

Science and Religious Experience

INTR/REL/PHYS 342, Spring 2002

T, F 1:10-2:25

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Syllabus - Expanded for Purposes of this Proposal

Catalog Description

The natural world seems very different than it did when the world's major religions developed. How should our developing understanding of the physical world affect our religious experience? Are the implications of science in conflict with religious concepts? Are science and religious experience entirely separate domains of understanding? Is there useful dialogue between them and perhaps even the possibility of integration?

The popular and semi-scholarly press are full of issues in science seen to have implications for religion. The human genome project brings issues of evolutionary design to everyone's attention. Cosmic creation issues are raised by ever more precise understanding of the cosmic background microwave radiation. The unpredictability of chaotic systems raises questions about the limits of scientific knowledge. There is increasing interest in "complexity," understood as the self-organization of systems according to principles not predictable solely from the properties of their constituents as understood individually. Biological and cosmic evolution seem to favor complexity, suggesting directionality of time, at least at the present time, and purpose. Complexity seems to suggest a "top-down" epistemological hierarchy, as opposed to the "bottom-up" hierarchy of scientific materialism (understood as "everything is simply a matter of interacting particles"). Quantum non-locality suggests that "particles," understood as localized entities, may not even exist at the quantum level. Neuroscience and robotics both raise new issues of "embodiment," understood as the separability (or not) of mind and nervous system, "soul" and "body."

We will draw our scientific examples from our current understanding of cosmology, chaotic systems, quantum physics, and evolutionary biology. Following William James, we will interpret religious experience as personal affirmation of the meaning of existence, whether or not guided by religious

institutions. We will explore the relationship of science to religious experience within the framework of conflict, separation, dialogue and integration developed by Ian Barbour.

Spring course. Lectures, demonstrations, multimedia presentations and discussion. Limited mathematical treatment of scientific concepts. Requirements: Active participation in class discussions, short answers to study questions associated with each assignment, two short papers, a midterm exam, and a final paper. Enrollment limited to 30. No prerequisites.

Rationale included in the Proposal to our Committee on Educational Policy

For a very long time humans have sought and found reassurance and relief from fear and anxiety through religious experience. These experiences have been systematized with theologies reflecting current cosmologies and communicated within communities using concepts and images derived from the natural world. As our understanding of the natural world has changed, so have interpretations of religious experience. For example, early successes of modern physics seemed to suggest that everything that happens is determined by natural laws, subject only to the initial configurations of their constituent parts. Early successes of evolutionary biology suggested that humankind itself developed in this way, as the inevitable consequence of initial conditions and natural laws. The entire universe seemed a gigantic clock, ticking away automatically, the meaning of it all buried in the distant past beneath obscure initial conditions. To some, this seemed to relegate supernatural intervention to the distant past as well, leaving only nature itself as a source of wonder and awe. Meanwhile, the analysis of systems in terms of constituent parts was extended so successfully to biological and even social situations that reductionism became almost synonymous with scientific method and a litmus test of legitimate intellectual inquiry.

Recent physics suggests a more complex and mysterious world in which unpredictable things happen. For example, in addition to being orderly at its most fundamental level, we find the world to be delicately balanced, highly interconnected, and playfully experimental. "Delicately balanced": The universe's expansion rate and fundamental forces are precisely as they must be for the universe to produce intelligent life. "Highly interconnected": Quantum non-locality demonstrates that at its most fundamental level, matter cannot be interpreted in terms of individual constituents. Our planet seems to have developed and to exist now as a highly interdependent geo-biological ecosystem. "Playfully experimental": Highly energetic systems search restlessly among myriad possibilities before settling on stable new structures and intricate new patterns of behavior. At higher levels of complexity, systems exhibit principles of organization qualitatively different from descriptions of their constituent parts. We are being led from reductionist to holistic modes of intellectual inquiry.

When supernatural power receded to the distant past, humans seemed to be the supreme beings of the universe and perhaps even the reason for its existence. Recent understanding of the origin and evolution of the cosmos and of life on our planet casts some doubt on the unique status of humans.

