GOD AND NATURE: SCIENTIFIC & RELIGIOUS PERSPECTIVES ON HUMANITY AND THE COSMOS

Institution: Global Stewardship Study Program, Christian Environmental Association

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COURSE DESCRIPTION

This course presents a broad overview of the methods, history, and contemporary issues in the relationship between scientific and religious ways of knowing. It includes emphasis on comparative methodologies and philosophies of science and religion, models of and approaches to faith science interaction, historical analyses of faith-science engagement, and a variety of specific topics involving scientific and religious perspectives on the nature of humanity and the cosmos. The emphasis is on developing a general conceptual appreciation of the range of ways in which scientific and religious understanding may interact, so that the you be able to bring this understanding to the appreciation of not only particular contemporary but hopefully future issues as well.

COURSE OBJECTIVES We want to be explicit about a number of general objectives we have for you as a student in this course. In addition to the following global objectives, there are specific goals and foci for each unit, indeed each session, which will be described both in class and later in this syllabus. Overall course goals include the following:

Your engagement with scientific understanding 1. You should develop a basic understanding of what has often been called the scientific method, including familiarity with areas of controversy and ambiguity about just what scientific methodology does and does not entail. 2. You should acquire an appreciation for how the theoretical content, understanding of method, and even the concept of "law" has changed historically in science. You should be able to relate the dynamic and tentative nature of scientific knowledge, evident through history, to its engagement with contemporary issues. 3. You should be able to formulate a variety of contemporary philosophical understandings of what scientific knowledge and progress, or change, entails. 4. You should be conversant with the theoretical content of scientific explanations for the specific questions about the natural world we will discuss as the course progresses. Moreover, you should be able to articulate the scientific and cultural significance of these ideas. Most of these theories will relate to the biological sciences, though some will involve physical sciences. They will, however, span human and non-human domains; microscopic, macroscopic, global, and cosmic levels of integration.

Your engagement with religious understanding 1. You should be familiar with various forms or sources of what is called religious knowledge, including systematic theology, mystical experience or revelation, textual exegesis, and community authority. You should recognize differing understandings of these phenomena, and variations in how different

Christian traditions relate them to one another. 2. You should develop an understanding of how religious concepts that relate to many of the ideas science engages, have changed over history and how much variety currently exists between religious traditions. While we will emphasize biblical, and specifically Christian understandings, you should come to an appreciation of the extensive diversity in coherently Christian interpretive perspectives. 3. You should acquire a (rudimentary) appreciation of how ideas about cosmology, origins, natural law, the environment, and humanity's place in the world differ between Christian and Mayan traditions.

Your engagement with religion-science dialogue 1. You should be able to describe a variety of approaches to relating scientific and religious knowledge, and critique the rationale for and problems with each. Moreover, you should be able to reflect on arguments for one approach being "best," or whether various approaches have merit for different topics or historic contexts. 2. You should be able to explain several distinct models for describing the differing ways of relating science and religion, i.e., describe not only different approaches to relating the disciplines, but differing taxonomies of those approaches. 3. You should have a sense of how basic explanatory tools like hypotheses, laws, models, myths, or paradigms are developed, tested, and employed in science and religion. You should have an idea of how we apprehend limits or boundaries to our understanding, and how we recognize error or conclude we're "right" in both science and religion. 4. You should be able to apply the above areas of understanding to particular scientific ideas that have theological import, and religious understandings that bear on issues science explores. Moreover, you should have an appreciation for a variety of specific issues where science and religion engage one another.

Your engagement with particular issues in science and religion There is a number of specific issues in science and religion we will treat in this course. Each are enumerated later in this syllabus, along with a description of significant questions and why those questions are important for educational goals. Some general objectives about our approach to particular issues include: 1. You should learn to approach issues with a sensitivity to the breadth of scientific and theological opinion that attends them, and an understanding of how they may be engaged by different ways of relating science and religion. 2. You should learn to evaluate issues on the basis of their significance to our general understanding of God's role in the world, the world's role in our understanding of God, and science and religion as ways of apprehending meaning - rather than on the merits of their ethical, technological, or clinical import. 3. You should encounter a variety of issues across history and cultures, and from that, be able to recognize commonalties that apply to our contemporary situation.

Personal or Affective Goals Some of the most important objectives of this course are not curricular or strictly cognitive at all. They have to do with how you personally relate to, enjoy, and integrate the ideas of other traditions and disciplines, other people, and even yourself. 1. *Appreciative Rationality:* In this course you will encounter a great range of diverse ideas, many of them quite different from what you may believe yourself. One important course goal is for you is to learn not just to cordially tolerate, but to actually appreciate, such diversity. An important tool for achieving that is what might be

