

Leader's Guide to TrueU Lesson 5: DNA by Design, Part 1—Biological Information

Correlation between the DVD chapters of this lesson and the questions in the student handout.

- Chapter 1: Beginning of the Lesson (no questions in the handout pertain to this chapter)
- Chapter 2: The Building Blocks of Life (question 1)
- Chapter 3: The Director of the Show (question 2)
- Chapter 4: What Does it All Mean? (questions 3-9)

Preparation

- Preview Dr. Meyer's lesson on the DVD.
- Note how today's student handout contains within itself sufficient hints for answering the questions. Sometimes such hints for one question occur in the very next question.

Lesson Plan: 53-63 minutes

- Introduction: 1 minute
 - Say something like this: "In previous lessons we discovered that the science of cosmology enables us to be confident that the universe had a beginning that was caused by a super intelligence. We learned that the universe has finely tuned physical laws that are friendly to life. But what specifically does it take to get life started in such a life-friendly universe? What is biological life and how does it originate? Today we begin this new investigation."
- 30 minutes of DVD and 20-30 minutes of discussion using the handout.
 - Play DVD chapters 1 and 2, and then discuss question 1 in the handout.
 - Do this by clicking "play" under "DNA by Design Part 1" on the menu and pausing the DVD when "The Director of the Show" (chap. 3) appears.
 - Play "The Director of the Show" (chap. 3) and discuss question 2 in the handout.
 - Play "What Does it All Mean?" (chap. 4) and discuss questions 3-9 in the handout.
- Conclusion: 2 minutes
 - While running through the end credits (to show "up next"), say: "Our next lesson looks at the chances of getting life by a lucky accident. Is there enough good luck available in the material world to make life originate without any guiding intelligence?"
 - Show the preview of the next lesson (the "up next" video clip).

Other Resources

- For background knowledge you may read chapters 1-2 of Dr. Meyer's book: Stephen Meyer, *Signature in the Cell: DNA and the Evidence for Intelligent Design* (HarperOne, 2009).
- Additional resources for this lesson may be found on the "resources and links" webpage of www.TrueU.org. Perhaps some entries within the TrueU blog will also be helpful.

A note on handout questions 3-6: The intelligent designer of this study guide typed all three sequences here: spspspspspsp, iurnsdyskidfawqn, and "time and tide wait for no man." This illustrates a point: What we call "necessity, chance, and design" might (as theists say) all ultimately be undergirded by a supreme intelligent agent who manages the universe in a variety of ways (three of which are listed above). The "necessity" of natural laws, for a theist, is only "necessity" *here and now*, because God *freely* chose to create this universe and upholds it with a particular set of natural laws. Even so, for good reasons, we use the "necessity-chance-design" distinctions in science and everyday life. After we have built a scientific case for the sort of intelligent design described above, and use this design inference in a larger argument for theism, then we can return to "necessity" and "chance" as theists and show how we understand them differently than do atheists and adherents of other worldviews.

Handout for TrueU Lesson 5: DNA by Design, Part 1—Biological Information

1. Although many leading nineteenth-century scientists thought that the cell was a “simple homogenous globule of plasm,”¹ evolutionary biologist Richard Dawkins has recently defined biology as “the study of complicated things that give the appearance of having been designed for a purpose.”² Describe the huge difference between non-living chemicals and a living cell.
2. What determines the three-dimensional shape of a protein, which gives it a specific life function? What is “sequence specificity” in regard to the amino acids that compose proteins? Include discussion of these facts about proteins:
 - DNA’s digital *code* directs the specific *sequencing* of amino acids in protein construction.
 - Precise amino acid *sequencing* determines protein *folding*.
 - *Folded* chains of amino acids form the *shapes* of proteins.
 - Protein *shapes* perform life-critical *functions*.
3. Which sequence below is complex (improbable) *and* matches an independent meaningful pattern? Contrast the *communication* function of a sentence with the *biological* function of a protein? What properties do they share?
 - spspspspspspspspspspspspspspspspspspsp
 - iurnsdyskidfawqznzklmfdifhseiklkskdihekiqo
 - “Time and tide wait for no man” (a medieval proverb that means we can’t control time).
4. Note how the details below help answer the question above. Then answer the additional questions.
 - spspspspspspspsp is highly specific (matches a pattern), but simple (follows a repetitive rule).
 - iurnsdyskidfawqznzklmfdifhseiklkskdihekiqo is complex, but not specified (no pattern match).
 - “Time and tide wait for no man” is complex and specified (i.e., it’s *specified information*):
 - How is *specified* information also *functional* information? What’s a proverb’s function?
 - A gene is a DNA segment that codes for a protein. Proteins have life-support functions. How is a gene like the medieval proverb “time and tide wait for no man”?

