Philosophy and History of Science and Technology

TR 3:30 – 4:45
CS-114

http://philosophy.tamucc.edu

Professor:

Don Berkich, Ph.D.

Office: FC-280
Hours: TBD
Office#: 3976 (do not leave a message, send email or text instead)
Mobile#: 944-2756 (never after 9:00 p.m., texts strongly preferred)
Email: don.berkich@tamucc.edu
Web: http://philosophy.tamucc.edu/berkich

Course Description:

The Garden of Eden was lost for partaking of the fruit of the tree of knowledge of good and evil, lost not for lust but for curiosity, not for sex but for science.
--Nelson Goodman

I wish, my dear Kepler, that we could have a good laugh together at the extraordinary stupidity of the mob. What do you think of the foremost philosophers of this University? In spite of my oft-repeated efforts and invitations, they have refused, with the obstinacy of a glutted adder, to look at the planets or Moon or my telescope.
--Galileo

Aristotle maintained that women have fewer teeth than men; although he was twice married, it never occurred to him to verify this statement by examining his wives' mouths.
--Bertrand Russell

If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties.
--Francis Bacon

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.
--Max Planck

The most important scientific revolutions all include, as their only common feature, the dethronement of human arrogance from one pedestal after another of previous convictions about our centrality in the cosmos.
--Stephen Jay Gould
Man had always assumed that he was more intelligent than dolphins because he had achieved so much...the wheel, New York, wars, and so on, whilst all the dolphins had ever done was muck about in the water having a good time. But conversely the dolphins believed themselves to be more intelligent than man for precisely the same reasons.

--Douglas Adams

Science is built up with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house.

--Henri Poincare

We feel that even when all possible scientific questions are answered, the problems of our life have not even begun to be touched.

--Ludwig Wittgenstein

Science may be described as the art of systematic over-simplification.

--Karl Popper

To those who do not know mathematics it is difficult to get across a real feeling as to the beauty, the deepest beauty, of nature ... If you want to learn about nature, to appreciate nature, it is necessary to understand the language that she speaks in.

--Richard Feynman

In my opinion, a mathematician, in so far as he is a mathematician, need not preoccupy himself with philosophy - an opinion, moreover, which has been expressed by many philosophers.

--Henri Lebesgue

The great tragedy of Science - the slaying of a beautiful hypothesis by an ugly fact.

--Thomas Huxley

All those who believe in telekinetics, raise my hand...

--Kurt Vonnegut

Plato pointed out that the world is notoriously not what we perceive it to be: A straight straw appears bent in a glass of water; A bucket of tepid water feels hot to a cold hand and cold to a hot hand; A red flower looks gray in moonlight. (Indeed, the world is radically different than what we perceive it to be if our best physics is correct!) What, then, is the nature of reality, how can we have knowledge of it, and what use can we make of that knowledge? The audacious enterprise of science is to discover answers to these questions.

Every culture has made significant contributions to our understanding of the world and our capacity to change it to better suit our needs. Yet the history of science and technology raises a number of fundamental questions:

- Why should we expect the world tomorrow to be anything remotely like it was today?
- What is a scientific theory, and how do scientific theories from different disciplines relate to one another?
- What is the nature and justification of a law of nature?
- Is the notion of a completed science coherent?
- Can science ever be completed?
- What is a scientific explanation, and how does it differ from other kinds of explanations?
- Does science reveal the fundamental nature of reality, and is revealing the fundamental nature a goal humans should expect to achieve?
• What are the characteristics of scientific progress and what factors contribute to it or detract from it?

• What are the scope and limits of technological progress?

• What is a scientific revolution, and how does a scientific revolution change the technical and cultural aspects of the society in which it occurs?

• How does a technological advance change the scientific and cultural aspects of the society in which it occurs?

• Should science and technology always be pursued, or is there a point at which we ought not go further?

• Why is Evolutionary Theory a scientific theory but not Creationism?

• How are scientific explanations justified?

• How do we adjudicate between competing scientific theories?

• Can all sciences be reduced to physics?

