**Abiogenesis**

Script

1. Origins 101--Abiogenesis
2. Our world contains an astonishing diversity of life forms—from the microscopic Paramecium / to the giant Sequoia…
3. From creatures that fly…
4. To those that live underwater…
5. From plants…
6. To animals
7. In order to believe that all this amazing diversity developed without a Creator / from a single-celled common ancestor, it is necessary to believe that two things happened:
8. …abiogenesis / and macroevolution. In this presentation, we will explore abiogenesis, and in the next presentation, we will talk about macroevolution.
9. To understand what abiogenesis means, / let’s look at each part of the word. / “A” means not or without; / “bio” means life; / and “genesis means beginning. So abiogenesis refers to the idea that the first life came from nonliving things
10. The idea that life came from nonliving things goes back to the time of the Greek philosopher Aristotle a few hundred years before Jesus lived, / and it was still around in the 1600s. / At that time, people noticed that mice would appear in a pile of rags / and that maggots would appear on rotting meat. They mistakenly thought that the meat produced the maggots and the rags produced the mice.
11. At that time, the idea of life from nonliving things was called spontaneous generation.
12. A series of famous experiments by scientists like Francesco Redi / and Louis Pasteur finally demonstrated that life does not generate spontaneously from nonliving things.
13. In spite of this, just a few years later, a biologist named T. H. Huxley coined the term abiogenesis to refer to the process of life coming from nonliving things.
14. And in 1924, a scientist named Alexander Oparin suggested that—even though spontaneous generation does not happen now--perhaps abiogenesis had been possible in the distant past when conditions on earth were different.
15. For many decades, beginning in the 1950s, scientists have been doing origin-of-life experiments to explore the possibility of abiogenesis. We will take a look at the results of these experiments, but first we need to understand what is required for life to exist.
16. For this portion of the presentation we are heavily indebted to Dr. Leonard Brand and the chapter on the Origin of Life in his book Faith, Reason, and Earth History.
17. According to Dr. Brand, the following components of life—AT LEAST—must be present for a biological entity to survive and produce more of its own kind: / proteins, / nucleic acids, / membranes, / enzymes, / ribosomes, / an energy source, / and a method of replication.
18. Let’s think first about proteins, which are made of amino acids. / We can use these children’s toys to represent amino acids.
19. Instead of five different kinds of blocks like the ones shown here, / there are 20 different kinds of amino acids. Each one is like a different letter in an alphabet. / Proteins are formed from a string of amino acids joined together—but not just a few amino acids like what we are illustrating here.
20. Proteins require dozens, hundreds, or even thousands of amino acids. And just like the letters in our alphabet have to be in a certain order to form words and sentences, very specific amino acids are required—in exactly the right order—to make proteins.
21. Then the chain of amino acids folds into a specific 3D shape to become a functional protein.
22. Proteins are necessary to produce other things on this list.
23. Membranes have many different proteins in them.
24. Enzymes, which are necessary for initiating biochemical reactions, ARE proteins.
25. And these enzymes are required for processing energy
26. Something else necessary for life are nucleic acids—like DNA and RNA. Four different nucleotide bases join together to make up DNA. They are kind of like a four-letter alphabet that is used to convey the information necessary to make an organism.
27. Ribosomes are made of both nucleic acids / *and* proteins
28. With this background about the components necessary for life to exist, let’s think about four steps that would have been necessary to create life from nonliving materials.
29. First, simple organic molecules like amino acids and nucleotides--as well as sugars, fatty acids, and other things--would have to be produced and accumulate in something often referred to as “primordial soup.”
30. In step two, many of these organic molecules would have to become linked together to form what are called macromolecules. In other words, the amino acids would have to link together to form proteins, and the nucleic acids would have to join together to form DNA or RNA.
31. In step three, a membrane would have to form to hold the macromolecules together in a working unit. We will call this a Protocell, which means a very simple, primitive cell.
32. In step 4, the protocell would have to develop all the complex machinery and processes of a fully-functioning cell. Keep all this in mind as we look at origin-of-life experiments.
33. Some influential origin-of-life experiments were done by Stanley Miller, supervised by Harold Urey, and published in 1953.
34. To simulate the origin of life, Miller tried to produce organic molecules using a closed glass chamber like this one.
35. He designed a hypothetical atmosphere containing water, methane, ammonia, and hydrogen…
36. …and circulated these gases around in the apparatus.
37. These gases were selected for the simulated atmosphere because they were thought to be the ones most likely to produce the amino acids, nucleotides, and sugars the experimenters were hoping to obtain. / Oxygen was NOT included, because any organic molecules produced would quickly be decomposed by the process of oxidation if oxygen was present.
38. Electric sparks were used to cause chemical reactions.
39. To simulate a hot environment, a heat source was provided, and the mixture was allowed to bubble for a week.
40. During this process, four amino acids and numerous other organic compounds were produced in the “soup.” (Understanding Creation, page 106)
41. In subsequent variations of Miller’s experiments, even more biologically significant molecules were produced, /including most of the 20 amino acids found in proteins, / several of the nucleotide bases found in DNA and RNA, / important sugars, / and fatty acids.
42. Researchers believed they had reproduced the beginning steps in the origin of life. / However, it appears that their optimism was premature because of several significant problems. In addition to the biologically significant molecules produced, / many non-biological molecules were produced as well. / In other words, amino acids were formed that are NOT found in living things. / At the very least they were not helpful, / but in the vast majority of cases, they were even destructive.
