HUM-402 **Experimental history of science I**

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Cursus	Sem.	Type
Humanities and Social Sciences	MA1	Obl.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Project	1 weekly
Number of positions	**30**

Remark

Une seule inscription à un cours SHS+MGT autorisée. En cas d'inscriptions multiples elles seront toutes supprimées sans notification.

Summary

The course allows students to learn by doing about the history of science, and the role played by experimentation, technical skills or material objects in the production of knowledge. Students will explore these topics by reconstructing a historical experiment, instrument or practice.

Content

The first half of the first semester will introduce students to what it means to reconstruct a historical experiment, instrument or practice. The goal of the historical reconstructions is not to replicate a known result (as in a science lab), but rather to obtain some novel or better knowledge about the past (which could not be obtained by simply reading a book). In the second part of the first semester students will work in groups to choose and research the most interesting and promising topics for a project. The best projects are those that raise some interesting historical questions, or that promise to provide some interesting historical insights. At the end of the first semester, students will present their project proposal and submit a written report. The second semester is dedicated to the actual historical reconstruction.

Past Projects

1. **The reconstruction of experiments**: Eratosthenes's measurement of the radius of the Earth; the Cavendish experiment for determining the density of the Earth; Foucault's pendulum experiment for demonstrating the rotation of the Earth; Young's double slit experiment; Hertz's experiment for the detection of electromagnetic waves; Fizeau's experiment for measuring the speed of light; Pictet's experiment on the radiation and reflection of cold; the Doppler effect; Lissajous's figures.
2. **The reconstruction of instruments**: a cloud chamber for visualizing cosmic rays; Volta's batteries; Franklin's Leyden Jars; a camera obscura; a 3D model of a 14th-century astronomical clock.
3. **The reconstruction of past practices and techniques**: cyanotype paper and technical drawing techniques; a comparison of pre-industrial and industrial soap making techniques; the chemical reconstruction of the perfumes of Julius Caesar and Henry VIII.

Plan

Week 1. Introduction
Part 1. Reconstructing Experiments
Week 2. Joule's experiment for measuring the mechanical equivalent of heat
Week 3. Newton's experimentum crucis
Part 2. Reconstructing Instruments and Machines
Week 4. The solar microscope
Week 5. Leonardo Da Vinci's robots
Part 3. Reconstructing Recipes and Techniques

Week 6. Newton the alchemist
Week 7. Matter, materiality, materials
Part 4. Practical Work
Week 8. Brainstorming on the project
Week 9. Lab work: scientific instruments
Week 10. Project Workshop
Week 11. Project Workshop
Week 12. Project Workshop
Part 5. Presentations
Week 13. Presentation of Project Proposals
Week 14. Presentation of Project Proposals

Keywords

re-enactment, past experiments, learning by doing, history of science, practices, artefacts, tacit knowledge
POLY-perspective :

- creative perspective
- interdisciplinary perspective

https://www.epfl.ch/schools/cdh/cdhs-vision/

Learning Outcomes

By the end of the course, the student must be able to:

- Identify important research questions in the history of science.
- Formulate a problematic and hypothesis.
- Analyze historical sources.
- Interpret historical artefacts.
- Assess / Evaluate the tacit and technical skills involved in the production of knowledge.
- Critique historical accounts and their own scientific skills and practice.
- Construct an argument

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Assess progress against the plan, and adapt the plan as appropriate.
- Access and evaluate appropriate sources of information.

Teaching methods

The course relies on the teaching method of *learning by doing*. We consider this to be a particularly appropriate method for imparting knowledge about the history of science.
Fall semester: lecture, discussion, presentation and practical work.

Expected student activities

Students are expected to attend lectures and the practical workshops, read the assigned articles, and participate actively to discussions. Students will prepare a presentation and a written report of their proposal for the Spring semester project.

Assessment methods

Independent evaluation at the end of both the autumn and spring term (grade associated to 3 ECTS).
Autumn term:

- Discussion (20%)

- Presentation of Project Proposal (40%)
- Written Project Proposal (40%)

Supervision

Office hours	Yes
Assistants	No
Forum	Yes
Others	Weekly meetings with supervisor or during alternative appointments with supervisor and own group. If appropriate, exchange via email, to be confirmed with respective supervisor.

Resources

Bibliography

- Sibum, Heinz Otto.#"Reworking the Mechanical Value of Heat: Instruments of Precision and Gestures of Accuracy in Early Victorian England". *Studies in History and Philosophy of Science Part A* 26, no. 1 (1995): 73-106.
- Schaffer, Simon. "Glass Works: Newton's Prisms and the Uses of Experiment". In *The Uses of Experiment: Studies in the Natural Sciences*, edited by David Gooding, Trevor Pinch, and Simon Schaffer. Cambridge: Cambridge University Press, 1989, pp. 67-104.
- Heering, Peter. "The Enlightened Microscope: Re-Enactment and Analysis of Projections with Eighteenth-Century Solar Microscopes". *British Journal for the History of Science*, 41 (2008): 345-368.
- Rosheim, Mark E. *Leonardo's Lost Robots*. Berlin: Springer, 2006, pp. 21-68.
- Newman, William R. "The Shadow of a Noble Experiment: Newton's Laboratory Records to 1696". In *Newton the Alchemist: Science, Enigma, and the Quest for Nature's Secret Fire*. Princeton: Princeton University Press, 2019, pp. 296-318.
- Smith, Pamela H. "Vermilion, Mercury, Blood, and Lizards: Matter and Meaning in Metalworking". In Klein, Ursula and Emma C. Spary (eds.), *Materials and Expertise in Early Modern Europe: Between Market and Laboratory*. Chicago: University of Chicago Press, 2010, pp. 29-49.

Ressources en bibliothèque

- Polanyi, Michael. The Tacit Dimension
- Long, Pamela O. Artisan/Practitioners and the Rise of the New Sciences, 1400-1600
- Smith, Pamela H., Amy R. W. Meyers, and Harold J. Cook, eds. Ways of Making and Knowing: The Material Culture of Empirical Knowledge
- Rosheim, Mark E. Leonardo's Lost Robots
- Sibum, Heinz Otto. Reworking the Mechanical Value of Heat
- Schaffer, Simon. Glass Works: Newton's Prisms and the Uses of Experiment

Références suggérées par la bibliothèque

- Newton the Alchemist: Science, Enigma, and the Quest for Nature's Secret Fire
- Klein, Ursula and Emma C. Spary (eds.), Materials and Expertise in Early Modern Europe: Between Market and Laboratory
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Moodle Link

- https://go.epfl.ch/HUM-402

Videos

- https://tube.switch.ch/channels/97089173

Prerequisite for

HUM-466: Experimental history of science II