Perspectives on Science and Mathematics

PHIL 2314-001
Fall 2015
Instructor: Dr. Kenneth Williford

Meeting Time: Tu & Th 12:30-1:50

Meeting Place: Trimble Hall (TH) 202

Office and Office Hours: 305 Carlisle Hall
Tu & Th 2:00-3:30PM & by appointment

Faculty Profile
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Course Description

This course is an introduction to the history of philosophy of science and mathematics for UTeach students. In this incarnation of the course we will learn about the logic of mathematical and scientific inference, the theory of knowledge ("epistemology"), how to tell the difference between science and pseudo-science, how science, mathematics, and philosophy relate to other areas of culture (e.g., the arts, religion, economics), and how all of this relates to education. We will "cover" the development of the scientific worldview from the ancient Greeks to Isaac Newton, and then we'll "cover" the development of evolutionary biology and modern geology from Darwin's main predecessors to the present.

Course Objectives

Students will come to understand that science has a fascinating history, is underpinned by deep philosophical presuppositions about the nature of knowledge and the nature of reality, and depends upon special social and cultural factors for its continued growth and revision. The pedagogical usefulness of historical and philosophical material in the teaching of science and mathematics will also be emphasized. The successful student will acquire the ability to skillfully incorporate material from the history and philosophy of science into the teaching of science and will also acquire a nuanced understanding of the social and cultural forces that have shaped the history of science and mathematics and continue to affect the appropriation of the sciences today. This understanding of the broader historical and philosophical background and context of science and math will provide the future teacher with an array of color, depth and richness with which to engage and inspire his or her own future students.

Student Learning Outcomes

Students who attend all classes and study properly will: (1) understand the nature of reasoning and argumentation; (2) have a broad understanding of some of the historical shifts in philosophical thought about science and mathematics; (3) be able to identify various philosophical themes and influences in science and

mathematics, and specify their relation to the contemporary world; (4) demonstrate competency in oral and written communication; and (5) work effectively in a collaborative environment.

Required Textbooks and Other Course Materials

The following texts are all available at the UTA Bookstore. They can be bought new or used, or rented, all at very reasonable prices:

http://www.bkstr.com/texasatarlingtonstore/home

(1) Richard DeWitt, *Worldviews: An Introduction to the History & Philosophy of Science*, Second Edition, Wiley-Blackwell, 2010. ISBN: 978-1-4051-9563-8

(2) Philip Kitcher, *Living with Darwin*, OUP, 2007. ISBN: 978-0-19-538434-5.

Ask your peers who did the course last semester to sell/give you their text, or you can also rent them. Or you can check them out at Half Price Books, or on Amazon—just get your hands on whatever is the lowest cost for you.

I also recommend buying:

Anthony Weston, *A Rulebook for Arguments*, Hackett Publishing Company, 2009 (any edition is fine, though 4th is the latest: ISBN: 978-0-87220-954-1)- also available in the Bookstore. (This is not required reading).

All other *required* reading material for this course will be provided by the instructor. The material will be posted on Blackboard; consult the Schedule below.

Evaluation

(1) Attendance, participation, and quizzes (25%)
(2) One take-home midterm exam (25%)
(3) One lesson plan (25%)
(4) One 10-page research paper (25%)

Attendance and Participation

At The University of Texas at Arlington, taking attendance is not required. Rather, each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I will take attendance everyday. A student may have up to three unexcused absences without this affecting his or her grade adversely. Participation will be noted.

Quizzes

There will be frequent but small quizzes over the reading material. There will be a quiz almost every week. **Quizzes will be posted on Blackboard and should be turned in on Blackboard as well.** At the end of the semester the cumulative quiz average will be combined with attendance and participation grades to yield 25% of the final grade.