43. In addition, the energy sources that caused the amino acids to join together could also break them down even faster. / In other words, the energy sources would be predominantly destructive. (Brand 143)
44. Perhaps one of the most challenging problems of all / is the fact that the amino acids produced were a mixture of left- and right-handed amino acids. Why is this important? / Because only left-handed amino acids are found in living things. / Some mechanism would be needed to distinguish between the usable left-handed amino acids / and the unusable right-handed amino acids. This dramatically changes the probability of proteins forming by chance.
45. Interestingly, the opposite is true for the sugars that form the backbone of DNA. They must be right-handed. The fact that in living beings only left-handed amino acids join together while only right-handed sugars join together is a strong argument against a chance origin for life.
46. Still another major problem with the Miller-Urey experiment is that it did not use a realistic atmosphere. Science magazine said in 1995 that experts now dismiss Miller’s experiment because ‘the early atmosphere looked nothing like the Miller-Urey simulation.’” (Case for a Creator 37)
47. In spite of all the challenges we just discussed, it would have been necessary for the simple organic molecules to be produced and accumulate in the “primordial soup.”—and not just in highly structured experiments designed by intelligent scientists with a basic understanding of chemistry—but as a result of random, undirected processes.
48. IF that did happen, the next step would be for the amino acids and nucleotide bases to link together to make larger molecules. In other words, amino acids would have to join to form proteins, and nucleic acids would have to join to form DNA or RNA. / This could happen either in the “soup” / or elsewhere in the apparatus as the gases circulate.
49. One problem with this is that the soup would have been very dilute. Unlike our diagram of the soup, where the individual amino acids and nucleotide bases appear to be crowded together, they actually would have been spread much further apart. The soup is estimated to have been as dilute as the concentration of the same compounds in the North Atlantic Ocean today
50. In the laboratory, they solved this problem of too much distance between the molecules by using a trap to catch and hold them. But under natural conditions, any realistic “soup” would have been too dilute to expect that molecules would link together. (Brand 144)
51. A second problem would be that the molecules would only survive in the “soup” for a short time. With all the dangers from the destructive nonbiological molecules and energy sources, it is much more likely that the molecules would be broken down before they had a chance to join together. For these two reasons, step 2 is exceedingly unlikely. / Remember also that a mechanism would be needed to sort out the useful molecules—like the left-handed amino acids (and right-handed sugars)
52. To summarize, under very controlled laboratory conditions, intelligent scientists have had considerable success in synthesizing building blocks / like amino acids, / nucleotide bases, / and fatty acids. However, / experiments consistently fail to synthesize the larger macromolecules like protein, / DNA, / or RNA/ in conditions intended to simulate an abiotic earth.
53. Let’s compare step 3 with the list of things necessary for life. In order to form a protocell, a membrane would be necessary to hold all the other parts together. / But remember that proteins are important building blocks of membranes. So unless proteins could be produced, no protocell could be produced either.
54. IF a way could be found to make a suitable primordial soup where individual molecules could avoid being broken down and be close enough to join together, / IF there were reactions that could produce proteins and DNA, / and IF everything necessary to form a protocell was available, / there would still be a huge gap between having a protocell and a true cell.
55. To illustrate this, let’s think about a city. A cell is often compared to a city—with infrastructure and systems in place for manufacturing, packaging, and transportation. This includes activities like taking out the trash and bringing in food.
56. In contrast to a fully functioning city, imagine a vacant lot where a city *could* be located someday.
57. This is a good illustration of the difference between a protocell and a true cell with all the organelles and systems in place to be a fully functioning cell capable of replicating itself.
58. This includes the presence of actual microscopic molecular machines—with moving parts just like machines designed by humans. If you haven’t already, we recommend that you watch our videos about Irreducible Complexity and some of the irreducibly complex molecular machines found in nature. (Cilia & Flagella and ATP Synthase)
59. If these machines were not present, the cell would not be alive. The theory of abiogenesis carries the heavy burden of convincing us that the origin of all these machines without an intelligent inventor is realistically possible
60. Any protocell that formed under natural conditions / would have to escape destruction as it became more and more complex in exactly the right way to produce a cell capable of sustaining and reproducing itself. / Since natural selection would only be in operation AFTER a true cell existed, the alleged transition from a Protocell to a true cell would have to happen essentially by chance. / In other words, there would be no help from the process of natural selection to help the protocell survive until it became a true cell.
61. The basic concept of abiogenesis originated before we had a sophisticated understanding of the cell. / This simple blob is all scientists in Darwin’s day could see when they looked at a cell under a microscope. / (And remember—people had believed in spontaneous generation for hundreds of years)
62. Each new discovery in molecular biology makes the challenge to the theory of abiogenesis more serious.
63. We began this presentation by stating that to explain the diversity we see around us without a Creator, one has to believe that two things happened: abiogenesis and macroevolution.
64. We have seen that the challenges to abiogenesis—at all four steps--are overwhelming.
65. For this reason Dr. Brand--and many other scientists—recognize abiogenesis as one of the weakest links in naturalistic theories of origins.
66. And since the possibility of life forming from nonliving material here on earth has been shown to be so unlikely, / some scientists have gone so far as to suggest that life began somewhere else instead and was transported to earth on an asteroid or inside a comet.
67. Our next presentation will look at macroevolution--the second thing that must have happened in order for the diversity around us to be explained without a Creator.