Midterm Practice

1. According to Soren Kierkegaard:

a. one can only attain the highest truths via natural theology

b. the highest truths can only be attained by an infinite subjective passion that is itself paradoxical from the objective point of view

c. natural theology is not only useless, but an impediment to attaining religious truth

d. A and B only

e. B and C only

2. According to the video episode "Great Transformations", if you line up the fossils of whales and their ancestors in chronological order you can see:

a. the gradual development of lungs instead of gills

b. the migration of the nostrils to the top of the head

c. the gradual develop of a tail which undulates up and down, from a tale which moves from side to side

d. All of the above

e. A and B only

3. What is Miller's point in raising the example of penicillin?

a. random mutations cannot create beneficial mutations

b. in order to save bacteria from penicillin, natural selection eventually gives bacteria what they need to become immune

c. the scientific method can allow man to overcome natural diseases

d. since penicillin is becoming less and less effective, the scientific method can only temporarily overcome natural diseases

e. random mutations can create beneficial mutations

4. According to the video episode "Great Transformations", the genetic explanation for why different animal species all resemble one another is:

a. all animals species use the same set of genes to build their bodies, inherited from a common ancestor

b. since all animals can be traced to a common ancestor, it makes sense that their bodies would resemble one another

c. there are only one general way that genes can combine to make animal bodies

d. animals of different species frequently interbreed, bringing the species closer to one another in appearance over time

e. none of the above; it is false that different animal species all resemble one another

5. On the 'hour model' of our planet's history, microbes are the dominant life form for:

a. the first five minutes

b. the first fifteen minutes

c. the first fifty minutes

d. for the first minute

e. up until the last second

PP209OC Midterm (40%)

Introduction: Covers the material from *Units 1-6*. Composed entirely of *multiple-choice and true/false questions*.

Location: DAWB 2-106

Time: Oct 30th, THURSDAY, 7:00-9:00 PM

Unit 1 Quiz (1st and 2nd attempt)

1. In the broad sense, _____ qualifies as an atheist.

a. anyone who believes in a theistic deity

b. anyone who disbelieves in any divine being, including a theistic deity

c. anyone who disbelieves in a theistic deity, but also believes in some non-theistic divine being

d. b and c only

e. none of the above

2. All deists deny that God loves us.

a. True

b. False

3. The name most prominently associated with the ontological argument is:

a. St. Augustine

b. St. Anselm

c. St. Aquinas

d. St. Hume

e. St. Darwin

4. Discussion of the problem of evil often distinguishes the two following kinds of evil:

a. bad evil and really bad evil

b. natural evil and supernatural evil

c. moral evil and immoral evil

d. natural evil and moral evil

e. supernatural evil and immoral evil

5. The scientific theory which has threatened the design argument most is:

a. Big Bang theory

b. Darwinian evolution

c. gravitational theory

d. Steady State theory

e. Newton's laws of motion

6. in the popular sense, an agnostic:

a. is someone who neither believes nor disbelieves in God

b. is someone disbelieves in God

c. is someone who can neither prove God exists nor prove God doesn't exist

d. is someone who thinks God exists but is unknowable

e. is someone who denies God's goodness

7. The principal point(s) on which deists, as a group, disagree with traditional theists, as a group, concerns:

a. whether God is good

b. whether God loves us

c. whether God provides 'special' revelations

d. all of the above

e. a and b

8. In the strict, philosophical sense, agnosticism is the view that:

a. God neither exists nor doesn't exist

b. Human reason is incapable of justifying belief in either God's existence or God's nonexistence

c. God either exists or doesn't exist

d. we can only learn about God via special revelation

e. we cannot learn about God via special revelation

9. A strong agnostic:

a. neither believes nor disbelieves in God's existence

b. thinks neither theism nor (positive) atheism can be justified by reason

c. thinks there is something wrong with being either a theistic or a (positive) atheist

d. all of the above

e. a and b only

10. Mere theism is:

a. a form of liberal Christianity

b. the core of beliefs common to Western monotheisms

c. the belief in a deity of limited power

d. the belief in a deity who ignores humanity

e. all of the above

11. Pantheists do the following:

a. reject the distinction between God and creation

b. reject the distinction between good and evil

c. believe in a large number of individual gods

d. all of the above

e. none of the above

12. Popular deism and 'proper' (basic) deism fundamentally agree:

a. God exists, but doesn't care about us

b. God exists and created the universe

c. God exists but provides no information we cannot figure out via worldly observations and our natural reason

d. all of the above

e. b and c only

13. Agnostics, in the popular sense, qualify as negative atheists.

a. True

b. False

14. The cosmological argument argues:

a. from design in nature to the existence of a designer

b. that the existence of the world demonstrates the existence of a transcendent cause of the world

c. the widespread phenomenon of religious experience to the existence of a supernatural object of such experience

d. that God does not exist

e. that God is omnibenevolent

15. A popular agnostic will necessarily be a philosophical agnostic; but a philosophical agnostic is not necessarily a popular agnostic.

a. True

b. False

16. Fill in the missing phrase from Quinn's description of the ontological argument: "we understand God to be a perfect being, something_____"

a. than which nothing lesser can be conceived

b. than which nothing greater can be conceived

c. which is so far beyond our comprehension we can say nothing about it

d. more wonderful than all the angels combined

e. that created all the heavens and all of the earth below

17. The ontological argument tries to show that a cosmic designer must exist.

a. True

b. False

18. As most commonly understood, atheism is_____.

a. simple nonbelief in the existence of God

b. the position that affirms the nonexistence of God

c. the view that God is mysterious and cannot be known

d. the view that we can justify neither belief in God's existence nor belief in God's nonexistence

e. the position that denies there are any theists

19. A contingent being is a being that could have failed to exist.

a. True

b. False

20. Choose the text which best completes the following quotation: "Although religions are typically complex systems of theory and practice, including both myths and rituals, philosophers_____".

