

**HWC 44  
SPRING 2002  
MODELS OF SCIENTIFIC THOUGHT  
COURSE OUTLINE AND READING LIST**

Course Staff

Harry Gibson, Coordinator  
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Rooms:

MS 127 & 130  
Time: 11:00 - 12:20  
Exam room assignments made in  
class prior to each test date

George Diggs  
Don Salisbury  
Hank Gorman

Guest Lecturers

Carol Daeley  
Karann' Durland  
Rod Stewart

Course Readings:

Ferris, Timothy. *Coming of Age in the Milky Way*  
Appleman, Philip, ed. 2001. *Darwin: A Norton Critical Edition*  
Lakoff, George & Johnson, Mark. *Metaphors We Live By.*  
HWC Packet (sold in the Campus Store)  
Library Reserve Readings as Assigned

Purposes of the Course:

This is a course about science and scientists. It is a course neither in a particular science nor exclusively in the history or philosophy of science. Rather, the course is designed to introduce you to the ways scientists have come to understand the world around them, and the way they express and solve problems.

Scientists work with models to help them understand the puzzles of nature and to allow them to make predictions about natural phenomena. Scientific models serve not only to describe nature in terms understandable to scientists, but also to offer theoretical frameworks that permit scientists to anticipate how nature will respond when conditions are varied. Scientists do not work in a social and cultural vacuum. The models they construct are influenced by thinking and attitudes of the non-scientific community. In turn, scientific thinking and models influence the social and political theories of their time, and are reflected in the art and literature of the period.

HWC 44 is designed to introduce you to the language, methods, and at times, the madness of science. You must be prepared to give up many notions you now have about science and scientists. Be prepared to explore the relatively ordered world of "normal science" but also the many blind alleys, wrong turns, and false starts that characterize both "normal" and "revolutionary" science. At the same time, be willing to give careful attention to the important connections between the sciences and the humanities.

### Grading

There will be four scheduled exams and one optional, cumulative final exam in this course. The dates for these exams are on the course syllabus. Your grade will be computed by averaging the four highest scores you achieve. The four unit exams are not optional; in order to take the optional final, you must have taken the four unit exams. If you achieve a higher score on the final than on one of the unit exams. that score will be substituted for the lower one.

There will also be "attendance" quizzes given several times during the course. The points from these quizzes will be added to your unit test score.

Course grades will be assigned using approximately the following distribution:

A	100-90
B	89-80
C	79-70
D	69-60
F	59-0
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S	100-70
D	69-60
U	59-0

Plus and minus grades will be assigned as appropriate.

### New Grading System

In November 2000, the faculty reviewed and approved a new grading system called S/D/U. Under the S/D/U grading system, course work of a C- or better will continue to receive an S, will not be included in the GPA computation, and will count toward graduation requirements. Coursework below D- will continue to receive a U, will be computed in the GPA, and will

not count toward graduation requirements. Any student on the S/D/U grading system who earns a grade from D- through D+ will be given D-, D or D+, as appropriate. Grades of D- through D+ will be posted to the student's transcript and will count in the GPA, and can be used to fulfill a graduation requirement. S/D/U grading is advantageous to those students who are below average in ability and who need to maintain a high GPA (3.75+) in order to keep a scholarship. Be sure to keep track of your grading system choice. If you change systems, keep your grade-system change notice until after grades are assigned.

### Examination Policies

**Lateness:** Exams begin at 11 AM. Once the first student leaves an exam room, no one else can begin the exam. The first student usually leaves around 11:20, so oversleeping can cause you to have to take the makeup exam.

**Missing an Exam:** If serious circumstances beyond your control make it impossible for you to take an exam, you must notify the course coordinator of this in advance of the exam, not after you miss it. The course coordinator is Dr. Harry Gibson (AC extension 2344, e-mail hgibson@austinc.edu). You must submit your request to take a makeup exam in writing to Dr. Gibson, either at hgibson@austinc.edu or his campus box 61552. If sudden and unanticipated calamity occurs (for example an automobile accident on the way to the exam, a death in the family, hospitalization for illness) that you are unable to tell Dr. Gibson about before the exam, you must submit written documentation of this calamity as soon as possible with your request to take the makeup exam.

**Taking a Makeup Exam:** Permission to take a makeup in place of the scheduled exam is at the discretion of the HWC 44 staff. The staff reserves the right to deny you the opportunity to take a makeup exam. There will be one and only one opportunity to take the makeup. Typically, a makeup exam will be given at 4:30 one week following the regular exam. The makeup for the fourth unit exam is given immediately following the optional final exam. There is no makeup for the optional final.

**Why You Should Avoid Makeup Exams:** Examinations are difficult to construct. The best sets of questions will have been used in constructing the regularly scheduled examinations. This means that the make-up exams are unavoidably more difficult than the regular exams; routinely, grades are lower on make-ups. It is

therefore to your advantage to take the regularly scheduled exams, even in the face of some hardship.