¹ T. H. Huxley, “On the physical basis of life,” *Fortnightly Review* 5 (1869):129-145. British spelling is “homogeneous.”

² Richard Dawkins, *The Blind Watchmaker* (New York: Norton, 1986), 1.

5. Explain how the three sequences above can be relabeled as follows (lesson 6 covers this more):
 - Low complexity + high specificity = simple order due to repetitive law.
(consistent with necessity)
 - High complexity + low specificity = complex but arbitrary arrangement.
(consistent with chance)
 - High complexity + high specificity = complex and functional.
(only known cause is intelligent design)

6. Study these definitions and explain how the three sequences above are examples.
 - Necessity: Something that *had* to happen by a natural repetitive law. Also called deterministic.
 - Chance: Something that didn't have to happen, but *wasn't* chosen. It "just happened."
 - Design: Something that didn't have to happen, but *was* chosen purposefully.

7. What kind of cause, routinely seen in operation today, is always involved in the appearance of new information (and its associated functional outcome)? What implication does this have for the origin of DNA, which carries the information for building the proteins critical for cellular functions?

8. Is the argument for intelligent design based on ignorance or on what we know about causes today?

9. *Complexity* can be expressed as how improbable it would be to get that same thing a second time without intelligent guidance. *Specificity* is the match between the thing and an independent meaningful pattern (one with a functional result). An ordinary mountain face is complex, but lacks specificity. A Mt. Rushmore presidential face is both highly complex and specified. What is the only adequate cause of highly complex and specified effects such as Mt. Rushmore and DNA's code?

Leader's Guide to TrueU Lesson 6: DNA by Design, Part 2—Doing the Math

Correlation between the DVD chapters of this lesson and the questions in the student handout.

- Chapter 1: Beginning of the Lesson (question 1)
- Chapter 2: Taking Your Chances (questions 2-6)
- Chapter 3: Climbing Out of the Hole (question 7)
- Chapter 4: Getting Organized (questions 8-9)

Preparation

- Preview Dr. Meyer's lesson on the DVD.
- Note how the student handout contains within itself sufficient hints for answering the questions.

Lesson Plan: 53-63 minutes

- Introduction: 1 minute
 - Say something like this: "In our last lesson we began to examine what it takes for the origin of life to happen? Today we continue this investigation by looking at the chances of getting life accidentally. Is there enough good luck in the material world to make life originate without any guiding intelligence?"
- 30 minutes of DVD and 20-30 minutes of discussion using the handout.
 - Play DVD chapter 1 and then discuss question 1 in the handout.
 - Do this by clicking "play" under "DNA by Design Part 2" on the menu and pausing the DVD when "Taking Your Chances" (chap. 2) appears.
 - Play "Taking Your Chances" (chap. 2) and discuss questions 2-6 in the handout.
 - Play "Climbing Out of the Hole" (chap. 3) and discuss question 7 in the handout.
 - Play "Getting Organized" (chap. 4) and discuss questions 8-9 in the handout.
- Conclusion: 2 minutes
 - While running through the end credits (to show "up next"), say: "Our next lesson looks at the chances of getting life by a lucky accident. Is there enough good luck available in the material world to make life originate without any guiding intelligence?"
 - Show the preview of the next lesson (the "up next" video clip).

Other Resources

- For background knowledge you may read chapters 8-11 of Dr. Meyer's book: Stephen Meyer, *Signature in the Cell: DNA and the Evidence for Intelligent Design* (HarperOne, 2009).
- Additional resources for this lesson may be found on the "resources and links" webpage of www.TrueU.org. Perhaps some entries within the TrueU blog will also be helpful.

functions. In other words, we can eliminate chance as a reasonable explanation for the unguided origin of just one protein that is 150 amino acids long, given all the time (15 billion years, say most scientists) and material interactions possible within the known universe.

5. Using the points below, discuss how common (or rare) functional sequences (i.e. proteins that could do something useful in a living system) are among all the possible combinations of amino acids (the building blocks of proteins).
 - Molecular biologist Doug Axe estimates that the ratio of functional to non-functional amino acid sequences is about 1 to 10^{74} .
 - This estimate is based on his studies of functional folds among sequences that are 150 amino acids long.