a. tend to ignore religious claims

b. tend to question whether there are any religions

c. tend to concentrate on evaluating religious truth claims

d. tend to concentrate on describing the particular beliefs of individual religious groups

e. none of the above

Unit 2 Quiz

1. Choose the most prominent strand(s) of atheology:

a. the concept of God is incoherent

b. the existence of God is incompatible with things we know about the world

c. religious language is not cognitively meaningful

d. all of the above

e. a and b only

2. The cosmological argument argues:

a. from design in nature to the existence of a designer

b. that the existence of the world demonstrates the existence of a transcendent cause of the world

c. from the widespread phenomenon of religious experience to the existence of a supernatural object of such experience

d. that God does not exist

e. that God is omnibenevolent

3. It is true that:

a. broad natural theology relies upon nothing beyond our natural cognitive resources

b. strict natural theology relies upon nothing beyond our natural cognitive resources

c. revelation-based theology relies upon nothing beyond our natural cognitive resources

d. a and b

e. b and c

4. The gist of Kant's criticism of the ontological argument is:

a. God is unfathomable

b. God is immutable

c. God must also require a cause

d. existence is not a real predicate

e. existence is a human concept, and cannot be applied to God

5. Thomas Aquinas only practiced natural theology via the strict conception.

a. True

b. False

6. Most critics of natural theology:

a. argue that one or more arguments of natural theology are failures

b. argue that natural theology is in principle doomed to fail

c. argue that natural theology is irrelevant to true religious knowledge

d. argue that natural theology actually impedes attaining religious truth

e. c and d only

7. According to Kierkegaard:

a. one can only attain the highest truths via natural theology

b. the highest truths can only be attained by an infinite subjective passion that is itself paradoxical from the objective point of view

c. natural theology is not only useless, but an impediment to attaining religious truth

d. a and b only

e. b and c only

8. Broad natural theology:

a. accepts both deductive and non-deductive forms of reasoning

b. accepts only evident premises

c. allows both evident and non-evident premises

d. accepts only non-deductive forms of reasoning

e. a and c

9. The starting point for teleological arguments is:

a. the observation that there are contingent beings

b. the idea that God is defined as a perfect being

c. the assumption that there are objective moral truths

d. the observation that there are now things undergoing change and causing change

e. the phenomenon of goal-directedness in nature

10. Many theists distinguish between religious truths which can be discovered by unaided human reason, and those which cannot. Thomas Aquinas thought the truth of _____ cannot be discovered by unaided human reason.

a. God's existence

b. God's goodness

c. the Trinity

d. the Incarnation

e. c and d

Richard Swinburne is an example of someone who follows the strict conception of natural theology.

- True
- ✓ False

Question 7

Natural theology contrasts best with:

- process theology
- ✓ revelation-based theology
- philosophy of religion
- liberation theology
- liberal theology

Question 4 **1 / 1 point**

The traditional, strict understanding of natural theology is based on a model of theoretical inquiry derived from _____ 's account of demonstrative science.

- ✓ Aristotle
- Aquinas
- Lewis
- Darwin
- none of the above

Question 2

Natural theology uses special methods of reasoning, methods which are inapplicable in other fields of inquiry.

Question 10

A deductive argument aims to meet the following standard:

- its premises be true
- its conclusion be true
- ✓ if its premises be true, then it is impossible for its conclusion to be false
- its premises and conclusion be true
- to have reasonable premises

Question 8

Fill in the following description of the ontological argument: "God is defined as a perfect being, something_____"

- than which nothing lesser can be conceived
- ✓ than which nothing greater can be conceived
- which is so far beyond our comprehension we can say nothing about it
- more wonderful than all the angels combined
- that created all the heavens and all of the earth below

Question 1

Strict natural theology allows:

- premises which are either evident or well-supported
- only dialectical reasoning
- only deductive reasoning
- only premises which are evident
- ✓ c and d

Unit 3 Quiz

1. John Beversluis argues Lewis's moral argument commits the following logical fallacy:

a. denying the antecedent

b. affirming the consequent

c. modus tollens

d. modus ponens

e. reductio ad absurdum

2. According to Stephen T. Davis, the deepest issue which arises in assessing the moral argument is:

a. whether descriptive moral relativism is true

b. whether the ends justify the means

c. whether it is possible to give a compelling account of morality in purely naturalistic terms

d. whether things are good because God commands it, or whether God judges things to be good because they are, independently of God's commands, good

e. whether moral values are objective

3. According to Lewis, the truth of God's existence could be determined by the following:

a. studying the stars and other astronomical bodies

b. studying the science behind the Big Bang

c. examining our personal subjective experiences

d. studying human physiology

e. examining the intricacies of cellular biology

4. The Euthyphro dilemma refers to the following alternatives:

a. either morality is independent of God, or God can arbitrarily declare anything he chooses to be moral/immoral

b. either morality is based on the divine nature, or God's existence is a product of morality

c. either Socrates will take Euthyphro on as a pupil, or he will not

d. either God is completely good, or God is completely evil

e. either God loves humanity, or God is indifferent to humanity

5. Lewis thought the following two things were the foundation of all clear thinking about ourselves and the universe we live in:

a. we all have a sense of the Law of Nature which we cannot get rid of; all of us break this law at one time or another

b. God loves us; we all have a sense of the Law of Nature which we cannot get rid of

c. we all break human laws; there is a somebody, rather than a something, behind the universe

d. quarrelling is unavoidable; God decides what is right and wrong

e. God decides what is right and wrong; we all have a sense of the Law of Nature which we cannot get rid of

6. As Davis uses the term, a subjective truth is best defined as:

a. a moral truth

b. a truth which necessarily conflicts with objective truth

c. a truth which is only revealed through through prayer and meditation

d. a truth which is always in agreement with objective truth

e. a truth which is dependent on what one or more persons think

7. According to Lewis, the two main cosmologies, or views of the universe are:

a. materialism and the religious view

b. the scientific view and the theistic view

c. monotheism and polytheism

d. theism and agnosticism

e. realism and idealism

8. Erik Wielenberg argues _____ is possible only if there is no divine justice.

a. ultimate self-sacrifice

b. moral relativism

c. the destruction of humanity

d. mass genocide

e. all of the above

9. Lewis uses the following as examples of what would constitute a "total difference" in morality:

a. people who run away in battle being admired

b. selfishness being considered morally good

c. people feeling proud for double-crossing all those who had been kindest to them

d. all of the above

e. b and c only

10. Lewis responded to (descriptive) moral relativism with the following:

a. the differences among the moral codes of different societies don't amount to a total difference

b. even if the differences among cultural moral codes amount to a total difference, it is obvious there is a single absolute moral law which we feel with an inner moral sense

c. the differences between the moral codes of different cultures are proof that God does not exist

d. "To hell with your standard!"

e. the differences among cultural moral codes does amount to a total difference

11. According to Lewis, science was the key to discovering which of the two main cosmologies was correct.

a. Ture

b. False

12. By the "Law of Nature" Lewis meant:

a. the "law of human nature"

b. the "law of physical nature"

c. the "law of Metaphysics"

d. the "law of Logic"

e. all of the above

13. Lewis's moral argument begins by referring to the following human activity:

a. mountain climbing

b. warfare

c. quarrelling

d. giving to charity

Question 9 1

In the course of his moral argument, C.S. Lewis says that there is one basic thing of which we can have knowledge that is not dependent upon observations of the external world:

- God
- mathematical and logical truths
- ✓ we are under a moral law which we cannot get rid of
- all of the above
- a and b only

Question 10 1

Normative cultural relativism states that what is right and wrong really does vary across cultural lines.