Species on our planet seem to have evolved partly by combining elements of common bacterial ancestors. Humans may be only, as Lewis Thomas has quipped, taxis by which bacteria are enabled to travel large distances. Species seem to last only a few million years before giving way to others. The universe itself will probably have an unhappy ending. How then do we find and affirm the meaning of our existence?

Texts

William James, *The Varieties of Religious Experience*, Simon & Shuster, 1997

Ian Barbour, *Religion and Science, Historical and Contemporary Issues*, Harper, 1997

Ursula Goodenough, *The Sacred Depths of Nature*, Oxford, 1998

D. Brian Austin, *The End of Certainty and the Beginning of Faith*, Smyth & Helwys, 2000

CD-ROM (to be distributed in class)

Packet (to be distributed in class)

E. O. James, *Creation and Cosmology*, Leiden, E. J. Brill, 1969, Preface. pp. ix-x.

S. Liebes, B. Swimme, and E. Sartouris, *A Walk Through Time*, Wiley, 1998, pp 8-28.

J. T. Cushing, *Philosophical Implications of Physics*, Cambridge, 1998, pp. 22-25, 29-31, 41, 43-46, 48-56, 59-62, 65-70, 74-79, 87, 89-95, 135-154, and 164-172.

Andrew White, *A History of the Warfare of Science with Theology in Christendom*, Appleton, 1896, pp. 130-143.

David Hume, *An Enquiry Concerning Human Understanding*, parts IV and V, in *The Empiricists*, Anchor Books, Doubleday, 1974, pp. 322-346.

John Leslie, *Universes*, Routledge, NY, 1989, pp. 2-6

About the Texts

The Varieties of Religious Experience is based on William James' 1901-2 Gifford Lectures on Natural Religion at the University of Edinburgh. His audience was drawn from the European intellectual elite of his day, but the book that resulted has been very widely appreciated. Influenced by his father's unorthodox religious views and his own tendency to depression, while growing up in the era of Darwin and the Civil War, James had gone on an extended biological collecting trip to South America with Louis Agassiz before teaching physiology, psychology, and philosophy at Harvard. For James, "religion" is most importantly personal, based on the experience, thoughts and feelings of the individual, whatever the theology or commitment to a particular religious tradition. The human condition requires surrender to

the universe; religion enables us to do so cheerfully and with fruitful consequences. He calls for calls for a philosophy of religion which would abandon metaphysics and deduction for criticism and induction. His "science of religions" would use facts of personal experience to discriminate the common and essential from the individual and local elements of religious beliefs, and would confront religious constructions with the results of natural science so as to eliminate doctrines known to be scientifically absurd or incongruous. He largely ignores the influence on individual interpretations of religious experience of theology and religious communities generally. On the other hand, his interpretation of religion as that which affirms the meaning of personal existence is not limited to Christianity or any formal religion and so provides a way of thinking about religion consistent with our increasingly global community.

Religion and Science, Historical and Contemporary Issues, is the latest version of Ian Barbour's 1965 Issues in Science and Religion, expanded and refined by 30 intervening years of teaching at Carleton College and delivering the Gifford Lectures almost 100 years after James. As it has evolved, it and other Barbour writing are often credited with creating the field of relating science and religion. The book has also become so inclusive of the developing scholarship in this field that some issues have had to be treated all too briefly. It nevertheless provides an indispensable guide to the field, as well as a clear exposition of key issues. The son of an Episcopalian mother and a Presbyterian father, who both taught at a university in China, Barbour earned a PhD in physics at the University of Chicago and taught physics at Kalamazoo College before studying religion at Yale and Union Theological Seminary. For Barbour, "religion" is primarily mainline Christian Protestantism, which takes the bible seriously but not literally. He advocates a "theology of nature" which presupposes mainline religious doctrines, but aims to help reformulate them so as to be in harmony with scientific understanding of cosmology, including human nature. He puts the reader in touch with current Christian theological issues, many of which are relevant to other world religions. His discussion of methods in science and religion introduces important links between the two as well as highlighting important differences. His discussion of contemporary science is a useful introduction and commentary on issues we will explore using other sources as well. In his conclusions he appeals to process philosophy, which is consonant with and extends the pragmatism of William James and his friend Charles Sanders Peirce. In the back of the book you will find a helpful glossary of terms, as well as an extensive index of scholars cited and a useful subject index.