6. Using the points below, discuss how likely is it that life—or even a single protein—came into existence by mere chance.
 - Based on Axe’s work and several other considerations that offer additional probabilistic hurdles, the chance of getting just one protein without intelligent guidance is far beyond the probabilistic resources of the entire known universe.
 - The leap from just one protein to life is even greater. Scientists have estimated that it takes at least 250 proteins (and much else) to construct a minimally complex single-celled organism.
 - Virtually all origin-of-life specialists have given up on “chance alone” explanations for life’s origin.

7. What is wrong with using “prebiotic natural selection” to overcome the great odds against the origin of life? Use these points below in your answer:
 - “Prebiotic” means before life began.
 - “Natural selection” means organisms that have favorable traits in a certain environment will tend to survive better than other competing organisms.
 - “Begging the question” is a logical mistake that is illustrated by the story of “going home to get a ladder to get out of a whole.”

8. What is the point of Dr. Meyer’s illustration of spelling words using magnetic letters on a refrigerator? Does magnetic attraction cause a particular sentence to appear on the refrigerator? What is the “medium” and what is the “message” in this case?

9. How is DNA’s genetic code (similar to refrigerator sentences) “spelled out” by a sequence of molecules whose arrangement is not determined by the forces of chemical attraction? What serious flaw in the self-organization theory of life’s origin does this identify?

Leader's Guide to TrueU Lesson 7: DNA by Design, Part 3—Information and Intelligence

Correlation between the DVD chapters of this lesson and the questions in the student handout.

- Chapter 1: Beginning of the Lesson (no questions in the handout pertain to this chapter)
- Chapter 2: What's the Best Explanation? (questions 1-3)
- Chapter 3: Processing the Information (question 4)
- Chapter 4: What's all This Junk For? (question 4)
- Chapter 5: Let's Break Some Rules (questions 5-8)

Preparation

- Preview Dr. Meyer's lesson on the DVD.
- Study the answer key to the student handout.

Lesson Plan: 53-63 minutes

- Introduction: 1 minute
 - Say something like this: "In our last lesson we examined the chances of getting life accidentally or by means of a natural law. Both of these alternatives failed. Today we will see why intelligent design is the best explanation for the origin of life."
- 30 minutes of DVD and 20-30 minutes of discussion using the handout.
 - Play DVD chapters 1 and 2, and then discuss questions 1-3 in the handout.
 - Do this by clicking "play" under "DNA by Design Part 3" on the menu and pausing the DVD when "Processing the Information" (chap. 3) appears.
 - Play "Processing the Information" (chap. 3) and "What's all This Junk For?" (chap. 4), and then discuss question 4 in the handout.
 - Play "Let's Break Some Rules" (chap. 5) and discuss questions 5-8 in the handout.
- Conclusion: 2 minutes
 - While running through the end credits (to show "up next"), say: "Our next lesson summarizes where we are in the series and explains why it matters. We will see how the study of biological information encoded in DNA helps us to eliminate false worldviews and identify one that best explains all of the evidence we have studied."
 - Show the preview of the next lesson (the "up next" video clip).

Other Resources

- For background knowledge you may read chapters 15-16 of Dr. Meyer's book: Stephen Meyer, *Signature in the Cell: DNA and the Evidence for Intelligent Design* (HarperOne, 2009).
- Additional resources for this lesson may be found on the "resources and links" webpage of www.TrueU.org. Perhaps some entries within the TrueU blog will also be helpful.

Handout for TrueU Lesson 7: DNA by Design, Part 3—Information and Intelligence

1. What makes an explanation about a past event the “best” explanation?
2. What is the only cause operating today that produces new functional information, such as the digital code that directs the assembly of airplane parts that support the function of flying? How does this observation help identify intelligent design as the best explanation of the origin of DNA’s digital code, which directs the assembly of the cellular components needed for life?
3. What two features, when they are both present in a natural object or event, reliably enable us to detect the work of intelligent design?
4. Why did most scientists, until recently, believe that much of DNA is useless “junk”? What sorts of functions (similar to computer software) do we now know that such DNA has?
5. What is “methodological naturalism”? Does it limit or enhance a scientist’s ability to find the truth about life’s origin? Why?
6. How might you discuss intelligent design with someone who embraces naturalism (materialism)?
7. Which pattern (below) in a complex thing reliably leads us to conclude that it was designed?
 - Fabrication: A pattern we *impose* on an object or event (it’s *not objectively* independent).
 - Specification: An *independent* meaningful pattern (Mt. Rushmore matches presidential faces).Suppose you shoot an arrow thoughtlessly into a wall. Which pattern above is illustrated by painting a target around wherever your arrow hit and saying to a friend: “look at the effect of my archery skill.” Which pattern above would be illustrated if your friend removed your arrow and then shot it into the exact same spot from 50 feet away?
8. How does this lesson strengthen the argument for the intelligent design of life (and by implication, God’s existence)? Why do you think many people seem determined to explain life’s origin without reference to the kind of intelligent designer whom theists worship, namely a God who interacts in special ways with humans?