- ✓ True
- False

Question 8

Descriptive moral relativism is the view that:

- objective moral values vary across different societies and times
- ✗ there are no objective moral values
- ➡ what people think is moral can vary across different societies and times
- all of the above
- a and b only

e. cannibalism

Lewis uses the following as examples of what would constitute a "total difference" in morality:

- people who run away in battle being admired
- selfishness being considered morally good
- people feeling proud for double-crossing all those who had been kindest to them
- all of the above
- b and c only

Question 2

Erik Wielenberg uses an historical example of religious faith inspiring moral atrocities involving the following location:

- modern day Iran
- the city of Moscow during the Russian Revolution
- the suicide bombers of September 11 2001
- the 13th century French city of Belziers
- the Kingdom of Fife during the 16th century

Question 6

According to theism, the hypothesis of theism to explain worldly order is:

- the most fertile hypothesis
- the hypothesis which is easiest to test
- the simplest hypothesis
- the hypothesis which yields the most predictions
- the most elaborate hypothesis

Question 7

The following philosopher is described in your readings as having delivered serious blows to the argument from design

- Wittgenstein
- Heidegger
- Plato
- Hume
- Descartes

Question 8

According to Swinburne, the Darwinian explanation of the existence of complex organisms is entirely false.

- True
- False

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Question 9

All atheist philosophers are relativists.

- True
- ✓ False

Question 3

Wielenberg argues that there is nothing to admire in the actions of people who believe in God.

- True
- ✓ False

Question 4

For Lewis, the moral law:

- goes beyond a mere description of the way things are
- ✗ is something of which we all, with very few exceptions, are aware
- is a description of the way people really behave
- is something of which we all, no exceptions, are aware
- ➡ a and b

Unit 4 Quiz

1. Craig's second philosophical argument against a beginningless universe can be summed up as:

a. a collection formed by adding one member after another cannot be beginningless, but the past of a beginningless universe would have to be formed by one event being added to another

b. there is no such thing as time

c. if the universe had no beginning then there wouldn't be enough space to sustain an actually infinite amount of time

d. motion is impossible

e. there are not any collections which count as an actual infinity

2. Morriston emphasizes the possibility that none of our hypotheses about the origin of the universe is especially likely to be true.

a. True

b. False

3. Presumably, none of you worries a tiger could just pop into existence, uncaused, in the room right now. Morriston thinks this is because:

a. we all know nothing can just pop into existence without a cause

b. people in their right mind just can't think that anything could pop into existence uncaused

c. no one could sincerely believe anything could just pop into existence uncaused

d. we have a lot of experience with tigers, and given our background knowledge we know they aren't the sort of thing which just pops into existence uncaused

e. a, b and c only

4. Craig's ultimate point regarding the actually infinite library with alternating red and black books is:

a. all actual infinities are impossible

b. actual infinities cannot exist in the real world

c. the series of past events needn't have a beginning

d. the library cannot be potentially infinite

e. there isn't enough paper in the world to make such a library; an actually infinite library is physically impossible

5. The concept of potential infinity usually comes into play when:

a. we subtract, one member at a time, from an actually infinite series

b. we add to an actually infinite series, one member at a time

c. we add to, or subtract from, a finite set without stopping

d. all of the above

e. a and b only

6. There are as many even numbers {2, 4, 6...} as there are natural numbers {1, 2, 3...}.

a. True

b. False

7. According to the second law of thermodynamics:

a. processes taking place in a closed system always tend toward a state of equilibrium

b. objects in motion tend to stay in motion

c. the closer you get to the speed of light, the slower time goes for you relative to slower moving objects

d. the universe is a steady, unchanging state

e. light from distant galaxies is slowing down relative to us

8. Craig thinks the following scientific observation/finding shows the universe had a beginning:

a. the universe is expanding

b. the universe is contracting

c. quantum mechanics requires that the universe have a caused beginning

d. the universe is a stationary, unchanging object

e. something cannot come from nothing

9. Craig begins his article, "The Kalam Cosmological Argument", with a question from Leibniz. Leibniz's question was:

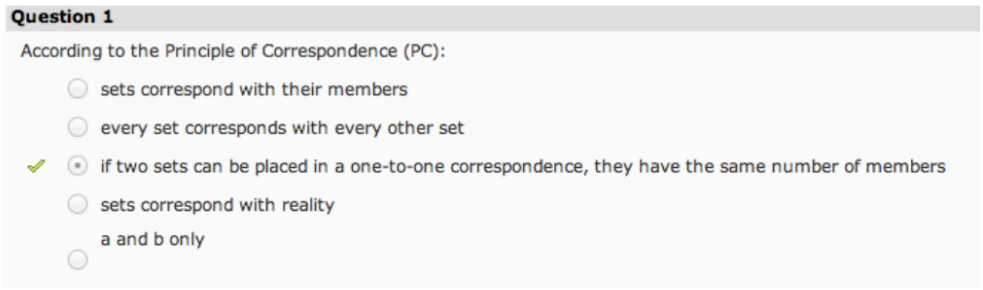
a. How many angels can dance on the head of a pin?

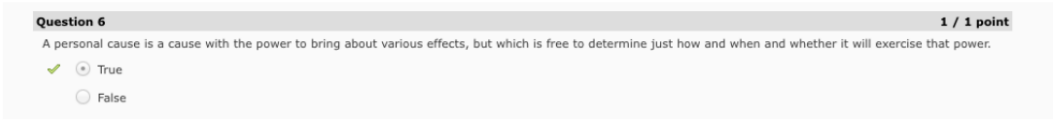
b. How much wood could a woodchuck chuck if a woodchuck could chuck wood?

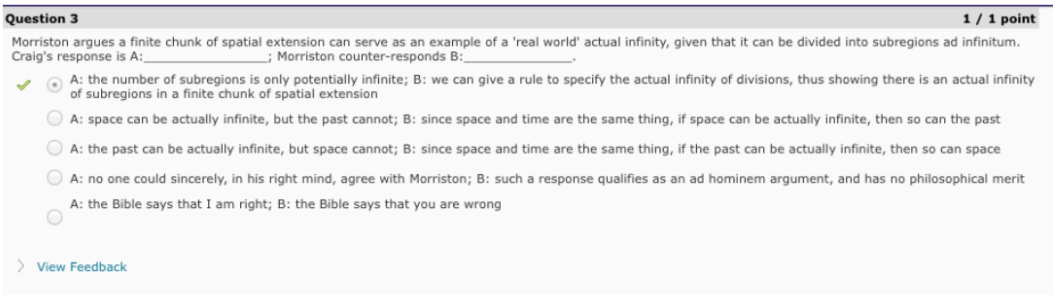
c. Why is there something rather than nothing?

