

# Atoms and Stars IST 2420 and IST 1990

Fall 2005

Sections 001, 005, 010 and 981

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[www.is.wayne.edu/drbowen/aasf05](http://www.is.wayne.edu/drbowen/aasf05)

# Handouts

- Class 1 Notes
- IST 2420 Syllabus
- Lab 1 Handout
- Midterm Questions
- IST 1990 Syllabus
- Moodle (for IST 2420 Partially online and IST 1990)

# Tonight's Schedule

- Logistics
- IST 2420, face-to-face and partially online
  - Syllabus
  - Characteristics of science
- Lab 1
- Moodle (2420 face-to-face free to leave)
- IST 2420 partially online
- IST 1990 (all 2420 free to leave)

# Logistics

- Food & beverage machines
- Student Center is fairly close (Shapero)
- Bathrooms
- Water
- Take care of your own trash!
  - We are guests here, and I will not allow individual conduct to get us kicked out.
  - For labs, repack equipment where you found it.

# IST 3360 (main course)

- Meets WSU Gen Ed requirement for
  - o Physical Science (PS)
  - o Natural Sciences (PS and LS) laboratory requirement
- Initial the sign-in sheet
  - o Check 1990 column for correct number of credits
  - o If you are not on the list, add your name at the bottom – this is NOT registration!!!
- Review of names

# IST 3360 (main course)

1. Topics in physical science
  - a. Nature of atmosphere
  - b. Speed of light
  - c. Solar system
  - d. Early chemistry, atomic theory
2. Nature of science
  - a. Scientific method
  - b. Experimentation
  - c. Scientific knowledge

# IST 2420

## Review of syllabus

- Contact information
- Textbooks and bookstore
- Topics
- Grading scale (W, X, I)
- Weights
- Assignment schedule

# Syllabus, continued

- Questions for exams and essays available in advance
  - Essay standards, Essay topics
  - Turn essays in on diskette
- Making up assignments
  - CHANGE: First two lab makeups at 100%, then at 50%
- Level of arithmetic in this course
- Grade appeals
- Educational Accessibility

# Syllabus, continued

- Early Assessment
- Makeup examinations
- Class conduct
- Late assignments
- Dropping classes
- Withdrawing
- Plagiarism

# Assignments for next week

- In Lab Manual, read General laboratory Instructions, Additional Laboratory Instructions and Experiment I
- Report on Temperamental Can due
- In reader, through Page 12

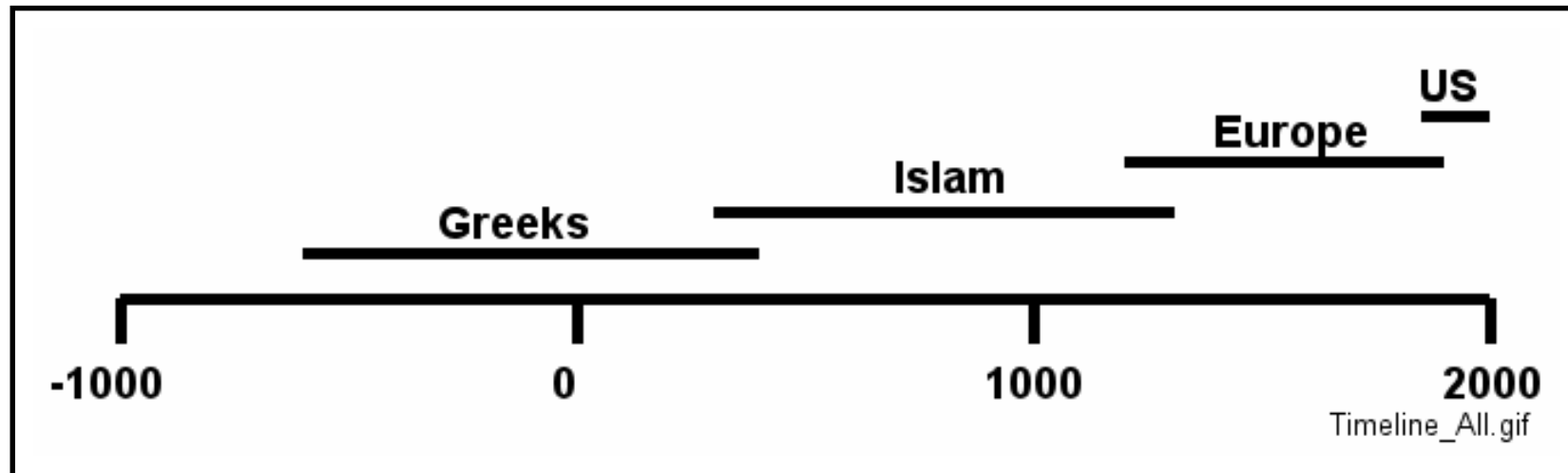
# Overview

- Science content of Science process (making more science)
  - We will do more process than a “normal” science course

## Process:

- Course is about origins of Physical Science about 1700 AD in Europe
  - Roots go back to prehistory, we will trace the roots at least partway

# Overview



- During development of science, much transmission by and (circa 1700) interaction with religion. Religion will come up.