Getting Your Exam Results: The HWC 44 staff want you to have your exam results as quickly as possible. In order for this to happen, we need your attention and cooperation to some important procedures. First, do not at any time in this course use your social security number for identification. Never. Ever. Instead, use your 5-digit campus mailbox number as your PIN (personal identification number) on all exams. Use the same campus mailbox number on all exams--your own. Your exam results will be mailed to this mailbox. In fairness to you, we will not mail these results until after the makeup exam is administered. After the makeup exam, copies of the regular unit exam will be available to you under the table in the Moody Science lobby that is used for HWC 44 materials.

#### Academic Integrity

The principles of academic integrity apply to all your work in this course. You are responsible for your own work. During examinations you are neither to give nor receive help from any source except course staff (if, for example, you have questions during the exam). Cheating on an exam will be dealt with harshly; it may result in expulsion from the course with a grade of F for a first offense. Austin College's published guidelines will be followed in dealing with any and all infractions of the honor principle.

#### Preparing for Exams

Doing the assigned readings and attending class regularly will do wonders for your exam performance. Keep in mind that questions may cover video, film, slide, or tape material as well as assigned readings.

Outlines of each lecture are available before the lecture on the table in the Moody Science lobby used for HWC 44 materials. Be sure to pick these up; they will not only help you follow the lecture but also are invaluable aids in organizing your studying.

Usually, audiotapes are made of the lectures; you can use these to help you review and expand your notes. Because of copyright laws, however, we cannot record for you most of the videotaped or audiotaped material used during lectures. The lecture tapes are not, therefore, an adequate substitute for attending class.

The staff normally will conduct a question/answer session on an evening prior to each unit exam. The Academic Skills Center also conducts course help sessions. And don't forget the staff are available after lectures to answer questions.

We encourage you to work together in mastering the course material and preparing for exams. And we encourage you to meet together regularly to formulate ten possible exam questions for each lecture and to make sure you understood the lecture material.

Plenty of research shows that students who don't study until just before exams actually spend more time studying but do less well on the exam. Doing it all along really does help, and it's a lot less painful.

#### Tips for Taking Multiple-Choice Exams

Be sure to read the questions very carefully. Many wrong answers are the result of misreading the question. Pay special attention to words like *although*, *but*, *not*, *both/and*, *either/or*. These little words are easy to slide over but often make the difference between the right answer and the wrong one. Be sure to consider each of the five possible answers; start by crossing out the ones you know are wrong. Then look very carefully at those which remain.

Spring 2002 Calendar  
**LECTURES AND RELATED READING ASSIGNMENTS**

UNIT I: MODERN SCIENCE

***Meeting #1–February 4, 2002 -- Monday***

Introduction to the Course, Underlying Themes, the Staff and Unit 1 (Gibson)

TOPIC Where in the World is Science? (Daeley)

REQUIRED READING

HWC Packet

Ferris: "Not rocket science."

***Meeting # 2 - February 6, 2002 -- Wednesday***

TOPIC Models, Theories, Hypotheses, and Model Evaluation in Science (Gorman)

***Meeting #3 -- February 8, 2002 -- Friday***

TOPIC Watching the ancient skies: regularities and cosmic drama(Salisbury)

REQUIRED READING

Ferris: Chapter 1-2, pp 19-45

***Meeting #4 -- February 11, 2002 -- Monday***

TOPIC To heaven and back: world systems from Aristotle to Copernicus (Salisbury)

REQUIRED READING

Ferris: Chapter 4-5, pp 61-101

***Meeting #5 -- February 13, 2002 -- Wednesday***

TOPIC Newton and the clockwork universe (Salisbury)

REQUIRED READING

Ferris: Chapter 6, pp 103-122

***Meeting #6 -- February 15, 2002 -- Friday***

TOPIC Einstein's gravity: the fabric of space and time (Salisbury)

REQUIRED READING

Ferris: Chapters 10, pp 177-204.

***Meeting #7 -- February 18, 2002 -- Monday***

TOPIC Cosmic expansion and microscopic wonders (Salisbury)

REQUIRED READING

Ferris: Chapter 11 and 15,pp 205-214, pp 285-299

***Meeting #8 -- February 20, 2002 -- Wednesday***

TOPIC Stellar Ovens  
REQUIRED READING  
Ferris: Chapters 15, pp 255-282.

