

Saint Leo University

SCI 115SC

Is Evolution True? Your Inner Fish

Course Description:

Are we humans just “souped-up” fish?! How did the human animal come to be what it is? What evidence of our evolution lies within our own bodies? How are we like fish? Worms? Even bacteria? Through paleontology (fossils), genetics, molecular biology, comparative embryology and comparative anatomy – we will reconstruct the history and examine the evidence for the building of human bodies through evolutionary adaptations. Is Evolution true? We will explore the evidence ranging from biogeography to geology, from molecular biology to physiology, so you can decide.

Prerequisite:

None

Textbooks:

Option 1 - Purchase all texts as a package:

Shubin, et al. (2009). *Your inner fish, custom package*. Boston, MA: Pearson Custom.
ISBN-13: 978-1-269-37341-8

Option 2 - Purchase each text separately:

Shubin, N. (2008). *Your inner fish*. New York, NY: Vintage Books. ISBN-13: 978-0-307-27745-9

Coyne, J. A. (2010). *Why evolution is true*. New York, NY: Penguin Books. ISBN-13: 978-0143116646

Learning Outcomes:

By the end of the course, the student will be able to:

1. Evaluate scientific theories using scientific principles through describing *the scientific method, explaining how it is different from other ways of knowing, and why science has become such a powerful tool; define theory, describe how hypotheses are proven; demonstrate critical thinking skills through discussion board, quizzes, term paper and exams.* **SC3**
2. Analyze physical, biological and/or ecological systems *through the explanation of both the process of Evolution by Natural Selection, and the evidence for evolution from paleontology, genetics, molecular biology, comparative embryology, comparative anatomy, physiology, biogeography, and geology through discussion board, quizzes, term paper and exam.* **SC1**
3. Trace the evolution of humans and explain the evidence for the building of human bodies through evolutionary adaptations *through discussion board, quizzes and exams.*
4. Explain the functioning of DNA, Genes, Chromosomes, and explain that evolutionary transformations often involve using ancient genes in new ways *through discussion board, quizzes and exams.*
5. Visualize events that happened millions and billions of years ago *through discussion board, quizzes and exams.*
6. Appreciate that the evidence and knowledge about basic evolution are so strong, that for all intents and purposes, they are facts *through discussion board, quizzes and exams.*
7. Interpret for intended and unintended meaning, assess different points of view, assumptions, and /or arguments, and support decisions using rigorous arguments based on criteria and evidence *through use their knowledge of the Natural Sciences with integrity to make*

decisions and apply values impacting their University, their communities, their government, their Earth evidenced through the term paper.
CT1-3 Integrity

Core Value:

The core value for this course is:

Integrity: The scientific endeavor is based upon integrity – without intellectual honesty and personal integrity the process of science would be impossible. We must use our knowledge of the Natural Sciences with integrity as we make decisions and apply values impacting our University, our communities, our government, our Earth.

Grade Score (%)

A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D+	67-69
D	60-66
F	0-59

<u>Item</u>	<u>Percent of Grade</u>	<u>Total Points</u>
Discussion Board Responses	24% (8 @ 3% each)	800 (8 @ 100 points each)
Quizzes	10% (6 @ 1.67% each)	600 (6 @ 100 points each)
Draft of Term Paper	3% (1 @ 3% each)	100 (1 @ 100 points each)
Term Paper	23% (1 @ 23% each)	100 (1 @ 100 points each)
Mid term Exam	20% (1 @ 20% each)	84 (1 @ 84 points each)
Final Exam	20% (1 @ 20% each)	80 (1 @ 80 points each)
Totals:	100%	1764 points

Evaluation:

Discussion Board Responses [L.O. 1-6]

Each module will include a discussion question for which you are expected to post an initial response to the question by Thursday 11:59 PM EST/EDT, and responses to at least two classmates by Sunday 11:59 PM EST/EDT of the same week.

Weekly Quizzes [L.O. 1-6]

Quizzes will be given during Modules 1, 2, 3, 4, 6 and 7 and will cover the material that you learned during that week.

(UE Key Assignment) Term Paper (APA style required) [L.O. 1,2,7]:

This is a 10-page essay in which you will reflect upon each of the chapter themes in *Why Evolution Is True*. It should include reflections on your development and understanding of what evolution is and is not. It should include your personal journey of discovery related to the concept of evolution. It should also include philosophical, theological, and sociological reflections as well as a demonstration of a scientific understanding of evolution. Additionally, you should critique and evaluate the ideas presented in the book using your scientific understanding of the process of evolution. A rough draft will be due

during Module 6 and will be worth 3% of your grade. A final draft will be due during Module 7 and will be worth 23% of your grade.

You must submit your Term Paper to Chalk and Wire. The Chalk & Wire link is located in the Key Assignment Module. Students who do not submit the assignment to Chalk & Wire will receive a zero. This is a key assignment assessment; the results are used to ensure students are meeting University Exploration program goals. Video and PDF instructions can be found on the course home page. PDF instructions are also located in the Start Here folder

Exams [L.O. 1-6]

Exams will be given during Modules 5 and 8. The Midterm Exam will cover the material that you learned during Modules 1-5. The Final Exam will cover the material that you learned during Modules 6-8.

