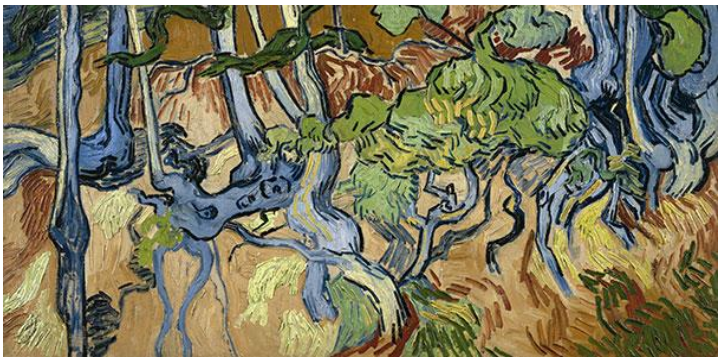

PHL480: Philosophy of Science

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Office hours: 10:00-11:00 M/W, or by appointment.
Class time: 12:40-2:30 M/W
Location: IM Sports West

AIMS OF THE COURSE

This course addresses some fundamental questions about the nature and development of scientific knowledge and understanding. Part I focuses on what is the nature of scientific understanding, how can scientific knowledge be known. It considers the problems that arise when we try to demarcate science from non-science as well as investigating the structure of scientific revolutions and progress. Part II focuses on key areas of philosophical discourse within the history and philosophy of the natural sciences: reductionism and antireductionism, innateness, the unity or disunity of science, and the actual practice in science. Part III focuses on how these general issues can be understood within the philosophy of the special sciences, in particular philosophy of biology, philosophy of chemistry, and philosophy of psychology.

INTENDED LEARNING OUTCOMES

Upon completion of the course, the student will be able to:

1. Demonstrate a systematic understanding of key philosophical ideas, a critical awareness of current problems and new insights in philosophy of science, much of which is at, or informed by, the forefront of the field of study;
2. Demonstrate a comprehensive understanding of some techniques applicable to research in philosophy of science and the special sciences;
3. Demonstrate originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline;
4. Demonstrate a conceptual understanding that enables the student to evaluate critically current research and advanced scholarship in the discipline, to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses.

ASSESSMENT

Assessment is by five concept papers (10%), one midterm exam (30%), one group seminar presentation (15%), one final essay (35%), and class participation (10%). Class participation requires students to contribution to seminar discussions (every week) having read the assigned texts and engage in the in-class problem-solving activities. Students will sign up for the short presentations at the beginning of the semester. In order to earn full marks for participation students must actively engage in classroom discussions as well as complete their presentation. Concept papers are 1-page essays focusing on the Seminar required readings. There are 12 options for concept papers. You will see the phrase "Concept paper option #" under each Seminar reading listed in the syllabus. You must complete 5 concept papers but it is your choice which of the 12 options you may complete.

The final essay should be 2000 words (excluding bibliography). The final essay must be submitted through D2L. More details about the essay will be given in separate handouts.

Please note that you must complete all assessed elements in order to pass this course. Anyone who does not complete ALL the coursework will receive an overall mark of "0.0". For each assessment generally you will need to master the content of the lectures, the required readings, and any other specified readings for essays.

READING MATERIALS

MAIN TEXTS

There are two required textbooks for this course, in which you can find all of the required readings and some of the recommended further readings, these are

- Martin Curd and J. A. Cover, ed., *Philosophy of Science: The Central Issues* (New York and London: W. W. Norton & Company). This is an anthology of classic readings, with some helpful introductions, notes and commentary by the editors. NB: you may use either the 2nd edition (2013) or the 1st edition (1998).
- A. F. Chalmers, *What Is This Thing Called Science?* (Indianapolis: Hackett Publishing Co). NB: you may use either the 4th edition (2013) or the 3rd edition (1999).
- The remainder of the readings are available online or from the library. A number of sources, particularly journal articles, are also available electronically or through inter-Library loan as well as JSTOR.

