**Origins 101-9**

**Origin of Information in the Cell**

Script

Instructions: Advance the PowerPoint slides at every new paragraph and anywhere you see “/”

[1] Origins 1-1—The Origin of Information in the Cell

[2] In previous presentations we have talked about the astonishing amount of genetic information contained in DNA. Where did all this information come from?

[3] Any theory of the origin of life must resolve the critical question of the origin of biological information. To understand more about this information, we need some background.

[4] Think about this sequence of letters and spaces. It is an orderly sequence of specific letters, that repeats over and over but doesn’t carry any meaningful information.

[5] It is similar to the repeating order we find in some inanimate objects, like table salt for example. Each salt crystal is shaped like a cube because of the specific, repeating order of its molecules.

[6] In contrast, look at this series of letters. / Instead of being an orderly repetition of a specific sequence, there is a complex and irregular collection of letters.

[7] Notice that neither the orderly repetition nor the irregularly complex sequence of letters says anything meaningful.

[8] The information found in cells is specific, but not repeating. / And it is complex.

[9] But instead of being random gibberish like this, / it has meaning

[10] Because it is specific and complex, we call it specified complexity. / And because it has meaning, / we say it contains information.

[11] So where do we find the specific and complex information in cells? / In proteins and DNA.

[12] Remember that proteins are made of amino acids. There are 20 different kinds of amino acids, just like there are 26 letters in our alphabet. And just like letters combine to make words that mean something, amino acids join together in a certain order to make proteins which contain meaningful information. Most proteins contain hundreds, or even thousands, of amino acids.

[13] Then the amino acid chains have to fold together into a specific 3D shape which enables the proteins to fit with other molecules, / like the teeth of a key fit into a lock.

[14] The sequence of amino acids is determined by information. We can’t have life without proteins. Where did they come from?

[15] No natural laws control which amino acids are more likely to join together. If there were, it would actually limit the possibilities.

[16] The instructions for assembling amino acids into proteins actually come from the information contained in the DNA molecule.

[17] The fact that DNA stores information—in the form of a four-character digital code—is considered to be one of the most extraordinary discoveries of the last century.

[18] DNA is composed of sequences of subunits called nucleotide bases. There are four bases-- / abbreviated A, C, G, and T--that are like a short alphabet.

[19] The order of the nucleotide bases contains information. / This information specifies the sequences of amino acids that make up the proteins. / No natural laws specify the order in which the bases occur.

[20] Sometimes we say that DNA is like a blueprint, but it’s really more like a library filled with blueprints for making all kinds of biological machines and larger structures within living organisms.

[21] Each cell contains 6 feet of tightly coiled DNA.

[22] It’s difficult to know for sure, / but it has been estimated that a full set of human chromosomes contains between twenty and thirty thousand genes.

[23] Many of these genes can produce parts of several different proteins. / It is thought that some of the more complex genes may be involved in producing as many as 20,000 different kinds of proteins

[24] The astounding capacity of microscopic DNA to harbor this mountain of information, carefully spelled out in a four-letter chemical alphabet vastly exceeds that of any other known system.

[25] In fact, according to Michael Denton, the information needed to build the proteins for all the species of organisms that have ever lived could be held in a teaspoon and there would still be room left for all the information in every book ever written.

[26] So we know that the instructions for making proteins come from the DNA. / But where did *that* information come from?

[27] When we want to know what caused something to happen in the past, / we can start by asking what causes that same thing to happen in the present. And then--unless there is a compelling reason to think otherwise--/ we assume it happened in the past the same way it happens in the present.

[28] So when we want to know where information came from in the past, / we ask ourselves where information comes from today. / And we know from experience that information always comes from a mind. / So unless we have some compelling reason to believe otherwise, we would expect that the information in DNA also came from a mind.

[29] Scientists have explored at least three other possibilities: / random chance, / natural selection, / and various chemical affinities or options for self-ordering.

[30] Scientists have estimated the probability of getting a fairly small protein by chance. / It is estimated that the probability of 150 left-handed amino acids / linking up in just the right order / with just the right bonds between them / is just 1 in 1 x 10 to the 195th power.

[31] That’s a 1 with 195 zeroes after it.

[32] These probabilities only apply to artificial situations like a chemistry lab where contaminants are excluded. In nature, contamination would prevent anything useful from happening, even by chance. / But even if one protein was somehow present, that would only be one of 300-500 protein molecules needed for a cell that is only minimally complex.

[33] According to Stephen Meyer, “to suggest chance against those odds is really to invoke a naturalistic miracle.”

[34] Although the idea that information could have arisen by random chance is still alive at the popular level, “virtually all origin-of-life experts have utterly rejected that approach.”

[35] Another explanation scientists have explored for the origin of information in the cell is natural selection. / Recall that natural selection is the process by which offspring with advantageous or beneficial traits survive and reproduce better than those without the advantageous traits.

[36] Notice that organisms have to be able to reproduce before natural selection can work.

[37] The problem is, you can’t have a self-replicating organism / without the information in DNA, which really means we are trying to explain the existence of information / using something that can happen only AFTER the information already exists!

[38] A third idea that scientists have explored is some form of self organization. Dean Kenyon, one of the first scientists to suggest that amino acids and nucleotide bases had some sort of self-ordering ability later repudiated the conclusions of his own book saying, “We have not the slightest chance of a chemical evolutionary origin for even the simplest of cells.”

[39] Amino acids don’t demonstrate any bonding affinities, but even if they did, self-organization wouldn’t yield meaningful information—just the meaningless repetition of a salt crystal.

[40] Especially without a compelling reason to think otherwise--

[41] we assume information originated in the beginning the same way it originates in the present

[42] Whether we’re talking about books, / computer code, / or the Rosetta Stone, / information is the hallmark of mind.

[43] None of these possibilities that scientists have explored appears to be a reasonable explanation for the origin of the information in the cell. / But it *is* reasonable to believe that the information in our cells came from the same place information comes from today—an intelligent mind.

[44] In our next presentation, we will define probability, review how to calculate it, and look at the kinds of probabilities we often encounter in discussions about origins.