The Sacred Depths of Nature presents a "religious naturalism" which appropriates Christian liturgy as well as secular poetry to express wonder, awe, gratitude and praise of the mysteries of nature and life. Goodenough is a professor of molecular genetics at Harvard, working on the "sexual eukaryotic unicellular green alga *Chlamydomonas reinhardtii*, asking how its genome encodes and triggers the transitions between mitotic growth, gametogenesis, and zygote maturation/meiosis/ germination." She seems to ignore theology, but in its appeal to religious ritual it echoes the claim by Philip Hefner's The Human Factor that only the myths and rituals of religion can command the allegiance needed to develop a comprehensive environmental ethic. Like many biologists, she also largely ignores epistemology, considering the current paradigms to be "true." Unlike the physicists, who have come up hard against the limits of their science, biologists are still in a happy what-you-see-is-what-you-get stage.

The End of Certainty and the Beginning of Faith has grown out of courses taught at Carson-Newman College in Jefferson City TN, where the author is a philosophy professor. Founded in 1851 as Mossy Creek Baptist Seminary, Carson-Newman continues its heritage of education for ministry and service to East Tennessee Baptists. Austin's book aims to reformulate traditionally conservative Christian perspectives to be consistent with the uncertainty attending the pursuit of scientific and other forms of knowledge. He sees Charles Peirce's pragmatism as affirming chance, risk, embodiedness and openness as beneficial to the life of faith, opening up a path between relativism and dogmatism. Like the pragmatists and process theologians, Austin is optimistically oriented to the future as confirming the meaningfulness of sacrifice and self-giving love.

Philosophical Implications of Physics is directed at students who have completed a one-year college level course in physics. As such, it freely uses more mathematics than is suitable for this course. For that reason students have not been asked to buy the book, lest they puzzle unfruitfully over the more mathematical sections. Cushing introduces the interplay between philosophy and scientific method using the story of the development of ancient and modern models of the universe. Both Galileo's contributions to the development of mechanics and his controversy with the Holy Office over scientific authority are treated in detail with excellent quotations from primary sources. Cushing has made a serious study of deterministic quantum theories and uses that issue to illustrate the limits of science and the importance of understanding such limits.

Religious Pluralism

Modern science grew up in a culture dominated by Christianity but has of course spread to cultures enjoying a wide variety of religious expressions. William James is interested in religious experience regardless of doctrine, and he does refer to religious traditions other than Christianity. Barbour also refers to other religious traditions from time to time, but by far the majority of his and James' illustrations are drawn from Christianity. They both come from Christian backgrounds and address audiences still primarily from Christian backgrounds. So do Goodenough and Austin. So do I. Rather than squeeze into the reading list some short, popular accounts of the relationship of science to other world religions, I urge those of you with interests in other religions to develop those interests on your own and use what you find to inform our discussions and your papers. I will be glad to consult with you about literature resources.

Course Requirements

- 1) Come to each class well-prepared: read the material in advance, take notes on it, and be ready to offer your own perspectives on it.

2) Bring your answers to the few short study questions to class. If you have had a specific CD-ROM assignment, bring your results. If you must be absent, email them to me beforehand.

3) With another student, prepare discussion questions and lead at least two class discussions.

4) Write two short papers (1000 words) and a longer final paper (3000 words). Do well on the midterm exam, based on the reading and discussion up to spring break.