• Is it legitimate for a scientific theory to postulate the existence of unobservable entities?

• Does scientific knowledge make technology possible, or does improvement in technology make scientific inquiry possible?

• What distinguishes a scientific discipline like chemistry or psychology from a pseudo-science like alchemy or para-psychology?

• Why is Evolutionary Theory a scientific theory but not Creationism or Intelligent Design?

• Are psychology and the so-called social sciences legitimate sciences?

• How is it that mathematics, a largely arm-chair discipline, works so well in scientific explanation and prediction as to be indispensable?

This course seeks to illuminate possible answers to these questions by exploring the philosophical, scientific, and technological developments of various cultures at various times, possibly including

• Mesopotamian
• Mesoamerican
• Egyptian
• Greco-Roman
• Indian
• Chinese
• Islamic
• European
• Russian
• Anglo-American

The course is not, however, an unwieldy historical survey: One or several specific technical and scientific contributions from several cultures are narrowly considered in light of important controversies at the time.
Topic Schedule:*

Week 1  Pseudoscience
Week 2  Pseudoscience
Week 3  Scientific Practice and Progress
Week 4  Scientific Practice and Progress
Week 5  Technology Interlude
Week 6  Under-determination
Week 7  Induction and Prediction
Week 8  Laws of Nature
Week 9  Technology Interlude
Week 10  Scientific Explanation
Week 11  Scientific Explanation
Week 12  Inter-theoretic Reduction
Week 13  Realism
Week 14  Course Summary

* Tentative, pending class pacing and interest.

Student Learning Outcomes:*

Students will

1. Learn the names of at least three important philosophers who have written on these topics--e.g., Aristotle, Popper, and Kuhn.

2. Learn the names of at least three important scientific and technological advances--e.g., the Copernican Revolution, the Lever, and the General Theory of Relativity.

* A requirement of the University for accreditation purposes only. A result of the contemptible commodification of education and the corporatization of its institutions. Used as the basis for a pre- and post-test in a facile attempt to demonstrate quality in teaching and learning. Fails to reflect any grasp of the distinction between training and education by presupposing that understanding, discovery, and knowledge can be precisely measured, economized, and thereby controlled. An embarrassing academic fad and an affront to the towering intellects whose investigations we have the privilege of pursuing this semester.

Texts:*


* Useful but not required--selections from these and other sources will be provided as necessary.

**Requirements:**

**Examination:**

There will be a final take-home examination due Thursday 5/9. Non-honors students may elect to replace the final examination with the term paper; honors students must complete both the final examination and the term paper.

**Problem Sets:**

Two to three essay questions about the readings and topics are assigned approximately every one to two weeks. Answers are strictly limited as to length and content. A total of ten problem sets will be assigned. The two lowest-scoring problem sets are dropped.

**Term Paper:**

The term paper is required of all honors students, whether they are enrolled for honors credit or not. Non-honors students may replace the final examination requirement with the term paper if they so choose. The term paper is a substantial, philosophically rigorous study of an issue or topic relevant to the course. All honors students and all non-honors students electing the write the term paper will be required to attend additional meetings approximately every other week with the professor on days and times to be scheduled. The final draft of the term paper will be due Wednesday, 5/9.

**Group Project:**

Students will be assigned to groups of five or so. Each group will identify, research, and replicate an important technological advance using only the tools and materials available at the time of the original advance. Each group will then present the technological advance to the class, explain how it was made, and describe its historic and scientific importance. For reasons of legality and safety, choice of advance is subject to professor approval. Each student will compile a portfolio of his or her individual contributions to the group project. Grades will be assigned based on the students portfolio, the novelty of the advance, and the coolness it adds to the professor's office upon being displayed there.
Policies:

The professor assumes that students enrolled in this course are sincere student-scholars. That is, the professor shall treat them with the respect due scholars, and, as scholars, they shall do their best to live up to the standards of scholars. To wit,

Preparation:

Scholars carefully read assignments in advance of class, take notes on their reading, explore specific issues in discussion with fellow scholars, and follow-up class by re-reading portions of the required readings and exploring suggested readings.

