Philosophy 12
Scientific Reasoning
Fall 2012, Mon., Wed., 6:30-7:50 pm

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Sections	TA	Office	Contact	Office hours
A01 Monday, 4 pm	Tanya Hall	HSS 7055	tahall@ucsd.edu	MW: 2:30-3:30 and by appointment
A02 Monday, 5 pm	Tanya Hall	HSS 7055	tahall@ucsd.edu	MW: 2:30-3:30 and by appointment
A03 Wednesday, 1 pm	Toyoma Sato	HSS 8089	tosato@ucsd.edu	MW: 3:30-4:30 and by appointment
A04 Wednesday, 5 pm	Toyoma Sato	HSS 8089	tosato@ucsd.edu	MW: 3:30-4:30 and by appointment

1. Course Description and Objectives

Reasoning is a fundamental activity in human life, and nowhere is it more important or better manifest than in science. Although scientific inquiry has roots deep in human culture, the mode of scientific inquiry that we know today is of fairly recent invention. It depends on people advancing hypotheses abount how phenomenon in the world are produced and evaluating those hypotheses against objective evidence that is often challenging to elicit. Scientific reasoning is neither natural nor easy, but it is extremely important not just for those engaged in science but for all of us who must evaluate the claims scientists make.

In this course we will address a number of questions about scientific reasoning:

- What makes for a good piece of reasoning in science?
- Can you ever be absolutely certain of the truth or falsity of a scientific hypothesis?
- How objective is observation? How can we avoid making mistakes in perception?
- What might we learn by systematic observation?
- What can we learn from discovering correlations between variables? How can we avoid being misled by illusory correlations?
- What does it take to establish a causal relationship?
- What are mechanisms, what role do they play in science, and how do scientists discover and reason about them?

This course will emphasize active engagement in the kinds of reasoning which scientists use in developing and testing hypotheses, especially through on-line exercises and demonstrations. The goals of the course are for students to understand the logical and statistical principles by which scientific claims are created and evaluated and to develop a critical appreciation for the methods by which knowledge is acquired in science. You should leave this course with a better ability to distinguish good from poor reasoning and decision making in science and other domains.

2. Course Materials

1. Inquiry website and printed course reader

The primary course materials are on the course website at http://inquiry.ucsd.edu. Login directions and initial login codes are included in the course reader, which is available at the UCSD bookstore (be sure you buy a new reader--used initial logins cannot be reused). If you have any problems with your login codes, contact me as soon as possible. The modules found on the website include text, animation, and interactive exercises, of which only the text is included in the reader. Some modules have questions to answer at the end. All activity on the site is recorded and logged, including answers to

question sets attached to the modules. Completion of the on-line exercises is a requirement of the course.

2. i>clicker student response system

If you do not already own one, you will also need to purchase an i>clicker student response transmiter. These transmitters, informally called "clickers," are available at the UCSD bookstore. Make sure to get an i>clicker and not a different system (e.g., H-ITT or PRS). For more information, visit http://acms.ucsd.edu/services/classroom-support/clickers.html.

3. Course Requirements

For each module, students are expected to complete it and any questions attached to it, before attending the class for which it is assigned. **Attendance in class and sections is required**.

Assessment

1. *Web-based exercises* (5%): timely completion of the interactive exercises and questions on the Inquiry website. Graded on whether you complete the exercises questions, not the accuracy of your responses. Click here for more information about this requirement, including what these exercises/questions look like and how to track your progress on them throughout the course.

2. *Lecture participation* (10%): your "clicker" score will be based on in-class questions scored using the i>clicker student response system. Several times during each class (except the first), I will pose a question (usually a multiple choice question) and ask you to "buzz in" with your answer; the system will automatically record your responses. In order to receive credit for your responses, you will need to register your i>clicker remote online at http://www.iclicker.com/registration within the first week of class. Each question is worth three points. Two points are awarded for simply answering the question, a third if your answer was correct. Your clicker score will be the percentage of points earned divided by the maximum possible. **Important: you must have your clicker every class period to get these points–no exceptions.**

3. *Section participation* (5%): participation and performance on quizzes in section.

4. *Short papers* (30%): two 1-2 page papers on assigned topics. Due dates are shown in the Schedule of Classes below. Assignments will be made at least one week before papers are due.

5. *Midterm exam* (25%): in-class exam consisting of multiple choice, short answer, and essay questions. Sample questions will be available at least one week before the exam.

6. *Final Exam* (25%): in-class exam consisting of multiple choice, short answer, and essay questions. Sample questions will be available at least one week before the exam.

The following scale will be used to convert numeric scores to letter grades: 98-100 A+, 93-98 A, 90-93 A-, 88-90 B+, 83-88 B, 80-83 B-, 78-80 C+, 73-78 C, 70-73 C-, 60-70 D, below 60 F. For students taking the course pass/no pass, a C- (70) is the minimum grade for receiving a pass.