Answer Key to TrueU Lesson 7

1. What makes an explanation about a past event the “best” explanation?

It should involve a cause that is known by experience today to produce the kind of effect under investigation. If all the rival theories utilize causes that are known to be inadequate for the job, then this further identifies the remaining theory as “best.”

2. What is the only cause operating today that produces new functional information, such as the digital code that directs the assembly of airplane parts that support the function of flying? How does this observation help identify intelligent design as the best explanation of the origin of DNA’s digital code, which directs the assembly of the cellular components needed for life?

“The creation of new information is habitually associated with conscious activity,” so wrote information theorist Henry Quastler.³ Conscious activity is intelligent design. Intelligence is the only cause known by experience today to produce the kind of effect (functional information which is necessary for the origin of life) under investigation. All the rival theories utilize causes (random events or repetitious events determined by natural laws) that are known to be inadequate for the job, and so this further identifies intelligent design theory as the best explanation of life’s origin.

3. What two features, when they are both present in a natural object or event, reliably enable us to detect the work of intelligent design?

Complexity and specificity. *Complexity* can be expressed as how improbable it would be to get that same thing a second time by an unintelligent process. *Specificity* refers to the match between the thing in question and a specific independent meaningful pattern or functional outcome. An ordinary mountain face is complex, but lacks specificity. A presidential mountain face on Mount Rushmore is both highly complex and highly specified. DNA’s code, like the Mount Rushmore presidential faces, is highly complex and highly specified, and thus it must have been intelligently designed.

4. Why did most scientists, until recently, believe that much of DNA is useless “junk”? What sorts of functions (similar to computer software) do we now know that such DNA has?

Darwinists expected the trial and error process of natural selection acting on random mutations to leave behind in the genome a junkyard full of useless DNA segments, among which only a small percentage of DNA would code for something functional, such as proteins. This prediction seemed to be confirmed until recently when scientists began to find unmistakable evidence of numerous functions for so-called “junk DNA.” Much of what was formerly thought to be junk in “non-coding regions” is now known to have function. Some of its functions like the operating system of a computer (but more sophisticated than human technology). For instance, so-called “junk DNA” governs *when* the protein-encoding parts of DNA are to be accessed, *where* the constructed proteins are to be used, and more.

Information processing systems found both in computers and cells include:

- Nested coding of information
- Files within folders hierarchical filing system
- Distributed storage and retrieval informational modules
- Operating systems such as Microsoft’s “Windows” and the Macintosh OS.

³ Henry Quastler, *The Emergence of Biological Organization* (New Haven: Yale University Press, 1964), 16.

5. What is “methodological naturalism”? Does it limit or enhance a scientist’s ability to find the truth about life’s origin? Why?

Methodological naturalism may be described as the idea that intelligent causes should not be considered in scientific inquiry because only material causes are allowed. Richard Dawkins revealed in his interview with Ben Stein on the movie *Expelled* (www.themovieexpelled.com) that he would be willing to break this methodological rule in origin of life studies, but only if (previously-evolved) alien intelligent life is intelligent designer, rather than God. Ben Stein then commented in *Expelled*: “So Professor Dawkins was not against intelligent design, just certain types of designers, such as God.”

A further irony here is that design theorists, *as scientists*, only infer the *operation* of intelligence, *not* the *identity* of the designing intelligence. Many design theorists go further than this, but only by using additional fields of knowledge beyond science, such as human history (e.g., evidence for Jesus’ resurrection). Methodological naturalism artificially *limits* a scientist’s ability to find the truth about origins. The reason for this is because it limits the possible answers to the question even before investigation begins. The biased approach of methodological naturalism is a different issue than whether one concludes, after inquiry, that material causes were responsible for the effects in many cases (e.g., microevolution, or limited biological change), but not in other cases (e.g., origin of the universe and life). The latter approach, simply following the evidence where it leads, is what critics of Darwinism and critics of methodological naturalism are attempting.

