**Origins 101-4**

**Sources of Variation**

Script

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

[2] Origins 101: Sources of Variation

[3] You have already learned that variation is an important piece of Darwin’s theory of evolution.

[4] It was variation in beak size that enabled the finch population on the Galapagos Islands to survive periods of drought or heavy rain.

[5] The process known as natural selection enabled the finches with the most advantageous beak size to survive. / But it’s important to understand that natural selection cannot create beneficial traits. / It can only work once a certain trait exists in the population.

[6] So where did the variation come from in the first place?

[7] In Darwin’s day, scientists could only guess where variation came from, / but today we know a lot about how traits are passed genetically from one generation to the next.

[8] Scientists have identified several sources of variation in the traits within a population: / the recombination of genes during reproduction, / mutations, / and epigenetics.

[9] A certain amount of variation happens naturally during the process of meiosis as genetic information from a parent is reshuffled. / Then genes from both mom and dad can combine in a limited number of ways to create variation in things like the hair color, height, and facial features of their offspring. / It’s important to realize that this does not create any new information. It just reshuffles the genetic information that was already there.

[10] Variation also comes from mutations—/ or mistakes that are made during the process of Meiosis. / Mutations are accidental, random changes in the genetic instructions, and they are usually harmful. / Since natural selection weeds out traits that are not beneficial, it would make sense for traits that happen as a result of harmful mutations to be eliminated from the population in time.

[11] Scientists have conducted experiments that purposely cause mutations in organisms to see if it is possible to produce major changes in body plans. / They found that mutations which happen early in the developmental process can produce major structural changes in the organism, / but those mutations are always lethal. / Although organisms can survive mutations which happen later in the developmental process, / those changes are always too small to alter the body plan.

[12] Another way to say this is that major changes are not viable. / And viable changes are not major.

[13] Another source of variation is called epigenetics. / The prefix “epi” means over, near, or in addition to. Epigenetic changes come, not from actual changes in an organism’s genes, / but from something in the environment that changes the way the genes are used or expressed.

[14] Remember that a gene can be compared to a chapter in a book. Now imagine what would happen if two pages in the chapter got stuck together. That would not be a change in the words on the page, but it would be a change that would prevent you from reading the words on the pages that were stuck together. Epigenetic changes are like that. They do not increase or decrease the amount of information in the gene, but they alter how that information can be used.

[15] As you have learned, many scientists equate microevolution with macroevolution. / They believe that many small variations / acted on by natural selection over millions of years / result in major changes.

[16] But because the major changes necessary to create new body plans and processes require new information,

[17] and these sources of variation do not produce new information, other scientists—even some who believe in evolution—/ question whether these sources of variation, combined with natural selection are capable of producing macroevolution.

[18] Does that mean that scientists are giving up on the theory of evolution? / Find out next time as Origins 101 continues with —Darwinism and Neo-Darwinism.