Books are available for purchase at the MSU Bookstore as well as online. (In the schedule of readings below, these sources will be indicated simply as "Curd and Cover" and "Chalmers".)

SESSION STRUCTURE

Students must attend every class—both Mondays and Wednesdays each week. Each week there will be a lecture and discussion seminar. The lecture will introduce the philosophical theory that will be discussed in that week and scientific questions that will be addressed. For the seminar, students will be required to discuss the topic for that week. Seminars will begin with a short presentation by a student. All students are required to attend both lectures and seminars. It is a requirement of the course that students attend seminars having read and reflected on relevant sections of the required readings and are prepared to actively participate in the seminar discussions. Remember that class participation makes up a substantial portion of your grade.

SCHEDULE OF LECTURES AND READINGS

PART I. INDUCTIONISM AND DEDUCTIONISM: WHAT IS SCIENCE?

UNIT 1. INTRODUCTION AND INDUCTIVISM
Lecture (29 August)
Welcome and Introduction

Required reading:
• Chalmers, pp. xix-xxii, 1-18 "Introduction", Ch. 1, "Science as knowledge derived from the facts of experience"
• Chalmers, pp. 41-48 of Ch. 4 "Deriving theories from the facts: induction"

LABOR DAY HOLIDAY—NO CLASSES—MONDAY, 3 SEPTEMBER

CLASS CANCELLED—WEDNESDAY, 5 SEPTEMBER

UNIT 2. FALSIFICATIONISM
Lecture (10 September)
Required reading:
• Chalmers, pp. 59-73 (Ch. 5) "Introducing falsificationism"

Seminar discussion (12 September)
Required reading:
• Karl Popper, "Conjectures and Refutations", in Curd and Cover, pp. 3-10.
• Karl Popper, "The Problem of Induction", in Curd and Cover, pp. 429-432.
**Concept paper option #1*

Also recommended:
• Karl Popper, *Conjectures and Refutations*, 3rd ed. (London: Routledge, 1969), pp. 39-59 (Sec. 1.IV-1.X). This is the continuation of the first selection above.
• Anthony O'Hear, *An Introduction to the Philosophy of Science* (Oxford: Clarendon Press, 1989), pp. 54-81 (Ch. 4).

UNIT 3. NORMAL SCIENCE
Lecture (17 September)
Required reading:
• Chalmers, pp. 104-112 (first part of Ch. 8) "Theories as structures I: Kuhn's paradigms"

Seminar discussion (19 September)
Required reading:
• Thomas S. Kuhn, "Logic of Discovery or Psychology of Research?", in Curd and Cover, pp. 11-19.
**Concept paper option #2*

Also recommended:
• Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970), pp. 10-51 (Sec. 2-5).
• Karl Popper, "Normal Science and Its Dangers", in Imre Lakatos and Alan Musgrave, eds., *Criticism and the Growth of Knowledge* (Cambridge: Cambridge University Press, 1970), pp. 51-58. Available on D2L.

UNIT 4. PROGRESS, RATIONALITY AND SCIENCE
Lecture (24 September)
Required reading:
• Chalmers, pp. 130-148 (Ch. 9) "Theories as structures II: Research programs"

Seminar discussion (26 September)
• Imre Lakatos, "Science and Pseudoscience", in Curd and Cover, pp. 20-26.
• Paul R. Thagard, "Why Astrology is a Pseudoscience", in Curd and Cover, pp. 27-37.
**Concept paper option #3*

Also recommended:
• Brendan Larvor, *Lakatos: An Introduction* (London and New York: Routledge, 1998), pp. 47-72 (Ch. 4).
• Imre Lakatos, "Criticism and the Methodology of Scientific Research Programmes", *Proceedings of the Aristotelian Society*, Vol. 69 (1968), pp. 167-186 (Sec. 3,4).