**Meeting #9 -- February 22, 2002 -- Friday**

TOPIC The big bang (Salisbury)  
REQUIRED READING  
Ferris: Chapters 17 and 18, pp 335-366

**Meeting #10 -- February 25, 2002 -- Monday**

\*\*\*\*\*UNIT 1 EXAM\*\*\*\*\*

Given in rooms, as assigned in class

UNIT II: SEEING AND THINKING

**Meeting #11 -- February 27, 2002 -- Wednesday**

Introduction to Unit: Why Light, Vision, & Thinking as a Unit  
(Gorman)  
TOPIC Newton's Rainbow (Salisbury)  
REQUIRED READING  
HWC Packet:  
Newton, "Questions on Natural Philosophy"

**Meeting #12 - March 1, 2002 -- Friday**

TOPIC An Eye-ful of Eyes: The Anatomy of Very Early Vision  
(Gorman)  
REQUIRED READING  
HWC Packet:  
Peterson, C. Vision, from Psychology: A Biosocial Approach  
REQUIRED READING  
HWC Packet:  
Walsh, V. and Kuliskowski, J. "Seeing colour." from Gregory et al.  
The Artful Eye

**Meeting #13 - March 4, 2002 -- Monday**

TOPIC On Seeing Color (Gorman)

**Meeting #14 - March 6, 2002 -- Wednesday**

TOPIC Perception and Vision I  
REQUIRED READING  
HWC Packet:  
Livingstone, "Art, Illusion, and the Visual System."

**Meeting #15 -- March 8, 2002 -- Friday**

TOPIC Perception and Vision II (Gorman)

Spring Break !

**Meeting #16 -- March 18, 2002 -- Monday**

TOPIC How Do Children See Depth? (Gorman)  
REQUIRED READING  
<http://cogweb.english.ucsb.edu/CogSci/Spelke.html>

**Meeting #17 -- March 20, 2002 -- Wednesday**

TOPIC How Do Children See Objects? (Gorman)

**Meeting #18 -- March 22, 2002 -- Friday**

TOPIC Vision and Metaphors (Gorman)  
REQUIRED READING  
Lakoff & Johnson, from *Metaphors We Live By*, pp 3 -76

**Meeting #19 -- March 25, 2002 -- Monday**

TOPIC Artificial Intelligence or Natural Stupidity? (Gorman)  
REQUIRED READING  
HWC Packet:  
Searle, "Is the Brain's Mind a Computer Program?"  
"Machine Consciousness" from *Consciousness: Robots and Minds*  
Allen, "Mind and Its Place in nature"

**Meeting #20 -- March 27, 2002 -- Wednesday**

\*\*\*\*\*UNIT 2 EXAM\*\*\*\*\*

Given in rooms, as assigned in class

UNIT III: THE DARWINIAN REVOLUTION

**Meeting #21 -- March 29, 2002 -- Friday**

TOPIC Pre-Darwinian Paradigms (Diggs)  
REQUIRED READING  
Appleman, "Biology Before the Beagle" (33-39)  
RECOMMENDED READING  
HWC Packet:  
Mayr, "The Nature of the Darwinian Revolution"

**Meeting #22 -- April 1, 2002 -- Monday**

TOPIC The Darwinian Revolution: Evolution of a Paradigm Shift (Diggs)  
REQUIRED READING  
Appleman, "Introduction" (3-20)  
"Introduction" to *Origin of Species* (95-98)  
"Who is Darwin?" (23-29)  
*Principles of Geology* (285-287)



RECOMMENDED READING

Appleman, *Origin of Species* (I, 98-105; II, 106-107; III, 107-135; IV, 135-147)

"Objections to Mr. Darwin's Theory of the Origin of Species"  
(265-267)

**Meeting #23 -- April 3, 2002 -- Wednesday**

TOPIC The Darwinian Revolution (Continued) (Diggs)

REQUIRED READING

Appleman, "Evolution and the Nature of Science" (289-304)

HWC Packet:

Dobzhansky, "Nothing in Biology Makes Sense Except in the Light of Evolution"

Mastny, "Antimicrobial Resistance Growing"

On closed reserve for HWC 44 in library: The Evidence for Evolution

RECOMMENDED READING

Appleman, *Origin of Species* (VI, 135-147)

Appleman, *Descent of Man* (Intro, 175-177; I, 177-194)

**Meeting #24 - April 5, 2002 -- Friday**

TOPIC Human Evolution Part 1 (Diggs)

REQUIRED READING

HWC Packet:

Lemonick & Dorfman, "One Giant Step for Mankind" from Time

Tattersall, I. "Once we were not alone" Scientific American, January 2000, pp 56-62.

