



Department of anatomy



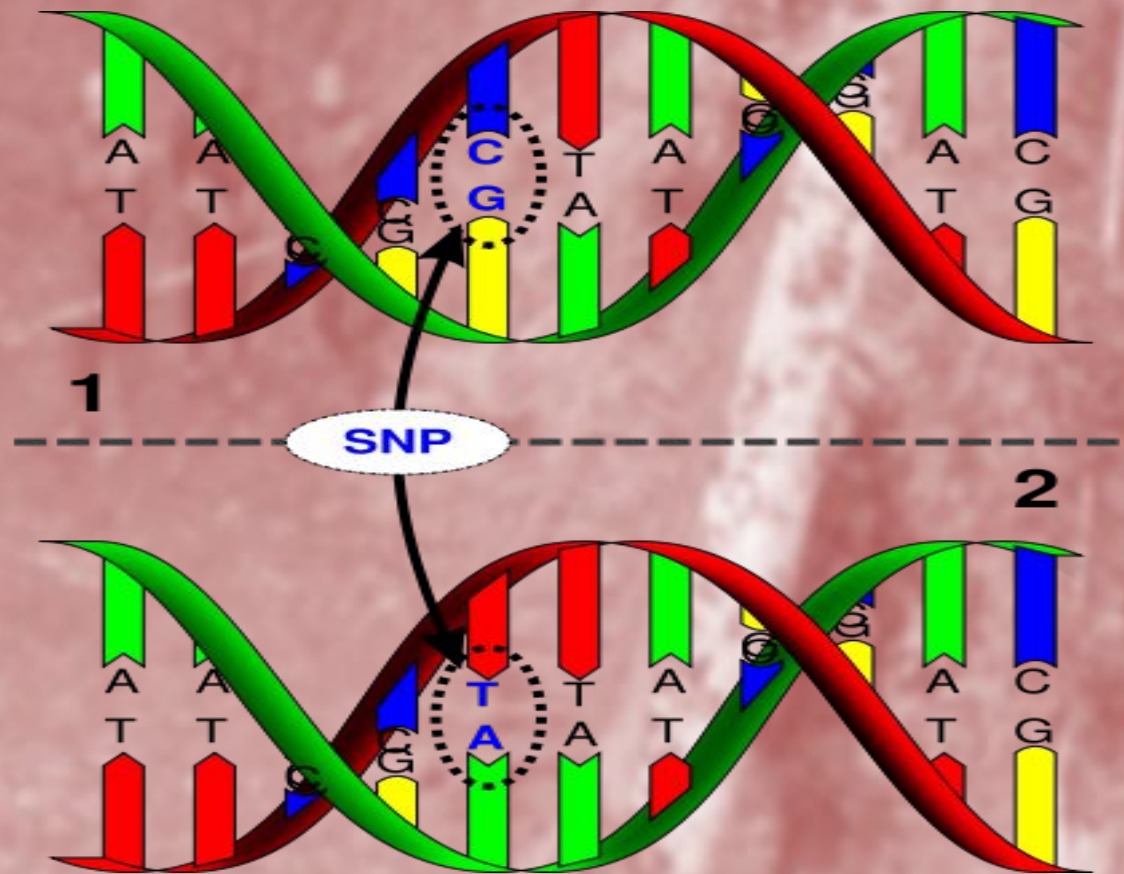
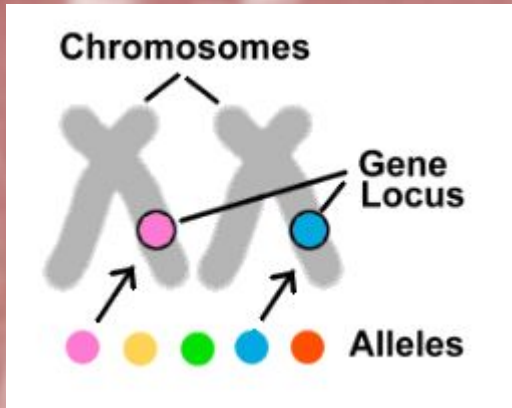
Population polymorphism and geographic variability of *Homo sapiens*



Ph.D. Nikel V.V.
M.D., Ph.D. Shuvaev A.N.

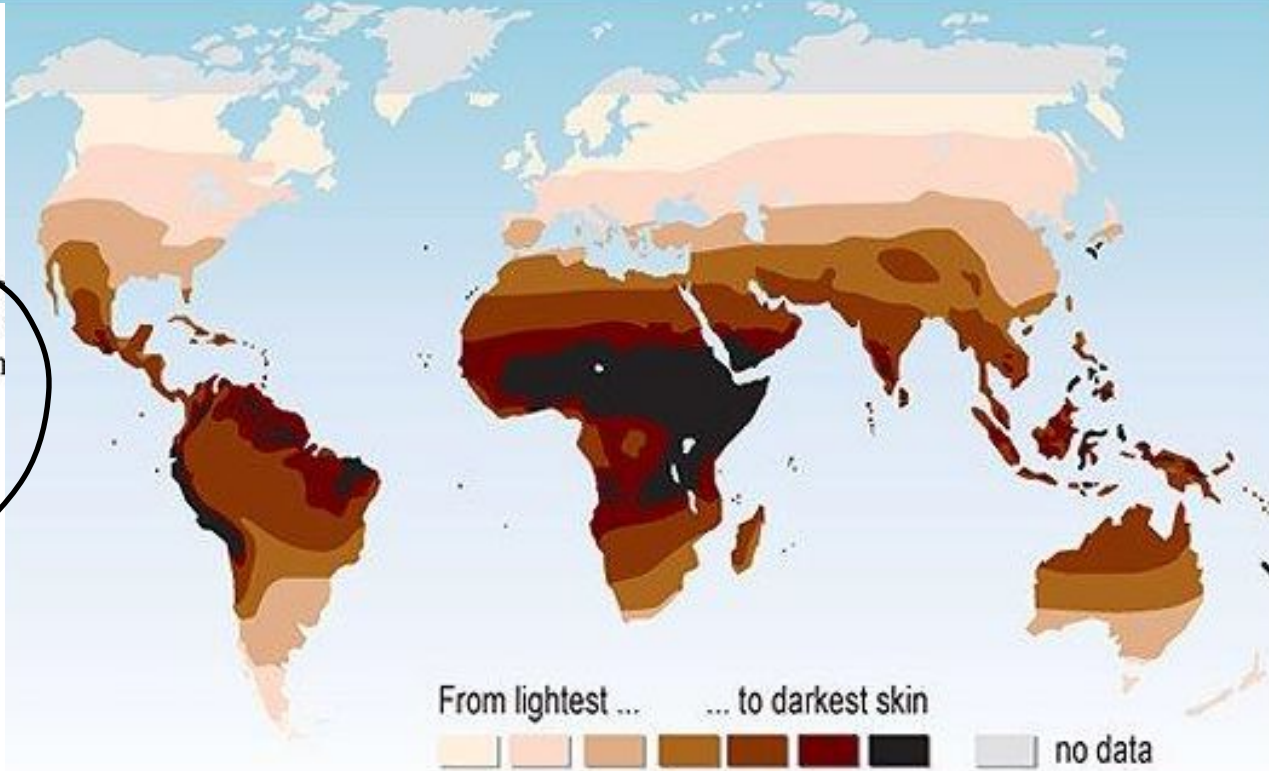
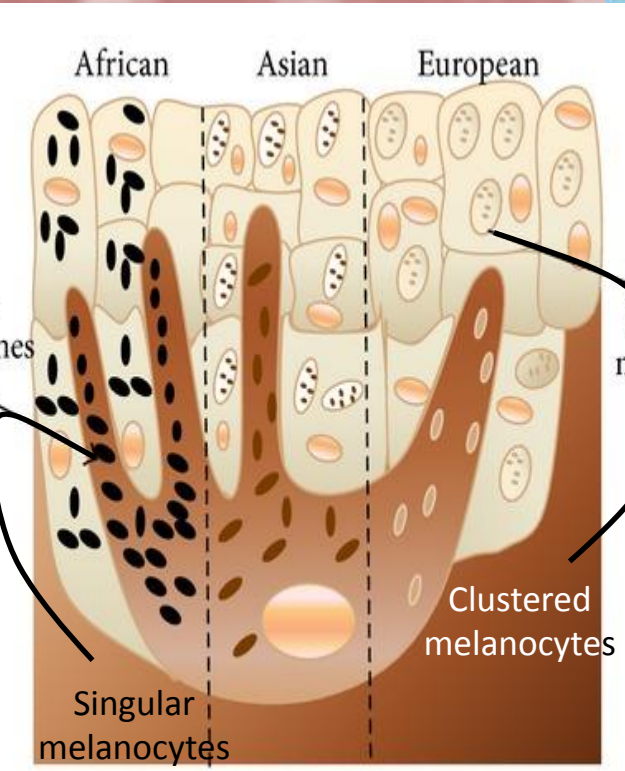
Genetic polymorphism

This is the presence of several alleles in the locus with sufficient frequency for their fixation in the population