UNIT 5. OBJECTIVITY AND EVIDENCE
Lecture (1 October)
Required reading:
• Chalmers, pp. 49-58 (Ch. 4), "Deriving theories from the facts: induction"

Seminar discussion (3 October)
Required reading:
• Helen Longino, "Science and Objectivity" in Curd and Cover, pp. 170-191
**Concept paper option #4*

***** MIDTERM EXAM, 8 OCTOBER*****

PART II. HISTORICAL AND PHILOSOPHICAL PROBLEMS IN THE NATURAL SCIENCES:

UNIT 6. REDUCTIONISM AND ANTIREDUCTIONISM
Lecture & seminar discussion (10 & 15 October)
Required reading
• Jerry Fodor, "Special sciences" in Curd & Cover.
**Concept paper option #5*

Also recommended:
Kitcher, P. (1984) 1953 and all that: a tale of two sciences. Philosophical Review 93: 335-373. (available online)
Rosenberg, A. (2001) Reductionism in a Historical Science. Philosophy of Science 68: 135-163. (available online)

UNIT 7. UNITY OF SCIENCE
Seminar discussion (17 October)
Required reading
• Kitcher, P. (1981) Explanatory Unification, Philosophy of Science 48: 507-531. Available on D2L.
**Concept paper option #6*

CLASS CANCELLED—WEDNESDAY, 22 OCTOBER

UNIT 8. DISUNITY OF SCIENCE
Lecture & seminar discussion (24 & 29 October)
Required reading
•Dupré, J. (1983) The Disunity of Science, *Mind* 92 (367): 321-346. Available on D2L.
**Concept paper option #7*

Also recommended:
Cartwright, N. (1999) The Dappled World: A Study of the Boundaries of Science, Cambridge: Cambridge University Press. pp. 1-34 (introduction and ch. 1).

Hacking, I. (1996) 'The Disunities of science' in P. Galison and D. Stump (eds) The Disunity of Science. Boundaries, Contexts and Power, Stanford: SUP.

CLASS CANCELLED—WEDNESDAY, 31 OCTOBER

CLASS CANCELLED—MONDAY, 5 NOVEMBER

UNIT 9. INNATENESS
Lecture & Seminar discussion (7 & 12 November)
Required reading:
• Griffiths, P. (2002) What is Innateness? The Monist, 85(1): 70-85. Available on D2L.
• Samuels, R. (2004) Innateness in cognitive science. TRENDS in Cognitive Sciences 8 (3): 136-141. Available on D2L.
**Concept paper option #8*

Also recommended:
Collins, J. (2005) "Nativism: In Defense of a Biological Understanding" Philosophical Psychology 18 (2): 157-177. (available online)

Griffiths, P. "The Distinction Between Innate and Acquired Characteristics" Stanford Encyclopedia of Philosophy. First published Tue Aug 4, 2009 (available online)

Mameli, M. and Bateson, P. (2006) "Innateness and the sciences" Biology and Philosophy 21:155-188. (available online)

Samuels, R. (2002) "Nativism in Cognitive Science". *Mind & Language* 17 (3): 233-265. (available online)

UNIT 10. PHILOSOPHY OF SCIENCE IN PRACTICE
Lecture & seminar discussion (14 & 19 November)
Required reading
• Chang, H. (2011) "The Philosophical Grammar of Scientific Practice". *International Studies in the Philosophy of Science* 25(3): 205-221. Available on D2L.
**Concept paper option #9*

Also recommended:
Kendig, C. (2016) "Activities of kinding in scientific practice" In C. Kendig (ed.) *Natural Kinds and Classification in Scientific Practice*. Abingdon and New York: Routledge, 1-13. On D2L.
Topics for Final Essay will be distributed

PART III. PHILOSOPHY OF THE SPECIAL SCIENCES: PHILOSOPHY OF BIOLOGY, PHILOSOPHY OF CHEMISTRY, PHILOSOPHY OF PSYCHOLOGY

UNIT 11. BIOLOGICAL INDIVIDUALS AND ORGANISMS
Lecture & Seminar (21 & 26 November)
Required reading
• Clarke, E. (2010). The Problem of Biological Individuality. Biological Theory 5(4): 312–325. Available on D2L.
**Concept paper option #10*

Recommended reading:
Clarke, E. (2013) The multiple realizability of biological individuals. Journal of Philosophy 110: 413-435. Available on D2L.

