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

Dave Pruett
James Madison University, pruettcd@jmu.edu

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 extra-ordinary. 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:

Timothy Ferris, *Coming of Age in the Milky Way*, Perennial, 2003.

Erwin Schroedinger, *What is Life? with Mind and Matter*, Cambridge University Press, 1967.

Immanuel Kant, *Prolegomena to Any Future Metaphysics*, translation by James W. Ellington, 2nd Ed., Hackett Pub. Co., 1977.

* 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:

Day	Topics	Readings**
	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	
18 Oct. 27	DISCUSSION: "Was Darwin Wrong?" *Nat. Geo.*, Nov. 2004	

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

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 (8:00–10:00a.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.

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