Philosophy 12: Scientific Reasoning

Instructor

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

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

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

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

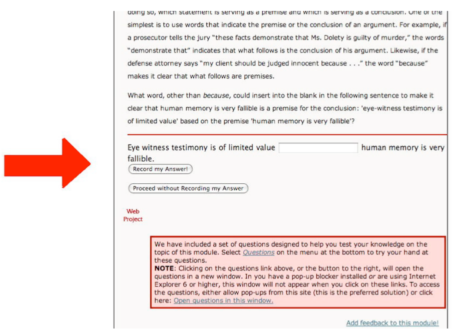
Inquiry Website

- 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

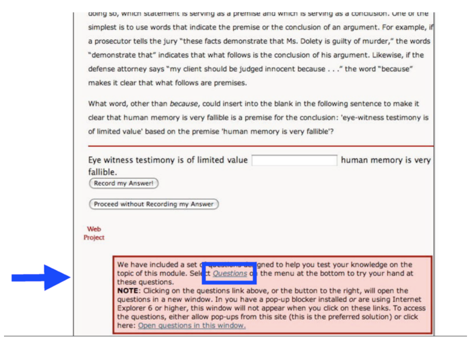
Web-site Assignments

- 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*

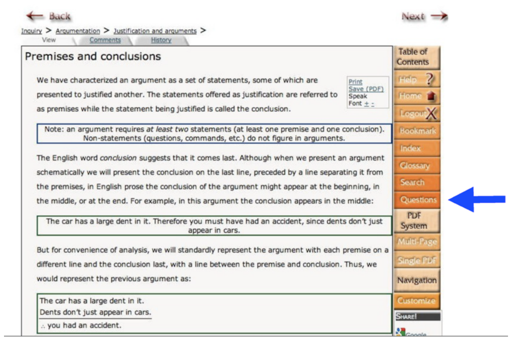
Interactive Exercises



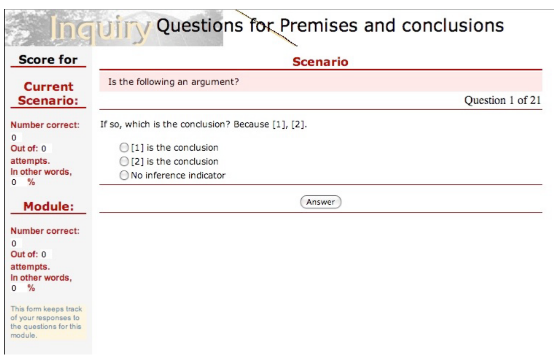
Questions to be Answered



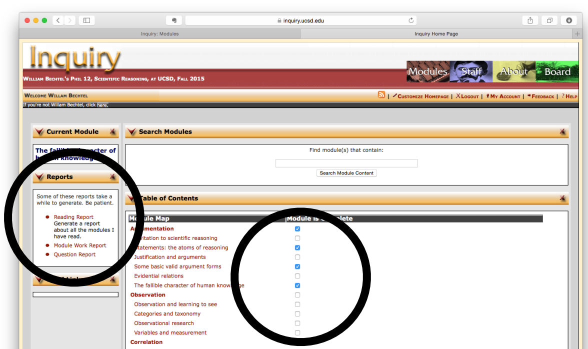
Questions to be Answered - 2



Questions to be Answered - 3



Checking Your Progress



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/

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.

How do you know your answer was received?

- In the window next to 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

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
  - 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 for FAQs
- Email 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

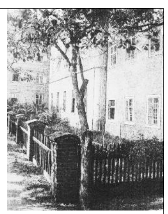
An Unsolved Problem

- 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

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

Gregor Mendel



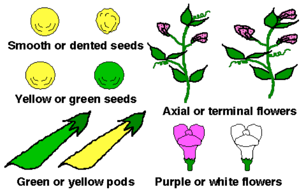
An Augustinian monk, Mendel studied physics and natural science in Vienna, but lived most of his adult life in the cloister at Altbrunn (now Brno in the Czech Republic)

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

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



Mendel's Procedure

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

All members of the F_1 generation exhibit the dominate traits

Allow members of the F_1 generation to self-pollinate

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

F_2 Generation

Produced by self-fertilization of members of the F_1 generation

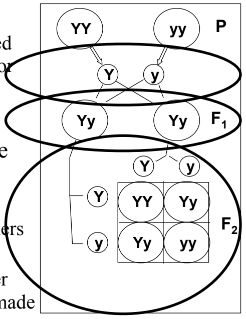
Individuals with recessive traits bred pure

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?

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



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.