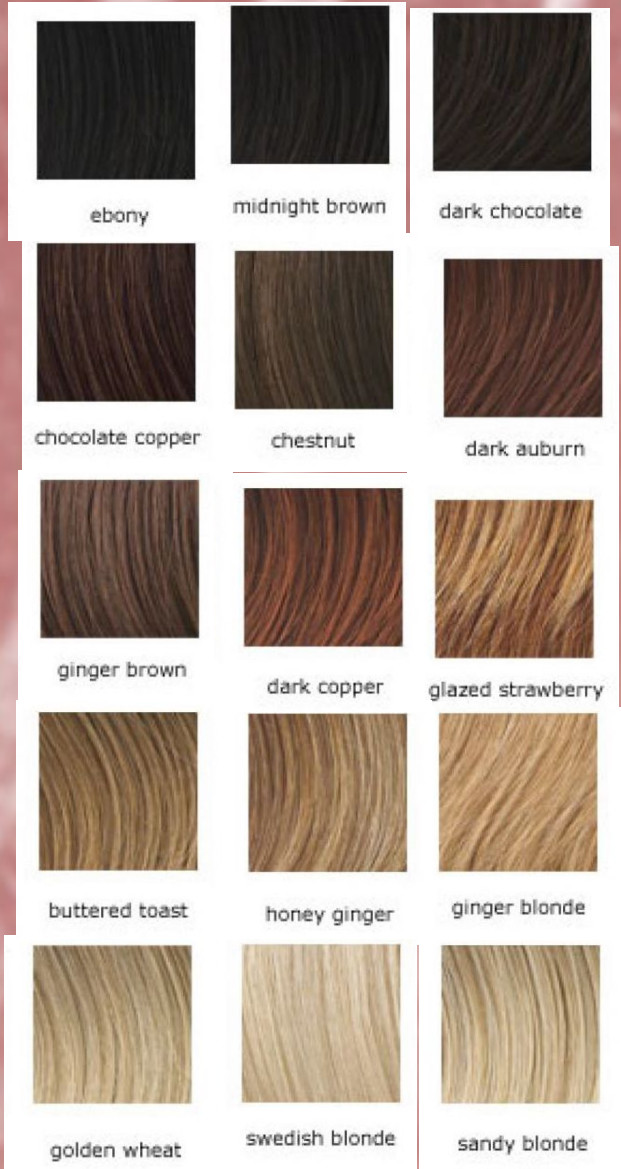


An allele is one of several sequences of a given gene

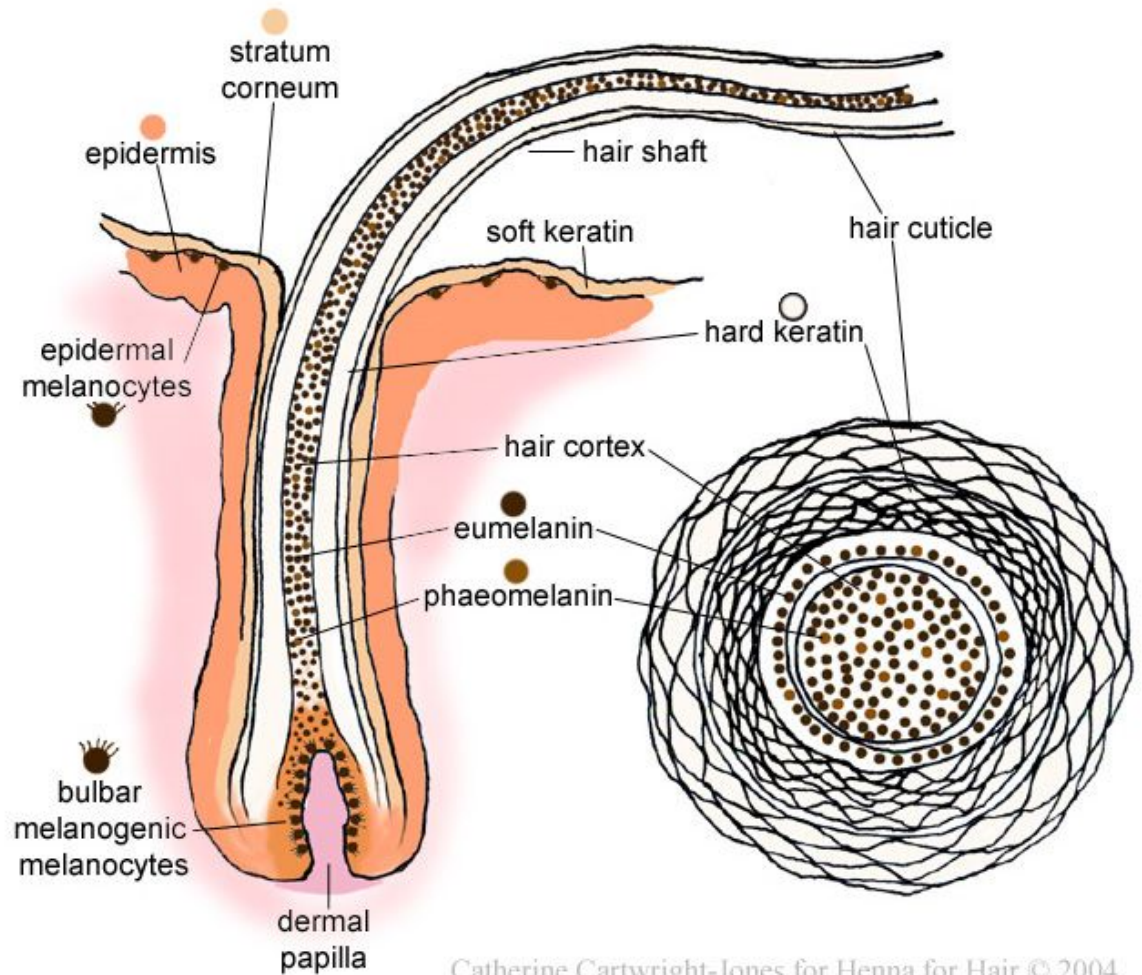
Continuous variability: *Pigmentation*



Continuous variability: *Hair color*

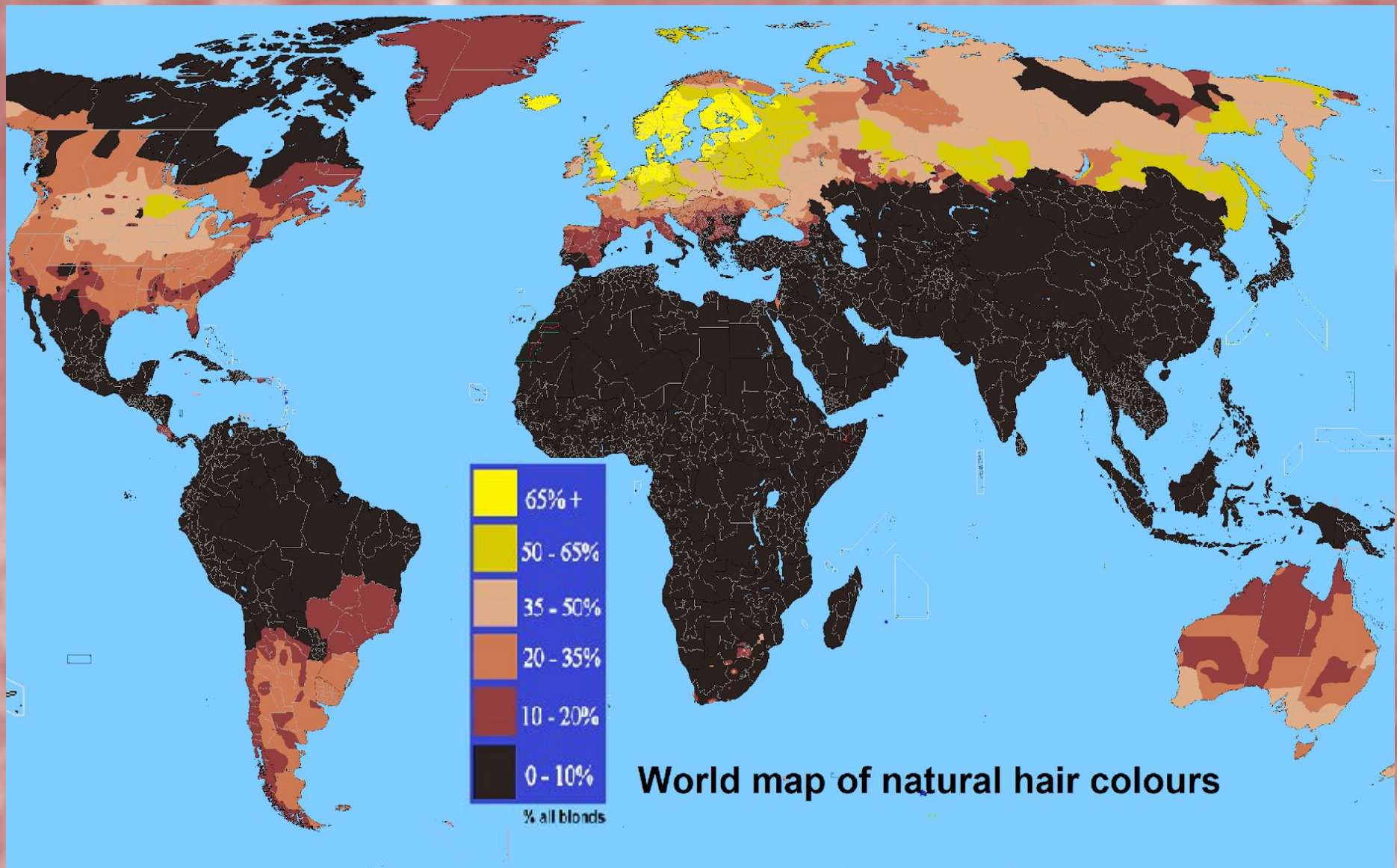


Schematic Diagrams of Dark Hair



Catherine Cartwright-Jones for Henna for Hair © 2004

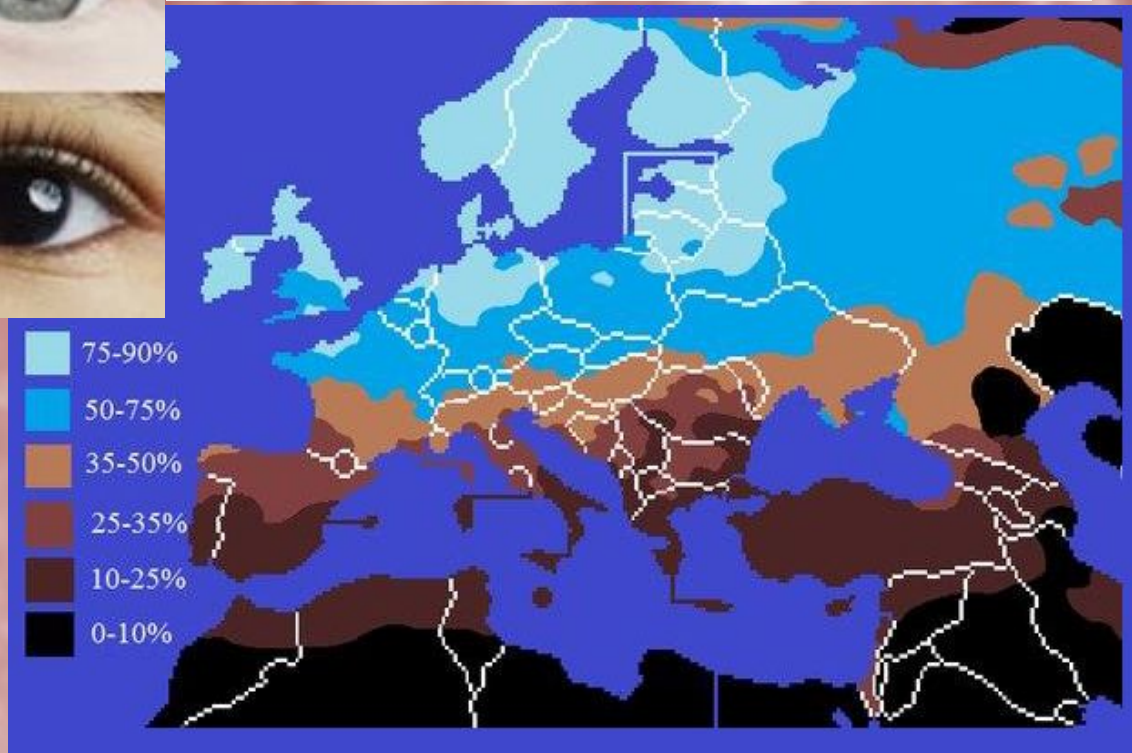
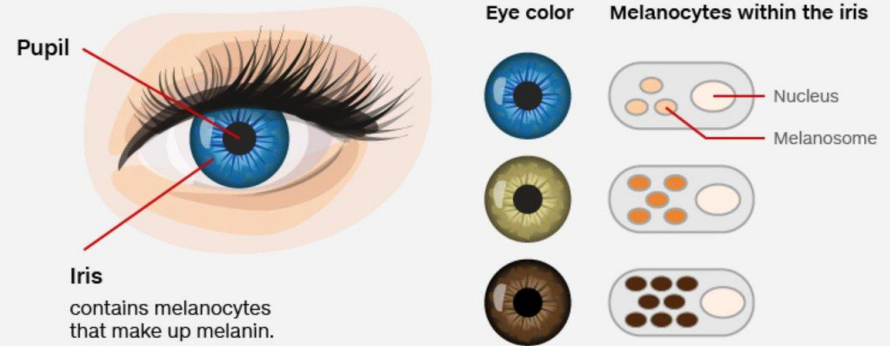
Continuous variability: *Hair color*



