

# Philosophy 12: Scientific Reasoning

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## Instructor

- William Bechtel
  - Office: HSS 8073
  - Office Hours: Wednesday, 3:30 -4:30 pm
  - Email for this course:  
phil12@mechanism.ucsd.edu

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## Sections

A01 Monday, 2 pm  
Justin Lawson HSS 8037 j1lawson@ucsd.edu  
W: 2:50-4:50 and by appointment

A02 Monday, 3 pm  
Justin Lawson HSS 8037 j1lawson@ucsd.edu  
W: 2:50-4:50 and by appointment

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## Course Website

<http://mechanism.ucsd.edu/teaching/F15/phil12/index.html>

- Syllabus
- Schedule of classes and readings
- Links to
  - Lecture slides
  - Study guides for exams
  - Paper assignments

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## Course Requirements

1. Web-based exercises (5%)  
These are scored for doing them, not for correctness of answer
2. Lecture participation (10%)  
Clicker scores: two points for answering a question, a third for answering it correctly
3. Section participation (5%)  
Quizzes and participating in discussion
4. Two short (1-2 page) papers (15%@; 30% total)
5. Early quarter quiz, 30 minutes (10%)
5. Midterm exam (20%)
6. Final Exam (20%)  
Exams will include multiple choice, short answer, and short essay questions

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## Inquiry Website

- Inquiry website: <http://inquiry.ucsd.edu>
- Login directions and initial login code found in printed course reader, *Inquiry into Scientific Reasoning*, available at Price Center bookstore
  - be sure you buy a new reader--used initial logins cannot be reused
- Printed reader doesn't include all course material--website has text, animation, interactive exercises, and questions

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# Web-site Assignments

- Readings (in italics) are titles of modules you're expected to complete before that day's lecture
- September 28: Introduction: The Inquiry Website and Exemplary Scientific Reasoning
- September 30: Elements of science: *Introduction to Scientific Reasoning, Statements: the atoms of reasoning; Justification and argument*
- October 5: Valid arguments: *Some basic valid argument forms*
- October 7: Confirmation, falsification, and fallibility: *Evidential relations; The fallible character of human knowledge*
- October 12: Early quarter quiz (30 minutes). Observation and categories: *Observation and learning to see*
- October 14: Categorizing phenomena: *Categories and taxonomy*

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# Interactive Exercises

Using so, which statement is serving as a premise and which is serving as a conclusion. One or the simplest is to use words that indicate the premise or the conclusion of an argument. For example, if a prosecutor tells the jury "these facts demonstrate that Ms. Dolety is guilty of murder," the words "demonstrate that" indicates that what follows is the conclusion of his argument. Likewise, if the defense attorney says "my client should be judged innocent because . . ." the word "because" makes it clear that what follows are premises.

What word, other than because, could insert into the blank in the following sentence to make it clear that human memory is very fallible is a premise for the conclusion: 'eye-witness testimony is of limited value' based on the premise 'human memory is very fallible'?

Eye witness testimony is of limited value \_\_\_\_\_ human memory is very fallible.

Web Project

We have included a set of questions designed to help you test your knowledge on the topic of this module. Select [Questions](#) on the menu at the bottom to try your hand at these questions.

**NOTE:** Clicking on the questions link above, or the button to the right, will open the questions in a new window. In you have a pop-up blocker installed or are using Internet Explorer 6 or higher, this window will not appear when you click on these links. To access the questions, either allow pop-ups from this site (this is the preferred solution) or click here: [Open questions in this window](#).

[Add feedback to this module](#)



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# Questions to be Answered

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## Questions to be Answered - 2

← Back Next →

Inquiry > Argumentation > Justification and arguments >  
View | Comments | History

### Premises and conclusions

We have characterized an argument as a set of statements, some of which are presented to justify another. The statements offered as justification are referred to as premises while the statement being justified is called the conclusion.

Note: an argument requires at least two statements (at least one premise and one conclusion). Non-statements (questions, commands, etc.) do not figure in arguments.

The English word conclusion suggests that it comes last. Although when we present an argument schematically we will present the conclusion on the last line, preceded by a line separating it from the premises, in English prose the conclusion of the argument might appear at the beginning, in the middle, or at the end. For example, in this argument the conclusion appears in the middle:

The car has a large dent in it. Therefore you must have had an accident, since dents don't just appear in cars.

But for convenience of analysis, we will standardly represent the argument with each premise on a different line and the conclusion last, with a line between the premise and conclusion. Thus, we would represent the previous argument as:

The car has a large dent in it.  
Dents don't just appear in cars.  
—  
you had an accident.

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## Questions to be Answered - 3

### Inquiry Questions for Premises and conclusions

**Score for Scenario**

**Current Scenario:** Question 1 of 21

**Number correct:** 0  
Out of: 0 attempts.  
In other words, 0 %

**Module:** Answer

**Number correct:** 0  
Out of: 0 attempts.  
In other words, 0 %

This form keeps track of your responses to the questions for this module.

Is the following an argument?

If so, which is the conclusion? Because [1], [2].