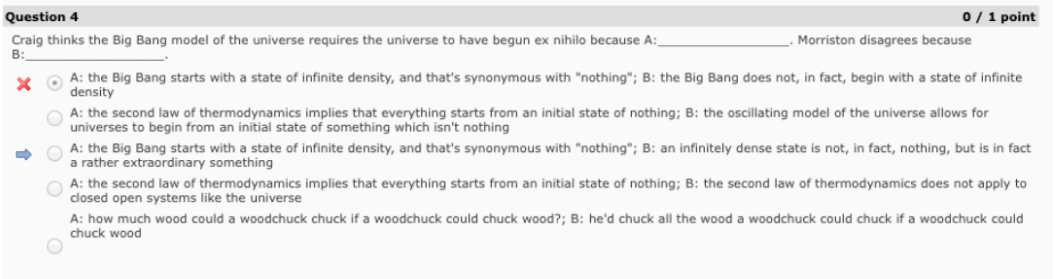
d. Why is the universe expanding?

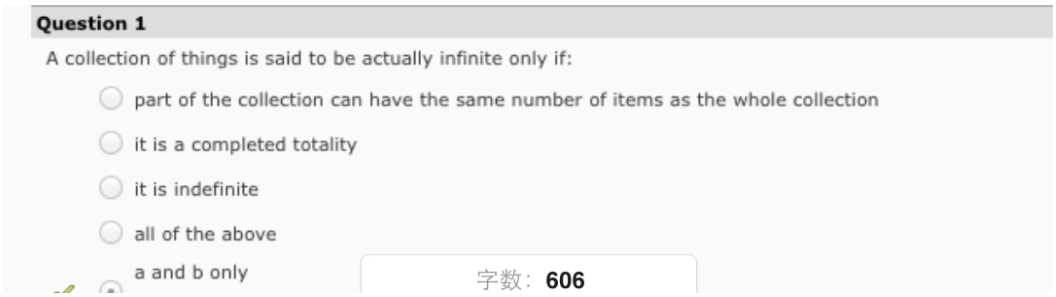
e. Why would God make the world?











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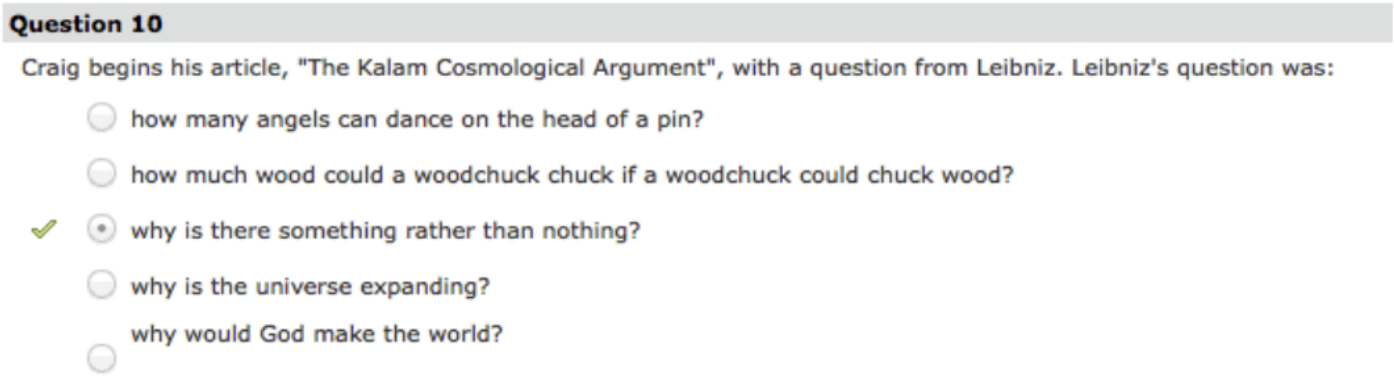

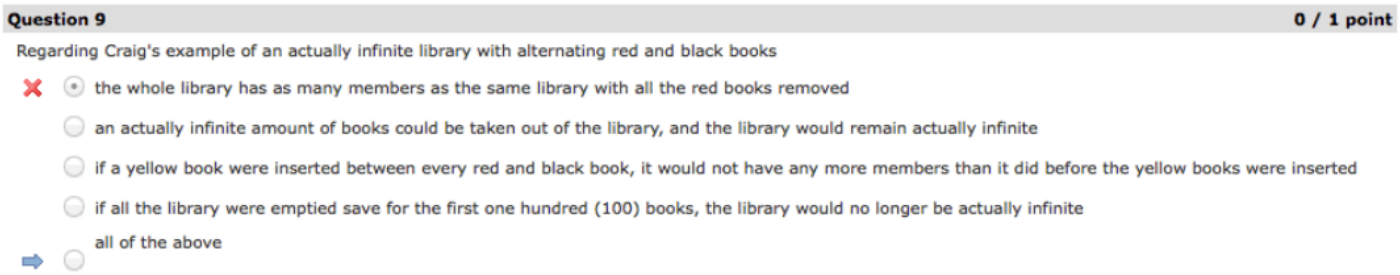

10. Suppose that Earth and Jupiter have been orbitting the sun from eternity. Also assume that Earth orbits the sun every year, while Jupiter orbits the sun every three years. Given these assumptions:

a. Earth will have completed three times as many orbits as Jupiter

b. Jupiter will have completed three times as many orbits as the Earth

c. the Earth and Jupiter will have orbitted the sun an equal number of times

d. each of the Earth and Jupiter will have orbitted the sun a potentially infinite number of times

Unit 5 Quiz

1. According to Swinburne, God has the following good reason to choose to make an orderly world: a world containing human persons is a good thing.

a. True

b. False

2. Richard Swinburne asserts his arguments prove it is certain that God exists.

a. True

b. False

3. Abiogenesis refers to:

a. the field of science devoted to showing that life popped into existence out of nothing

b. the field of science devoted to showing that species do not evolve from earlier species

c. the view that life is eternal, and has no beginning

d. the emergence of life from non-living components via completely naturalistic mechanisms

e. the view that life began at the Big Bang

4. According to theism, the hypothesis of theism to explain worldly order is:

a. the most fertile hypothesis

b. the hypothesis which is easiest to test

c. the simplest hypothesis

d. the hypothesis which yields the most predictions

e. the most elaborate hypothesis

5. In his most famous analogy for design, William Paley analogized a(n)_____ to a(n)_____.

a. watch, eye

b. chariot, soul

c. watch, clock

d. computer, human brain

e. eye, heart

6. The following argument is an instance of modus ponens.

a. If Binky is a bunny, then pigs can fly. Pigs can fly. Therefore, Binky is a Bunny.

b. If Binky is a bunny, then pigs can fly. Binky is a Bunny. Therefore, pigs can fly.

c. If Binky is a bunny, then pigs can fly. Binky is not a bunny. Therefore, pigs cannot fly.

d. If Binky is a bunny, then pigs can fly. Binky is a bunny. Therefore, pigs cannot fly.

e. If Binky is a bunny, then pigs can fly. Pigs cannot fly. Therefore, Binky is not a bunny.