Participation:

Scholars are eager to respectfully, openly, and critically discuss arguments and issues raised by the readings. Scholars are adept at following a line of reasoning wherever it may lead. Most importantly, scholars welcome the insights and criticisms of their peers: A scholar understands that it is possible to entertain a proposition without believing it, just as it is possible to present an argument without personally endorsing the argument. Scholars enjoy vigorous deliberations and are always careful to treat fellow scholars with patience and good humor.

Assignments:

Scholars fully immerse themselves in assignments and never assume that an assignment is only legitimate if it will be covered on a test. Scholars are naturally curious and see every assignment as an opportunity to explore new issues, see old issues in new light, and hone their growing skills.

Cheating:

Scholars are very careful to give proper credit and maintain the highest standards of scholarly conduct. Thus, subject to university guidelines, any instance of cheating (including plagiarism) will be vigorously prosecuted.

Attendance:

Scholars always attend class barring serious injury, illness, or disaster. Scholars view class-time as rare and valuable for the thought it evokes and the opportunities it presents. Scholars arrive early for class and never leave class early without obtaining prior approval from the professor.
Grading Formula:

There are 1000 points possible as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem Sets</td>
<td>50 points each</td>
</tr>
<tr>
<td>Technology Project</td>
<td>100 points</td>
</tr>
<tr>
<td>Term Paper Prospectus</td>
<td>50 points</td>
</tr>
<tr>
<td>Critically Annotated Bibliography</td>
<td>100 points</td>
</tr>
<tr>
<td>Rough Draft</td>
<td>150 points</td>
</tr>
<tr>
<td>Final Draft</td>
<td>200 points</td>
</tr>
</tbody>
</table>

Total Points = sum of the best eight problem sets + technology project + prospectus + bibliography + draft + term paper

Course Grade is determined by the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>900-1000</td>
</tr>
<tr>
<td>B</td>
<td>800-899</td>
</tr>
<tr>
<td>C</td>
<td>700-799</td>
</tr>
<tr>
<td>D</td>
<td>600-699</td>
</tr>
<tr>
<td>F</td>
<td>000-599</td>
</tr>
</tbody>
</table>

Additional Notes:

Any change in the above will be announced in class. No change will be made which would be detrimental to the student's grade.

Please note that this syllabus is not authoritative. That is, the syllabus on the course website supersedes this syllabus wherever they differ. The professor and the students are only responsible for the syllabus as it appears in its entirety on the course website, including the schedule of topics and readings. This syllabus is provided solely to meet the requirements of the Texas State Legislature and has no bearing whatsoever on how the course will in fact be run.

Any student missing a due date must provide a documented, acceptable reason according to university guidelines. Students with a proper excuse for missing a due date will be given a reasonable extension.

Students without a proper excuse for missing a due date will lose 20 points per day after the due date.

*Required University Note to Students with Disabilities:* The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Corpus Christi Hall, Room #116. If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.
**Required College of Liberal Arts Note on Academic Advising:** The College of Liberal Arts requires that students meet with an Academic Advisor as soon as they are ready to declare a major. Degree plans are prepared in the CLA Academic Advising Center. The University uses an online Degree Audit system. Any amendment must be approved by the Department Chair and the Office of the Dean. All courses and requirements specified in the final degree plan audit must be completed before a degree will be granted. The CLA Academic Advising Office is located in Driftwood #203. For more information please call 361-825-3466 or log onto http://cla.tamucc.edu/advising/.

**Required College of Liberal Arts Note on the Grade Appeal Process:** As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures (available at http://academicaffairs.tamucc.edu/rules_procedures/assets/13.02.99.C2.01_student_grade_appeal_procedure.pdf). For complete details on the process of submitting a formal grade appeal, please visit the College of Liberal Arts website, http://cla.tamucc.edu/about/student-resources.html. For assistance and/or guidance in the grade appeal process, students may contact the Associate Dean’s Office.

By accepting this syllabus the student indicates that the syllabus has been read, all requirements