- [1] is the conclusion
- [2] is the conclusion
- No inference indicator

## Checking Your Progress

Inquiry: Modules

### Inquiry

William Bennett's Pers 12, Scientific Reasoning, at UCSD, Fall 2015

William William Bennett | Course Overview | X-Listings | My Account | Progress | Help

▼ Current Module | Search Modules

Find module(s) that contain:  
Search Module Content

▼ Table of Contents

- Introduction
- Introduction to scientific reasoning
- Premises: the atoms of reasoning
- Justification and arguments
- Some basic valid argument forms
- Defeasible reasoning
- The fallible character of human knowledge
- Observation
- Observation and learning to see
- Categories and taxonomy
- Observational research
- Variables and measurement
- Correlation

Reports

- Reading Report: generate a report about all the modules in their field.
- Module Work Report
- Question Report

## i>Clickers



- Available at the Price Center bookstore
- You will need to bring the clickers to every lecture
- For more info: <http://clickers.ucsd.edu/>

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## Basic Operation of i>Clicker



- Turn on the clicker by pressing the bottom “On/Off” button.
  - Text will appear in the window at the top of the remote.
- Set frequency to BB
  - While clicker is off, hold power button until flashing text appears
  - then press the two letter code
- When I ask a question in class (and start the timer), select A, B, C, D, or E as your answer.

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## How do you know your answer was received?



- In the window next to the answer you submitted a check mark will appear
- You can vote early and often, but only your last answer will be scored
  - As long as the timer is going, you can change your answer by simply voting again

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## Registering your i>clicker

- In order to earn points for your i>clicker responses, you must register your i>clicker online (but don't worry, you will still get the points from before registration).
  - Go to [www.iclicker.com/registration](http://www.iclicker.com/registration)
  - Fill in:
    - your name
    - your PID (student ID) number
    - your clicker ID (located on the back of your clicker, below the scan code)
  - click ENTER



## Other i>clicker information

- Before using a new clicker for the first time, pull the plastic tab out of the battery compartment.
- Check out [www.iclicker.com](http://www.iclicker.com) for FAQs
- Email [support@iclicker.com](mailto:support@iclicker.com) or phone 866-209-5698 for help

## An Unsolved Problem

- You, the scientific community, are puzzled by a very important problem, and the person who solves the problem will win a Nobel Prize
- The challenge is to figure out the law operating in a domain that allows some sequences and not others
  - One that is allowed is 2, 4, 6

## An Unsolved Problem

- As mother nature, I can
  - tell you whether a sequence fits the law
  - but cannot tell you what the law is
- As members of the scientific community, you can
  - propose sequences to test
  - publish possible laws
  - together decide when you think someone has solved the problem
    - and award them the Nobel Prize

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## Exemplary Reasoning in Science

- Heredity Prior to Mendel:
  - The basic idea that offspring are similar to their parents had been obvious to people for ages
  - It also was clear that offspring often differed from their parents
- Animal and plant breeders capitalized on these differences
  - By controlling mating and eliminating undesired organisms, breeders were able to produce plants and animals with desired traits
  - By multiply breeding offspring and eliminating variants, breeders could generate pure breeds

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**Gregor Mendel**



An Augustinian monk, Mendel studied physics and natural science in Vienna, but lived most of his adult life in the cloister at Altbrunn (now Brno in the Czech Republic)

Starting in 1856 he conducted plant breeding experiments in the cloister's garden

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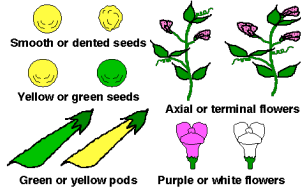
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## Mendel's Breeding Experiments

Choice of peas: naturally self pollinated but easy to cross-pollinate

Based on which trait appears regularly in crosses between pure breeding lines with different traits, Mendel introduced the vocabulary of *dominant* and *recessive* characters




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## Mendel's Procedure

Cross-pollinate between pure breeding lines with alternative traits—yellow/green, smooth/dented

All members of the F<sub>1</sub> generation exhibit the dominant traits

Allow members of the F<sub>1</sub> generation to self-pollinate

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## First Generation from Hybrids

|                      |                                |      |      |        |
|----------------------|--------------------------------|------|------|--------|
| Form of seed         | Round / Wrinkled               | 5474 | 1850 | 2.96:1 |
| Color of albumin     | Yellow / Green                 | 6022 | 2001 | 3.01:1 |
| Color of seed coat   | Violet flowers / White flowers | 705  | 224  | 3.15:1 |
| Form of pods         | Inflated / Constricted         | 822  | 299  | 2.95:1 |
| Color of unripe pods | Green / yellow                 | 428  | 152  | 2.81:1 |
| Position of flowers  | Axial / terminal               | 651  | 207  | 3.14:1 |
| Length of stem       | Long / short                   | 787  | 277  | 2.84:1 |

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## F<sub>2</sub> Generation

Produced by self-fertilization of members of the F<sub>1</sub> generation

Individuals with recessive traits bred pure

One out of three of those showing the dominant character produced only offspring with the dominant character

**Theoretical problem for Mendel—what could explain these and other patterns he found?**

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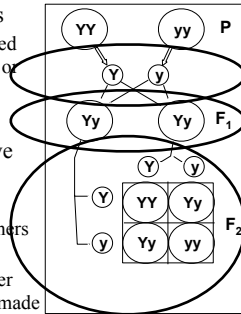
## Mendel's Hypothesis

Behind the characters lay factors

- pollen and egg cells each possessed the factor for either the dominant or recessive trait

What evidence does Mendel have for these factors?

- Only that they account for the inheritance pattern he saw and others he predicted
- Without his hypothesis, these other predictions would not have been made



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## Features of Mendel's Reasoning

He designed a study that could reveal structure in the phenomena

He found a systematic pattern in the phenomena

He proposed a hypothesis that could explain the pattern

He supported this hypothesis by both the pattern he initially observed and others which it predicted. These patterns would otherwise be unexpected!

Message: Successfully predicting what would otherwise be unexpected is typically the way hypotheses gain support.

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