considered a generously probing rationality - i.e., using your mind as a vigilant sleuth to uncover the reasons another has for maintaining a position. Cultivate the assumption that a trail of good reasons is a joy to discover and is often present even if not initially recognized. This will not only open up vistas of fruitful dialogue, but will confer access to an enriching domain of intellectual enjoyment. 2. *Intellectual Humility:* In order to appreciate the ideas of other people and disciplines, you do not have to be apologetic about having firm beliefs yourself. Another goal of this course is to enable you to develop and hold your own convictions about what is true - and learn to embrace them reasonably, even persuasively, yet with appropriate tentativeness. Such tentativeness is rooted in recognition that our understanding is always frail, ever open to revision or improvement. For the Christian intellectual task, this humility does not reflect half-hearted conviction, but rather whole-hearted recognition that with all our understanding, even (perhaps especially) in the important area of relationship with God, our life rests not on the complete adequacy of our knowledge, but on the complete assurance of His faithfulness: "Lean not on your own understanding, but trust in the Lord with all your heart..." is a basis for epistemological humility, which ironically becomes a means of approaching the most constructive understanding. 3. *Worldview Integration:* The "integration of faith and learning" has become something of a shibboleth or catch phrase in Christian higher education, as has rhetoric affirming the importance of "developing a biblical worldview." Indeed, these are both crucial endeavors, but they have often come to mean merely the construction of a conceptual edifice for harmonizing particular theological and scientific notions. Our goal is to help you develop a meta-level approach to relating very different kinds of understanding, or elements of your worldview. Moreover, as sociologists of religion Peter Berger and Thomas Luckmann observe, a worldview is much more than a mere cognitive structure, but is a posture of engaging the world which influences not only your ideas, but also your feelings, your commitments, your values, your decisions. In fact, our cognitive structures can actually serve to obscure our underlying worldview from recognition! In such a case, what needs "integrating" is our worldview itself, with the conceptual and behavioral elements of daily life. Bottom line: an important but elusive goal of this course is to contribute to your recognizing and developing the deep perspective on the world that actually influences how you live.

COURSE FORMAT As with all courses in the GSSP, this course seeks to balance participatory group learning and independent study, substantial reading and regular writing, faculty lectures and student discussion/presentations, and experiential field-work with reflective journaling. This is not an attempt to give you more to do than can be reasonably accomplished. Rather, it is based on the observation that various kinds of activities contribute jointly to effective learning. In fact, the course design and program structure reflect the conviction that instructional design is itself part of the "curriculum," i.e., how you engage course material is as important a contributor to your learning as is the curricular content itself. Therefore, the course will utilize the following assignments:

A. Readings / Reading Journals All students will complete core readings, plus independently chosen sources for research projects. The core readings will come from the primary course texts and supplemental articles or book chapters specified in this syllabus. Because we want you to do and keep up on the readings in order to participate in

intellectual dialogue, not just pass a test at the end of the semester, the major responses to the readings will involve regular, daily discussion sessions and journaling. Journals will entail regular personal reflections on the reading, as well as brief essays over assigned synthetic questions.

B. Lectures / Exams Visiting faculty will conduct lectures and discussion sessions, and work with you on research topics during 7-14 day on-site stays. During these times, you will be working exclusively on the material for this class. There will generally be lecture followed by class discussion in the morning, reading in the afternoon, and student presentations and discussion sessions in the evening. At the conclusion of each instructional unit with visiting faculty, there will be an exam. During periods between units when there will not be lectures or visiting faculty present, you will be doing reading and research projects, and convening for field trips and discussion sessions as led by the Course Director.

C. Discussions / Group Learning A major portion of this course will be regular discussion sessions. In these sessions students will read from their journals and critique and explore implications of the readings. Becoming a learning community, learning from the insights of others, and learning how to express your ideas to others is a major goal of this course. In fact, we believe genuine learning must involve developing the ability to participate in intellectual dialogue, rather than merely memorizing facts or delivering a formal argument. It is imperative that you come to discussion prepared to participate - you must have done the reading, and equally important, you must have reflected upon it. That is one reason why keeping up on your reading/reflection journal (see below) is important. The famous ecologist, Garrett Hardin, wrote an influential essay entitled "The Tragedy of the Commons," in which he argued that a large, commonly accessed resource - like oceans or atmosphere - is unusually vulnerable to exploitation. That is because each person thinks they can neglect their individual duty to sustain it, and it will not be felt if there is sufficient corporate responsibility. The problem is, everyone is susceptible to doing that, and the commons degrades. Don't let discussion times reflect the tragedy of the commons syndrome! Your contribution matters. If all of us come prepared, we will be jointly and individually enriched.

D. Projects: Research / Praxis Each student will participate in two kinds of projects, either or both of which may be conducted in groups. First, in consultation with course director and/or faculty, you are to formulate a research question, do additional reading on a meta-level faith/science topic of interest, synthesize results, and articulate it in a written paper and oral presentation to the class. Your paper and presentation will be graded and computed into your final course grade. Second, you will be involved in the local life of Blue Hole community through educational, clinical, or environmental internship projects. This activity will not be graded as part of this class, and indeed its praxis orientation-- constitutes a counterpoint to our emphasis on meta-level questions. But we want you to be able to make a connection between the theoretical questions we study in this course and the pragmatic implications of the issues you encounter as science meets religion in the surrounding culture. For example, if you are teaching science in a local school or doing public health work in the local village where, in each case, there are significant

interactions with prevailing religious beliefs, your study in this course should contribute to your ability to reflect broadly on your experience. This is not an attempt to use your studies to "fix" the local situation, but it involves the opportunity for you to observe, participate in, and learn from the dialogue between scientific and religious perspectives on contemporary issues - here. Therefore, you might consider the similarities and differences in the engagement between science and religion in American and Belizean cultures. In the U.S. there is considerable attention on creation/evolution, alternative or "New Age" medicine, secular environmentalism, and religious suspicions of "secular" naturalism. Here, you will find public concern for shamanism, Mayan views of nature, medicinal herbalogy, and indigenous religion's hesitation about "first world" science. At the end of the semester, students will share with the class their own reflections on how the underlying themes of this course related to their observations of science and religion in the surrounding culture.