Continuous variability: *Eyes color*



The human eye



Continuous variability: *Hair texture*



coarse
straight



(fine)
straight



wavy



curly



tight curly

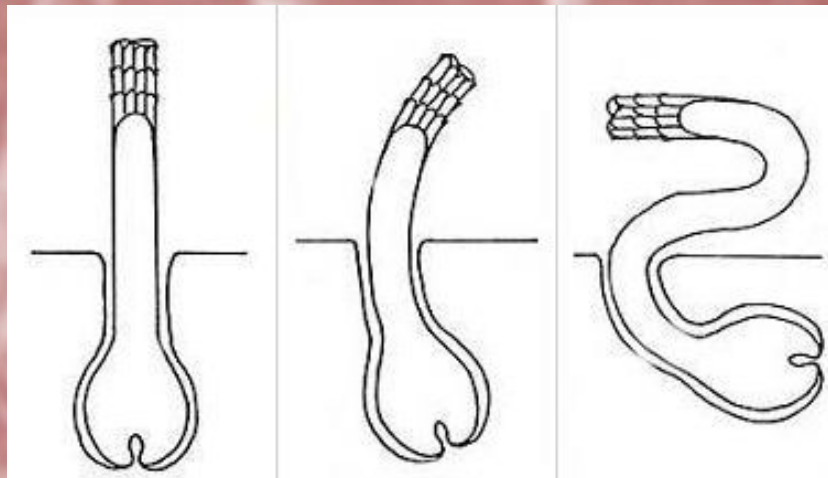


kinky



peppercorn

<http://humanphenotypes.net/metrics/texture.html>



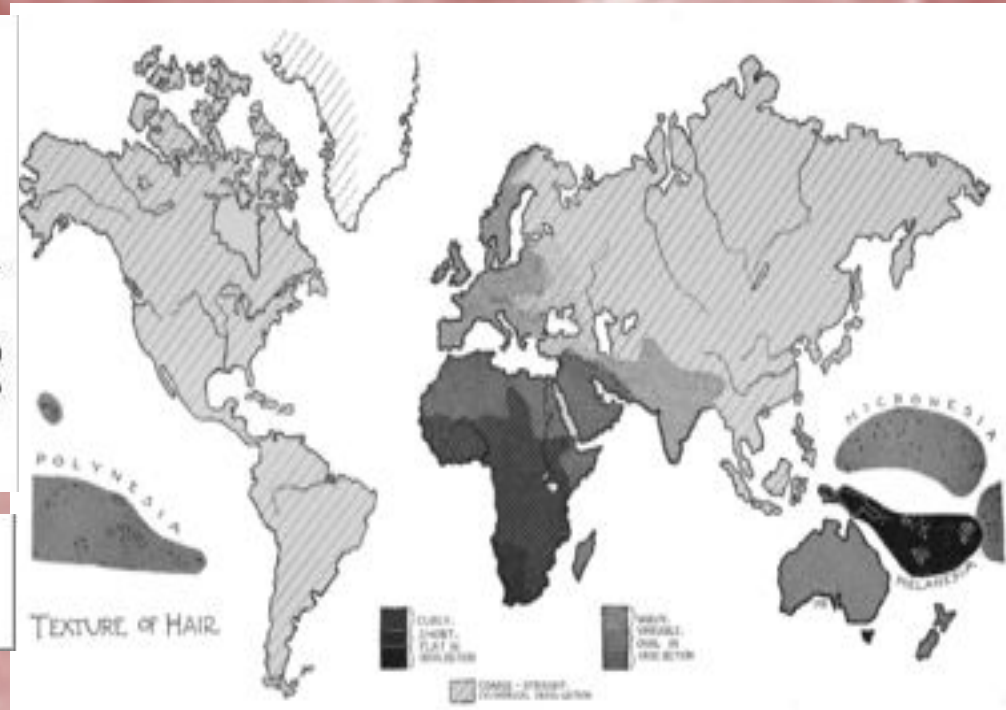
straight



wavy

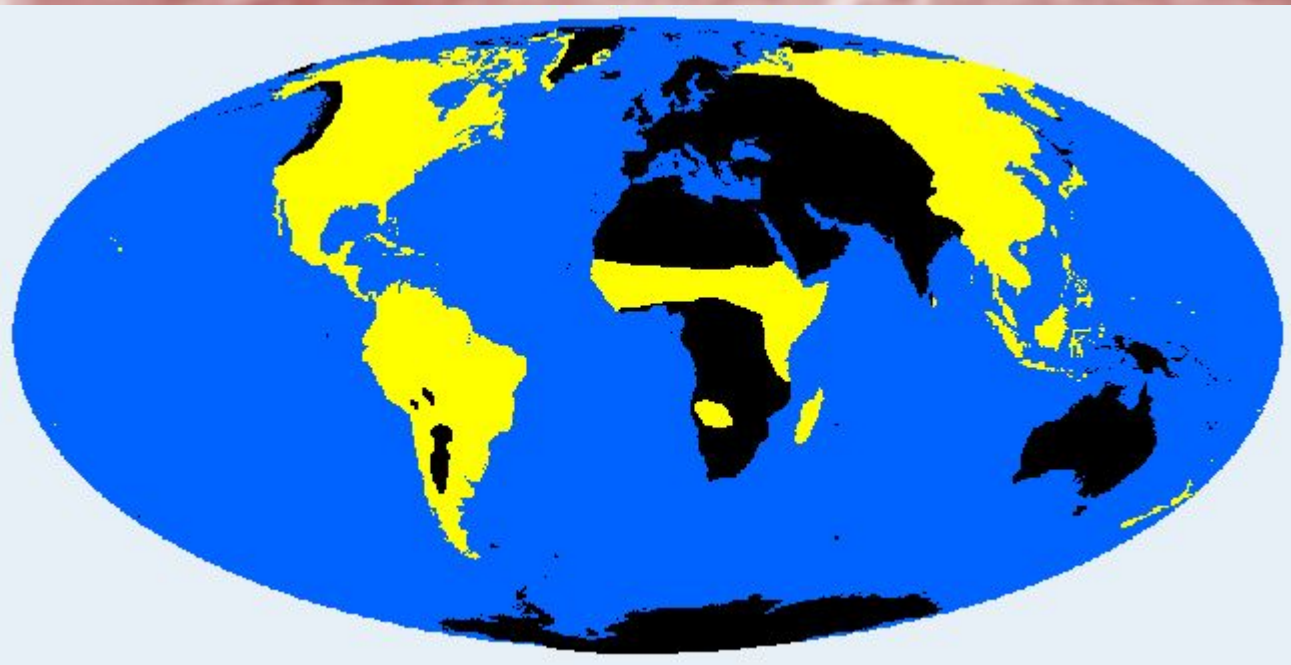
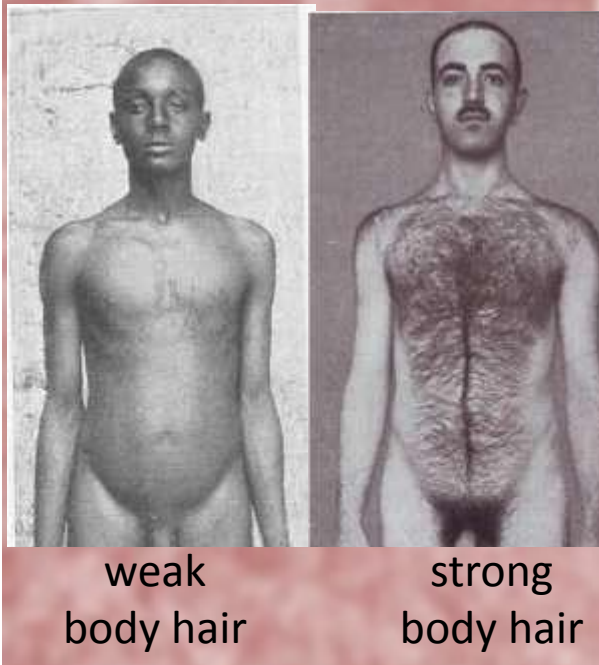


curly



Continuous variability: *Body hair*

Weak is the hair of some East-Asian Mongoloids where beard growth is particularly sparse. In Africa, most of the northern savannah populations (Sudanids, Nilotids, Ethiopids) show very little hair, as well as Malagasy. In America, most groups have little hair, just like in South-East Asia and Polynesia. African forest populations as well as Pacificids and Huarpidids of South America show stronger hair growth



Continuous variability: *Beard*



Very weak

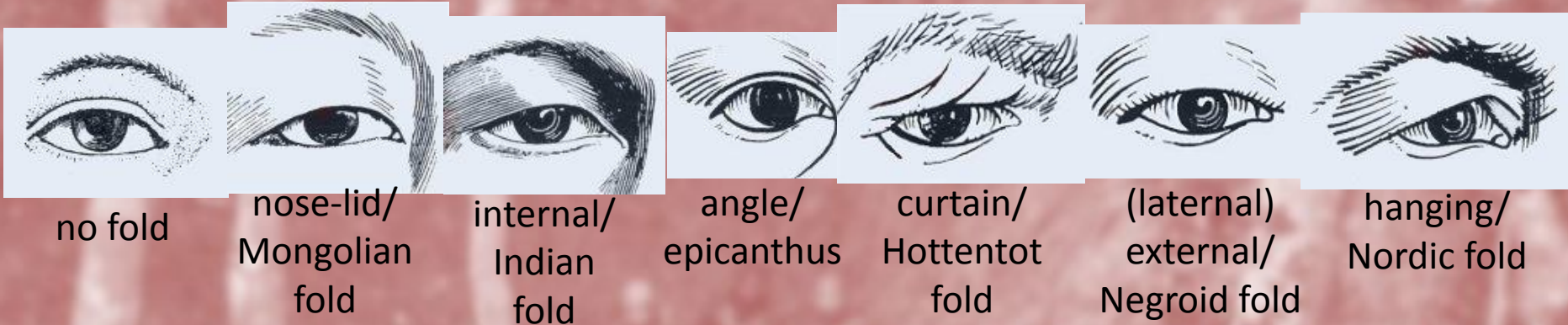
Weak

Medium

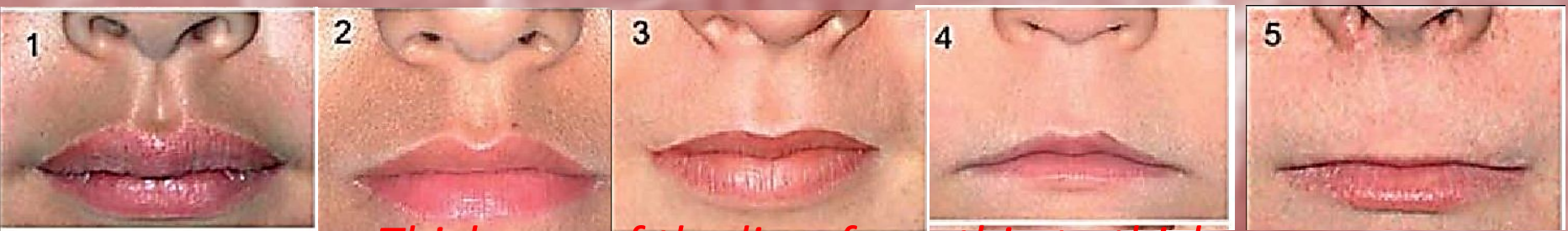
Prominent

Very prominent

Continuous variability: *Face morphology*



Many populations in Europe, South Asia, Africa, and Australia do not show any significant eye fold

