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Great Questions That Have Changed the World*
(HON 183)

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DAVE PRUETT

Great Questions That Have Changed the World*
HON 183, 3 Credit Hours

DAVE PRUETT
(DEPARTMENT OF MATHEMATICS & STATISTICS)
JAMES MADISON UNIVERSITY
MAUREEN SHANAHAN, DIRECTOR OF THE HONORS PROGRAM

General Description:
“Which [do we] love more, the small island of [our] so-called knowledge or the sea of infinite mystery?” (Karl Rahner). “Great Questions” are those that radically alter our perceptions of physical reality, of self, and/or of our place in the universe. For example, Jacob Bronowski observed of Einstein that he was “a man who could ask immensely simple questions” from whose answers he could “hear God thinking.” Einstein’s theories of special and general relativity each originated from simple questions and Gedanken (thought) experiments that can be readily grasped by ordinary persons. It is the answers that are extraordinary. The course will examine selected interrelated “great questions” from the domains of science and philosophy as well as their impact upon human perceptions of self and of physical reality.

Texts:

*Based upon a preliminary version developed at JMU in summer 2004 by Cheryl Talley (Psychology) and Dave Pruett (Mathematics & Statistics), with contributions by Cindy Klevickis (Integrated Science & Technology).
**Syllabus:**

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<th>Day</th>
<th>Topics</th>
<th>Readings**</th>
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**Part I—Where am I? (are we?): Questions of Place & Cosmology**

**Week 1**
- 01 Aug. 30 Introductions & Expectations
- 02 Sep. 01 Does the Earth Move?—Cosmological Origins

**Week 2**
- 03 Sep. 06 The Dome of Heaven: The Ptolemaic Universe Chaps. 1–2
- 04 Sep. 08 Earth Dethroned: The Copernican Revolution Chaps. 3–4

**Week 3**
- 05 Sep. 13 The Music of the Spheres: Kepler, Galileo, & Newton Chaps. 5–6, Newton.doc
- 06 Sep. 15 *The Search for Longitude* (VIDEO) Chaps. 7–8

**Week 4**
- 07 Sep. 20 Special Relativity I: An “Immensely Simple Question” Chaps. 9
- 08 Sep. 22 Special Relativity II: *A Wrinkle in Time* Chap. 10

**Week 5**
- 09 Sep. 27 General Relativity I: The Principle of Equivalence Chap. 10 still
- 10 Sep. 29 General Relativity II: Cosmological Implications Chap. 11

**Week 6**
- 11 Oct. 04 *Stephen Hawking’s Universe* (VIDEO): “The Big Bang” Chap. 14
- 12 Oct. 06 **Test I**

**Part II—What am I? (are we?): Questions of Biological Origins**

**Week 7**
- 13 Oct. 11 Bronowski’s “Old Testament God” Einstein Einstein.doc
- 14 Oct. 13 DISCUSSION: How Old is the Earth? Chaps. 12–13

**Week 8**
- 15 Oct. 18 *Darwin, His Daughter, and Human Evolution* Chap. 13
- 16 Oct. 20 *The Voyage of the Beagle* (AUDIO selections)

**Week 9**
- 17 Oct. 25 Evolution: Theory & Misperceptions

*Chapters refer to *Coming of Age in the Milky Way.*

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Week 10
19 Nov. 01 The Quantum Universe I: Uncertainty Chaps. 15–16
20 Nov. 03 The Quantum Universe I: Uncertainty continued

Week 11
21 Nov. 08 The Quantum Universe II: Wave-Particle Duality Chaps. 17–18
22 Nov. 10 Entropy: The Arrow of Time

Week 12
23 Nov. 15 DISCUSSION: What is Life? What is Life?
24 Nov. 17 The Double Helix. Nature, April 25, 1953

Part III—Who am I? (are we?): Questions of Perspective

Week 13
25 Nov. 22 Test II
— Nov. 24 THANKSGIVING HOLIDAY

Week 14
26 Nov. 29 The Quantum Universe III: Schroedinger’s Cat and Quantum Mystery
27 Dec. 01 DISCUSSION: Kant’s Prolegomena Prolegomena

Week 15
28 Dec. 06 DISCUSSION: Schroedinger’s Mind and Matter Chap. 19
29 Dec. 08 Summary Discussion: The Web of Interconnections Chap. 20

Week 16
30 Dec. 15 FINAL EXAM (8:00–10:00 a.m.)

Grading:
This course will examine selected “immensely simple questions” from the domains of philosophy and natural philosophy as well as their impact upon human perceptions of self and of physical reality. Because of the close historical connection between philosophy and natural philosophy (science), it is fitting that these two domains of inquiry should be considered in unison, as “inner” and “outer” approaches to probing the deeper mysteries of the universe. Because the course was designed expressly for Honors students, it will be interdisciplinary in nature and will incorporate a variety of formats and evaluation techniques.

Balance & Interdisciplinary Connections—The “immense questions” to be considered naturally blur the lines between scientific inquiry, philosophy, and religion. The course will especially focus upon resonances; that is, those points of nexus where scientific and philosophical lines of inquiry lead toward mutual illumination.
GREAT QUESTIONS THAT HAVE CHANGED THE WORLD

Critical Thinking—A premise of the course is that the process of inquiry is as at least as important as the answers gleaned. That process should follow appropriate guidelines relative to “critical thinking.”

Primary Sources—Whenever appropriate, readings will excerpted from primary sources. For example, Darwin’s *Voyage of the Beagle*, Schroedinger’s *What is Life?* and Kant’s *Prolegomena* are each primary.

Writing Intensive—Students will be required to write one book report and to keep a journal in which to respond to class discussions. Tests will include essay questions. The book to be reported upon should be chosen from a list of approved references or pre-approved alternatives, and the report will be due early in the semester to ensure that students are invested in some component of the course, for which they bring to the class relative expertise.

Communication Intensive—Approximately 1/3 to 1/2 of class time should be devoted to discussion in seminar format. Each student (in groups of 4–5) will be required to assume leadership for a class discussion. Good communication skills will be emphasized. Among these, students should employ critical and sensitive listening behaviors and should be able to deliver effective and concise oral presentations.

Historical & Cultural Context—What is the story behind the scientific or philosophical achievements? Who were the principal players? What was their historical context? Their cultural perspective? What qualities did they have that predisposed them to ask the relevant questions? What obstacles did they overcome? What was the impact of their achievement upon their culture? Upon humankind?

Grading Scale: 90–100 A, 80–89 B, 70–79 C, 60–69 D, below 60 failing, with appropriate +/-

Weight Assignment
10% Class participation (attendance, contribution to discussions, sensitive listening)
15% Presentations (“expertise” assignment 5%; leadership of assigned discussion 10%)
18% Bi-weekly journal
30% Two one-hour tests; see dates on schedule
12% 4–5 page book report
15% Final exam

The author may be contacted at pruettcd@jmu.edu

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