Grading

Class participation 20%

Study Questions 10%

Midterm 20%

Short papers 20%

Final Paper 30%

Auditing

No auditors except when classes are open to visiting parents and prospective students. I hope that the class will develop as a community of college-age students well-prepared and willing to share personal views. So I discourage auditors, except periods officially designated for visits by parents and prospective students, and then only if the class agrees to have company. Anyone who would like to sample one or classes at one of those times would be more than welcome.

CD-ROM

The CD-ROM was initiated last summer by Bill Lindeke, '01, Iskra Valtcheva, '03, Jesse Dill, '04, and Naila Baloch, '03, working as the Hypernauts Team as part of the Williams Instructional Technology (WIT) Project. Bill and Iskra have continued working on it part time. It provides pictures, movies and interactive animations to help you learn the science yourselves, using a mouse instead of detailed mathematical analysis. You will use the CD-ROM on your own, but it will also be woven into class lectures, supplemented by demonstrations which have proved effective over many years for introducing physics to students not themselves in the sciences. The programs should run on any computer having an application to run Quicktime movies. Just open MasUsers, if using a Mac, PCUsers.exe, if using a PC. The first time through, open How To Use This Program first, then go from there. The CD is a work in progress! I look to feedback to help us explore and exploit this medium more effectively, in preparation for next year's course.

Course Format

Classes will begin with a brief review of the previous class's discussion. There will sometimes be a brief visual presentation supplementing the reading for the day, followed by discussion led by me and students or visiting instructors. After a short break, we will spend a few minutes on housekeeping and questions that have come up that are not necessarily directly related to the day's topic. Then I will present an introduction to the topic for the next class and distribute the study questions.

Teams

After the first two classes, the discussions in classes not led by visiting instructors will be led by pairs of students on the basis of questions they have made up in addition to the prior study questions. I invite you to choose your own partner and volunteer to lead discussions on topics that particularly interest you and for which you may have helpful background.

Guest Instructors

No one can be expert in all aspects of a broadly interdisciplinary field like this one. Fortunately, several Williams faculty expert in particular areas are willing to contribute to our discussions. Professor Will Dudley specializes in 19th and 20th Century Continental Philosophy, especially Kant and Hegel. He teaches a Philosophy course called Faith and Reason. Professor Lois Banta is a microbiologist and geneticist specializing in issues relating to agriculture. Professor Marek Demianski is a theoretical astrophysicist specializing in cosmology. He was a scientific advisor to the present pope when he was Bishop of Krakow. Professor Bill Wootters is a theoretical physicist specializing in quantum entanglement with applications to quantum computing and cryptography. With Wojciech Zurek, he is the author of a well-known proof that a single photon cannot be cloned.

Reading Load

Besides working with the CD-ROM, an average of about 36 Barbour-equivalent-pages are assigned for the 22 sessions for which reading is assigned. In addition, the middle chunk of James is assigned to be read over spring break. I will provide a guide to the places in those chapters useful to understanding James' eventual conclusions or particularly relevant to the other readings.

Schedule

Part One - Introduction and Cosmology

There is no assignment to be completed before the first class. During the first class a PowerPoint slide show introduces the course issues and progression. The CD-ROM is also introduced. Navigation through the movies is explained, and some illustrative segments are displayed and discussed. Housekeeping issues such as the course requirements are addressed. The assignment for the second class is to become familiar with the A Walk Through Time exhibit in our Unified Science Center. Spread out along a mile of corridors, panels display and discuss the evolution of the earth from its formation to the present, with 80 panels spread out at the rate of one million years per foot of travel. There is a description of the display at <http://www.globalcommunity.org>. In class a PowerPoint presentation emphasizes issues such as fine tuning, contingency, emergence, chance and law, self-organization, relatedness, and interdependence. The class discussion focuses on what students find to be surprising and significant. Throughout there is an emphasis on the nature and value of stories and also the subjectivity of stories.