E. Field Trips / Field Log Believe it or not, a variety of field trips will illustrate issues and immerse you in locations pertinent to the focus of this course. While it wouldn't seem like a course on science and religion could meaningfully incorporate field trips, the fact is that both science and religion are responses to humans' experience of the natural world. We will visit a number of places that have figured prominently into the development of both scientific and religious ideas. Major field trips will visit Tikal, the ancient Mayan cultural and intellectual hub laid out according to their religion's astronomical and cosmological principles; the Panti ethnopharmacological research center and medicinal botany preserve; the Smithsonian Carrie Bow reef research station, alongside a subsistence fishing community practicing Garifunal religion; and an extended stay in a rainforest site similar to those which provoked the scientifically and theologically significant ideas of nineteenth Century naturalists, particularly Darwin and Wallace. For these trips and other shorter day trips, you should record your observations, questions, and reflections in a Field Log, which along with your reading journal, will constitute a legacy to yourself from experiences in this course. Questions to consider on these trips, and their particular relevance of each to the subject matter, are described in the topical schedule of this syllabus.

COURSE TEXTS The following texts will serve as major course references, and will be required reading for all students. In addition to these texts, there are also various reserve articles which all students will read. The text and reserve readings for each class session are specified in the topical outline found in the next section of this syllabus.

Barbour, Ian. 1997. *Religion and Science: Historical and Contemporary Issue*s. Harper Collins, New York.

Hutchingson, James E. 1993. *Religion and the Natural Sciences: The Range of Engagement.* Holt, Rinehart, and Winston, Inc.

Lindberg, David C. and Ronald L. Numbers. 1986. *God and Nature: Historical Essays on the Encounter between Christianity and Science*. University of California Press.

Reichenbach, Bruce R. and V. Elving Anderson. 1995. *On Behalf of God: A Christian Ethic for Biology*. Wm. B. Eerdmans, Grand Rapids.

COURSE TOPICS AND READINGS The following outline provides a structural overview of where we will be going in this course. It describes topics for lecture and discussion and specifies required readings (for all students) in the context of what kinds of questions we will be exploring and why they are significant. The included questions are not exhaustive but are representative of two general types. Some are fairly specific, and reflect significant issues which should be clear from lecture or readings, and which are important for the development of your understanding. Others entail a more reflective and synthetic approach, and ask you to assess the relationship between ideas, or explore your own positions. Both kinds of questions will be discussed in class, and both would provide excellent substrate for analytic extrapolation in your journals.

A. Scientific and Religious Ways of Knowing This unit will introduce you to similarities and differences in how science and religion develop, implement, and evaluate explanations. Humans "understand" things through a many kinds of explanatory and cognitive devices: models, theories, myths, stories, metaphors, paradigms, and world views. As you will see, there is a range of interpretations even about what constitutes science and religion, and also about what their respective strengths and limitations are. *** = *course text***

1. Overview of the method and knowledge of science. *Reichenback & Anderson, Ch. 1: *Science as a Human Endeavo*r. Mannoia: *What is Science?* (photocopied pages on reserve) We will begin to develop a sense of how scientists and philosophers of science understand what distinguishes scientific knowledge. Questions we will discuss include, what is the traditional Bacon Ian and positivist conception of science? In what ways is science deductive and in what ways is it inductive? What is meant by "hypothetical-deductive" reasoning, and how does or does it not typify science? In what ways is mere observation necessary but insufficient for science, and how does the interpretation of observations depend on assumptions or the non-observable? How do we change ideas in science, and how do Popperian and Kuhnian views of science differ? This is important, because it sets us thinking about how varied are the understandings about the ways knowledge is modified, corrected, and rejected. Finally, in preparation for ensuing classes - we need to distinguish between a theory, a paradigm, and a world-view. How do they relate to one another, and how do they all figure in science?

2. Models and paradigms in science and religion. *Barbour, Ch. 5: Models and Paradigms

We want to take the concepts you learned about science and expand them into an appreciation for differing theories about what science is and how we test scientific knowledge. We also want to examine various interpretations of the ways in which religious knowledge is similar to and different from scientific knowledge. What are four criteria for assessing theories in scientific research, and what does Barbour mean by saying he believes the meaning of truth is just one of these (correspondence with reality),

but the criteria of truth must include all four? This is important because it lays the basis for intellectual humility: the conviction that there really are true ideas about the world, but determining their truthfulness is difficult because of limited access to the "reality" of the world. How does he relate this to the notion of critical realism? Now we want to look at how models are used in religion. How are models used in religion in ways that are similar to science? How are they used without parallel? In what ways does this relate to the distinction between personal and impersonal models? This enables us to look at general differences and similarities between the use of paradigms in science and religion. How is it that religious paradigms seem more resistant to change, yet there are paradigmatic revolutions in both personal and social religious life (e.g., conversions and reformations). In what ways is Lakatos's notion of a "program" intermediate to Kuhnian "paradigms" and Popperian falsificationism? This is important, because it may be helpful in understanding change in religious concepts. How does Nancy Murphy propose to use Lakatos's method in understanding theology? Does it help us understand the tension between resistance to change and modifiability of religious ideas, if we consider some of them "central" and others "peripheral" in a way analogous to Lakatos's hard core and auxiliary hypotheses? But how do we determine the difference between these domains in religion, and how do we conduct dialogue between religious communities that differ in their understanding of what is central? Finally, what is meant by the observation that differences between science and religion usually entail scalable differences in emphasis on one term of a shared polarity, e.g., objective & subjective, criticism and tradition, etc.