4. Policities

Special Accommodations

Students requesting accommodations and services due to a disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. OSD Academic Liaisons also need to receive current AFAs. For more information, contact the OSD at (858) 534.4382 (V); (858) 534-9709 (TTY); osd@ucsd.edu, or http://osd.ucsd.edu.

Academic Integrity

Students are expected to do their own work, as outlined in the UCSD Policy on Integrity of Scholarship: http://www-senate.ucsd.edu/manual/Appendices/app2.htm Cheating will not be tolerated, and any student who engages in forbidden conduct will be subjected to the disciplinary process. You are responsible for familiarizing yourself with these policies; ignorance will not be an excuse. If you have any questions about these policies, feel free to contact me.

Deadlines for Assignments

Make-up exams (for midterm and final) or extended deadlines (for the papers) will only be given under the most severe circumstances. Any student who wishes to take a make-up exam or needs an extension must inform me (in person or by email) before the deadline. In order to qualify for a make-up exam or an extension, 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.

Classroom Conduct

Please arrive to class on time. Students should be respectful of their fellow classmates, allowing them to finish before speaking, listening to and respecting classmates' views/opinions. In addition, students must silence all cellular telephones, pagers, and iPods, etc., before entering the classroom. Laptops and other electronic devices may not be used in class, except for lecture note-taking.

5. Email List

There are email distribution lists for this course, one for each section. It is required that you subscribe to the list for your discussions section. Do it **IMMEDIATELY**. You can always unsubscribe later if you drop the course or change sections. The purpose of the list is to allow the TAs and me to distribute information regarding due dates for assignments, changes of schedule, etc. Some of this information is crucial, and some of it may be distributed early in the quarter. To subscribe, you simply need to send an email message to the address corresponding to your section
Section A01 – sec-01-subscribe@mechanism.ucsd.edu
Section A02 – sec-02-subscribe@mechanism.ucsd.edu
Section A03 – sec-03-subscribe@mechanism.ucsd.edu
Section A04 – sec-04-subscribe@mechanism.ucsd.edu
After you send the subscribe request, you will receive a reply from sec-0*-request@mechamism.ucsd.edu (where * is the number of your section) that will ask you to confirm your request. Follow the directions in this message to confirm you subscription. If you later want to remove yourself from this list, send email to sec-0*-unsubscribe@mechanism.ucsd.edu.

Only the TAs and I have authorization to send mail to this list. There should be no spam. If you receive mail from this list that is not from one of us, be assured that I will as well and will take measures to block further abuse. (The welcome message you receive suggests that you can send email to the list. Sorry, but you cannot.)

6. Schedule of Classes and Web Assignments

This schedule of class assignments and reading assignments is tentative and subject to revision. Changes will be announced through the email list for this course. Items in italics are modules on the Inquiry website. You should complete these, including any attached questions, before the assigned class (although subsequent review is certainly encouraged).

Copies of the powerpoints presented in lecture will be made are available close to the time of each class. Follow the links from the title of each lecture. Sample questions for the exams and topcs for the assigned papers will also be made available as links from the listings on the schedule.

October 1: Introduction: The Inquiry Website and Exemplary Scientific Reasoning
October 3: Elements of science: *Introduction to Scientific Reasoning, Statements: the atoms of reasoning; Justification and argument*

October 8: Valid arguments: *Some basic valid argument forms*
October 10: Confirmation, falsification, and fallibility: *Evidential relations; The fallible character of human knowledge*

October 15 : Observation and categories: *Observation and learning to see*
October 17: Categorizing phenomena: *Categories and taxonomy*

October 22 : Observational research: *Observational research*
October 24: Distributions and samples: *Variables and measurement*

October 29: Midterm Exam
October 31: Predicting relationships between variables: *Predicting relations between variables*

November 5: Predicting from correlations: *When variables are correlated*
November 7: Differences between means: *When variables are not correlated; When groups differ*

November 14: Correlation and causation: *Correlational studies as tests of causal claims; Correlational vs. experimental research*

First 1-2 page written assignment due: Friday, November 16 by Noon *(papers should be in .doc or .rtf format and emailed as attachments to your TA)*

November 19: Causal explanation: *Causal explanation*
November 21: Reasoning about and graphing causes: *Reasoning about causation; Causal reasoning with directed graphs*

November 26: Causality and experiments: *Testing causal claims experimentally*
November 28: Causation when experiments are not possible: *When randomized experiments are not possible*
Second 1-2 page written assignment due: Friday, November 30 by Noon (papers should be in .doc or .rtf format and emailed as attachments to your TA)

December 3: Mechanism and mechanistic explanation: *Entities and activities organized to produce a phenomenon; Levels of organization within mechanisms*
December 5: Discovering and modeling mechanisms: *Describing and portraying mechanisms; Experimenting on mechanisms*

Final Exam: Monday, December 10, 7:00-9:59 pm