1. F 2/1/02 Introduction: (a) A Pragmatic Approach to Science and Religion. We act on the basis of feelings based on thoughts based on experience. Science grew out of thinking about experience in terms of models. Models have come to be judged on the basis of simplicity and fruitfulness, as well as coherence and fit with observational data. Models have come to be understood as contextual and provisional, looking to the future for revision on the basis of experience. William James proposes that we take a similar approach to interpreting religious experience. What we observe and intuit about the world is data for interpretation of religious experience. The world is increasingly understood as finely tuned to produce the potential for abundant life, as driven by chance and natural law to self-organized complexity, as intricately interdependent. These ideas are illustrated by a brief preview of the course CD-ROM. (b) Outline of the course organization. No prior reading or other assignment.

2. T 2/5/02 Creation Stories. How, when and why the universe and this world have come into existence, their purpose, significance and eventual end, are perennial questions which have exercised the human mind throughout the ages. We explore a current scientific story emphasizing an ecological perspective, an emphasis on our microbial ancestry, the DNA revolution, and life's creativity in response to crisis. Assignment: Read: E. O. James, *Creation and Cosmology*, Leiden, E. J. Brill, 1969, Preface. pp. ix-x.* Brian Swimme, *Cosmic Prologue*, and Elisabet Sartouris, *The Evolving Story of Our Evolving Earth*, in *A Walk Through Time*, Wiley, 1998, pp 8-28.* Tour the A Walk Through Time tour, either by walking through the Unified Science Center exhibit, or by studying it on the www.globalcommunity.org web page. I recommend the USC exhibit for its better visual quality, the experience of walking for a mile through our beautiful new USC, and the modest exercise involved. A detailed guide is provided.

Part Two - Introduction to the Course Material

The four principal authors introduce their intents. Students are provided in advance with an outline of issues to look out for. In class the instructor connects the readings to what has gone before in both the readings and the class discussions. The class discussions focus on questions the readings have raised in the minds of the two student discussion leaders. For example, what challenges are presented by James' insistence on ignoring theological claims?

3. F 2/8/02 Introduction to Religious Experience. William James defines faith broadly as "the sense of life by virtue of which humans do not destroy themselves, but live on. It is the force by which they live," an affirmation of the meaning of existence. Read: William James, *Varieties of the Religious Experience*, Introduction by Reinhold Niebuhr, pp. 5-8; Lecture 1, Religion and Neurology, pp. 21-38; Lecture 2, Circumscription of the Topic, pp. 39-58.**

4. T 2/12/02 Introduction to Science in Relation to Religion. Should one believe in God today? Can one believe in God today? What God? Why are people religious? Do science and religion need to talk to each other? Read: Ian Barbour, *Religion and Science*, Introduction & Ch 1 through I, *The Medieval Drama*, pp. xiii-xv, 3-9.** D. Brian Austin, *The End of Certainty and the Beginning of Faith*, Introduction, pp. v-ix.** Ursula Goodenough, *The Sacred Depths of Nature*, Introduction, pp. xiii- xviii, Ch 1, pp. 3-15, and Ch 2, pp. 17-31.**

As an example of study questions, the study questions for this class are:

Study Questions 2/12

Bring short (1-3 sentence) answers to class, or email them beforehand.

No more than three sentences, please.

1. According to Barbour, what are the upsides of science-based technology? What are the downsides?
2. Of the aspects of religious pluralism cited by Barbour, which do you think most important? Why?
3. Of the many aspects of Medieval world view cited by Barbour (the tendency of each object to reach its final resting place, explanation in terms of perfect forms, nature as essentially static, humanity as distinct from and over nature, God revealed by nature, revelation as the source of belief, ...), which do you think most strongly challenged by science? Why?
4. According to Austin, what can we expect Peirce's philosophical notions to help us see?
5. What two aspects of any religion shared by its adherents does Goodenough wish to be shared among high-minded people working within diverse economic, military and political arrangements?
6. What is the chief role of an enzyme?