3. The language of explanation in science and religion. *Huchingson, Part II: Words, Images, and Stories; Roger Schmidt, "The Functions of Language in Science and Religion"; Earl Mac Cormack, "Metaphor in Science and Religion"; Susanne Langer, "Understanding Myth"; Brian Swimme, "A Cosmic Creation Story"

Having briefly examined the method and content of scientific and religious understanding, we want to compare and contrast how they express understanding - in part, because the use of language may itself significantly interact with understanding. Questions we will consider on the basis of readings and lecture include the following: How does the search for objectivity influence character of language used by science? Why do positivists claim religious language is emotive and cognitively meaningless? What is double-intentional language, and how does religious language reflect this? How does Schmidt explain the difference between understanding that involves a paradox and a sense of meaning that is ineffable. Why is it claimed by some that language cannot describe the "sacred" in the same way that it describes the "secular"? This will have important implications for how we seek to understand dialogue between science and religion. How are metaphors used in science and theology, and what are the limitations involved in "metaphorical tension"? What is a faded metaphor? This is important because commitments to particular language can over assert its correspondence or outlive its utility. Langer points out that objects in nature have often been used as personal agents in myths. How has science served to reverse this? This is significant, because many believe this process may have contributed to human objectification of or alienation from nature. Swimme suggests that we can bridge the gap between nature and our lives by telling stories. How are theories different from and similar to stories? Swimme claims current

scientific theories are being used to create a new story. What would Langer think of this? Again, this tension has significant implications for how science and religion may engage one another.

4. Further similarities and differences in science and religion *Barbour, Ch. 6: Similarities and Differences; Langdon Gilkey, "Theories in Science and Religion"

What is the difference between theoretical and historical explanation in science, and how do they make differential use of laws vs. narrative? What is the role of "law" (or doctrine) vs. narrative in theology, and what differences exist regarding current interpretations of the importance of whether biblical narrative has historical veracity? This has significant implications for the relationship between biblical narrative and science. Barbour believes that the point of biblical narrative is not history, but message; yet historical veracity is important because many stories lose their power if the illustrative event (e.g., the Exodus or crucifixion) never occurred. How do we distinguish between narratives where the history does and doesn't matter? How might this relate to the Lakatosian-derived notions of central and peripheral truth claims? For Gilkey, a historian cannot identify God as a cause, but a theologian may interpret events as manifestations of God's providence or judgment. Why does this require him to advocate a large methodological divide between religion and science? One of the ostensible advantages of this divide is his claim that religious assertions cannot be empirically disproved, i.e., religion does not have to retreat before science. What are the disadvantages of such immunity to falsification and the attendant disciplinary separation?

B. Relating Science and Religion: Philosophical Models & Historical Perspectives In this unit we will take the differences and similarities between science and religion we have discussed, and use them to explore the variety of understandings for how science and religion interact. It is, after all, not just the character of but the engagement between science and religion, which is the focus of this course.

5. Barbour's "four approaches" model for relating science and religion *Barbour, Ch. 5: Ways of Relating Science and Religion.

Although there are many variations, Ian Barbour has suggested ways of relating science and religion can be meaningfully grouped under four broad categories: conflict, independence, dialogue, and integration. Although Barbour is treating religion's relationship to science rather than culture in general, in what ways are Barbour's typology and approach similar and dissimilar to the classic work by Niebuhr discussed in class, Christ and Culture. Niebuhr has recently been criticized by many theologians, especially those in the Anabaptist tradition, for representing some traditions as "straw men". Why do you think Barbour has not generated a similar response amongst theologians and science-religion scholars? Barbour is straight forward about his support for the dialogue model, but he acknowledges that a number of sophisticated workers take a different approach - in fact, many of them take different approaches on different issues. Why would Barbour favor one position as a general approach? What does this accomplish in terms of setting an intellectual agenda? What are its limitations? In his

discussion of integration, what is meant by the distinction between natural theology and theology of nature? If we have no natural theology, how do we know God exists other than by mystical revelation or brute scriptural authority, i.e., what difference does the world make to belief ? If we have no theology of nature, what difference does God make to our engagement with the world? Although most believers participate in each tradition to some extent, they also have risks to both faith and science. What are the risks? Finally, Barbour discusses attempts at syntheses, in which science may inform our theology, but theology not only helps interpret nature, but may inform our science. While biblical literalists (like scientific creationists) are often categorized as subscribing to the conflict model, in what ways might they be viewed as attempting synthesis? What are the attractions and pitfalls of such an ambitious endeavor?

6. Other approaches to science-religion: cooperation *Huchingson, Part I: The Range of Engagement; Harold Schilling "The Threefold and Circular Nature of Science and Religion"; H. Richard Niebuhr "Radical Faith and Western Science"; Hans Kung "On the Relationship of Theology to Science"

Although Schilling argues that differing but complimentary methods of science and religion make dialogue possible, what could the two approaches talk about given their distinctive emphases? Some critics of the dialogue model have suggested it really only involves successive monologues, with no collaborative search for truth as in the advocates of integration claim to seek. Is this true? How would the "kinds" of projects on which science and religion might collaborate, differ between Schilling and a natural theologian or synthesist (i.e., one seeking integration)? Niebuhr (not the author of Christ and Culture) believes that the great enemy of monotheism is unwavering commitment to a closed truth system, which he takes to be idolatry. How can the enterprise of science both generate such a system and resist it? Given Niebuhr's resolute opposition to scientism, how can he still claim that science is a strong ally of monotheism? In what ways does Niebuhr's position fit none of Barbour's four models, yet still allow for positive though indirect and unilateral interaction? Although Kung, like Pascal, believes theology answers the more important questions of existence, why is he neither an example of separation nor of conflict? How is his affirmation of incomplete pictures of reality, an example of intellectual humility? How does he advocate going beyond successive monologues?