Course Schedule:

Module 1 Finding Your Inner Fish

Objectives

At the conclusion of this module, students will be able to:

- Distinguish between the scientific and the colloquial use of the word “theory.”
- Define evolution and indicate why it is viewed as controversial by nonscientists.
- Describe and apply the scientific method.
- Explain the apparent significance of Shubin’s discovery of *Tiktaalik*.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Why Evolution Is True</i>, Chapter 1- <i>Your Inner Fish</i>, Chapter 1	
Post an introduction to the class	Thursday 11:59 PM EST/EDT
Work through the content in the module	
Post a response to the first discussion question	Thursday 11:59 PM EST/EDT
Post a response to the second discussion question	Sunday 11:59 PM EST/EDT
Complete Quiz 1	Sunday 11:59 PM EST/EDT
Begin working on the draft for the Term Paper	Sunday 11:59 PM EST/EDT of Module 6

Module 2 Written in the Rocks

Objectives

At the conclusion of this module, students will be able to:

- Describe the mechanisms of fossil formation.
- Reconstruct the history of life from fossil evidence.
- Evaluate the evidence that scientists use to determine the age of rocks.
- Explain how the fossil record could support/refute the theory of evolution.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Why Evolution Is True</i>, Chapter 2	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Quiz 2	Sunday 11:59 PM EST/EDT
Continue working on the draft for the Term Paper	Sunday 11:59 PM EST/EDT of Module 6

Module 3 Homologies: The Great Family Tree Revealed

Objectives At the conclusion of this module, students will be able to:

- Distinguish between analogy and homology.
- Compare scientific and non-scientific interpretations of homology.
- Explain how homologous structures support the theory of evolution.

Assignments

Items to be Completed:	Due No Later Than:
Read - <i>Why Evolution Is True</i> , Chapter 3 - <i>Your Inner Fish</i> , Chapters 2 and 4	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Quiz 3	Sunday 11:59 PM EST/EDT
Continue working on the draft for the Term Paper	Sunday 11:59 PM EST/EDT of Module 6

Module 4 Deep Homology

Objectives At the conclusion of this module, students will be able to:

- Explain how the means by which genetic information is translated into protein structure is evidence for evolution.
- Explain how great diversity can result from changes in the action of regulatory genes.
- Evaluate atavisms as evidence of evolutionary theory.

Assignments

Items to be Completed:	Due No Later Than:
Read - <i>Your Inner Fish</i> , Chapters 3, 5, and 6	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Quiz 4	Sunday 11:59 PM EST/EDT
Continue working on the draft for the Term Paper	Sunday 11:59 PM EST/EDT of Module 6

Module 5**Selection****Objectives**

At the conclusion of this module, students will be able to:

- Describe how populations change over time in response to biotic interactions and their environment.
- Distinguish between micro and macroevolution.
- Illustrate microevolution in action using several “real world” examples from the literature.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Why Evolution Is True</i>, Chapters 5 and 6- <i>Your Inner Fish</i>, Chapter 7	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Midterm Exam	Sunday 11:59 PM EST/EDT
Continue working on the draft of the Term Paper	Sunday 11:59 PM EST/EDT of Module 6

Module 6**Macroevolution****Objectives**

At the conclusion of this module, students will be able to:

- Describe the link between the concepts of micro and macroevolution.
- Explain the biological species concept.
- Apply knowledge of reproductive isolating mechanisms to explain past speciation events.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Why Evolution Is True</i>, Chapter 7	
Work through the content in the module	
Complete Quiz 5	Sunday 11:59 PM EST/EDT
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Submit a rough draft of your Term Paper	Sunday 11:59 PM EST/EDT

Module 7**The Evolution of Humans****Objectives**

At the conclusion of this module, students will be able to:

- Compare major theories of man's recent evolutionary history.
- Define human.
- Identify features of humans that are relics of man's common evolutionary history with other animals.
- Discuss several indirect means that scientists have used to learn about man's evolutionary origins.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Your Inner Fish</i>, Chapter 11- <i>Why Evolution Is True</i>, Chapter 8	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Quiz 6	Sunday 11:59 PM EST/EDT
Submit the final draft of your Term Paper	Sunday 11:59 PM EST/EDT

Module 8**The Meaning of It All: Is Evolution True?****Objectives**

At the conclusion of this module, students will be able to:

- Present and defend their views on evolutionary theory.

Assignments

Items to be Completed:	Due No Later Than:
Read <ul style="list-style-type: none">- <i>Why Evolution Is True</i>, Chapter 9	
Work through the content in the module	
Post an initial response to the discussion question	Thursday 11:59 PM EST/EDT
Post responses to at least two classmates	Sunday 11:59 PM EST/EDT
Complete Final Exam	Sunday 11:59 PM EST/EDT