

Unit 2: Genetics, Heredity, Forces of Evolution, Population Genetics, and Modern Human Variation

Readings:

Larsen, Chapters 3-5

Shubin, Chapters 8-11

Topics Covered in this Unit:

In this unit we will begin by addressing the need to COMBINE the ideas of Darwin and Mendel into a comprehensive theory of evolution—the evolutionary synthesis. We will then take this further and learn about the processes underlying evolutionary change in populations. Finally, we will address the issue of human race and variation from a scientific perspective.

Important Terminology:

<u>The Cell and DNA</u>		
nucleus	cytoplasm	ribosomes
DNA	double helix	somatic cell
sex cell/gamete	chromosomes	homologous
mitosis	meiosis	recombination
adenine	guanine	thymine
cytosine	genome	
<u>Protein Synthesis</u>		
protein synthesis	messenger RNA	translation
codon	anticodon	transfer RNA
uracil	transcription	polypeptide chain
amino acid		
<u>Principles of Inheritance</u>		
Gregor Mendel	gene	allele
dominant	recessive	homozygous
heterozygous	Law of Segregation	genotype
phenotype	Mendelian traits	Law of Independent Assortment
codominance	polygenic traits	Punnett square
<u>Evolutionary (Modern) Synthesis and Forces of Evolution</u>		
evolutionary synthesis	polygenic vs. Mendelian traits	population
structural gene	regulatory gene	Hardy-Weinberg equilibrium
forces of evolution	mutation	migration/gene flow
genetic drift	Founder Effect	adaptation
diversifying selection	stabilizing selection	directional selection
adaptive radiation	sickle cell anemia/malaria	polymorphism
hemoglobin	reproductive isolation	speciation

Modern Human Variation		
race as social construct	cline	
population genetics	Human Genome Project	
prenatal stage	postnatal stage	adult stage
sexual dimorphism	genetic adaptation	First exposure/acclimatization
functional adaptation	Bergmann's Rule	Allen's Rule
melanin	melanocytes	vitamin D/folate
hypoxia	nutritional adaptation	workload adaptation

Study Questions:

1. Darwin was frustrated since he never knew about DNA and how traits were passed from one generation to the next. Why was this frustrating to him?
2. Describe the structure and function of DNA. What is it made of and how does it carry information?
3. Using information from lecture and your textbook, define the concepts of first exposure (aka. acclimatization), functional adaptation, and genetic adaptation and give their significance to biological anthropology. Be able to give example of these in humans.
4. What is the Evolutionary Synthesis (define, describe, give the history of the idea)? Given what you just presented, explain why you must learn genetics to understand how evolution works.
5. Describe protein synthesis. Be sure to use the appropriate terminology and explain each new term and concept included in your description. Why is protein synthesis important to the study of biological anthropology?
6. Define the concepts of phenotype and genotype. What is the relationship between phenotypes and genotypes, and what is an example of each in humans?
7. Name and describe the Forces of Evolution (also known as evolutionary mechanisms). For each force, discuss how alleles change over time, and demonstrate this with an actual example from life.

Note: There will be Punnett Square problems on the exam!