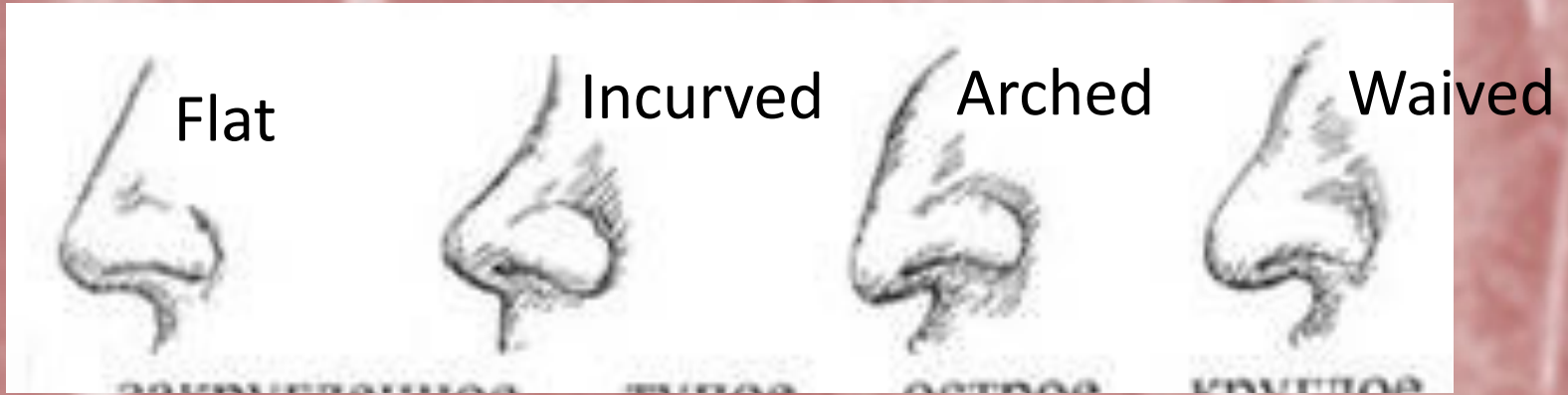


Thickness of the lips: from thin to thick

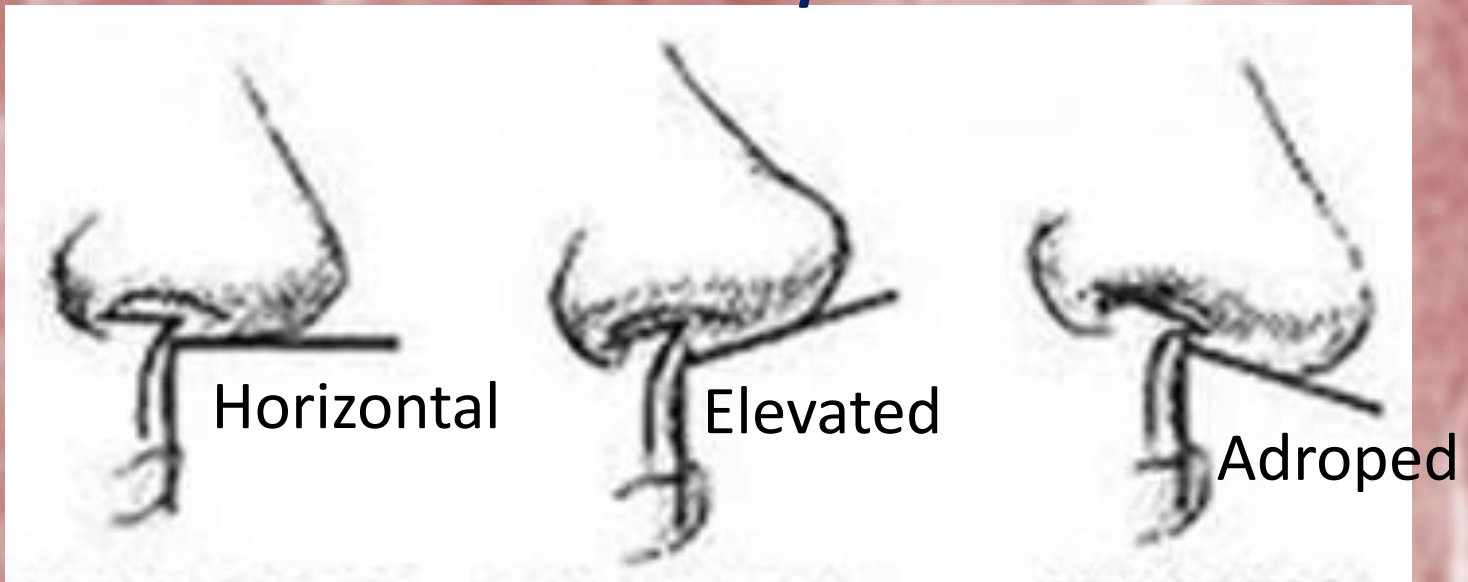


Continuous variability: *Nose*

Ridge of the nose

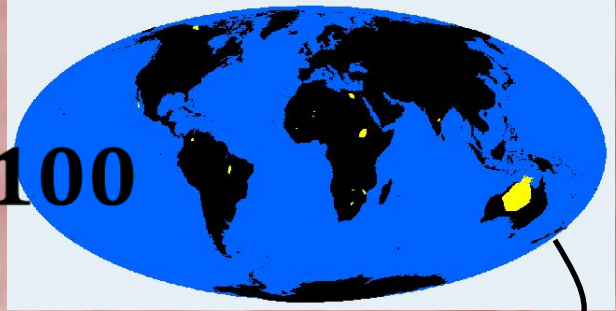


Nose tip



Continuous variability: *Cephalic index*

$$\text{Cephalic index} = \frac{l_{\text{breadth}}(\text{cm})}{l_{\text{length}}(\text{cm})} \times 100$$



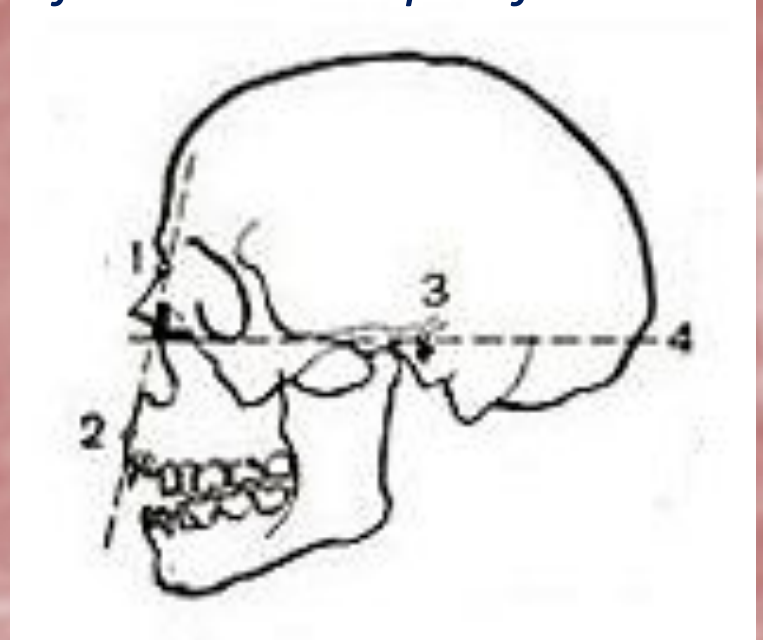
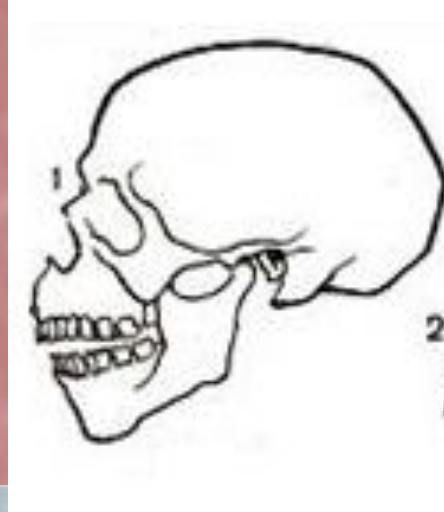
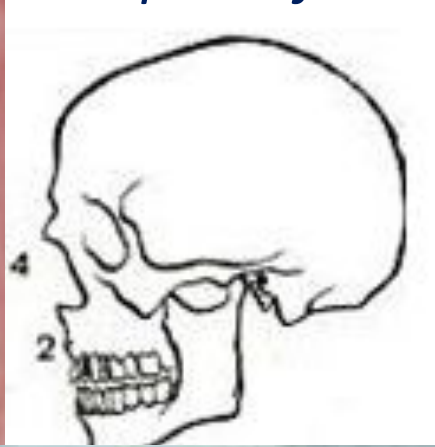
Hyperdolichocephaly was found in some early humans, but is rare today on the population level. The largest area of hyperdolichocephalic dominance is found from Central Australia to North Australia



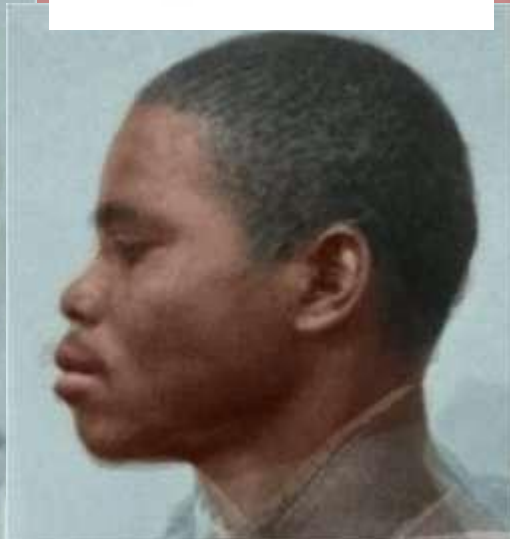
hyperdolichocephalic	dolichocephalic	mesocephalic	brachycephalic	hyperbrachycephalic
<71	71,1-75,9	76-80,9	81-84,9	>85

Continuous variability: *Prognatism*

Prognathism describes a projection of the jaws. The shape of the lower part of the nose is altered as well.



orthognathous



prognathous

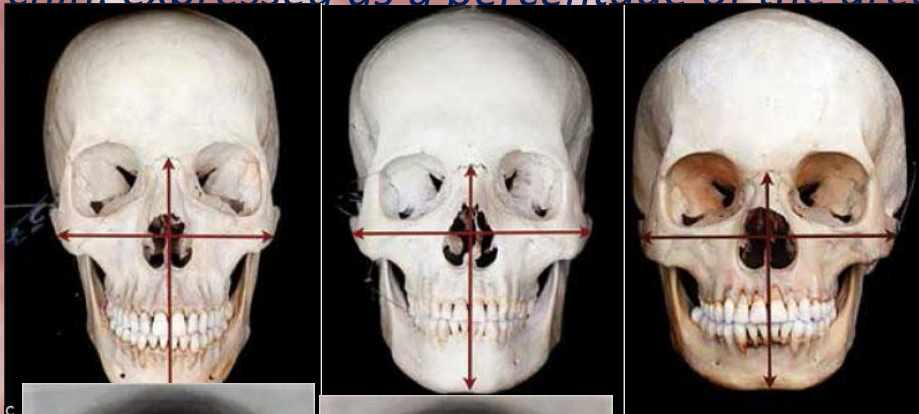
Orthognathy developed relatively early in the evolution of Homo sapiens and continuously increased in frequency, especially in colder regions.



Continuous variability: *Facial index*

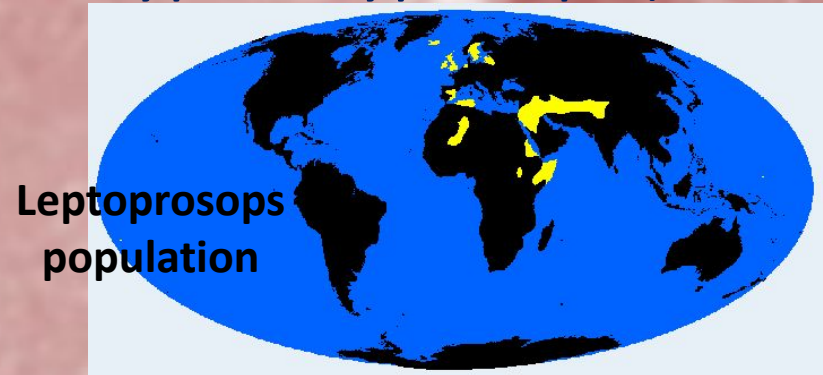
$$\text{Facial index} = \frac{l_{\text{facial skull length}}(\text{cm})}{l_{\text{bizygomatic diameter}}(\text{cm})} \times 100$$

It is measured by the length of the face from the root of the nose to the bottom of the chin, expressed as a percentage of the greatest breadth across the cheek-bones.