7. Swinburne enthusiastically agrees that there are multiple universes, each with their own different sets of natural laws.

a. True

b. False

8. According to Swinburne, the Darwinian explanation of the existence of complex organisms is entirely false.

a. True

b. False

9. Newton's laws are the most fundamental laws of nature, and are totally accurate for all phenomena.

a. True

b. False

10. Not all Christians disagree with evolutionary theory.

a. True

b. False

11. Teleological arguments conclude that God exists on the basis of the fact that the something exists rather than nothing.

a. True

b. False

Question 2

The Greek word *telos* is a philosophical term for:

- God
- improbability
- theology
- fine-tuning
- ✓ purpose

Question 8

Jean-Baptiste Lamarck was a student of Darwin's who connected Darwin's theories to then-current genetic theory.

- True
- ✓ False

Question 10 1 / 1 p

Stephen Hawking suggests, in a passage quoted by Swinburne, that the following phenomenon/phenomena would eliminate the need for the theistic hypothesis to explain the "affairs of the universe":

- ✓ space and time forming a closed surface without boundaries
- Darwinian evolution
- tachyons which travel faster than light
- worldly evil
- none of the above: Hawking argues God is necessary to explain the universe

Question 7 1 / 1 point

According to Everitt, it is impossible that the universe would contain kinds of objects (or kinds of stuff) and yet be wholly chaotic; therefore, it is hardly surprising that our universe, which contains kinds of objects/stuff, is ordered by regularities. Further, this means that the mere existence of order in the universe cannot count as evidence for the existence of God.

- ✓ True
- False

Question 8 1 / 1 point

Fine-tuning arguments don't need to dispute either Darwinian evolution or abiogenesis.

- ✓ True
- False

Question 3

The most famous historical proponent of the classic design argument was:

- Immanuel Kant
- David Copperfield
- William Wordsworth
- ➡ William Paley
- ✗ David Hume

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Question 1

The following argument is an instance of "affirming the consequent":

- If Doug is a general, then Doug is in the army. Doug is a general. Therefore, Doug is in the army.
- ✓ If Doug is a general, then Doug is in the army. Doug is in the army. Therefore, Doug is a general.
- If Doug is a general, then Doug is in the army. Doug is not in the army. Therefore, Doug is not a general.
- If Doug is a general, then Doug is in the army. Doug is a general. Therefore, Doug is not in the army.
- If Doug is a general, then Doug is in the army. Doug is not a general. Therefore, Doug is not in the army.

Question 7

The following philosopher is described in your readings as having delivered serious blows to the argument from design

- Wittgenstein
- Heidegger
- Plato
- ✓ Hume
- Descartes

Question 7

Swinburne's response to the *anthropic principle* relies upon an anology involving:

- an archer hitting his target
- a chariot pulled by two horses
- a tree with many branches
- a crossword puzzle with no solution
- ✓ a killer card shuffling machine

Unit 6: Evolution I

Readings and Sources

- ☐ Kenneth Miller
  - "Darwin's Apple," 119-127.
  - "Eden's Children," 129-148.
  - "Notes," 149-151.
    From his *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* (Harper: 1999).

- ☐ PBS, "Great Transformations." From the series *Evolution*.

Reading/Viewing Instructions

1. Read the introduction to these notes.
2. Read "A. Understanding evolution for teachers."
3. Read "B. Marked participation exercise #6."

4. Read Miller's first, somewhat autobiographical, chapter: "Darwin's Apple" (pp.119-127); realize his endnotes are reproduced on pp.149-151 of the Course Package.
5. Read "C. Miller: Darwin's argument summarized."
6. Turn to Miller's second chapter: "Eden's Children" (pp.129ff.). Specifically, read the untitled introduction, and the sections titled "Plain Talk," "Gumshoe Science," and "A Fire in the Sky" (pp.129-133).
7. Read "D. Miller: Fallibility in science."
8. Read "E. Miller: The sun — knowledge at a distance."
9. Read the sections of Miller's second chapter titled "The Material of Understanding," "Pop-Top Science," and "Looking Backwards" (pp.133-137).
10. Read "F. Miller: Reading the signs."
11. Read the sections of Miller's second chapter titled "Thinking the Unthinkable," "Steps in the Parade," and "Patterns in Time and Place" (pp.137-141).
12. Read "G. Miller: Evidence in the rocks."
13. Read the final four sections of Miller's second chapter: "Change in Detail," "Evolution as a Creative Force," "Evolution as a Tool," and "Leaving the Garden" (pp.141-148).
14. Read "H. Virtual field-trip."
15. Read "I. Great Transformations."
16. Watch the DVD "Great Transformations."
17. Read "J. Conclusion and weekly quiz."

Introduction

Questions about evolution are a natural outgrowth of the debate surrounding the design argument. Granted, neither of our authors from the last unit (not even Swinburne, the philosopher defending the design argument) took issue with Darwinism. But there are those who flatly deny the ability of Darwinian mechanisms to explain the origins of species and variety of life we currently find on the Earth today.

Although not limited to North America — one prominent anti-evolutionist, Ken Ham, hails from Australia — opposition to evolution is fiercest in the former continent, particularly the United States. States like Arkansas, Kansas, and most recently (as of the time of this writing) Pennsylvania have all tried, in one way or another, to combat the perceived pernicious influence of Darwin's legacy by challenging its presence in public school science classes. Each of these challenges has so far been ultimately unsuccessful (either failing at the outset or initially succeeding but then

being struck down by a higher court), but more legal challenges to the teaching of evolution are sure to be forthcoming.