Part Three - The Rise of Physics and Its Authority

Fitting increasingly accurate measurements of planetary positions to the requirement that heavenly bodies move only in circles gradually became so cumbersome as to call the geocentric celestial sphere

itself into question. That posed difficult problems for theology based on Aristotelian philosophy and physics. Galileo is a key figure in both the rise of scientific method and questions of authority.

5. T 2/19/02 Models of the Solar System. The development of increasingly explanatory models of the solar system traces the path of science from developing only descriptions explained according to sacrosanct assumptions to developing explanations based on observations. Read: J. T. Cushing, *Philosophical Implications of Physics*, Cambridge, 1998, Ch 4, Secs 4.1-4.2, pp. 43-46 and Secs 4.4-4.7, pp. 48-56; Ch 5, Sec 5.1, pp. 59-62 and Secs 5.3-5.4, pp. 65-70.* Work through the CD-ROM, Ch 2, Ancient Greek Astronomy, and Ch 3, The Newtonian World, through Copernicus and Kepler.

6. F 2/22/02 Galileo and Newton. The Copernican system and Kepler's laws were thought to be mere mathematical oddities until Galileo and Newton put mathematics to motion. Read: Barbour, Ch. 1, Sec II through Sec III.1, pp. 9-18; Cushing*, Ch. 2, Secs 2.5-6 pp. 22-25; Ch 3, Secs 3.1-2, pp. 29-30; Part II, p. 41; Ch. 6, Secs 6.1-3, pp. 74-79; Part III, p. 87; Ch 7, Secs 7.1-2, pp. 89-95. View CD-ROM, Ch 3, The Newtonian World, Galileo and Newton.

7. T 2/26/02 Questions of Authority, the Trials of Galileo. Should descriptions of nature be forced to fit doctrines based on scripture, or should scripture be interpreted metaphorically when in conflict with observations of nature? Augustine and Aquinas were evidently sympathetic to the latter. Galileo thought that the purpose of the bible was not teach science, but that science could inform the sense of the scripture. The Holy Office disagreed. Read: Cushing, Ch. 10, pp. 135-147; Andrew White, *A History of the Warfare of Science with Theology in Christendom*, Appleton, 1896, pp. 130-143.*

The First paper

Having thought about the natural world as science now tells the story, and having experienced a story of the rise of science and its challenge to ecclesiastical authority, the students are asked to take a first look at their own perspective of the relationship of science to religion.

8. F 3/1/02 Ways of Relating Science and Religion. Are science and religion in conflict? Are they inherently isolated from each other by method and language? Is there meaningful dialogue between them? Is there even a possibility of fruitful integration? Read: Barbour Ch 1, Sec IV, pp. 24-29; Ch 4, pp. 77-105. First paper due. Topic: In terms of Barbour's four categories, write about your own perspective on the relationship to science of some aspect of religion which interests you. Choose something from your own experience or beliefs (or non-beliefs, if you think of them that way), whether or not they are associated with a particular religious community. I will suggest some examples in class and would be glad to talk with you individually about topics. About 1000 words, three pages.

Part Three - The Rise of Determinism and Philosophical Responses

Newton's Laws led the way to a view of the world as particles moving like clockwork responsible only to initial conditions, to attempts to model philosophy on mathematics, and to pervasive reductionism. But by the end of the nineteenth century philosophy had failed to find objective reality, and subjectivity was on the rise. Philosophical Responses II moves from Hume and Kant to begin to introduce pragmatism. Drawing on his experience with both thermodynamics and the statistics associated with precision measurements, Charles Sanders Peirce developed "tychism," a way of thinking about pervasive chance as creative and oriented to the future.

9. T 3/5/02 Determinism. If the forces on objects determine all changes of velocity (speed and direction), and velocities determine all changes of location, and everything is made up of particles in motion, is everything that happens predetermined? Read: Barbour, Ch 1, Sec. III.2-III.4, pp. 18-23; Ch. 2 through Sec II, pp. 33-42; Cushing, Ch. 11 through Sec 11.2, pp. 148-154, Ch. 12, pp. 164-172.