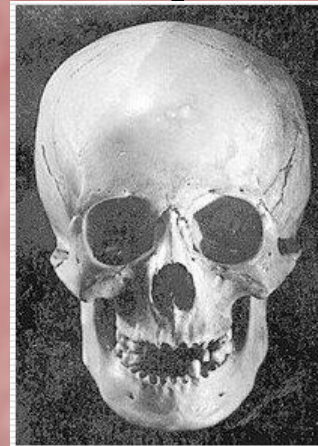
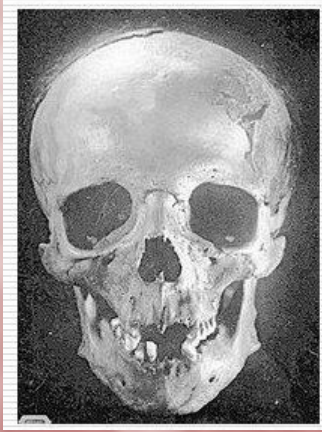


leptoprosop *mesoprosop* *euryprosop*

- ❖ *Hyperleptoprosops (> 95%)*
- ❖ *Leptoprosops (90-94,9%)*
- ❖ *Mesoprosops (85-89,9%)*
- ❖ *Euryprosops (80-84,5%)*
- ❖ *Hypereuryprosops (<79,9%)*



Continuous variability: *Facial proloferation*



Well proliferated face (high nose root, buried cheeks)

Poor proliferated face (low nose root, prominent cheeks)



IRISH IBERIAN.

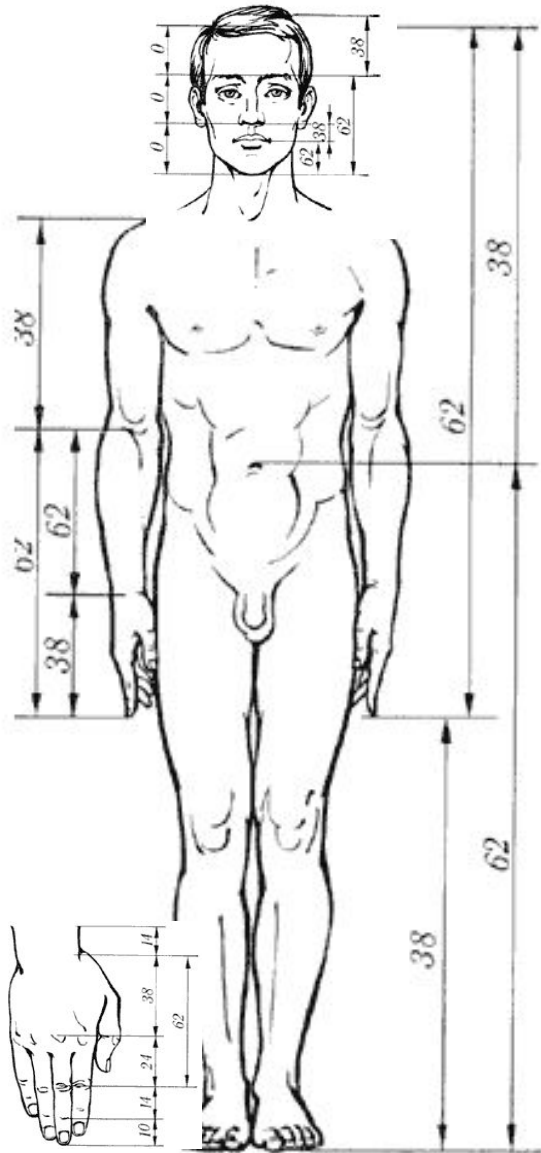


ANGLO-TEUTONIC



NEGRO.

Continuous variability: *Osteological traits*



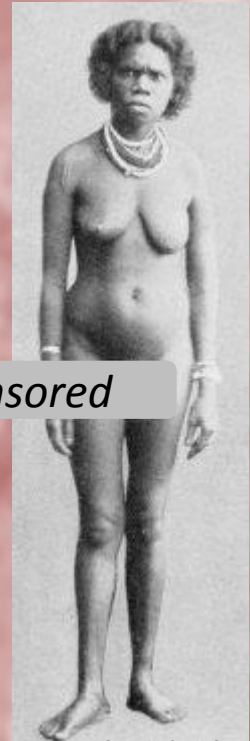
Hyper-



Macrokelic



Mesoskelic



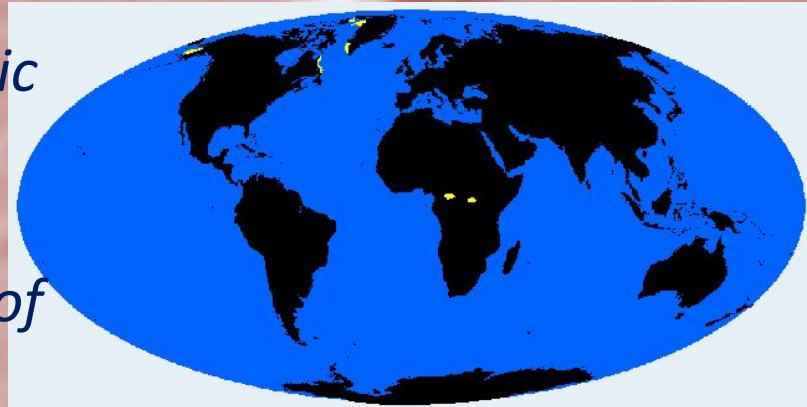
Brachyskelic



Hyper-

Censored Censored Censored Censored

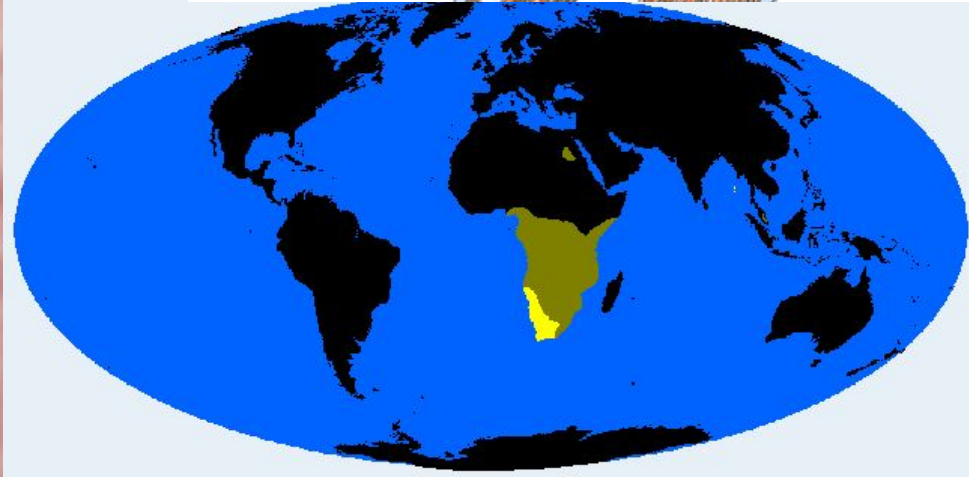
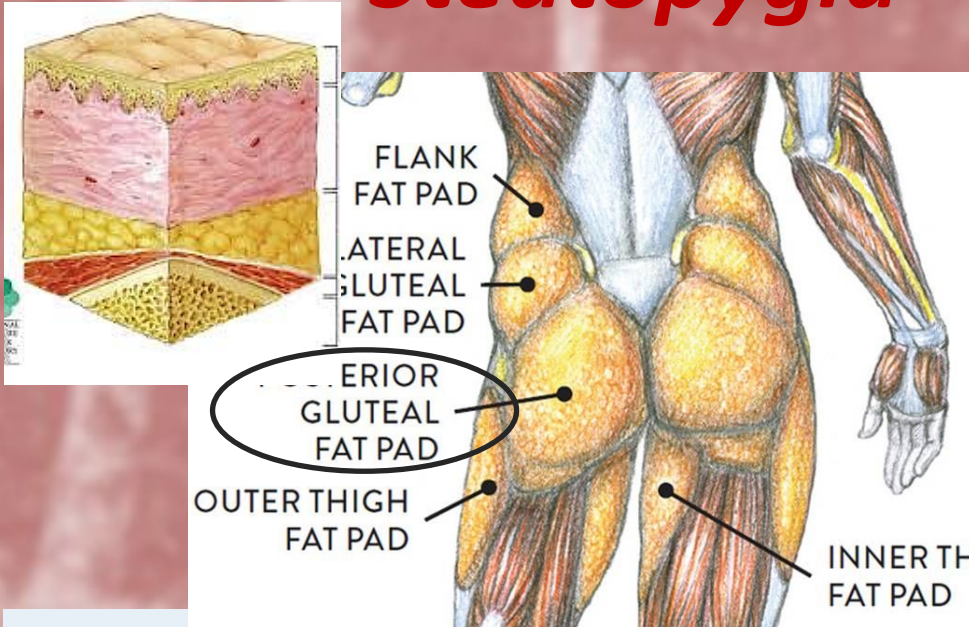
In hypermacrokelic individuals the sitting height is greater than 55% of the overall height.



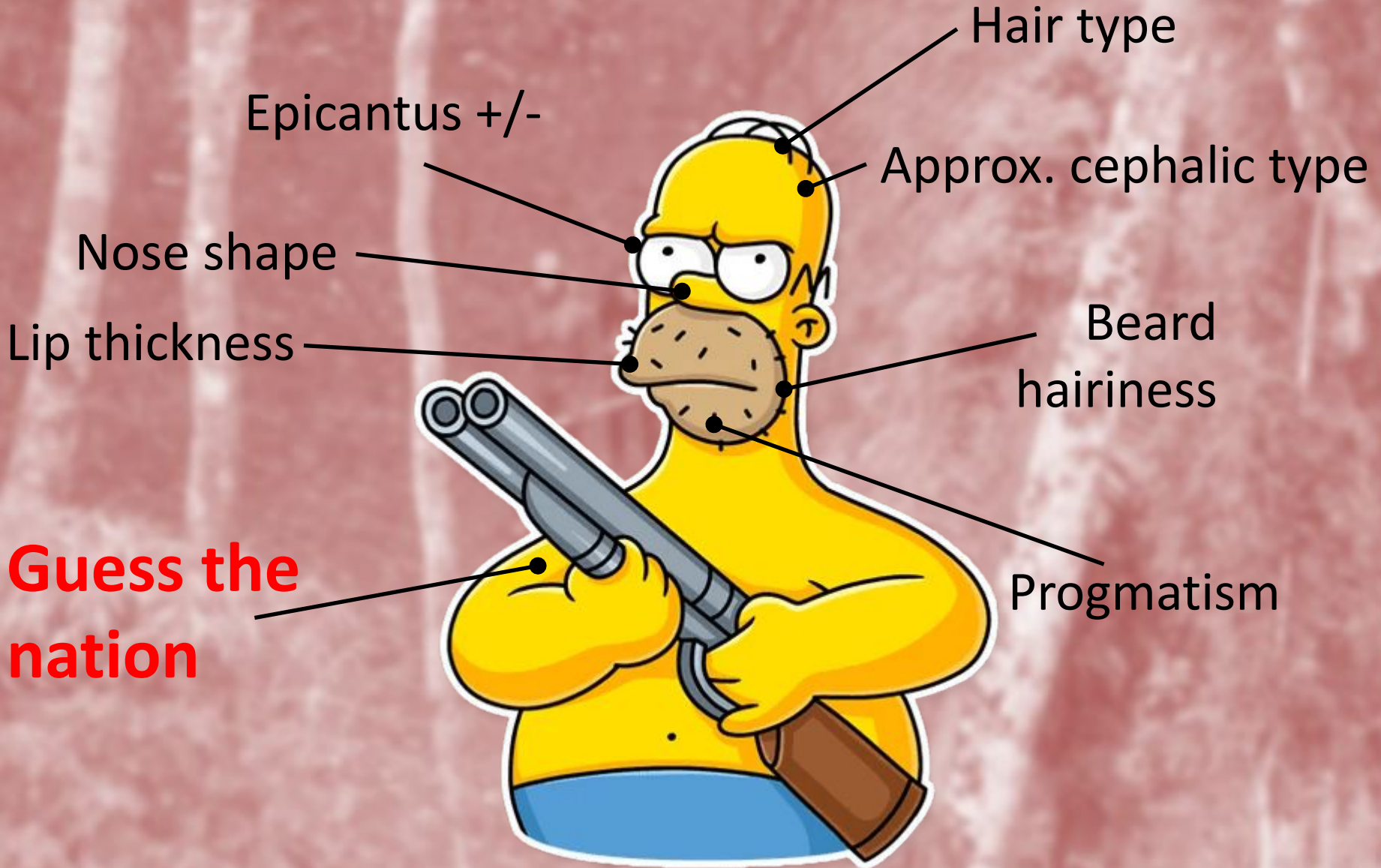
Continuous variability: *Body traits*

Steatopygia

In steatopygic individuals there is a marked accumulation of fat over the buttocks, even when the fat layer of the rest of the body is only slight to moderate. It is found mainly in tropical regions, especially among Khoids.