It seems wise to include an introduction to evolutionary theory at the beginning of our look at the debate over this scientific theory. After all, a common complaint from the pro-evolutionist side of the dispute is that anti-evolutionists frequently have mistaken ideas about just what, exactly, the theory of evolution is, or have mistaken ideas about science in general. Therefore I have chosen the first two chapters from Kenneth Miller's highly readable *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* as readings for the current unit. Miller is a professor of biology at Brown University, and a coauthor of many high school and college-level biology textbooks. As well, he has participated in many debates over evolution, and has testified as an expert witness in some of the various court battles over the teaching of evolution in American public schools.

Aside from Miller's qualifications and readability, there is another benefit in using him as our introduction to evolution: he can help to forcefully make a point which may need making. Frequently, it is assumed that conflicts between religion and Darwinism are conflicts between two well-defined religious groups: the pro-evolution side is populated exclusively with atheists, agnostics, and other non-theists; the anti-evolution side is made up entirely of religious critics of evolution.

Actually, there is a little truth in this generalization, but perhaps not where you think. It is probably true that anti-evolutionists are, in the vast majority, theists in general and often very devout Christians in particular. But it is far from true that *all* theists, or all religious people in general, stand on the anti-evolution side of the debate. Miller identifies himself as a practicing Roman Catholic, certainly believes in God, and is one of the foremost critics of anti-evolutionism writing today. Nor is he exceptional in this regard: much of the opposition to creationism comes from religious persons or groups, and many prominent religious groups have explicitly adopted a non-hostile, even friendly stance toward Darwin. For example, Pope John Paul II said the following in his 1996 Address to the Pontifical Academy of Sciences:

Today...new knowledge leads to the recognition of the theory of evolution as more than a hypothesis. It is indeed remarkable that this theory has been progressively accepted by researchers following a series of discoveries in various fields of knowledge. The convergence, neither sought nor provoked, of the results of work that was conducted independently is in itself a significant argument in favor of this theory. (www.firstthings.com/ftissues/ft9703/articles/johnpaul.html)

Accordingly, using Miller as a Catholic defender of evolution helps to remind us that it is not only atheists and other non-believers who think that Darwin discovered the basic outlines of the best explanation of how species of one sort can give rise to entirely new species without invoking supernatural intervention. It will be useful to keep this point in mind when examining the conflict surrounding over evolution, since it can often be obscured (some would say suppressed) in those debates.

After completing this unit you should be able to answer the following questions and perform the following tasks:

- name one high profile Christian leader who is not an anti-evolutionist
- what is the gist of Darwin's theory?
- explain the idea of fallibilism in science
- is scientific study limited to objects which can be studied directly in a laboratory?

- ☐ briefly explain the relevance of the general pattern in the fossil record to evolution
- ☐ what mechanism do many Young Earth Creationists appeal to in order to explain patterns in the fossil record?
- ☐ what feature makes basilosaurus interesting to evolutionary biologists; why do they find this feature interesting?
- ☐ explain what "the Cambrian explosion" refers to, and why it is thought by some to present a challenge to evolutionary theory
- ☐ what was it about Darwin's *Origin of Species* that made Miller reluctant to put the book down?
- ☐ how many of your direct ancestors died in childhood (i.e., before the age of reproductive maturity); why this is the only possible answer?
- ☐ briefly explain Miller's point involving beer cans buried in landfills and municipal dumps
- ☐ what does Miller claim early amphibian species resembled more than later amphibian species?
- ☐ briefly explain the relevance of pesticides and their effectiveness to evolution
- ☐ briefly explain Miller's reasoning for declaring evolution is both a fact and a theory

A. Understanding evolution for teachers

If you're not already reading this online, fire up your computer and visit the "Understanding Evolution for Teachers" website (http://evolution.berkeley.edu/evosite/evohome.html). If your search doesn't work, it is possible the url has changed; try Google or some other search engine to find its new address. Assuming this website hasn't changed too much, you should see a blue semi-circle above a red semi-circle. On the right-hand side of the blue semi-circle you will find a link called "Misconceptions." Go through the Misconception pages for a quick "pre-introduction" to Miller. Take the quiz at the end where you click on the students' hands and they ask you questions: see if you can formulate an answer before clicking on the answer provided; ask whether yourself whether the answer provided is a good one.

As a word of warning, you may notice in the introductory page to the website a wee tone of hostility. You will be told that some questions about evolution are intended to "disrupt the learning process," are "intentionally disruptive," and are not "legitimate inquiry." While not discounting the existence of legitimate questions about evolution, the tone of the website is clearly that some of the attacks on evolution are either

intellectually dishonest, irresponsible, or both. Creationists sometimes say similarly unflattering things about evolutionists. If and when you come across such "name-calling," try to read past it; just because someone is being rude or insulting does not mean they don't make any good, substantial points or arguments (nor does the fact that someone is saying something with which you are sympathetic mean that their case is necessarily a good one).

B. Marked participation exercise #6

Make a note of what you thought of the website you just visited. Did you find it helpful? Unhelpful? Did it just appear to be pro-evolution propaganda? Did it have any impact upon what you already thought about the evolution-creation controversy? Post your thoughts, between one to five paragraphs, in the Bulletin Board.

Creationist Defined

The term "creationist" can mean a wide variety of things: in the present discussion, it serves as a handy general label for those opposed to evolution, and can serve as a synonym for "anti-evolutionist."

C. Miller: Darwin's argument summarized

Miller does a good job of summarizing the essential gist of Darwin's argument as it appears in the *Origin of Species* (1859). If it didn't jump out at you the first time around, here it is in brief:

Domesticated plants and animals show a tremendous range of variation...
A similar range of variation exists in nature among wild species...
All living things are engaged in a struggle for existence... (pp.122-23).

The process resulting from these facts is *automatic*: "Those individuals that lose in the struggle for existence generally do not get to produce the next generation, but those individuals that do succeed get the greatest of all possible rewards—they get to pass their winning traits along to their offspring" (p.123).

D. Miller: Fallibility in science

As Miller makes clear in "Gumshoe Science," science ideally practiced does not aspire to *absolute*certainty about evolutionary issues. After all, the scientific enterprise is, by its very nature, attentive to empirical evidence; and one cannot *absolutely* rule out the possibility that counter evidence to a scientific hypothesis, theory or law may arise in the future. But that does not undermine the rationality of a given scientist's belief that evolutionary mechanisms account for all life on Earth.