7. Other approaches to science-religion: complimentarity or independence
*Huchingson, Part III: The Two-Storied Universe; Langdon Gilkey, "Theories in Science and Religion" (reread or review); C.S. Lewis, "The Naturalist and the Supernaturalist"; Richard Bube, "The Failure of the 'God of the Gaps'"; Albert Einstein, "Science and Religion"

Gilkey argues that science and religion are incommensurate with respect both to their methods and their topics of investigation. How could he, and those advocating conflict, dialogue, and integration all have testified on the same side (against creation science) at the Arkansas trials over science curricula - given the fact that they disagree over the boundaries between science and religion? If Gilkey doesn't believe biblical statements

are empirically falsifiable (e.g., the Fall is not a historical reality), does he believe it and similar doctrines are ontological realities? How can that be? How does C.S. Lewis define scientism and naturalism? Why is he opposed to each on both theological and general intellectual grounds? Some argue that in addition to resisting scientism, Lewis was actually hesitant about and under appreciative of the importance of traditional science itself, and even betrayed a disposition toward the conflict model. Is there such a thing as "just war" model in science-religion, where one recognizes the legitimacy of conflict without asserting its inevitability or preferability? Bube's critique of the "God of the Gaps" was made by Bonhoeffer, and as with Gilkey, saves notions of God the humiliation of shrinking as science expands. What is the difference, if any, between G-o-G and the imputation of God's agency to the miraculous? Do you think there is any connection between Bonhoeffer's original critique, his notion of a God that can be pushed out of the world, and the events of the Holocaust that he witnessed first hand? Einstein argued for separation of scientific explanations of mechanism and religious teachings of morality - with no dialogue. Yet he also passionately affirmed that nature revealed an intelligence, in a way reminiscent of 19th Century natural theologians? How did he do this without contradiction? How is it that he experienced genuinely religious awe over design in nature, while eschewing supernatural accounts in both science and religion? Given his suggestion that religion discard belief in the supernatural, how would C.S. Lewis respond?

8. Other approaches to science-religion: complimentarity *Reichenbach & Anderson Ch.2: A Christian Ethic of Stewardship. What is meant by Christianity in isolation and Christianity held hostage? Although this may refer to relationship with a variety of cultural elements, how may it be used to describe engagement between religion and science? How is a middle ground described that balances interactive tensions, and in what way may this facilitate dialogue? The paradigm of stewardship may provide a foundation for dialogue between what we know about the world and how we understand our relationship to it and our Creator. However, what new tension or paradox is implicit to the notion of stewardship? How is the notion of changing creation for the good of the Landlord, made more comprehensible by a revised view of how the Landlord may gain from his creation? This is important, because our obligation to change the world for the benefit or its Creator has an impact on how we view scientific knowledge and its application. How may a notion of stewardship thus legitimate science and technology? How does it also impose moral obligation on those who conduct science, and cause us to view science and technology as being non-neutral with respect to values? The notion of stewardship has often been applied to care for ecological integrity, but it may also inform the way scientific and religious perspectives interact in our care for all aspects of nature and human persons.

B. HISTORICAL CASE STUDIES OF SCIENCE/RELIGION INTERACTION

This unit will briefly examine several examples of the historic interaction between religion and science. The readings will focus on significant events in the relationship between religion and European science, although where appropriate, we will compare these events with analogs in the largely unified system of Mayan religion and science.

9. Models for understanding historic interaction between science and religion
*Lindberg and Numbers: "Introduction" As with Barbour, Lindberg proposes or rather reviews several basic interpretive approaches to the historic interaction between religion and science: warfare, harmony, and complexity. In what ways are they similar to and different from Barbour's typology? How could one subscribe to the harmony model of historic interpretation with-out advocating the integration model of theoretical engagement? Why has the warfare model been largely abandoned, and how has a more sophisticated understanding of conflict recently reappeared without ascription of villainy? Unlike philosophical models for interaction, which all have their advocates, why do you think models of historical engagement are all recognized as having some merit in different contexts?

10. Galileo's cosmology *Barbour, Ch. 1 "Galileo's 'Two New Sciences'"; William Shea "Galileo and the Church" (*Lindberg & Numbers, Ch. 4) While the Galileo affair is traditionally used as an example of conflict between religion and science, how do some use it as an illustration of how the conflict model itself is a historical oversimplification? From the perspective of Barbour's models, critique Galileo's statement, "science tells us how the heavens go; the bible tells us how to go to heaven." What would Gilkey, Einstein, Niebuhr, and Kung think of this? Which Christian theological traditions would agree and which would disagree with the assertion that this is primarily what the Bible tells us. What theological issues were at stake in the controversy over Galileo's cosmology, and how do they relate to the distinction between "core" and "peripheral" knowledge. What other religious and social issues were involved?

11. Newton's mechanics *Barbour, Ch. 1 "The Newtonian World-Machine"; Richard Westfall, "The Rise of Science and the Decline of Orthodox Christianity: A Study of Kepler, Descartes, and Newton." (*Lindberg & Numbers, Ch. 8); Margaret Jacob, "Christianity and the Newtonian Worldview" (*Lindberg & Numbers, Ch. 9); Roger Hahn, "Laplace and the Mechanistic Universe" (*Lindberg & Numbers, Ch. 9)

Newton's theory raised significant challenges to conceptions of divine agency. Why do you think his theory experienced less resistance than did Galileo's? Newton himself anticipated the theological implications of his system. How did he address this through a unique integration of natural law and divine action? What would he have said to Laplace's version of naturalism? Although several centuries old, how does a mechanistic notion of the universe still raise profound and challenging implications for a theology of divine action, efficacy of prayer, miracles, sacred history, and even human freedom?