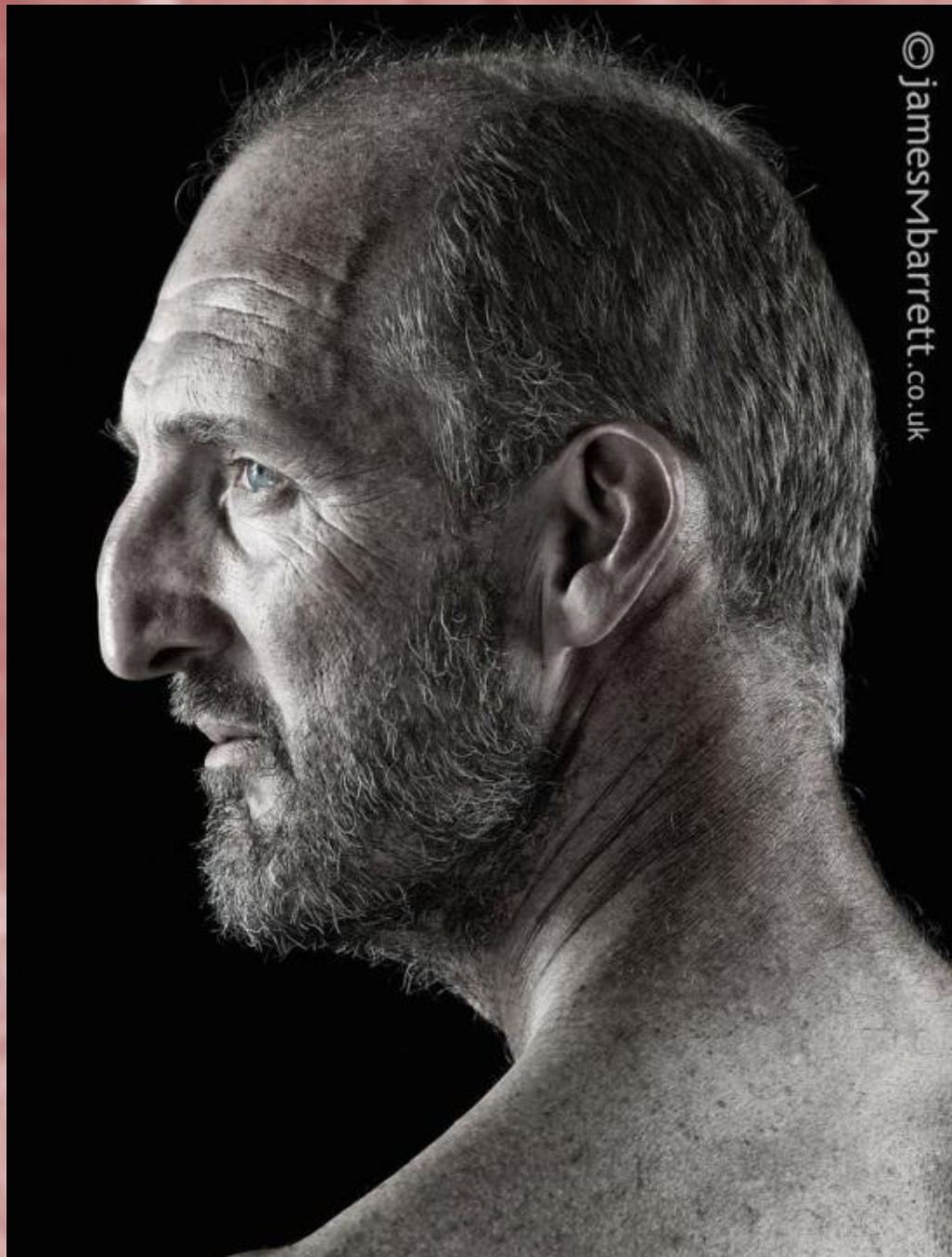
Today's Homework





Afro-American

©jamesmbarrett.co.uk



British



Afro-American



Chinese



Afro-american



British



Chinese



Afro-American



Turkish



Peruvian



Australian aborigine



Eskimo



Turkish



Peruvian



Australian aborigine



Eskimo



Ethiopian



German



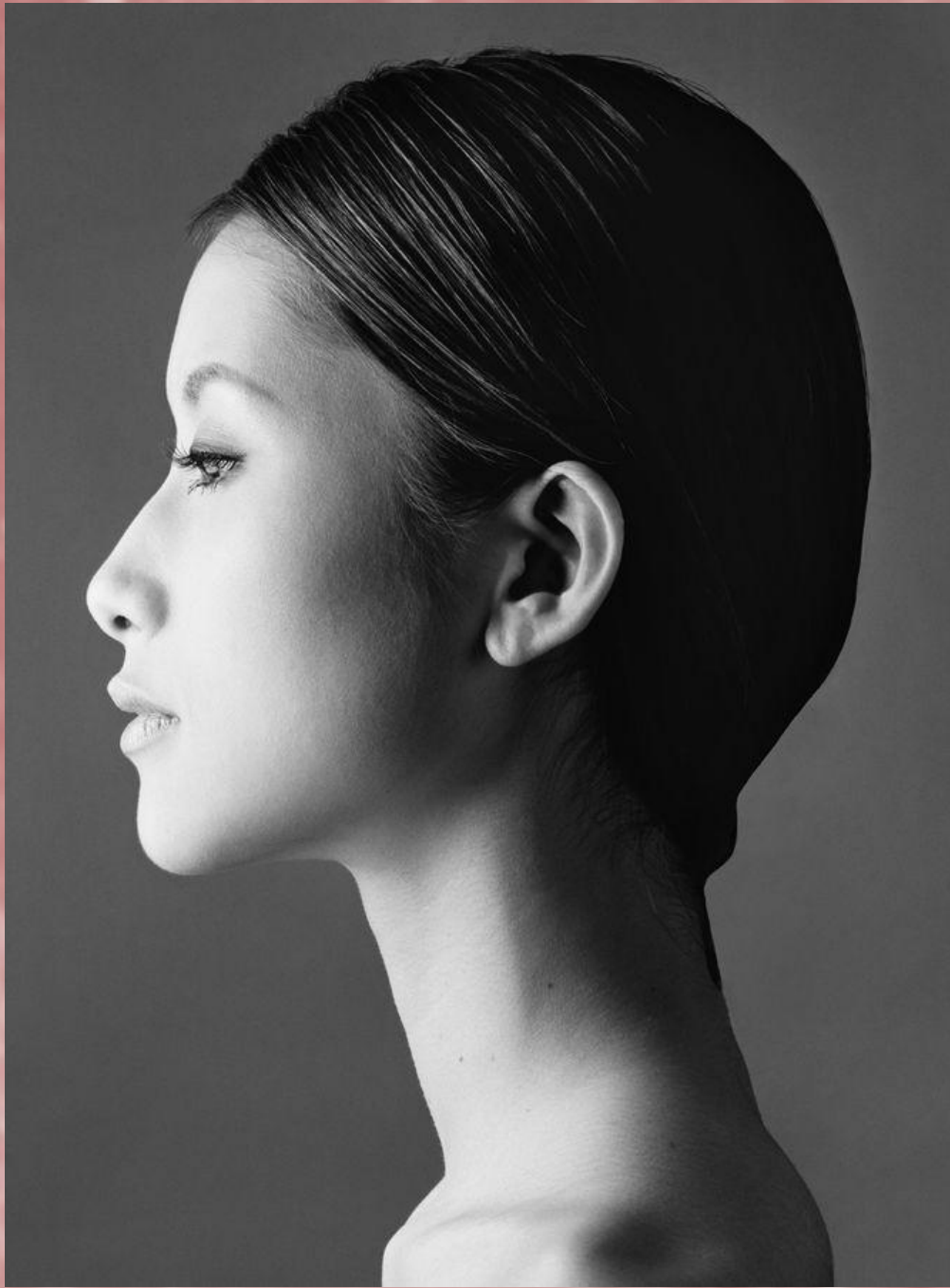
Indonesian



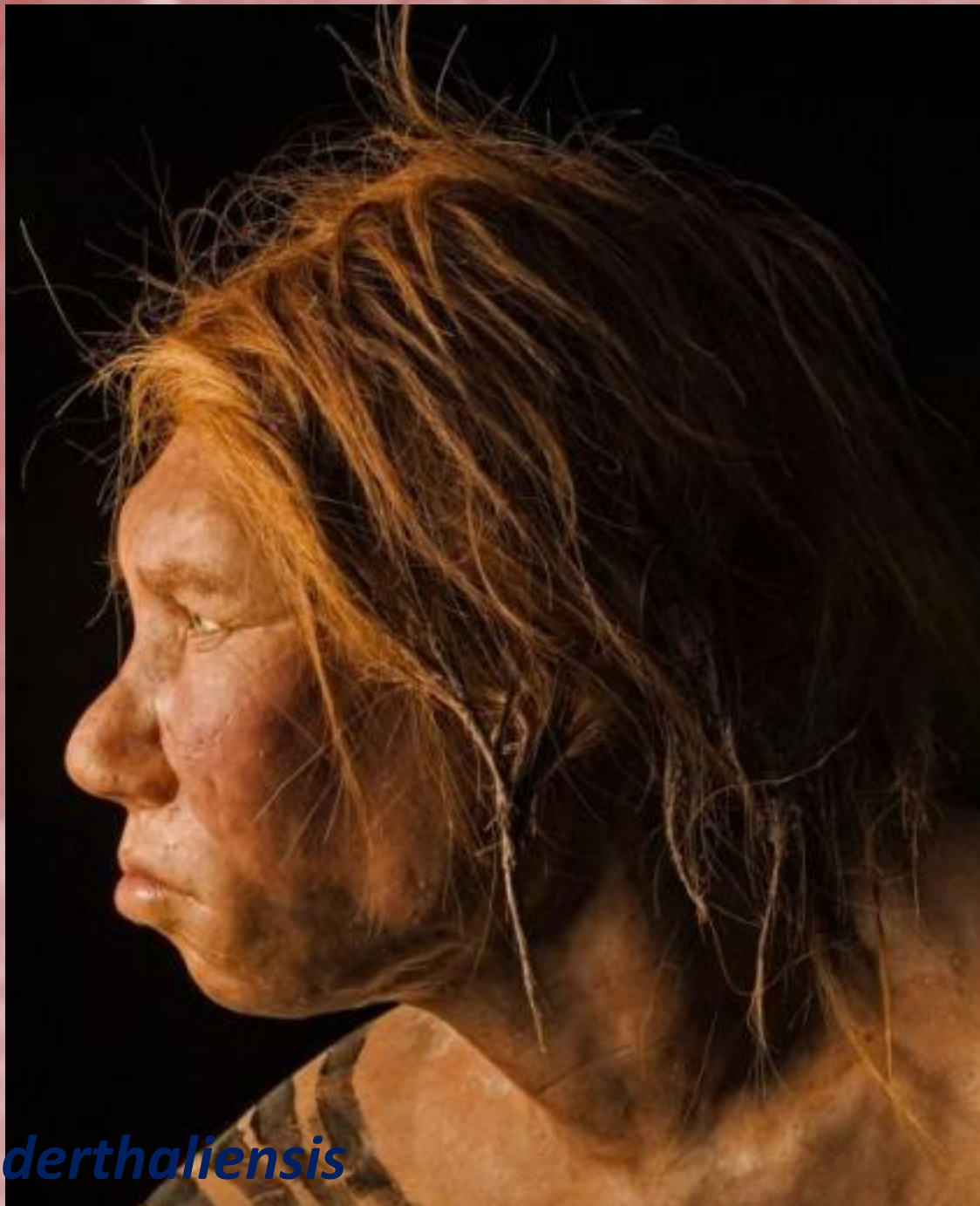
Homo heidelbergensis



Philipino



Japanese



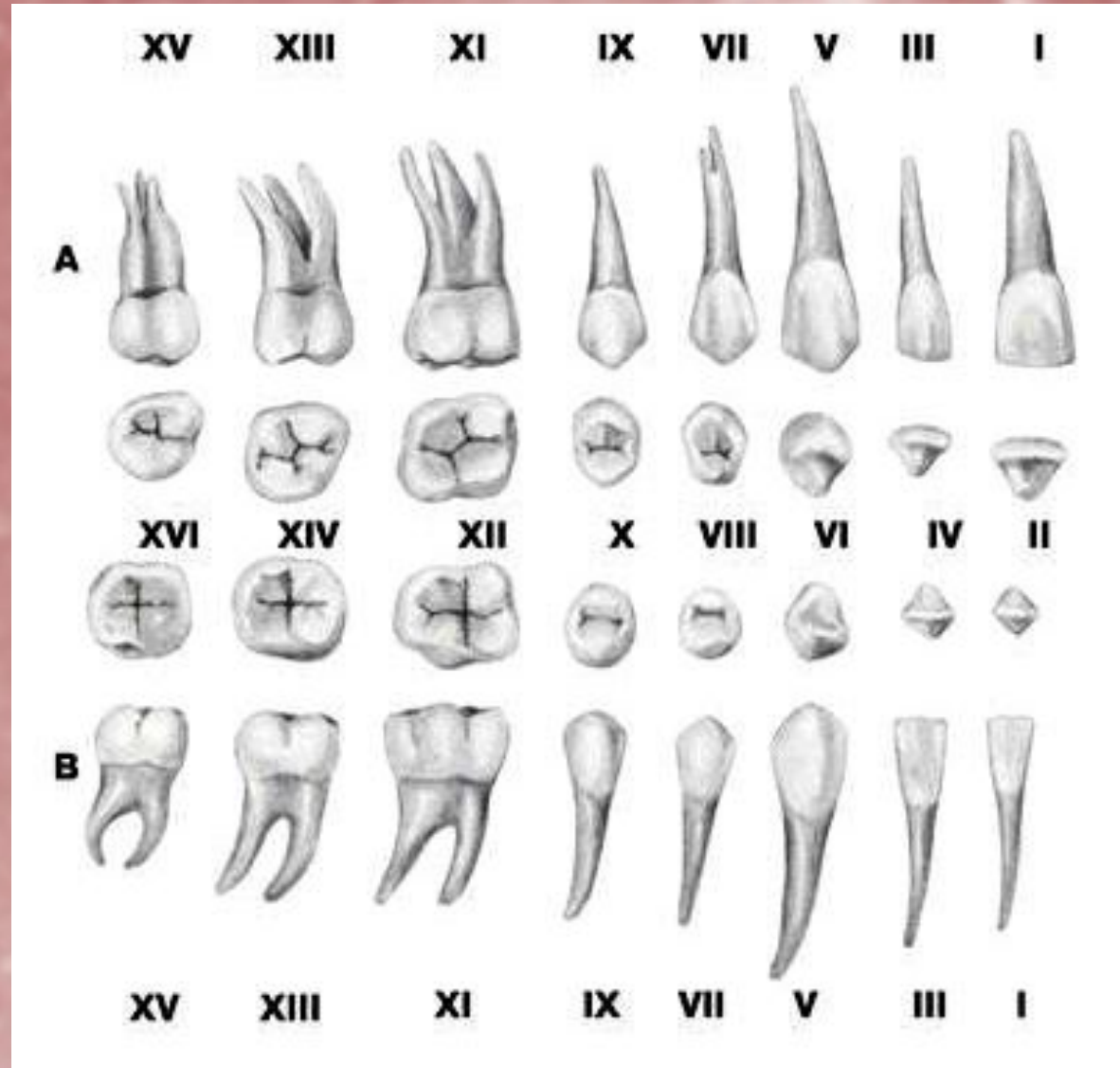
Homo neanderthalensis