Let me give an analogy to help make this point clear. I believe that all four of my grandparents were born in the year 1900. I claim this is a rational belief of mine to have, based as it is upon my memories of testimony from my parents. But am I *absolutely certain* that all four of my grandparents were born in that year? Probably not: it is *possible* that I am misremembering; perhaps my parents told me that my grandparents were born in 1895, or perhaps they told me that only three of them

were born in 1900. It was, after all, a long time ago when I had to make a family tree for an elementary school project; maybe the passing years have distorted my memories. Or maybe my memories are fine, but my parents were lying to me. Maybe they had a good reason to deceive me about when their parents were born; maybe they didn't really know, but didn't want to appear ignorant. Or perhaps one of my grandparents lied to my parents about when he/she was born. It's certainly *possible*: after all, for a joke my father used to mislead my mother about the date of his birth; why couldn't one of my grandparents have been deceiving everyone as to when he/she was born in order to be thought of as younger or older than he/she really was?

In short, if I want to maintain a "scientific attitude" toward when my grandparents were born, I have to be open to correction on this point: I should not be *absolutely* certain that they were all born during the first year of the twentieth century, at least not so certain that no possible amount of evidence or persuasion could convince me to change my mind. But such openness to correction doesn't mean that I don't believe they were all born in 1900, or that I can't *reasonably* believe that to be the case. Recognizing one's fallibility does not require one to abandon all of one's beliefs; it doesn't even rule out believing something with a great deal of confidence; all it rules out is believing something with such confidence that one will never be able to be convinced — even in theory — that one is wrong about something.

Accordingly, it is hardly an effective complaint against a belief that one does not hold it with *absolute*confidence. Being open to the possibility of error does not entail that one does not, or should not, really believe what one claims to believe. Miller's point in "Gumshoe Science" is that a scientific hypothesis, like neo-Darwinian evolutionary theory, is not a weak, bad, discredited, or otherwise unworthy hypothesis merely because a scientific attitude requires us to be fallibilists about its truth. We must also be fallibilists regarding the heliocentric model of the solar system which places the sun at the gravitational centre, but that is hardly an effective criticism against that model.

E. Miller: The sun — knowledge at a distance

Another important point Miller makes is that scientists can study things which they cannot necessarily manipulate directly under laboratory conditions. The example he uses is the sun. Presumably, all of you remember from high school chemistry class the periodic table of elements. You probably can't recall all of the elements that were on that table, but you will remember many of them. For example, hydrogen, the first element, has one proton in its atomic nucleus; helium, the second element listed on the table, has two protons in its atomic nucleus; lithium, the third element, has three protons in its atomic nucleus; etc.

Let's talk about helium, a gas with which all of us have probably had some direct experience: this is the gas which is used to inflate lighter-than-air balloons which float (rather than the boring balloons which fall to the ground when released); this is the gas many of us have inhaled (in small quantities!) in order to make our voices high pitched and squeaky. As Miller reveals, helium was first detected in 1868, not anywhere on the Earth, but at a distance, in the sun;[1] it was not successfully isolated on Earth until 1895. "A Fire in the Sky" demonstrates that investigators of the physical universe are not prevented from making scientific claims about things which exist outside of laboratories, even things which exist a seemingly inaccessible 93 million miles away.

Of course, the point of this example is to soften you up toward a different claim: human investigators can not only fruitfully investigate things which are far far away, but can also investigate things which happened long, long ago. And since evolution is an historical claim, it is the latter claim which is most interesting to us in this unit. Assume, for the sake of argument, that we really do share a common ancestor with, say, chimpanzees, a common ancestor which lived hundreds of thousands or even millions of years ago. Even granting this is true, is it possible for people living today to discover this fact? As Ken Ham will ask (rhetorically) in our video for the following unit, is it possible for scientists to know*anything* about what life was like millions of years ago when no one alive today was there to serve as a witness?

F. Miller: Reading the signs

More than ten years before Darwin had even been born, there was a civil engineer by the name of William Smith who was responsible for constructing the Somerset Canal. Smith's task largely involved cutting out a path for the canal, a task which necessarily involved digging up, and therefore revealing, many layers of rock. Smith noticed that some layers of rock contained fossil remains not found in other rock layers. Since the rock formations were often ordered consistently, he was able to use his fossil findings to predict, on the basis of the fossils discovered in an exposed layer of rock, what sort of rock would lay beneath it.

Soon after, geologists and engineers were using fossilized remains to trace geological history. One thing they noticed was that the youngest fossils, those taken from the uppermost rock layers, were of creatures nearly identical to those alive during the present day. The further one went through the rock layers, the further one went back into time, the more different the fossils became. Many took this as incontrovertible evidence that life on Earth was not the same throughout the ages; moreover, it was often possible to trace a gradual change from the fossils of one layer to fossils contained in the layers immediately above and below. Many took this to suggest that living things changed — evolved — over time. Contrary to popular opinion, the idea that species changed over time was not invented by Darwin.

G. Miller: Evidence in the rocks

Dead things do not necessarily fossilize: in fact, most dead bodies will never fossilize; the conditions have to be just so; of course, we then have to *find* the fossil in question without destroying it, and then recognize what it for what it is. Thankfully, we have found a good number of fossils (although certainly not all of them!), and what we have found is thought by the mainstream scientific community to strongly support the claim that species evolve over time.

One striking piece of evolutionary evidence is the very pattern in which we find fossils sorted in the many layers of rock. If, as many have believed, all the species were created at roughly the same time, then we would expect no such pattern: we would expect to find human fossils, for example, in the same strata containing dinosaur fossils, and distributed equally through all the rock layers. But a random jumble of fossils is exactly what we *don't* find.

Let me summarize the contents of Figure 2.1. (p.139) regarding animals. In rock layers containing fossils over 700 million years old, we only find fossil remains of bacteria and algae, no birds, no reptiles, no mammals — not even multicellular animals! Multicellular animals appear shortly after, followed by molluscs and

arthropods[2] in rocks a little less than 570 million years ago. Around the same time we can also find fossilized remains of creatures belonging to an animal phylum called "chordata";[3] such creatures are called "chordates," and are characterized by, among other things, a dorsal hollow nerve cord and a post-anal tail.

Let's pause briefly. According to our fossil evidence, 570 million years ago there were no elephants, giraffes, cats, dogs, birds, or any of the animals familiar to us from our domestic lives and occasional visits to the zoo; there aren't even any lizards, amphibians or insects; certainly, there is no evidence of human beings. All of this appears highly coincidental if all species were created relatively simultaneously, but exactly what one would expect if species evolved from ancestor species.

To continue the story, jawless fish fossils show up a little less than 500 million years ago. Fossil remains of land plants show up next, at about 430 million years ago. Then come species of bony fish, Teleost fish, at a little later than 400 million years. Fossilized insects and amphibians first appear in rocks of about the same age — a little over 350 million years ago — and the oldest reptile fossils date to 280 million years ago.