**Meeting #25 -- April 8, 2002 -- Monday**

TOPIC Human Evolution Part 2 (Diggs)

REQUIRED READINGS

HWC Packet:

Lemonick, "One Less Missing Link" from Time

**Meeting #26 -- April 10, 2002 -- Wednesday**

TOPIC Uses and Abuses of Biology: Racial Pseudo-science (Stewart)

REQUIRED READING

HWC Packet:

Begley, "Three is not enough" from Newsweek

On closed reserve for HWC 44 in library: Gould, *The Mismeasure of Man*, Chapter 2

**Meeting #27 -- April 12, 2002 -- Friday**

TOPIC Changes in Worldview: Sociobiology (Diggs)

REQUIRED READING

HWC Packet:

Rensberger, "On Becoming Human"

Grady, "The Brains of Gay Men"

RECOMMENDED READING

Appleman, from *Sociobiology: The New Synthesis* (409-414)

Appleman, "Biological Potentiality vs. Biological Determinism  
(415-419)

De Waal. "The End of Nature versus Nurture" *Scientific American*,  
(6), 1999, pp 94-99

**Meeting #28 -- April 15, 2002 -- Monday**

TOPIC Sex and Murder: Matching and Dispatching, (Gorman)

REQUIRED READING

HWC Packet:

Buss and Schmitt, *Sexual Strategies Theory: An Evolutionary  
Perspective on Human Mating*

**Meeting #29 -- April 17, 2002 -- Wednesday**

TOPIC Creationism (Diggs)

REQUIRED READING

HWC Packet:

Set of Creationism articles (13 pages)

RECOMMENDED READING

Appleman, "Mainstream Religious Support for Evolution" (527-533)

Appleman, "Frequently Asked Questions about Evolution and the  
Nature of Science" (617-623)

**Meeting #30 -- April 19, 2002 -- Friday**

\*\*\*\*\*UNIT 3 EXAM\*\*\*\*\*

Given in rooms, as assigned in class

UNIT IV: THE ENVIRONMENT

**Meeting #31 -- April 22, 2002 -- Monday**

TOPIC Plate Tectonics (Diggs)

REQUIRED READING

On closed reserve for HWC 44 in library: Miller excerpt, "A  
Mysterious and Mobile Earth" and Marvin excerpt

HWC Packet:

Hallam, "Alfred Wegener and the Hypothesis of Continental Drift"

**Meeting #32-- April 24, 2002 -- Wednesday**

TOPIC Plate Tectonics (cont.) (Diggs)

REQUIRED READING

HWC Packet:

Molnar & Tapponnier, "The Collision between India and Eurasia"

Magnuson & Angier, "A Noise Like Thunder" and "Anatomy of an  
Earthquake"

Russell & Angier, "Columbia's Mortal Agony" and "In the Belly of the Beast"

**Meeting #33 -- April 26, 2002 -- Friday**

TOPIC The Environment -An Overview (Diggs)

REQUIRED READING

HWC Packet:

Brown, "World Grain Harvest Drops"

Gardner, "Population Increases Steadily"

Larsen, "Hydrological Poverty Worsens"

**Meeting #34 -- April 29, 2002 -- Monday**

TOPIC Ozone Depletion and Global Climate Change (Diggs)

REQUIRED READING

HWC Packet:

Dunn, "Global Temperature Steady"

Karl and Trenberth, "The Human Impact on Climate" *Scientific*

*American*, (6), 1999, pp 100-105

**Meeting #35 -- May 1, 2002 -- Wednesday**

Biodiversity and the Extinction Crisis (Diggs)

REQUIRED READING

HWC Packet:

Blaustein, "Amphibians in a Bad Light"

Carpenter & Holmes, "Living with Nature"

Lewin, "Damage to Tropical Forests, or Why Were There So Many Kinds of Animals"

Wilson, "Threats to Biodiversity"

**Meeting #36 -- May 3, 2002 -- Friday**

TOPIC Tropical Rain Forests (Diggs)

REQUIRED READING

HWC Packet:

Raven, "Tropical Rain Forests: A Global Responsibility"

Raloff, "Unraveling the Economics of Deforestation"

Holloway, "Sustaining the Amazon"

**Meeting #37 -- May 6, 2002 -- Monday**

TOPIC: Why care about the environment? (Durland)

REQUIRED READING

HWC Packet:

Des Jardins, J. "Ethics, Science and the Environment."  
*Environmental Ethics: An introduction to Environmental Philosophy.* pp 9-10.

Des Jardins, J. "Biocentric Ethics and the Value of Life."  
*Environmental Ethics: An introduction to Environmental Philosophy.* pp 9-10.

**Meeting #38 - May 8, 2002-- Wednesday**

TOPIC The Environment of North Central Texas: From the Local  
Perspective to the Global (Diggs)

REQUIRED READING

HWC Packet:

Diggs, Lipscomb, and O'Kennon, "The Blackland Prairie"

**Meeting #39 -- May 10, 2002 -- Friday**

**\*\*\*\*\*UNIT 4 EXAM\*\*\*\*\***

Given in rooms, as assigned in class

**Meeting #40 -- May 10, 2002 -- Monday**

Question and Answer Session

**Meeting #41 -- May 15, 2002 -- Wednesday**

**optional EXAM 12 to 2 pm.** Given in rooms, as assigned in class