12. Darwinian Theory *Barbour, Ch. 3, "Biology and Theology in the 19th Century" - Darwin and Natural Selection - Theological Issues in Evolution; A. Hunter Dupree, "Christianity and the Scientific Community in the Age of Darwin" (*Lindberg & Numbers, Ch. 14); Frederick Gregory, "The Impact of Darwinian Evolution on Protestant Theology in the 19th Century" (*Lindberg & Numbers, Ch. 15)

Although parts of the Christian community have objected to Darwinism from the beginning, the reasons for this objection have not been at all constant. What were the

theological issues at stake in the original objections, and how do they differ from the topics of contention in contemporary American creationism? In the opinion of many scholars, the original objections were more astute both scientifically and theologically. Why do you think this might have been so? Barbour highlights the Darwinian challenge to scripture, design, human nature, and morality. Which were most significant. Why do you think American fundamentalism seems primarily concerned about the former, and only particular issues (e.g., age of earth) related to the former? On the other hand, why might concerns over the latter two have been picked up by many secular social scientists? This is important in illustrating shifting terms of engagement between science and religion, and may highlight Mac Cormack's notion of "fading metaphors."

D. CURRENT SCIENTIFIC AND BIBLICAL VIEWS OF PERSONS AND NATURE This unit will discuss several emerging scientific theories about human beings and the natural world, which have highly significant theological implications. One of the most fascinating aspects of nearly all the following issues, is that there is so much interpretive diversity in both the scientific and theological positions. As you will see, the controversies, though sometimes heated, do not have to shut down exchange, but can actually open up a wide range of fruitful dialogue.

13. Biological and theological perspectives on human nature and sin *Barbour, Ch. 10: "Human Nature"; Philip Hefner, "Biological Perspectives on Fall and Original Sin"; Langdon Gilkey, "Evolution, Culture, and Sin: Responding to Philip Hefner's Proposal"; Langdon Gilkey, "Biology and Theology on Human Nature"

Although both Hefner and Gilkey both subscribe to a fully evolutionary account of human origins, they differ radically in their interpretations of how biology relates to human nature and sin. Why does Gilkey feel Hefner gives too much weight to biology? What are the implications for this in terms of a doctrine of the fall, and our understanding of redemption? In what ways do their differences reflect theological differences? On the other hand, how could you predict Gilkey's resistance, from the fact that he endorses the independent model and Hefner the dialogue model of engagement? This is important, because it reveals how our general model for interaction may relate to the position we take on particular issues - and how they may influence and be influenced by theological perspective. Hefner is a physicalist. Does Gilkey need to invoke dualism to justify a non-biological cause of sin? If sin is "built in" to humans biologically, is it fair of God to allow that? How might that relate to the notion of original sin? But if it is biologically innate, does God do a physical miracle at regeneration? How would a physicalist like Hefner handle this?

14. Biological / evolutionary theories of human morality *Reichenbach & Anderson Ch. 9: "Brains, Genes, and Moral Responsibility" *Huchingson Part V The Approach of Sociobiology Michael Ruse and E. O. Wilson, "The Evolution of Ethics"; Peter Singer, "Ethics and Sociobiology"; Arthur Peacocke, "God and the Selfish Genes"

What is the difference between hard-core and soft-core determinism? Is there good evidence that humans experience at least stochastic behavioral influences from genetic

and neurophysiological substrates? As above, what does this imply for our theological understanding of not only human freedom and responsibility, but also God's agency in our lives, in the form of redemption, sanctification, deliverance from temptation? How do we avoid the extremes of biological-environmental determinism on the one hand, and on the other hand a Gnostic immaterialism that does violence to the doctrine and scientific reality of our embodiment? Beyond the general issue of biological influences on behavior, is the fascinating, specific issue of how evolutionary processes have shaped our basic behavioral and, in particular, our moral inclinations. While Wilson is a genetic reductionist, Ruse is not, yet (when they wrote this) both shared a conflict model of science and religion. Why do both claim that the end of morality is merely the proliferation of genes? Even if that were true, does Ruse's conclusion follow, that morality and religion are therefore fictions, without ontological grounding. This is a tremendously theologically significant implication of this particular interpretation of evolutionary theory. But it is also an instructive illustration of how conclusions relate to ones general starting model of faith-science interaction. Although Singer is a materialist, why does he strongly object to sociobiological reductionism? How would he distinguish materialism, reductionism, and determinism? What are the theological implications of each? Which do you think Hefner is? Gilkey? Reichenbach & Anderson, or Peacocke? How is "biological altruism" and the "selfish gene" a scientific metaphor? How does Peacocke solve the dilemma of the need to "transcend" that to which the selfish gene metaphor refers? What connections are there between Peacock's views and the similar views of T.H. Huxley in his classic, Evolution and Ethics? One criticism of the Huxleyan tradition, perpetuated in the work of Dawkins, is that the exhortation to "resist" nature makes no sense within a fully naturalistic paradigm. In what ways do the observation that such notions seem to require transcendence, present the opportunity for natural theology, but also the risk of God-of-the-Gaps?