We find our earliest dinosaur fossils in rocks a little over 225 million years old (and none in rocks younger than 60 or so million years old). Mammals, the class of vertebrates into which we humans fall, appear about the same time, although the diversity of mammal species doesn't really explode until the dinosaurs go extinct. Birds show up after mammals, over 135 million years ago, and at this moment in time birds are frequently argued to be direct descendants of dinosaurs.

Many have found this striking pattern of fossil remains to be unmistakable evidence that the species were not all created at the same time. There are some, however, who are unimpressed. Young Earth Creationists challenge the very idea that *any* rocks date to as old as even a million years, and believe that the Earth is merely a few thousand years old (exactly how old varies by religious sect, from roughly six thousand to ten thousand years). To account for the pattern which persists regardless of how old the rocks are — after all, only bacteria can be found in the deepest layers of rock, and mammals are only found in more shallow layers — many Young Earth Creationists have used the Noachian Deluge (i.e., the worldwide flood survived by Noah described in the Book of Genesis) as an alternate mechanism to explain the sorting. The mainstream scientific community does not presently take this alternative seriously; Miller does not mention it at all. Even many anti-evolutionists avoid mentioning the Noachian Deluge when making their case against evolution; the creationist author in the following unit only mentions it to emphasize that creationists needn't rely upon such measures to criticise the theory of evolution.

In any event, the apparent sequence in the fossil record is not just a sequence in time; it is a sequence in place, as well. When Darwin had been collecting his fossils from South America, he found evidence of animals most unlike any found anywhere else on earth. Nevertheless, these extinct specimens were most anatomically similar to then present-day South American specimens. The obvious inference, the inference Darwin made, was that many of the then current species of South America were direct descendants of the extinct, fossilized species which he had uncovered. As Miller observes:

If the armadillo, to take just one example, was a species that had been created *ex nihilo*, why was it found in the exact same spot on the globe as the fossil species most similar to it? The answer, of course, is that the armadillo was found only in the New World because it had*evolved* there from its ancient ancestors.

Exactly the same considerations can be applied to the fossil animals of North America, Eurasia, Africa, and especially Australia. In each and every case, the pattern of temporal succession of the fossil record is linked to a matching pattern of geographical succession (pp.140-41).

These patterns are taken as very strong evidence that, however it happened, the unique species we find in the world today are direct descendants of unique species we find in the past. Many evolutionists refer to these patterns in the fossil record as the "facts" of evolution; Darwin provides the theory which is then used to explain these facts. Accordingly, many evolutionists will insist that evolution is both a fact and a theory, an insistence which undoubtedly does not impress those critics who challenge evolution on the grounds that it is "only a theory."

H. Virtual field-trip

So far, we haven't looked too much at criticisms of evolution. Miller spends more time trying to convince his readers that evolution is true than he does defending it against its detractors. Our next unit will remedy this shortcoming by looking at an article by the man many consider to be the father of the present-day Intelligent Design movement, Philip Johnson. As is characteristic of Intelligent Design, Johnson does not challenge evolution by challenging the mainstream scientific community's views about the age of the earth; nor does he engage in "flood geology" to make his case.

This should not be taken to mean, however, that Young Earth Creationism criticism of evolution has subsided. As an optional exercise, take a look at the Answers in Genesis website:www.answersingenesis.org . Specifically, click the "Get Answers" link in the task bar near the top of the page, which takes you to the Article Topic Index. Click on one (or more) of these topics (e.g., Flood, Fossils), skim the articles, and choose at least one to read (in the case of an exceptionally long article, just read the first few paragraphs, then skim the rest).

After you've done that, take a look at one of the following sites which criticise the position defended by Answers in Genesis: Answers in Creation (www.answersincreation.org) criticises Answers in Genesis from both an Old-Earth Creationist and a Theistic-Evolutionist perspective; No Answers in Genesis (http://home.austarnet.com.au/stear/default.htm) claims to be a resource for teachers, and seems (at my casual glance, anyway) considerably less sympathetic than is Answers in Creation. As before, find an article on one of these sites to read. The goal of this "field-trip" is not to study the material in any depth, but just to make you aware of some of what is available out there on this topic.

I. Great Transformations

Up next is our first DVD from the PBS *Evolution* series. This episode is titled "Great Transformations," and gives an excellent visual summary of both what evolutionists claim and some of the evidence which they believe supports these claims.[4] To help keep you on track, make sure you can answer the following questions once you've viewed the episode (some of them may appear on your midterm).

Questions for "Great Transformations"

1. Of mammals, fish, and whales, which evolved first? Second?
2. On the "hour model" of earth history, how long are microbes the dominant life form? When did animal life appear? When does human history begin?
3. What features characterize mammals? Did mammals evolve in the water, or on the land?
4. What does the fossil record show regarding whale evolution?
5. What did basilosaurus have which is lacked by present-day whales?
6. The fossil record aside, what other evidence is there for the particulars of whale evolution?
7. What is a tetrapod? Where did the earliest tetrapods live? What is the significance of the fact that some fishes were tetrapods?
8. What is the Cambrian explosion? Did Darwin admit the Cambrian explosion presented a difficulty for his theory?
9. What is the genetic explanation for the fact that different animal species resemble one another?
10. The episode dwells for a time on some genetic experiments involving fruit flies. What is the significance of these experiments?
11. What is the closest living relative of *homo sapiens*. Did we evolve from this relative?
12. Once our ancestors stood up, was it virtually inevitable that we, *homo sapiens*, would be the result?

J. Conclusion

By the end of this unit, you should have a pretty good idea of what biological evolution does and does not involve, what are some of the major claims made on its behalf. This is, of course, by no means an exhaustive introduction, but it should be adequate for our purposes. Next week we will be reading an actual exchange between an anti- and pro- evolutionist; given your familiarity with the contents of the present unit, you should be well prepared to follow the debate. As always, those who had a hard time with this unit should seriously consider re-reading it a second time. There is no online quiz for this unit, although the material of this unit will be included on the midterm.

Notes:

1. To be precise, its presence was inferred from an analysis of light from the sun.
2. Arthropods are characterized by a hard exoskeleton, with a segmented body possessing appendages on each segment
3. A phylum is a taxonomic category. The Linnaean sequence of categorization is as follows: kingdom, phylum, class, order, family, genus, species. Accordingly, phylum such as Chordata are very broad categories, and encompass a wide variety of species. It is worth noting that some claim the Linnaean system is out-of-date, and prefer to classify along molecular lines.

4. By way of trivia, the narrator's voice may sound familiar: it is that of film actor Liam Neeson, perhaps best known for his role as Oscar Schindler in "Schindler's List," also the voice of Aslan in the "Chronicles of Narnia" movies.