Take-Home Midterm Exam

Around midterm, there will be a take-home examination consisting of two essay questions and some short-answer questions. Answers will need to be typed, double-spaced, and in a 12-point font with reasonable margins. In order to answer the questions adequately, the student will need to be familiar with the reading and lecture material. It will count for 25% of the final grade. More information concerning expectations and evaluation criteria will be provided later. **The exam is to be turned in through Blackboard.**

Lesson Plan

Each student will be responsible for developing and presenting a 5E lesson plan. The lesson plan will have to do with a topic from the history or philosophy of science or mathematics. The target audience will be high school students. The lesson plans will be presented to class during the final days of the semester. Fellow students will give feedback. More details and specifications will be given out at a later date. The lesson plan and its presentation will count for 25% of the final grade.

Research Paper

Each student will write a 10-page research paper on a topic in the history or philosophy of science or mathematics. The paper will need to be typed, double-spaced, and in a 12-point font with reasonable margins. The topic will need to be cleared with the instructor early on. The student will need to include an annotated bibliography. The bibliography will need to be in MLA or APA format. Shortly after midterm, students will need to turn in a draft bibliography and a draft of approximately one half of the paper (roughly five pages) for comment from the instructor. Shortly after that students will exchange draft papers with two other students in order to give each other feedback. Records must be kept of all feedback. This will figure into participation grades, and the extent to which a student learned from good feedback will be a factor in the determination of their final paper grade. The paper will count for 25% of the final grade and must be turned in via Blackboard no later than 1:30PM on Thursday, December 17. More details and specifications will be given out at a later date.

There is no final examination in this class.

Course Dates: August 27-December 9

Class Meeting Time: Tuesdays and Thursdays 12:30AM-1:50PM

IMPORTANT POLICIES OF MINE

Late Work: All late work will be docked a full letter grade for every day that it is late.

Laptops and Phones: In my class I do not allow students to use laptops, smartphones, or other electronic devices without special permission. Any note taking must be done the old fashioned way. However, since recordings of all lectures and any Power Point slides used will be posted on Blackboard, students are discouraged from taking handwritten notes while in class. There is neuroscientific evidence that attempting to write while listening actually impedes understanding. Students are encouraged to listen and ask questions and write sparingly.

Homework for Other Courses: Students are not allowed to read for or do homework for other courses while in my class.

Incompletes: I will not give a student a grade of Incomplete (I), unless he or she has a compelling, and documented, reason (e.g., a medical emergency).

Plagiarism: No student should have any doubt about what counts as plagiarism. I will assume that every student in this class has seen this tutorial provided by the UTA library and have taken the quiz embedded in it: http://library.uta.edu/plagiarism/index.php. All cases of plagiarism will be turned over to the Office of Student Conduct.

UNIVERSITY POLICIES & OTHER USEFUL PIECES OF INFORMATION

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/aao/fao/).

Disability Accommodations: UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA), The Americans with Disabilities Amendments Act (ADAAA),* and *Section 504 of the Rehabilitation Act.* All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a letter certified by the Office for Students with Disabilities (OSD). Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting:

The Office for Students with Disabilities, (OSD) www.uta.edu/disability or calling 817-272-3364.

Counseling and Psychological Services, (CAPS) www.uta.edu/caps/ or calling 817-272-3671.

Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: *The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit uta.edu/eos. For information regarding Title IX, visit* www.uta.edu/titleIX.

Academic Integrity: Students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

> *I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as "lecture," "seminar," or "laboratory" shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

The English Writing Center (411LIBR): Hours are 9 am to 8 pm Mondays-Thursdays, 9 am to 3 pm Fridays and Noon to 5 pm Saturdays and Sundays. Walk In Quick Hits sessions during all open hours Mon-Thurs. Register and make appointments online at http://uta.mywconline.com. Classroom Visits, Workshops, and

advanced services for graduate students and faculty are also available. Please see www.uta.edu/owl for detailed information.

Library Info:

Library Home Page	http://www.uta.edu/library
Subject Guides	http://libguides.uta.edu
Subject Librarians	http://www.uta.edu/library/help/subject-librarians.php
Library Tutorials	http://www.uta.edu/library/help/tutorials.php
Connect Off- Campus	http://libguides.uta.edu/offcampus
Ask A Librarian	http://ask.uta.edu

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist handicapped individuals.