15. Scientific and biblical perspectives on human mating and pairbonding.
*Reichenbach & Anderson, Ch. 10: "Stewardship of Human Sexuality"; John Money, "Love and Love Sickness"; Jared Diamond, "The Evolution of Human Sexuality"

How does Reichenbach's & Anderson's discussion reflect notions of proximate biological causation, Money's reflect mediate causation, and Diamond's reflect ultimate causation? While all raise significant theological questions, why is it that ultimate (evolutionary) explanations are the only ones that attempt to interpret the "meaning" of human sexuality? Which model of science-religion dialogue does this represent? When St. Francis referred to his body as "brother ass", he was expressing recognition of the need to control it for God's purposes. How does Reichenbach's & Anderson's notion of sexual stewardship entail this notion, but also go beyond it? How does it provide the basis for incorporation of scientific knowledge about sexuality, without allowing scientific explanations to be the adjudicator of sexual meaning?

16. Natural selection, evolutionary disteleology, and the problem of evil. Francisco Ayala, "The Disteleological Character of Natural Selection"; Ralph W. Burhoe, "Attributes of God in an Evolutionary Universe"; Annie Dillard, "All Nature is Touch and Go"; George Williams, "Mother Nature is a Wicked Old Witch"

What is meant by the assertion of James Rachels, echoed by Ayala and Williams, that the effect of Darwin was to "demolish the perception of design in nature"? While this situation, if true, would certainly inhibit natural theology, how could it actually stimulate further thinking in theology of nature? What are the biblical resources for dealing with the ostensible purposelessness of nature, and how have Ralph Burhoe and Annie Dillard dealt differently with that challenge? Which author reflects a more explicit integration of theology with scientific theory? Which reflects a closer engagement with the world described by science? When George Williams argues the cruelty of natural selection reveals a malicious creator, is he doing science or theology? In fact, it has been called natural atheology, and raises the question of whether how theological inference is informed by scientific data and theoretical conclusions; or does it appear to emerge - like the interpretation of religious experience - from deeper elements of his world view? Calvin DeWitt has spoken of the "evangelical testimony of Creation"? While we will talk about this later, how does such a view do justice to the scriptural ambivalence about nature and the experiential encounter all of us have with natural evil? We will talk about this more when we discuss stewardship and the redemption of nature.

17. Cosmology and Origins of the Universe *Barbour, Ch. 8: "Astronomy and Creation" The Big Bang Creation in Judaism and Christianity *Huchingson Part IV: The Cosmos; Douglas P. Packey, "The Big Bang and the Cosmological Argument"; Robert John Russell "Cosmology and Theology"

18. Anthropic principle and the question of purpose. *Barbour, Ch. 8: "Astronomy and Creation" Design, Chance, and Necessity Theological Implications *Huchingson Part IV: The Cosmos, cont'd.; Freeman Dyson, "A Growing God"; George Wald, "Life and Mind in the Universe"; John Polkinghorne, "More to the World Than Meets the Eye"

19. Biospheric integration and GAIA. *Huchingson Part VI: Ecos and GAIA; Sally McFague, "A Holistic View of Reality"; James Lovelock, "God and GAIA"; Catherine Roach, "Loving Mother Earth: Some Reservations"

20. Theologies of creation and stewardship. *Reichenbach & Anderson, Ch. 4: "Stewardship of the Environment" *Huchingson Part VI: Ecos and GAIA, cont'd.; J. Patrick Dobel, "Stewards of the Earth's Resources"; John B. Cobb, "Process Theology and Environmental Issues"; Elizabeth Gray, "A Critique of Dominion Theology"; Holmes Rolston, "Does Nature Need to be Redeemed?"

IX FIELD TRIPS While you will be immersed in the forest for the semester you are here, there will nevertheless be a number of field trips for this course and others. Three field trips relate specifically to the issues of this course. They will be accompanied with pretrip reading, lectures, and post-trip discussion sessions.

Tikal *Reading:* Marvin Harris, *Cannibals and Kings.* Chapter 8: "The Pre-Columbian States of Mesoamerica" Chapter 9: "The Cannibal Kingdom" Napoleon Chagnon, *The Fierce People* Introduction to the Astronomical Foundations of Tikal. We will go to the largest, most advanced, and most cosmopolitan Mayan site in Meso-America. Questions

to consider as you do the pretrip reading and encounter the wondrous site first hand, include: In what ways would the Mayan civilization be considered prescientific, and how did it evidence a sophisticated science? How did science and religion interact in the Mayan culture, i.e., in what ways was religious life a motivator of science, and how did science inform religious life? For that matter, does there appear to have been a clear distinction between scientific and religious knowledge? Many Mayan ideas about the world were inspired by mystical experience (e.g., natural history, astronomical, and medical notions), but then were tested against the world in daily practice. Could this be considered science? One of the great anthropological puzzles is the extent of human sacrifice by Mayan cultures. Over the past couple of decades several materialist theories have been suggested by evolutionary and ecological anthropologists like Napoleon Chagnon and Marvin Harris. On the other hand, many Christians view this practice as a manifestation of demonic influence. Could either of these ideas be tested? Are they mutually exclusive? Does a materialistic theory rule out the possibility of separate or emergent spiritual reality? As with our consideration of genetic determinism, what are the implications of Harris's ecological determinism for human moral responsibility?

