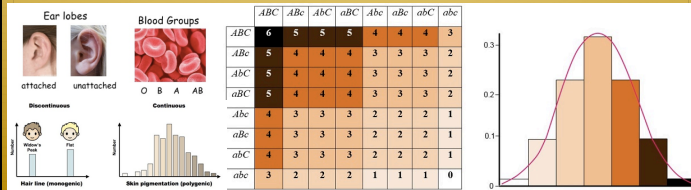## XIV. Types of Variation (10.2)

A. Variation can be discrete or continuous AND The phenotypes of polygenic characteristics tend to show continuous variation-
1. Discrete variations are those where individuals fall in specific categories (blood type, attached or unattached earlobes, etc.) usually due to the affects of a single gene.
2. Continuous variations are the product of polygenic inheritance, where two or more genes affecting the trait (skin color, wheat kernel color, etc.) resulting in a "bell curve" distribution or phenotypes.

Rossbiology; Biology Dictionary; IB Bioninja

XIV. Types of Variation (10.2)

B. Polygenic Inheritance of Skin Color-
1. Globally we observe continuous variation in skin colors. Skin color is the result of pigments, such as melanin, being produced - the darker the skin, the greater the protection against the harmful effects of the Sun.
2. Skin color is thought to be controlled by up to four separate genes, each with their own alleles. To simply we'll look at two genes with two alleles each.
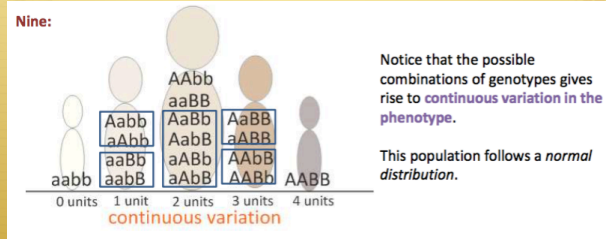
Example: 2 genes (A and B), 2 alleles each
   Assume: genes are not linked (separate chromosomes)
   In polygenics, alleles can be:
   • Contributing (they add to the phenotype)
   • Non-contributing (they do not add to the phenotype)
   How many genotypes are possible?

A = add melanin
a = don't add melanin
B = add melanin
b = don't add melanin

Bioknowledgy

XIV. Types of Variation (10.2)

Notice that the possible combinations of genotypes gives rise to continuous variation in the phenotype.

This population follows a normal distribution.

i-Biology

XIV. Types of Variation (10.2)

C. Polygenic Inheritance of Wheat Kernel Color-
1. Inheritance of color of wheat kernels works in a similar way to human skin color.

A wheat plant which is homozygous dominant for both genes is crossed with one which is heterozygous for both genes. What is the predicted ratio of phenotypes in the cross?

F_0 *homozygous dominant for both genes* X *heterozygous for both genes*

Genotype:

Punnet Grid:

1 very red, 2 red, 1 pink

Wheat kernel colour

A = add red
a = don't add red
B = add red
b = don't add red

Bioknowledgy

XIV. Types of Variation (10.2)

Mathematical Questions

A trait is controlled by **two genes**, each with **two alleles**.

How many genotypes & phenotypes are possible for this trait?

Key to alleles:
A = contributing
a = non-contributing
B = contributing
b = non-contributing

Bioknowledgy

XIV. Types of Variation (10.2)

Mathematical Questions

A trait is controlled by **three genes**, each with **two alleles**.

How many genotypes are possible in a cross between a homozygous dominant male and a homozygous recessive female?

Key to alleles:
A, B, C = contributing
a, b, c = non-contributing

Bioknowledgy

XV. Environmental Influence

A. Polygenic traits such as human height may also be influenced by environmental factors-
  1. Most traits, including polygenetic traits such as height, maybe influenced by the environment of the organism.

  Is it possible for twins to be:
  a. *different colors?*
  b. *lighter or darker than both parents?*

Human Trait	Environmental Factors
Height	•Dietary factors (e.g. protein content) •Certain childhood diseases
Skin color	• Exposure to sun • Burns • Scaring

50 year old twins whose different lives have affect their aging.

Gao Rongguo