Emergency Phone Numbers: In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381

Tentative Schedule & Important Dates

This schedule may be subject to some adjustments as the semester progresses. There will be readings to accompany many of the lectures. These will be announced in class and posted on Blackboard. We will not be able to cover every topic and example listed under each lecture in equal depth.

Thursday, August 27

Introduction: Philosophy, History, Science, Mathematics, and Education

Questions Raised and Discussed: Why do UTeach students have to take this course? Why should math and science teachers care about the History and Philosophy of Science and Mathematics? Can this course help you teach Science and Mathematics? What is the relationship between Science and Mathematics and human knowledge? What are the cultural factors that support the generation and transmission of knowledge? What is the relation between the practice of teaching, the theory of knowledge (Epistemology), and the History of Science and Mathematics? What is Science anyway?

UNIT ONE (9/1-10/20): Logic, Probability, and the Philosophy of Science

Tuesday, September 1

Knowledge and Worldviews (Scientific and Otherwise)

Reading: DeWitt, Ch. 1

Questions Discussed: How should we define knowledge? What is the relationship between knowledge and truth? What is the difference between knowledge based on perception and knowledge based on inference? Do we have any knowledge? Can understanding the nature of knowledge help us to teach (transmit knowledge) better? What do we consider the main sources of knowledge and the disciplines that deal in genuine knowledge? Have all cultures throughout history always agreed on what the main sources of knowledge are? What is a worldview?

Thursday, September 3

The Concept of Truth

Reading: DeWitt, Chs. 2-3

Questions Discussed: What is the concept of truth? What are some competing theories of truth? What are their problems? What is the relationship between evidence, belief, and truth? What kinds of things are properly called true? What are theories? Can theories be true? What are facts?

Tuesday, September 8

Evidence and Inference, Confirmation and Disconfirmation

Reading: DeWitt, Ch. 4

Questions: What is an argument? What are the components of an argument (viz., premises and conclusions)? What are propositions or statements? How do arguments relate to knowledge? What is the difference between deductive reasoning and inductive reasoning? What are confirmation, disconfirmation, falsification, and verification? What is it for a deductive argument to be valid or invalid, sound or unsound? What is it for an inductive argument to be strong or weak? What is *non sequitur*? How were the topics of Logic and Probability important in the History of Science and Mathematics? Are they still important for *everyone* now?

Thursday, September 10 & Tuesday, September 15

Basic Deductive Logic Part One—Propositional Logic

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics and Questions: Truth-Values: True & False, 1 & 0. Bivalence and Consistency. The logical connectives: And, Or, If/Then, Not, If-and-Only-If. Tautologies, Contingent Statements, and Contradictions. Common propositional argument forms: Modus Ponens, Modus Tollens, Hypothetical Syllogism, Constructive and Destructive Dilemmas, Disjunctive Syllogism. Two proof strategies: Conditional Proof and Reductio ad Absurdum. Two common formal fallacies: Affirming the Consequent, Denying the Antecedent. Truth-tables. Using truth tables to test arguments for validity, to test single statements for tautologousness, contingency, and contradictoriness, and to test sets of statements for consistency. Is this material useful for teachers (besides Computer Science and Mathematics teachers)? Some notes on the history of Propositional Logic and from Ancient Greece to the Computer Age.

Thursday, September 17

Review and Activity Day

Main Topics: Identifying Arguments vs. Non-Arguments, Identifying Propositional Argument Forms, Using Truth-Tables to test for Validity and Consistency, etc.

After a review of all the material from 9/10 and 9/15, students will divide into groups and be given examples of arguments taken from a variety of scientific and other texts. The groups will come up with an analysis of the texts, isolating premises and conclusions, identifying argument forms and rhetorical elements, and analyzing the arguments for validity and sets of statements for consistency, as appropriate. Two randomly selected groups will present their analyses in class for general debate and discussion.