# Overview

- My views (so you can evaluate what I say):
  - o Scientist, advocate of science - secure and reliable information to support action
  - o Current science not a basis for living: human nature & interactions, place in world, purpose
  - o Member of church (Quakers, or Society of Friends), have taught Sunday School, been clerk, secretary, given counsel within the church.
    - A liberal church - I am liberal within that church.
  - o Also a Ph.D. physicist (technical qualification)

# Overview

- o I make no claim to expertise in religion
- o You have right here to your beliefs, to state those beliefs, to question, to reject science
  - Grading on your understanding of the course material, including the basis for trusting science
  - Science makes truth claims - what is the basis for believing those claims?
- o I believe science and religion are compatible
  - Not all religious beliefs compatible with all science.
  - Once you reject some science, hard to stop
    - Science is interconnected

# Overview

- 3 areas to course - some will want more religion and culture, some more science content, but science process a core here
- Two pillars of science:
  - o data / observations / experiments
  - o hypotheses / laws / theories

# Overview

- Data / observations / experiments
  - Direct, not secondhand
  - Must be repeatable by anyone who cares to try
    - Often suggested by a hypotheses / law / theory, but must be repeatable even if you disagree
    - Anything important is repeated
    - Some things (speed of light) repeated for 100+ years
      - Improved technique triggers another round of measurements

# Overview

## Components of science

- #1: Data / observations / experiments
  - If data from different scientists disagree, discrepancy must be checked and resolved
  - Results cannot depend on beliefs or preferences – such effects must be checked and resolved
  - Often data suggested by a theory, but data stand even if theory fails

# Overview

- Data or observations.
  - o Must be recorded, not restricted or secret, with procedure (what you did, including preparation) and results (what you saw / measured)
    - So that others can repeat and verify your results
  - o Discrepancies must be resolved before others take it seriously
  - o Raw notes kept, will be reviewed if questions arise

# Overview

- #2. Hypotheses / laws / theories
  - Hypothesis: first step - a guess, explain the data
  - Law is older term, theory is newer term (less assured)
  - Accepted theory must:
    - Be capable of being disproven (falsifiability)
    - Explain all (vast majority) data
    - Discrepancies must be addressed and eventually resolved

# Overview

- o Accepted theory must (continued):
  - Have direct evidence - not accepted just because rival theory fails
    - If two theories agree with data, must look for and do critical experiments that decide between them
  - Be productive - predict new, unsuspected measurements, new phenomena, new results, which must be tested and which must agree
- o Simpler theory preferred to complicated
- o Lack of consistency must be fixed

# Overview

- Typical sequence of advance:  
measurement, description, understanding,  
(recently - app 50 years), control  
(technology)
  - Understanding is often first association  
(statistical) then causal
- Science is progressive
  - Start in small area, expand

# Overview

- Science is progressive
  - Later theory / experiment can change earlier theory
    - Example: Einstein's 1915 General Theory of Relativity changed ideas about his 1905 Theory of Special Relativity
    - However, old results still correct but range extended
  - Scientific knowledge provisional – subject to change

# Overview

- Science is progressive
  - Scientific knowledge can change rapidly at the frontier
    - Later experiments can show errors in the first ones
    - Extending theory beyond data can introduce errors
- Science is not:
  - Fair – theories do not have a right to be considered – someone must want to do this

# Overview

- Science is not:
  - Democratic – no votes, nor formal consensus, theories can come “back to life” (string theory)
  - Not based on authority – Newton and Einstein can be (were) wrong
- Individual scientists often do not follow these rules
  - Science works socially – check each other

# Overview

- Individual scientists often do not follow these rules (continued)
  - Scientific arguments can be fierce
    - Issue about women and aggressive argument
    - Our heroes – the people who overthrew the established order
    - Instant success: prove someone else wrong
  - Scientists often become advocates of a theory
    - Social interaction corrects this

# Overview

- Scientists are skeptical about truth claims
  - Many strongly-held beliefs have been shown to be wrong, e.g. common ideas about space
  - Many purely rational arguments have been shown to be wrong – e.g. Aristotle

# What's out there?

- Universe – everything (15 billion years old)
- Galaxy – large group of stars
- Solar system – sun, planets, moons etc. (5 billion years old)
  - o Greeks knew what they could see with the naked eye – some stars, Sun, Earth, our Moon, five other planets - Mercury, Venus, Mars, Jupiter, Saturn

# Some Greek Science

- Aristotle:
  - o Universe is full, no room left
  - o If something moves in air, air must move out of way, then move in behind
  - o Cannot be a vacuum – “Nature abhors a vacuum”
    - “abhors” – hates, but here “will not allow”

# Lab

- Form five Lab groups. Will generally be the same each lab session
  - If changes, max group size is six
- Temperamental Can – handout
- Each person keeps his/her data sheet
- Report will be individual, with an answer for each Assignment 1 – 12.
- Start heating water for Assignment 2 as soon as possible. This will take time to boil.