10. F 3/8/02 Philosophical Responses I. Considering scientific and philosophical developments through the 17th century, what can we know rationally or empirically about anything, in particular, about God? Guest Instructor: We will be joined by Professor William Dudley, Williams College Philosophy Department. Read: Barbour, Ch 1, Sec III.5, pp. 23-24, and Sec. V, pp. 29-32; Ch 2, Sec III, pp. 42-48; Austin, Ch. 1, pp. 1-17; Cushing, Ch. 3, p. 31; Hume, An Enquiry Concerning Human Understanding, parts IV and V, in *The Empiricists*, Anchor Books, Doubleday, 1974, pp. 322-346.*

11. T 3/12/02 Philosophical Responses II. Less categorically than (as James puts it) "that particularly uncouth part of (Kant's) philosophy," the process philosophers and the pragmatists nonetheless interpret our experience in terms of abstractions we cannot fully describe rationally. "Abstract and essential goodness, beauty, strength, significance, justice soak through all things good, strong, significant, and just." (James again) There is a convincing reality presented to us by these qualities, but they are intuitions coming from a deeper level than the rational, and even the subconscious interpretation varies from person to person and from time to time. Reading: Louis Menand, *The Metaphysical Club*, Ch 13.4, pp. 351-358.* Austin, Ch. 2, pp. 19-34. James, Lecture 3, *The Reality of the Unseen*, pp. 59-77.

Midterm Exam - Based on the readings

A midterm exam just before a long spring break provides an ideal opportunity for review and a check on how well students have responded to the course material to that point. The two week spring break provides an ideal opportunity for students to read through the material of James' long middle chapters with their numerous examples.

12. F 3/15/02 Midterm

Spring Break

Read William James. Lectures 4-17, pp. 78-336. A summary of major points is provided.

Part Four - Religious and Philosophical Pragmatism

After many examples illustrating his ideas about religious experience, surrender, conversion and saintliness, James introduces his pragmatic philosophy of religion. The subsequent reading from Austin, introducing Peirce's philosophical pragmatism, is supplemented by a lecture presentation.

13. T 4/2/02 Philosophical responses III. Philosophy cannot hope "to demonstrate by purely intellectual processes the truth of the deliverances of direct religious experience." Therefore philosophy should "abandon metaphysics and deduction for criticism and induction, and frankly transform herself into a science of religions." James, Lecture 18, pp. 337-376

14. F 4/5/02 Philosophical responses IV. "The future is an indispensable part of all our thinking, scientific or otherwise, and that future is irreducibly fuzzy." So "we work out our salvation in fear and trembling." Read: Austin, Ch 3, pp. 37-57; Ch 4, pp. 59-75

Part Five - What Can We know, and How Can We Know It

The pragmatic approach to knowledge of religion and science leads nicely into Barbour's exposition and analysis of models and paradigms and the similarities and differences between methods in science and religion. The discussion in Barbour's chapter on biology and theology in the 19th century needs to come before that.

15. T 4/9/02 Evolution. Although the components of a theory of evolution had been separately proposed previously, the Darwinian synthesis provided a natural explanation for such a wide variety of data as to challenge all previous concepts of design, and not only in biology. Read: Barbour, Ch. 3, pp. 49-74. Goodenough, Ch 3-4, pp. 33-61

16. F 4/12/02 Models and Paradigms. What can we know, how we can know it, and implications for religion. Abstract models and tentative contextual approaches to understanding. Read: Barbour, Ch 5, pp. 106-136.

17. T 4/16/02 Similarities and Differences. Continuation of what we can know, how we can know it, and implications. Read: Barbour, Ch 6, pp 137-161. Second paper due. Topic: What we can know and how we can know it, differences and similarities between knowing in science and in religion, and implications. Those wishing to use Christian examples may wish to use parts of Ch 5 and CH 6. Others may wish to draw on outside sources. Again, I will suggest some examples in class and would be glad to talk with you individually about topics. About 1000 words, three pages.