Tuesday, September 22 & Thursday, September 24

Basic Deductive Logic Part Two—Predicate Logic

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics and Questions: The Logic of All and Some—the Quantifiers. Universal statements versus Existential statements. Aristotle's Square of Opposition and George Boole's "Modern" Square. Categorical Syllogisms. How to use Venn Diagrams to test Categorical Syllogisms for validity. Immediate Inferences. Universal Instantiation and Generalization; Existential Instantiation and Generalization. Common formal fallacies in Predicate Logic. Predicates and Classes (Sets). Axioms and axiomatic method. Notes on the history of Predicate Logic and its relation to Science and Mathematics from Aristotle to Boole, Frege and the Computer Age. Why should we care about learning Predicate Logic? Will this help one teach anything (other than Mathematics and Computer Science)?

Tuesday, September 29

Review and Activity Day

Main Topics: Interpreting and Assessing Predicate Logic Arguments using Venn Diagrams

After reviewing the material from 9/22 and 9/24, students will divide into groups and be given examples of arguments. The groups will come up with an analysis of the texts or exercises, isolating premises and conclusions, identifying argument forms and rhetorical elements, and analyzing the arguments for validity by using Venn Diagrams, as appropriate. Two randomly selected groups will present their analyses in class for general debate and discussion.

Thursday, October 1

Common Informal Fallacies and Debate in Science (and Everywhere Else!)

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics and Questions: Common Informal Fallacies, the Distinction between Logic and Rhetoric, the practice of Debate and Dialectic in Ancient Greece and in Medieval Scholasticism (European and Indo-Tibetan), Debate, Competition, and Controversy (public and private) in the History of Science and Mathematics (e.g., the trial of Galileo, the 1860 Oxford Evolution debate). What are the cultural factors conducive to free inquiry and the unrestricted assessment of argument and evidence? Should we care about preserving a culture that enshrines these factors? What are some example of times and places in history when these factors were not operative? What were the consequences? Is any of this important for science teaching?

Tuesday, October 6

Bayes' Theorem and Bayesian Confirmation Theory

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics and Questions: Basic Probability Theory. Conditional Probability vs. Prior Probability. Bayes' Theorem. "Likelihood" Comparison. How do we change our beliefs in the light of new evidence? In what ways

do we sometimes fail or even refuse to do this? How does this relate to scientific theory change and scientific progress? How does this relate to education?

Thursday, October 8

The Duhem-Quine Thesis or How to Hold on to a Theory Forever!

Reading: DeWitt, Ch. 5

Topics and Questions: What is the Duhem-Quine Thesis? How does it relate to axioms? What is Occam's Razor? How does the Thesis related to Occam's Razor? What problem does the thesis raise about sources of evidence and evidential impasses? What is "underdetermination"? What are "background assumptions"? What is "falsificationism"? What is the "hypothetico-deductive method"? How does the Thesis relate to theory change? How does it relate to conspiracy theories?

Tuesday, October 13

Review and Activity Day

Main Topic: Holding on No Matter What!

Students will divide up in to four groups (teams). The teams will pair off and the pairs pitted against each other. Two teams will be given a completely absurd claim to try to defend to the bitter end against their opposition. The opposing teams will present evidence against the defenders of the absurd claims, and defenders will have to come up with clever ways of defending the claims while maintaining logical consistency. Towards the end of the class we will discuss how the debates went.

Thursday, October 15

The Problems of Induction and Falsificationism

Reading: DeWitt, Chs. 6-7

Topics and Questions: The Problems of Induction. Types of Inductive Arguments: Enumerative, Statistical, Analogical, Parsimony. Inductive skepticism. Inductive fallacies: Overlooked Evidence, Hasty Generalization, Base Rate Neglect, Overuse of the Availability Heuristic. "Faith" vs. Reason. The Demarcation Problem and Falsificationism. Argument to the best explanation and assessing competing explanations.

Tuesday, October 20

Intstrumentalism and Realism

Reading: DeWitt, Ch. 8

Topics and Questions: What is Scientific Realism? What is Instrumentalism about scientific theories? Should we be instrumentalists or realists? What sort of progress does science make? The pessimistic meta-induction.

