

146: Philosophy of Physics

Christian Wüthrich

Fall 2007

Class schedule: TuTh 12:30-1:50pm, Warren Lecture Hall 2207
Website: <http://philosophy.ucsd.edu/faculty/wuthrich/>
Contact: Office hours are Mo 1-2, Th 2-3
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What is the nature of space and time? This class will address this metaphysical question and survey the classic debates in the philosophy of space and time. These debates are inextricably linked with developments in fundamental physics, in particular Newtonian mechanics, statistical mechanics, special and general relativity. We will try to understand how the metaphysical issues concerning space and time interact with foundational issues in spacetime physics.

Prerequisites: Upper-division standing or permission of instructor.

Required texts

- Barry Dainton, *Time and Space*, McGill-Queen's University Press (Montreal and Kingston, 2001). This book is available at the Price Center Bookstore.
- There are links from the course web page to all other articles, except those that will be made available through e-reserves.

Course requirements and evaluation

The grade for this course will be determined by the total points a student earns from the three types of evaluation indicated below. I guarantee that a total of 60 points will earn at least a **D** and a total of 70 points will at least get you a **C**. If you take the class for a Pass/Fail grade, you must have at least a **C** in order to pass the class.

1. *Quizzes* (30 points): There will be **six short quizzes** during the quarter, each worth 5 points. They will be announced in class one meeting before they will be held. No make-up quizzes will be given.
2. *Midterm paper* (30 points) [turnitin.com]: There will be a **take-home midterm paper** worth 30 points, due on 6 November 2007 at the beginning of class. This exam is “open books”, i.e. you are allowed—and encouraged—to use any sources such as libraries or the internet, and you are permitted to discuss the exams with your classmates. All sources, including discussions with classmates, must be appropriately acknowledged. *All answers given must be in your own wording.* Closely paraphrasing or simply copying the work of others (such as authors of books or articles, or classmates)

is not allowed and will be severely penalized. For each day your exam is late, five points will be deducted from your point total, although no negative point totals will be given for the midterm exam.

3. *Final exam* (40 points): There will be a **final exam** on 14 December 2007, 11:30am-2:29pm, in a location to be announced. This exam will consist of short identifications, one-paragraph-answer questions testing your comprehension of important arguments, as well as a question asking for an essay-length answer for which you must synthesize material. You are not allowed to use any books or notes or the like, i.e. the exam is “closed-books”. The final exam is cumulative, i.e. it covers all the material of the entire course.

The midterm paper must be submitted *both as hard copy as well as through turnitin.com* in order to earn credit. You must enroll at turnitin.com by creating a new profile. You will need the following course information:

Class ID: 1931313
Enrollment Password: 599681

If you have any problems with using turnitin.com, please notify the UCSD Student Conduct Coordinator or his Assistant at 4-0778.

The fine print

Students agree that by taking this course all required papers will be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the terms of use agreement posted on the Turnitin.com site.

You must observe the University’s Policy on Integrity of Scholarship, which can be found at <http://www-senate.ucsd.edu/manual/appendices/app2.htm>.

Make-up exams (for both midterms and final) will only be given under the most severe circumstances. The student who wishes to write a make-up exam must inform me (by phone or email) ahead of the time of when the exam is due (midterms) or takes place (final). In order to qualify for a make-up exam, appropriate evidence of the most severe circumstances must be produced by the student. I will determine, in consultation with the student, what qualifies as appropriate evidence.

Tentative schedule

Readings: for each session, the corresponding chapter in Dainton must be read in advance; the readings with an asterisk are background reading which will not be examined in either the quizzes or the final exam. SEP stands for Stanford Encyclopedia of Philosophy, edited by Ed Zalta. You should read the Internet Encyclopedia of Philosophy’s entry on time (<http://www.iep.utm.edu/t/time.htm>) as we discuss the topics in the course.

Date	Topic and readings
27 Sept	Introduction: time and space Dainton, Ch 1
2 Oct	McTaggart on time's unreality Dainton, Ch 2 SEP entry on change, http://plato.stanford.edu/entries/change/ , Secs 1-5
4 Oct	Static time Dainton, Ch 3 *Donald C Williams, "The Myth of Passage," <i>J Phil</i> 48 (1951), 457-472.
9 Oct	Asymmetries within time Dainton, Ch 4 *SEP on asymmetry in time, http://plato.stanford.edu/entries/time-thermo/
11 Oct	Tensed time Dainton, Ch 5
16 Oct	Dynamic time Dainton, Ch 6 *Ned Markosian, "How fast does time pass?" <i>PPR</i> 53 (1993), 829-844.
18 Oct	Time and consciousness Dainton, Ch 7 *SEP on experience of time, http://plato.stanford.edu/entries/time-experience/
23 Oct	Time travel Dainton, Ch 8 *David Lewis, "The Paradoxes of Time Travel," <i>Am Phil Q</i> 13 (1976), 145-52 *Deutsch and Lockwood, "The quantum physics of time travel," <i>Sci Am</i> , March 1994, 68-74
25 Oct	Conceptions of void Dainton, Ch 9
30 Oct	Space: the classical debate Dainton, Ch 10 SEP on absolutism and relationalism, http://plato.stanford.edu/entries/spacetime-theories/
1 Nov	Absolute motion Dainton, Ch 11 *SEP on Newton on space and time, http://plato.stanford.edu/entries/newton-stm/ SEP entry on inertial motion (Sec 1), http://plato.stanford.edu/entries/spacetime-iframes/
6 Nov	Motion in spacetime Dainton, Ch 12
8 Nov	Curved space Dainton, Ch 13
13 Nov	Tangible space Dainton, Ch 14
15 Nov	Spatial anti-realism Dainton, Ch 15
20 Nov	Special relativity Dainton, Ch 16 *Michel Janssen's survey article "Appendix A: Special Relativity"
27 Nov	Relativity and reality Dainton, Ch 17 SEP on becoming and modern physics, http://plato.stanford.edu/entries/spacetime-become/

Date **Topic and readings**

29 Nov **General relativity**

Dainton, Ch 18

*SEP entry on inertial motion (Sec 2), <http://plato.stanford.edu/entries/spacetime-iframes/>

4 Dec **Spacetime metaphysics**

Dainton, Ch 19

SEP on hole argument, <http://plato.stanford.edu/entries/spacetime-holearg/>

6 Dec **Strings and loops**

Dainton, Ch 20

*Lee Smolin, "Atoms of space and time," *Sci Am*, January 2004, 56-65

14 Dec **Final exam** 11:30am-2:29pm, location TBA