Arabic (UAE)

Continuous variability: *Odontoglyphical traits*

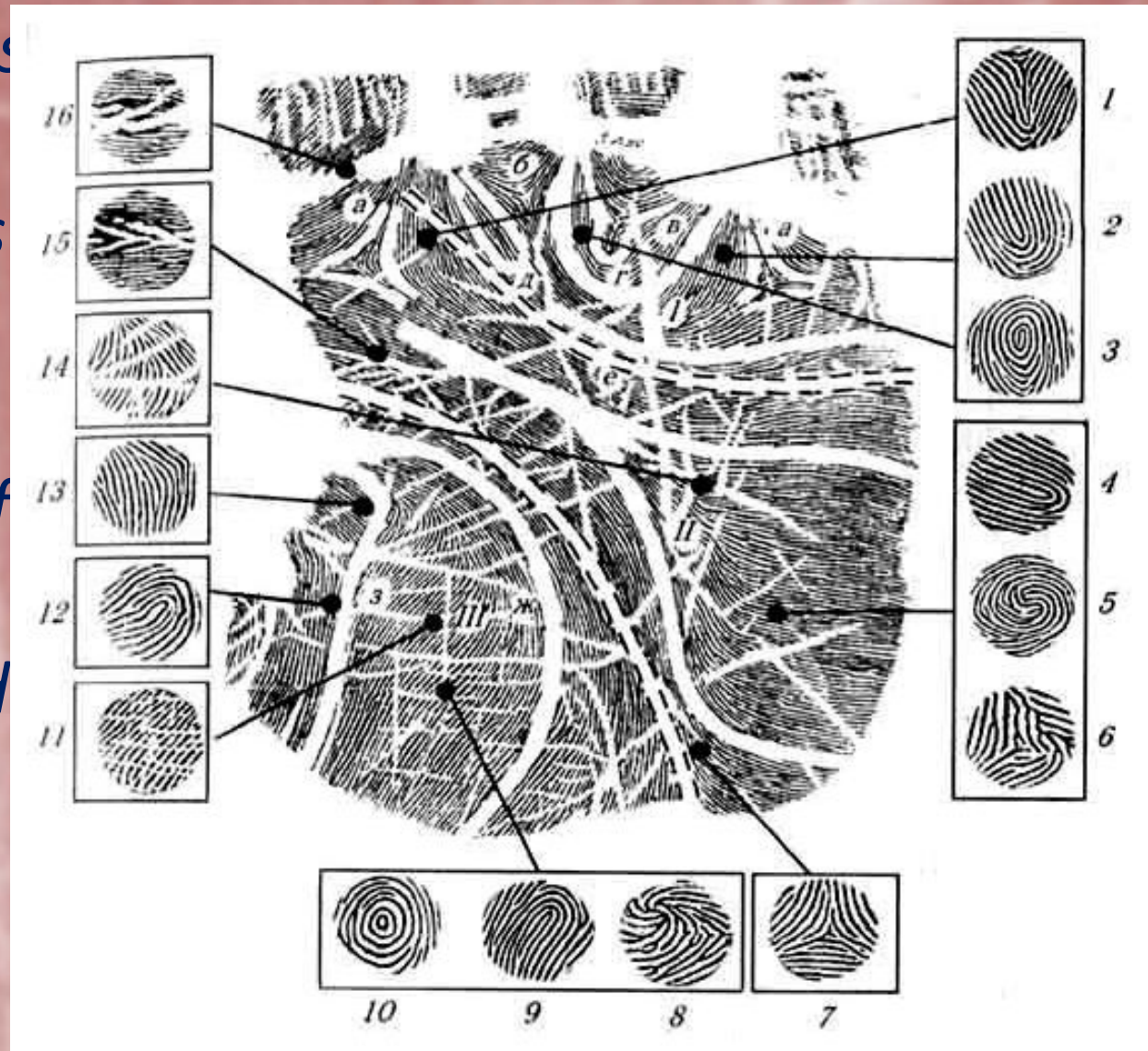
Odontoglyphics is the method of classification of the molar grooves defined in an individually distinctive pattern like that of fingerprints.



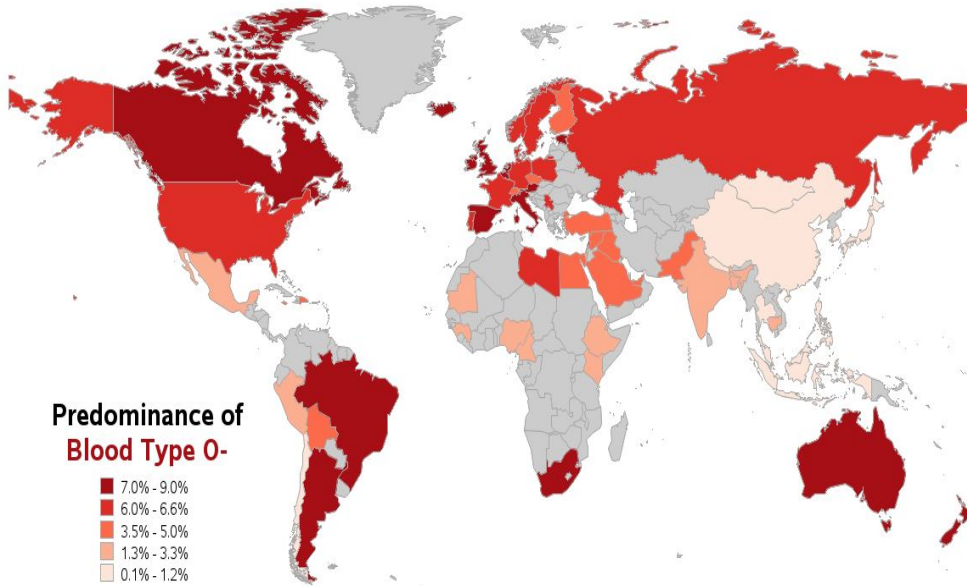
Continuous variability:

*Dermatoglyphical
traits*

Dermatoglyphics is the study of the patterns of ridges of the skin of the fingers, palms, toes, and soles; of interest in anthropology and law enforcement as a means of establishing identity.