UNIT TWO (10/22-11/5) Logic and the Foundations of Mathematics

Thursday, October 22

Historical Introduction to the Philosophy of Mathematics

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics & Questions Discussed: So what is mathematics? What are abstract objects? Do they exist? What are numbers, sets, proofs? How do we have mathematical knowledge? What is the relationship between mathematics and science? What is the relationship between mathematics and logic? What is mathematical intuition? Platonism, Formalism, Logicism, Intuitionism.

Tuesday, October 27

Axiomatic Method, Logic, and Mathematical Proof

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics & Questions Discussed: The Axiomatic Method in Mathematics from Euclid to the *Principia Mathematica* of Russell and Whitehead. Work in the "Foundations of Mathematics". What is mathematical proof? What are axioms? Axiomatization and data compression. Formalization. Axiomatic Set Theory. From philosophical inquiries into the epistemology of mathematics to the computer (from Frege to Turing): How philosopher-mathematicians created the computer age. That's what philosophy has done for us lately!

Thursday, October 29

The Foundational "Crisis": The Paradoxes of Logic and Set Theory

Readings: See Blackboard for readings that cover this material in case you need to supplement the lecture/discussion.

Topics & Questions Discussed: The Paradoxes of Naïve Set Theory: Russell's Paradox, Mirimanoff's Paradox, Cantor's Paradox. Semantic Paradoxes of Self-Reference: The Liar Paradox, Curry's Paradox, Berry's Paradox. The application of paradox-like reasoning within mathematics: Gödel's Incompleteness Theorems.

Tuesday, November 3

Review and Activity Day

Main Topic: The Liar Paradox—What can it teach us about mathematical intuition?

After reviewing material from 10/27 and 10/29, students will divide into groups and attempt to develop proposals for resolving the Liar Paradox. They will need first to isolate the assumptions upon which the paradox rests and then determine which assumption they want to give up and the consequences of doing so. In the latter part of the class groups will be asked to present their proposals for debate and discussion.

Wednesday, November 4 ***Last Day to Drop Classes (by 4:00 PM)***

UNIT THREE (11/5-12/1) Evolutionary Biology

Thursday, November 5

The Design Argument before and after Darwin

Reading: Kitcher, Ch. 1

Topics and Questions: Kinds of Design Arguments. The Design Argument and its Critics in Antiquity. The Epicurean Alternative to Design Theory. Evolutionary Thinking in Antiquity. Hume's Criticisms of the Design Argument. Ultimate Explanations. The Design Argument and the Problem of Evil.

Tuesday, November 10

The Age of the Earth

Reading: Kitcher, Ch. 2

Topics and Questions: What are fossils and what did people think they were? The Principle of Faunal Succession. The rise and demise of Flood Geology. Cultural factors shaping thought about the age of the earth and universe. Attempts to date the earth from antiquity to radiometric dating. Transitional Forms in the Fossil Record. Mass Extinctions. Charles Lyell's Uniformitarianism vs. Catastrophism—myths and realities. A Brief History of Creationism and its varieties.

Thursday, November 12

Historical Overview of Evolutionary Theory

Reading: DeWitt, Ch. 27

Topics and Questions: From Darwin and Wallace to the Modern Synthesis. What are the main components of the theory of evolution? What is its evidence base? What does it purport to explain? What does it *not* purport to explain?

Tuesday, November 17

Darwin and Common Descent—The Tree of Life

Reading: Kitcher, Ch. 3

Topics and Questions: The Tree of Life and the Great Chain of Being: A Brief History. From Faunal Succession to Common Descent. From Darwin's Diagram in the *Origin of Species* to contemporary 3D interactive "trees". "Analogies" and "Homologies". Basic principles of Systematics. Basic Taxonomic Terminology. When is Common Ancestry the best explanation of similarities and when not? From gross anatomical similarities to genomic similarities. The Origin of Life. The Distribution of Life in the Cosmos.