Part Six - Some New Relevant Science

Modern biology and physics seem to confirm the direction in which philosophical conjectures about the methods and limits of science and the creative role of chance had been heading at the end of the 19th century. There are new stories of fine tuning, contingency, emergence, chance and law, self-organization, relatedness, and interdependence. Quantum physics calls into question the existence of the localized entities we call "particles," let alone the question of their determinate role in nature. This year's order of these topics has been determined by Professor Banta's availability and my need to be away for a week at the Kanuga Spiritual Formation Summit,

18. F 4/19/02 Evolution of Biocomplexity. Does the interplay of chance and lawful consequences lead naturally to complex structures and behaviors? Guest Instructor: We will be joined by Professor Lois Banta, Williams College Biology Department. Read: Austin, Ch 7, pp. 118-134. Goodenough, Ch 5-8, pp. 63-115. Work through the CD-ROM, Ch 1, Cosmology and Evolution, starting with Sec 4, Origin of Life.

19. T 4/23/02 Cosmology & the Anthropic Principle. The universe seems to have evolved so far so as to be especially, perhaps uniquely, hospitable to the development of an ecosystem favorable to humans. If it had not, we would not know it because we would not exist. Were there special plans, or did it just happen by chance? Guest Instructor: The class will be taught by Professor Marek Demianski, Williams College Astronomy Department, as I will be away at a conference. Read: Barbour Ch 8, pp. 195-220. John Leslie, Universes, Ch 1.4-1.4, pp. 2-6. Work through the CD-ROM, Ch 1, Cosmology and Evolution, through Sec 3, The Solar System.

20. F 4/26/02 Quantum & Chaotic Uncertainty. Considering the sensitivity to initial conditions of far-from-equilibrium, nonlinear systems, can the future be predetermined even in principle? Guest Instructor: The class will be taught by Professor William Wootters, Williams College Physics Department, as I will still be away at a conference. Read: Barbour, Ch. 7, pp. 165-174, 179-194. Austin, Ch 5, pp. 77-96, Ch 6, pp. 100-114. Work through CD-ROM, Ch 4, Certainty and Uncertainty, and Ch 5, Quantum Beginnings. The study questions for this class contain explicit instructions for using the interactive animations to illustrate deterministic chaos and quantum uncertainty and non-locality.

21. T 4/30/02 Evolution and Continuing Creation. Is there a relationship between random sampling of parameter space by far-from-equilibrium biological systems and the successful development of complex structures? Is there a plan? Is there a goal? Read: Barbour, Ch 9, pp. 221-249. Austin, Ch 8, pp. 135-152.

22. F 5/3/02 The Human Future I. Can we guess the unpredictable future? Is there an ultimate future? Is that the meaning of the present? Is that the only meaning? Read: Austin, Ch. 9, pp. 153-165 and Ch 10, pp. 167-178. Goodenough, pp. 167-174. Barbour, Ch 10, Sec III, pp. 277-280.

Part Seven - Conclusions

We consider several ways in which our understanding of religious experience might be reconsidered on the basis of our understanding and the limits of our understanding.

23. T 5/7/02 Theologies of Nature. Reformulating our understanding of God. Read: Barbour, Ch. 10, pp. 253-280 and Ch 11, pp. 281-304

24. F 5/10/02 Conclusions. Read: James, Lecture 20 & Postscript, pp. 377-408.

Final Paper due by the end of reading period. About 3000 words, 10 pages. Topic of your choice. Again, I will suggest some examples in class and would be glad to talk with you individually about topics.

* Packet (to be handed out)

** Required Text

Refining the course

At the end of the last class, as is true of all classes at Williams, students will fill out two course evaluation sheets. The formal college form is included with this proposal. In addition, as is traditional in the Physics Department, there will be an additional sheet exploring reactions to particular course features. Together with the three papers from each student, these evaluations will form the basis for revising the course before offering it next year.