Panti Ethnopharmacological Preserve *Reading:* Catherine Caulfield, *In the Rainforest*: Chapter 8: "Fever Bark" Healing Plants of the Panti Trail

You will visit the Panti Medicine Trail and Preserve, where many species of indigenous plants, and the cultural knowledge of how to medically employ them, are being cultivated and passed on. The traditions of shamanism and traditional herbalogy raise fascinating questions about the relationship between science and religion. A number of herbal cures are demonstrably and dramatically efficacious, but many are completely lacking in ostensible merit. How was the system of knowledge "tested", and in what ways does it reflect the resistance to falsification characteristic of religion? How does the belief that a plant's form reveals its healing utility, reflect the interaction between myth, metaphor, and world view in this system of knowledge? How does the perceived relationship between cosmology and natural history of local species (e.g., the huge, buttressed roots of Ceiba trees ascribed to hold up the earth), illustrate Reichenbach and Anderson's point about worldview influencing our interpretation of observation? With all the Mayan activity in caves, and the opportunity to clearly see the finitude of Ceiba root systems, what do you think sustained this belief ? A very interesting incident in the relationship between science and religion involves the discovery, or rather the sustained failure to utilized already discovered, quinine. How does this story violate the stereotype of religious warfare against developing scientific knowledge? What factors contributed in this case to the scientific resistance to genuine but religiously-based knowledge? Is the tardy but eventual employment of quinine in western medicine, an example of explanatory resistance or openness of scientific understanding?

Cockscomb Basin Jaguar Preserve *Reading:* George Williams. "Huxley's Evolution and Ethics in Sociobiological Perspective." Charles Darwin. Handout from *Voyage of the Beagle.* We will hike and overnight in the remote Cockscomb Preserve, the largest and one of the most unspoiled forest preserves in Central America. We will need to take a number of precautions, which will be explained prior to the outing. You should have a

wonderful opportunity to become immersed in the natural wonder and beauty you already encounter daily at camp. But you will also have greater opportunity to encounter the snakes, stinging and biting insects, poisonous plants, and other biological perils that characterize the tropics. In fact, while appreciating the natural beauty of the deep forest, we also want to intentionally reflect on the ways in which tropical nature may seem (and with greatly magnified competition, predation, parasitism, and toxic defenses, in many was it simply is) "inhospitable". The experience of this "biological struggle" by Wallace and Darwin not only provoked a revolution in biology, but also in natural theology. In what ways might the Darwinian revolution in some measure be attributable to the encounter between the tropics and 19th Century naturalists like Darwin, Wallace, and Bates? What did Huxley mean by stating that nature is opposed to what is good, and what does Williams mean by asserting that a century later, we know Huxley understated the problem? How do these statements entail the kind of pre-existing interpretive frame-work that exists in all theorizing but is, according to Barbour, especially operative in religion? In what ways is Williams actually doing natural theology? How have professional theologians responded (or failed to respond) to the what is now referred to not as the problem of evil's existence, but good's absence (i.e., that there are not only plenty of natural evils, but that the process of natural selection actually filters out anything that would appear to the human moral sense as "good")? Does this involve an inappropriate anthropomorphism of impersonal nature? Or is it a reasonable inference by human exegetes attempting to see the Creator behind or in what He has made? A personal question: as you immerse yourself in the surrounding biome, do you feel the weight of being continually vigilant about what is out to get you? I.e., would you feel more inclined to sing "This is my father's world," or "This world is not my home"? This is actually not a facetious question, because it highlights a subtle and profound ambivalence about the natural world in both mainstream culture, and the scriptures as well. How might this ambivalence represent theological resources for reflecting on the world as it is, and not just as we'd like it to be? How do (or don't) the evolutionary and ecological theologies we have studied incorporate ambivalence about nature (through notions of the Fall, the need for redemption, etc.)? How can we distinguish between theologically appropriate reservations about nature's completeness or goodness, and inappropriate disregard or even quasi-Gnostic contempt for God's creation? This is crucial if we are to fulfill our responsibilities as stewards; in fact, the paradigm of stewardship can itself help us approach these tensions.

X EVALUATION Evaluation is more than grading. The purpose of evaluation is to help you learn by receiving interactive feedback on your ideas and how you communicate them. In order to promote your learning, we want to provide you with evaluative information in a variety of ways, in addition to providing instructional assessment through grades.

Faculty-Student Dialogue Because the class size will be kept to 18 students, each student will have the opportunity to meet individually and in groups with the course director and participating faculty. This is particularly important in formulating, refining, implementing, and analyzing your research project. Expect to meet daily or every other day when you are conducting your project. In addition to this, faculty will give feedback

to students through written comments on their journals, and oral debriefing after student presentations.

Peer Evaluation: Student-Student Dialogue Impromptu feedback on your ideas, the way you present them, and the way you interact with the ideas of others will be regularly provided in group discussion - you will hear how others respond to your intellectual contributions. Beyond this, we will participate in "journal swapping," where you give and receive journals (namelessly), reading and responding to what you read.

Written Responses Faculty will provide written responses to your tests and research paper. They will also site down with you and provide face to face feedback after you complete your paper and oral presentation.

Grading Just as in peer review of academic scholarship or collegial assessment in the professions, so in this course your work will ultimately be formally evaluated, and you will be assigned a final course grade. The overall grade will be a numeric average of the grades assigned by each faculty person teaching major course units, each of which will entail three, equally-weighted pieces of work: Unit Exam 25%; Research Project 25%; Reading Reflection Journal 25%; Class Discussion & Presentations 25%. You will maintain one reading/field journal for the entire course, but it will be graded in installments by participating faculty, along with the course director. The unit exams will each be administered and graded by individual faculty.