6. How might you discuss intelligent design with someone who embraces naturalism (materialism)?

Use the key points in the lesson to engage others in conversation about design and naturalism.

7. Which pattern (below) in a complex thing reliably leads us to conclude that it was designed?

- Fabrication: A pattern we *impose* on an object or event (it’s *not objectively* independent).
- Specification: An *independent* meaningful pattern (Mt. Rushmore matches presidential faces).

Suppose you shoot an arrow thoughtlessly into a wall. Which pattern above is illustrated by painting a target around wherever your arrow hit and saying to a friend: “look at the effect of my archery skill.” Which pattern above would be illustrated if your friend removed your arrow and then shot it into the exact same spot from 50 feet away?

Painting a target around wherever your arrow hit is *fabrication* because you *imposed* this pattern of concentric circles around your arrow’s arbitrary impact point. Such a pattern is *not independent* of the event in question (the arrow’s impact). Legitimate targets, ones that reliably indicate archery skill, are set up before an arrow takes flight and thus are *independent* of the event of arrow shooting. Such would be the case in the scenario in which a friend manages to shoot an arrow into the exact pre-specified point where your arrow had previously landed. This would reliably indicate archery skill, which is a kind of intelligent design.

8. How does this lesson strengthen the argument for the intelligent design of life (and by implication, God’s existence)? Why do you think many people seem determined to explain life’s origin without reference to the kind of intelligent designer whom theists worship, namely a God who interacts in special ways with humans?

This is a summary question that could be answered in many different ways.

Leader's Guide to TrueU Lesson 8: DNA by Design, Part 4—Return of the God Hypothesis

Correlation between the DVD chapters of this lesson and the questions in the student handout.

- Chapter 1: Beginning of the Lesson (no questions in the handout pertain to this chapter)
- Chapter 2: Those Who Have Gone Before Us (question 1)
- Chapter 3: Let's Review (question 1)
- Chapter 4: Some Additional Evidence (questions 2-3)
- Chapter 5: The Return of the God Hypothesis (question 1 again)

Preparation

- Preview Dr. Meyer's lesson on the DVD.
- Note how this lesson contains much review and sets what we have done in a larger context.

Lesson Plan: 53-63 minutes

- Introduction: 1 minute
 - Say something like this: "Today our lesson summarizes where we are in the series and explains why it matters. We will see how the study of DNA, the fossil record, and other areas of science, when seen as an integrated whole, helps us to eliminate false worldviews and identify one (theism) as the best explanation of the evidence."
- 30 minutes of DVD and 20-30 minutes of discussion using the handout.
 - Play DVD chapters 1-3, and then discuss question 1 in the handout.
 - Do this by clicking "play" under "DNA by Design Part 4" on the menu and pausing the DVD when "Some Additional Evidence" (chap. 4) appears.
 - Play "Some Additional Evidence" (chap. 4) and discuss questions 2-3 in the handout.
 - Play "The Return of the God Hypothesis" (chap. 5) and discuss question 1 again.
- Conclusion: 2 minutes
 - While running through the end credits (to show "up next"), say: "Our next lesson turns to a major new topic: morality. We will investigate which worldview best makes sense of our moral experience."
 - Show the preview of the next lesson (the "up next" video clip).

Other Resources

- For background knowledge you may read chapters 17-20 of Dr. Meyer's book: Stephen Meyer, *Signature in the Cell: DNA and the Evidence for Intelligent Design* (HarperOne, 2009).
- Additional resources for this lesson may be found on the "resources and links" webpage of www.TrueU.org. Perhaps some entries within the TrueU blog will also be helpful.

Handout for TrueU Lesson 8: DNA by Design, Part 4—Return of the God Hypothesis

1. Review the evidence that points to theism as the best explanation for the origin of the universe and life. How might you find the courage to discuss this evidence, or at least dissent from naturalism, within an academic setting overwhelmingly committed to atheism and scientific materialism?
2. What is the Cambrian explosion of animal life? How does this episode in earth history, and other sudden appearances of many radically new life forms challenge both deism and Darwin's idea that all life evolved from a single common ancestor?
3. How are tiny bacterial rotary engines and many other molecular devices found in living cells best described as "functionally integrated high tech systems"? How does this evidence, alongside the scientific discoveries discussed earlier, call for a highly reasonable "return of the God hypothesis" in our time—echoing, with amplification, the confident voices of early modern scientists who believed in God?