UNIT 12. CHEMICAL CLASSIFICATION
Seminar (28 November)
Required reading
• Chang, H. (2015) The rising of chemical natural kinds through epistemic iteration. In Kendig, C. (ed) *Natural Kinds and Classification in Scientific Practice*. Abingdon and New York: Routledge. Available on D2L.
**Concept paper option #11*

Also recommended:
Chang, H. Inventing Temperature: measurement and scientific progress. Oxford University Press, 2004. Read the Introduction and Chapter 1 (p. 3-53). Available at the MSU Library.

UNIT 13. THE EXTENDED MIND
Seminar (3 December)
Required reading
•Clark, A. and Chalmers, D. (1998) "The Extended Mind", Analysis 58: 7-19. Reprinted in Grim, P. (ed) (2000) The Philosopher's Annual vol XXI-1998, 59-74. Also available on Andy Clark's webpage and D2L.
•Clark, A. (1995) "I am John's Brain", Journal of Consciousness Studies 2,2 : 144-148. Available on D2L.
**Concept paper option #12*

*****FINAL ESSAY DUE WEDNESDAY 5 DECEMBER, UPLOAD TO D2L*****

Attendance
Your participation in class discussions contributes significantly to your overall grade. Obviously, you can only participate in class discussions if you regularly attend class. Therefore, if you have more than 6 absences this semester you will drop one letter grade as you will fail to adequately complete one element of the class due to non-attendance and inadequate participation in class discussions.

Submission of Coursework
Essay papers must be submitted on time. There will be no extensions given. In order to pass this course all coursework must be completed. Failure to complete all assignments will result in a "0.0".

General Evaluation Criteria*
Essay exams and papers will be evaluated on the basis of the following criteria.

a) *Clarity and precision* The central claims of the paper should be stated precisely and presented in a manner that another student who was interested in the topic, but not enrolled in the course, could understand. Frequent spelling and grammatical errors are distracting, and will lower your grade. Clear and concise prose is of the utmost importance. The more people that read your work and think that it makes sense, the more likely it does make sense. Remember: I am reading what you write very closely and with a critical eye. Say what you mean and mean what you say. Be careful!

b) *Depth and Persuasiveness* I ask: How deep (i.e., how insightful) are the central claims of the paper, and how persuasive are the arguments given in support of them? Your arguments should at the very least provide plausible support for their conclusions. Also, the arguments should be consistent with one another. Important concepts and terms should be clarified. Generally, the deeper the paper's central claims, and the stronger their support, the better the paper.

c) *Breadth of knowledge* Have you made good use of the relevant concepts, distinctions, and arguments **that have been included in the assigned readings or that were brought out in classroom discussion**? For example, where one of your central claims clearly contradicts a thesis in one of the reading assignments you should explain what is wrong with the opposing position. (*adopted from M. McKeon, Spring 2009)

4 Point Scale to Percentage Conversion Key.
Your final grade will be converted to 4-point scale as follows:

4.0 = 92—100%
3.5 = 87—91%
3.0 = 80—86%
2.5 = 75—79%
2.0 = 70—74%
1.5 = 65—69%
1.0 = 50—64%
0.0 = 0—49%

The Meaning of Grades**

4.0 =excellent work
"4.0" assignments are of exceptionally high quality. They are innovative, adding something to the topic. They are accurate, clear, organized, use compelling reasoning, and possess a spark of innovation/creativity. They show depth of thought and the writing is polished.

3.0= good work
"3.0" assignments meet the expectations of the assignment and are accurate, clear and organized. They contain good reasoning and although they do not have any significant problems, they do not add anything to the topic.

2.0= acceptable work that has significant problems
"2.0" assignments contain inaccuracies or significant problems with reasoning, organization, or quality of writing.