# Lab

- Discuss Assignment 1 before doing Assignment 2, and write individual answers.
- Then do rest of Assignments, come back to Assignment 2, 3 and 4 at the end.

Partially online and IST 1990 continue after

# Lab

- Reports should include:
  - o Your name, experiment number, title and date
  - o Names of lab partners
  - o Data sheet with procedure (description of what you did), observations (what you saw happen) and measurements during the lab period.  
Separate from everything else.
  - o Any calculations and answers to questions in the lab manual

Questions or comments?

# Moodle

- Handout
  - o [techtools.culma.wayne.edu/moodle](http://techtools.culma.wayne.edu/moodle)
  - o Creating an account
    - Enrolment key
  - o Using Moodle
  - o This course listed as “Fall 2005 IST 2420 / 1990”

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CULMA\_Forums » ISP\_1600

People

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Search



Administration

- [Grades...](#)
- [Activity report...](#)
- [Change password...](#)
- [Unenrol me from ISP\\_1600...](#)

Weekly outline

- [Link back to course web site](#)
- [News forum](#)
- [Introduce Yourself!](#)
- [One interesting thing](#)
- [Course discussion](#)
- [Open chat](#)

3 19 January - 25 January

- [Weekly Report](#)

4 26 January - 1 February

- [Turn in Study Schedule](#)

Online Users

(last 5 minutes)

[David Bowen](#)

Latest News

**(No news has been posted yet)**

Upcoming Events

- [Weekly Report \(Quiz closes\)](#)  
Thursday, 3 February (06:00 AM)
- [Turn in Study Schedule](#)  
Thursday, 3 February (06:00 AM)

[Go to calendar...](#)  
[New Event...](#)

Recent Activity

Activity since Saturday, 29 January 2005, 12:55 PM

[Full report of recent activity...](#)

Nothing new since your last login

# Moodle

- What is there:
  - Participants (list of class)
  - Online users (class members online now)
  - Chat
  - Edit Profile
  - Forums
  - Assignments – turn in files – file names
  - Recent activity (everyone, since the last time)
  - Under Administration, Activity report (yours)
  - Link back to course web site
  - More coming (grades)

# Moodle: Activity Reports



- Outline: what you did
- Complete: what you read and did
- Today's logs: graph  $V$ s time, today
- All logs: graph  $V$ s time, from start

# Moodle

- Assigned postings (count towards course requirement for number of postings):
  - Introduce yourself
  - Starting out
- Pictures
- Warning about online courses
  - One week – two weeks is stretching it
- Moodle warning – watch for message
- Watch course web site and email (weekly)

# Moodle

- Do not expect instantaneous responses from me
- You do not need to respond to everything – gets out of hand if you do
  - I usually do not respond to messages that I agree with
  - I always respond to messages that I disagree with
  - Responses as well as original messages count
- In a public setting, be sure to log out

# IST 2420 partially online

- Everything turned in online except for Midterm and Final
  - o Labs: FAX Data Sheet, turn in rest as file, using Moodle
    - Label clearly so I can put them together!
  - o File names
- Course summaries
  - o Notes online – must have PowerPoint or Acrobat Reader (pdf)

# IST 2420 partially online

- Postings – 26 (“25” in Syllabus is a typo)
  - Replies count as well as originals
- Free to come to class
  - If you want hardcopy of notes, let me know three days in advance
    - Then you do not need to turn in Summary

# IST 1990

## IST 2420 free to go

# Course Topic

- Science and religion - the interaction
- Free to hold your own religious beliefs, but course is about the range of beliefs.  
Optional: where do yours fit in?
- Range of beliefs is very wide
  - o Religion is superior
  - o No conflict, some conflict
  - o Science is superior

# IST 1990

- Review of syllabus
  - o Course description
  - o Working on your own
  - o Textbooks (at Barnes & Noble Campus Bookstore. 313-577-2436)
    - Gould: science and religion are, and should be, separate – they deal with separate areas
    - Barbour: what is the range of attitudes? Matrix
    - (four credits only) Ruse: How to reconcile Catholic doctrines with science
    - [www.bkstore.com/wayne](http://www.bkstore.com/wayne)

# IST 1990

- Review of syllabus
  - o Assigned readings on course web site (4 credits only)
  - o Assignments and schedule
    - Participation in online discussion
      - Set up account this week
    - Essays (two or three depending on credits)
  - o Standards for essays and participation

Questions or comments?