Thursday, November 19

Natural Selection and Random Mutation Part 1

Reading: Kitcher, Ch. 3, pp. 72-100

Topics and Questions: The idea of natural selection (or something close to it) before Darwin: Hume and Maupertuis. Darwin's extrapolations and crucial observations. Myths about how Darwin got the idea of Natural Selection. Darwin and Wallace. Natural Selection as an Algorithmic Process. Variation and Mutations: Beneficial, Neutral, and Deleterious. Random Genetic Drift vs. Natural Selection. Fitness Curves. The Path Dependence of Evolution. Examples of Natural Selection at Work.

Tuesday, November 24

Natural Selection and Random Mutation Part 2

Reading: Kitcher, Ch. 3, pp. 100-116

Topics and Questions: What Natural Selection can explain and what it was never intended to explain. Confusions about Natural Selection. Natural Selection and Predation, Parasitism, Pathogens, and Mass Extinctions. The Directionlessness of Mutations. The quasi-intelligent look of the products of Natural Selection. Why we should not be surprised by sub-optimal design and useless vestigial organs. Why we should not be too surprised by absurdly inefficient reproductive strategies. The "No Designer Worth Its Salt" Argument.

Thursday, November 26 ***Thanksgiving Day Holiday, No Class!***

Tuesday, December 1

Philosophical Implications of the Theory of Evolution

Reading: DeWitt, Ch. 28 (Optional, Kitcher, Ch. 5)

Topics and Questions: Does the theory of evolution have any implications for religious belief? What about ethics? How should a teacher deal with these issues if the come up in the classroom or with the parents of students? Science and Religion. Science and Ethics. Science, Religion, and Education.

Thursday, December 3

Lesson Plan Presentations

Tuesday, December 8 ***Last Day of our Class***

Lesson Plan Presentations

Thursday, December 17 ***1:30 PM Papers Due***

University of Texas at Arlington
College of Education
Conceptual Framework

The conceptual framework of the UT Arlington College of Education was developed collaboratively and has evolved over time. Following the identification of a set of core values held by all involved in the preparation of candidates enrolled in the College, members of the University, PK-12 districts, higher education institutions, and area business and foundation communities worked together to develop a shared vision for education.

All activities in the College are guided by the premise that we are Partners for the Future, committed to fostering critical, creative thinkers prepared to engage meaningfully in a dynamic society. This premise is characterized and distinguished by three core values: Professionalism, Knowledge, and Leadership. Research, Diversity, and Technology are themes woven throughout each core value. The College mission, core values, and themes serve as the coherent thread running through all professional programs, guiding the systematic design and delivery of clinical/field experiences, course curricula, assessments, and evaluation. The Conceptual Framework consists of six interrelated and interacting components, which are viewed as essential contexts for the shaping of informed, skilled, and responsible partners:

- The first core value, **Professionalism**, represents the contention that candidates develop an expertise and specialized knowledge of their field. A high quality of work, standard of professional ethics and behaviors, as well as work morale and motivation are all necessary factors of a developed interest and desire to excel in job performance.

- The second core value, **Knowledge**, represents candidate theoretical or practical understanding of a subject. In today's world, candidate knowledge includes not only academic content mastery, but also skills such as critical thinking, communication, technology literacy, and collaboration, each required for success in college, life, and career.

- The third core value, **Leadership**, represents candidate ability to organize, assist, and support others in the achievement of a common task. Candidates develop and refine their leadership skills within the context of their interactions with PK-20 students, curricula, faculty, and other professionals. The additional three components of the model, Research, Diversity, and Technology, represent themes woven into the core values:
    - **Research** encompasses the investigation of ideas and theories with the purpose of discovering, interpreting, and developing new systems, methods, and support for knowledge, behaviors, and attitudes.
    - **Diversity** is an indispensable component of academic excellence. A commitment to diversity means a dedication to the inclusion, welcome, and support of individuals from all groups, encompassing the various characteristics of persons in our community such as race, ethnicity, national origin, gender, age, socioeconomic background, religion, sexual orientation, and disability.

    - **Technology** is emphasized throughout all programs and is used to support and improve content delivery and student learning.

All components lead to the achievement of one goal–the development of informed and responsible Partners for the Future–who are committed to fostering analytical, innovative thinkers prepared to engage meaningfully in a dynamic society.