1.0 work has serious problems and is unacceptable as college-level work.

0.0 is normally reserved for work that is not turned in, is borderline unintelligible, or has little or no relevance to the assignment. (***adopted from Hedrick 2010)

Classroom Courtesy
Be nice. Respect yourself and each other. I want you to be bold, argumentative, and challenging—but in an open-minded and thoughtful way. You will disagree with each other. Being respectful doesn't mean you have to agree with each other, it just means you are willing to listen to each other.

Please arrive to class on time. All mobile phones must be turned off during class time (this includes discussion sessions unless explicitly allowed by me). Do not text, use your phones, iPods or MP3 players in class. If you do so you will be asked to leave.

MSU Email Communication
All communication will be through your MSU email. Please refer to
Student Rights and Responsibility (https://www.msu.edu/~ombud/index.html) .

Course Management System: *Desire to Learn*
Syllabus, reading materials, PowerPoints, and announcements are available on Desire to Learn. All papers completed for the course will be uploaded to *Desire to Learn* site for this class. It is your responsibility to understand how to use *Desire to Learn*. Help is available at: http://learndat.tech.msu.edu/communicate_guide/
and instructions for technical assistance for *Desire to Learn* at: https://d2l.msu.edu or 355.2345 or 1-800-500-1554

Academic Honesty
Do not cheat. Do not plagiarize.
Submitting another's work as your own—either in part or in whole.
Penalty for plagiarism is a zero on the assignment and the student will receive an F for the course.

Turnitin Statement from MSU
"Consistent with MSU's efforts to enhance student learning, foster honesty, and maintain

integrity in our academic processes, instructors may use a tool called Turnitin to compare a student's work with multiple sources. The tool compares each student's work with an extensive database of prior publications and papers, providing links to possible matches and a "similarity score." The tool does not determine whether plagiarism has occurred or not. Instead, the instructor must make a complete assessment and judge the originality of the student's work. All submissions to this course may be checked using this tool.
Students should submit papers to Turnitin Dropboxes without identifying information included in the paper (e.g., name or student number), the system will automatically show this information to faculty in your course when viewing the submission, but the information will not be retained by Turnitin."

Reminders of Relevant University Policies
Please be aware that MSU prohibits the commercialization of course notes and materials. MSU prohibits students from commercializing their notes of lectures and University-provided class materials without the written consent of the instructor.

Disability Accommodation Requests
Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to me at the start of the term and/or two weeks prior to the accommodation date (test, project, etc). Requests received after this date will be honored whenever possible.

Notification of Changes, Inclement Weather Policy, and Emergency Procedures
The schedule of reading is the plan for the course. However, changes may need to be made and so it is tentative and subject to change. Any changes or modifications to the course schedule/syllabus will be announce ahead of time in class. Emergency Procedures: If there is an emergency or there is inclement weather, or other related cancellations, we will follow University policy. Any additional necessary changes to will be posted to D2L.

Related Student Organizations or Clubs, if Applicable	http://studentlife.msu.edu/about-student-life
Learning Resources Center:	355.2363 or http://lrc.msu.edu/
Office of Supportive Services:	353.5210 or http://www.oss.msu.edu
The Writing Center:	http://writing.msu.edu
Libraries:	432.6123 or www.lib.msu.edu/
MSU IT Service Desk:	Help Desk: 432.6200 or www.tech.msu.edu/support/
Office of the Ombudsperson:	353.8830 or www.msu.edu/unit/ombud
Olin Student Health Center:	http://olin.msu.edu/
MSU Counseling Center:	www.counseling.msu.edu
MSU Psychological Clinic:	355.9564
English Language Center:	www.elc.msu.edu

Community Groups (Adult Students, International Students, Persons with Disabilities, LBGT, Family Resource Center, Veterans, The Women's Resource Center) see *Student Handbook and Resource Guide: http://splife.studentlife.msu.edu/information-and-services/services-for-community-groups*