Logic of Mathematical Discovery*, Cambridge University Press 1976

Carl G. Hempel: *Philosophy of Natural Sciences*, Prentice-Hall 1966

Bruno Latour & Steve Woolgar: *Laboratory Life. The Social Construction of Scientific Facts*, Sage London 1979

Bas Van Fraassen: *Laws and Symmetry*, Clarendon Press Oxford 1989

Douglas Hofstadter: *Gödel Escher Bach*

Larry Laudan: *Progress and its Problems*, RKP London 1977

Larry Laudan: *Science and Values. The Aims of Science and Their Role in Scientific Debate*, University of California Press 1984

History of Science

John Gribbin: *Science – A History*, Penguin ISBN 0-140-29741-3

Thomas Heath: *A History of Greek Mathematics*, Dover Volume 1 ISBN 0-486-24073-8 , Volume 2 ISBN 0-486-24074-6

William Kneale & Martha Kneale: *The Development of Logic*, Clarendon Press Oxford ISBN 0-19-824773-7

Reviel Netz & William Noel: *The Archimedes Codex*, ISBN 0306817373