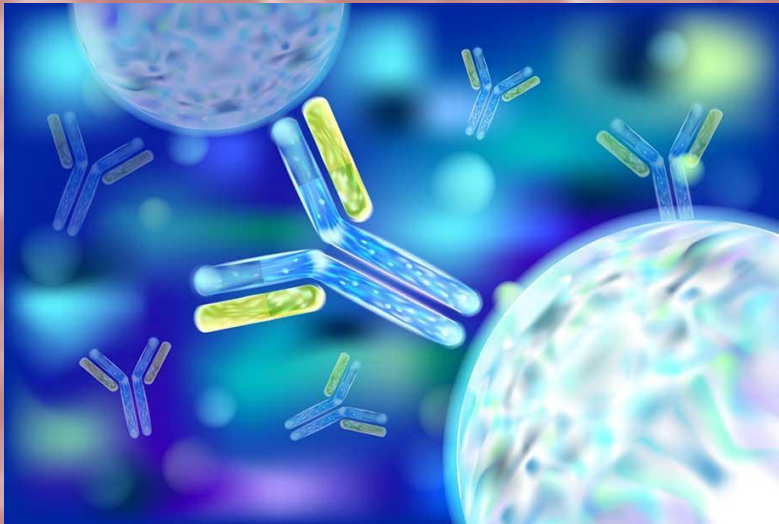


Discontinuous variability: *Blood types*



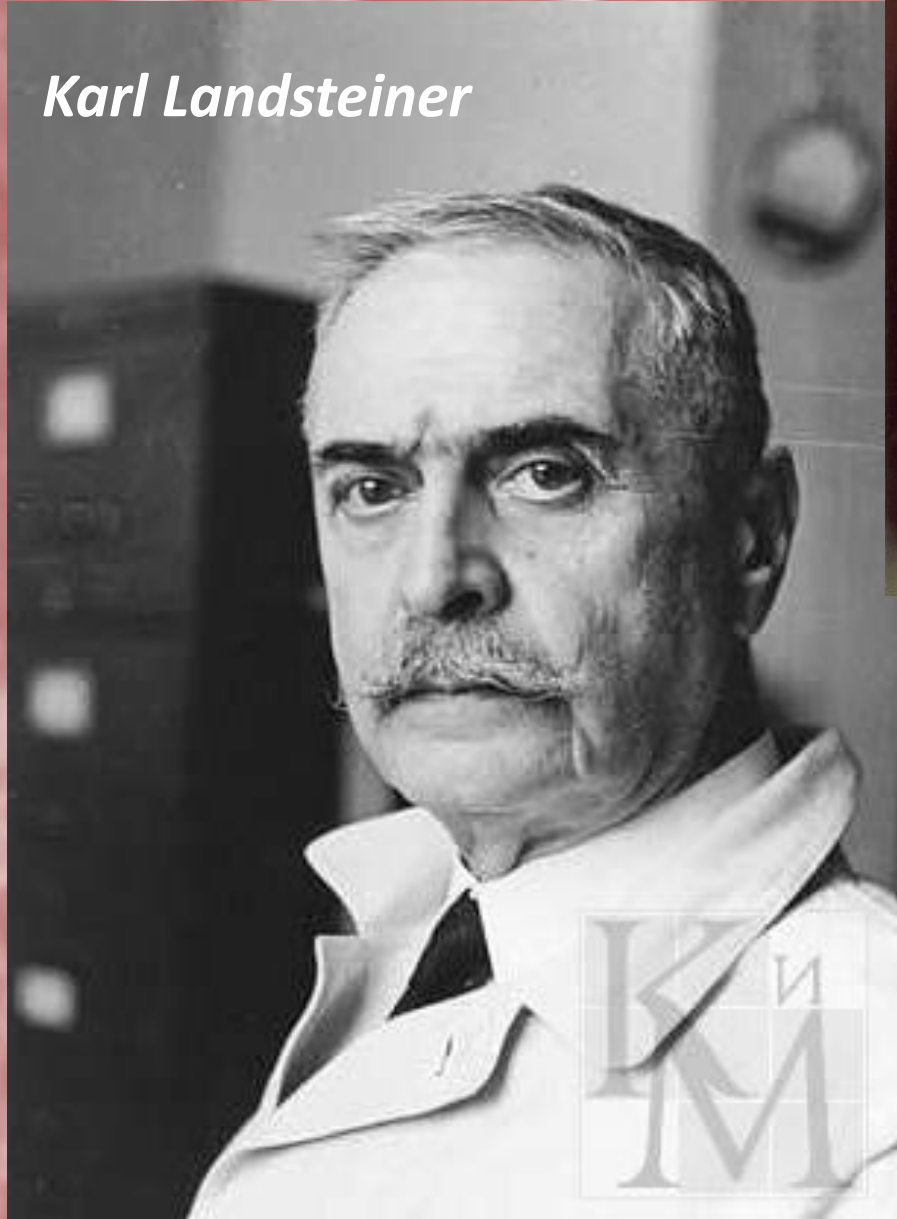
II III IV I

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma			None	
Antigens in red blood cell	A antigen	B antigen	A and B antigens	None

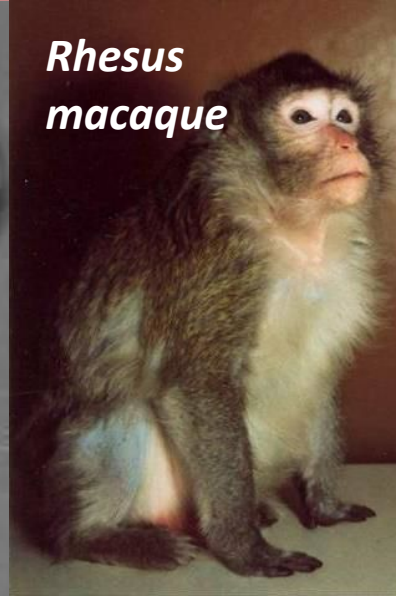


Discontinuous variability: *Blood types*

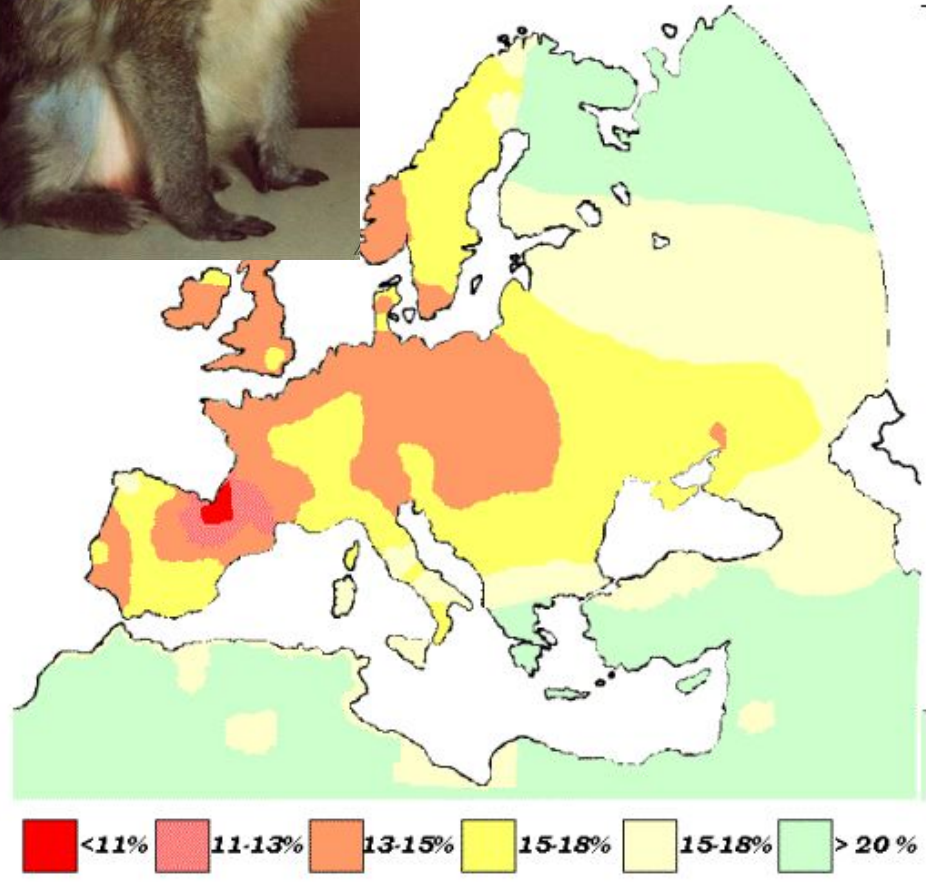
Karl Landsteiner



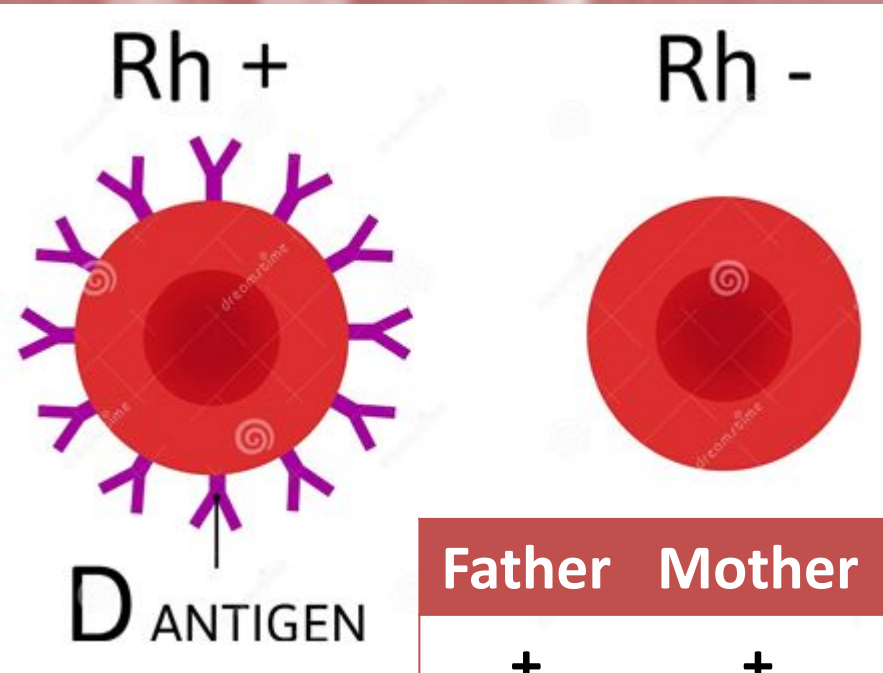
Rhesus macaque



Rh blood group system

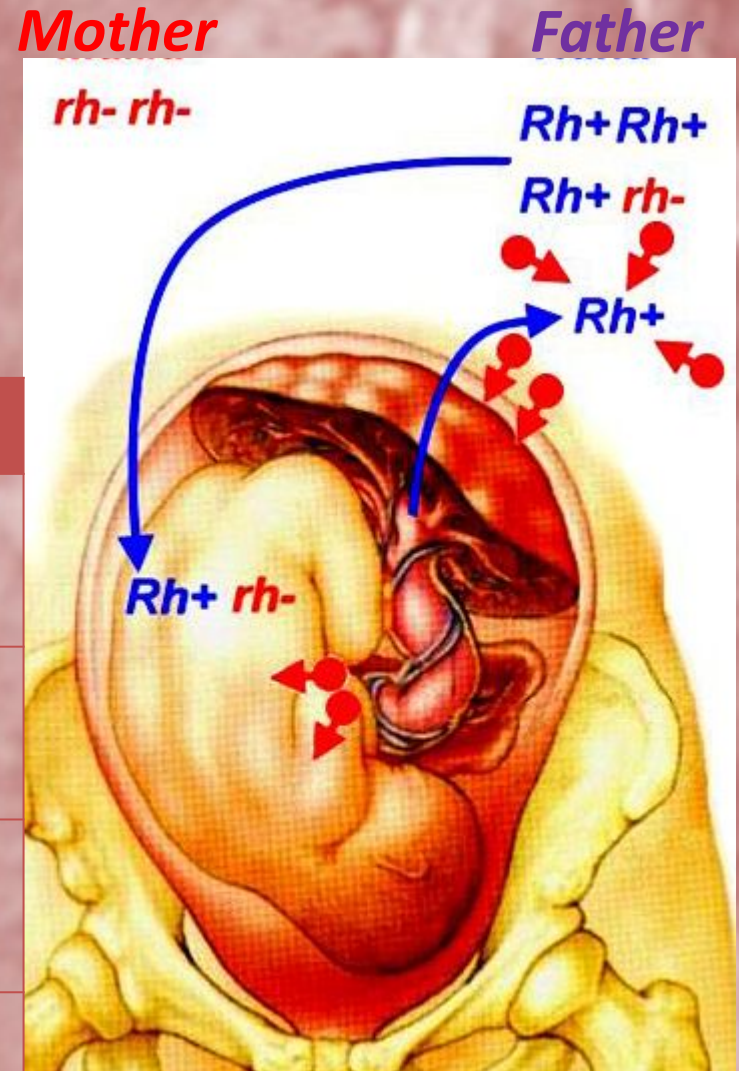


Discontinuous variability: *Blood types*

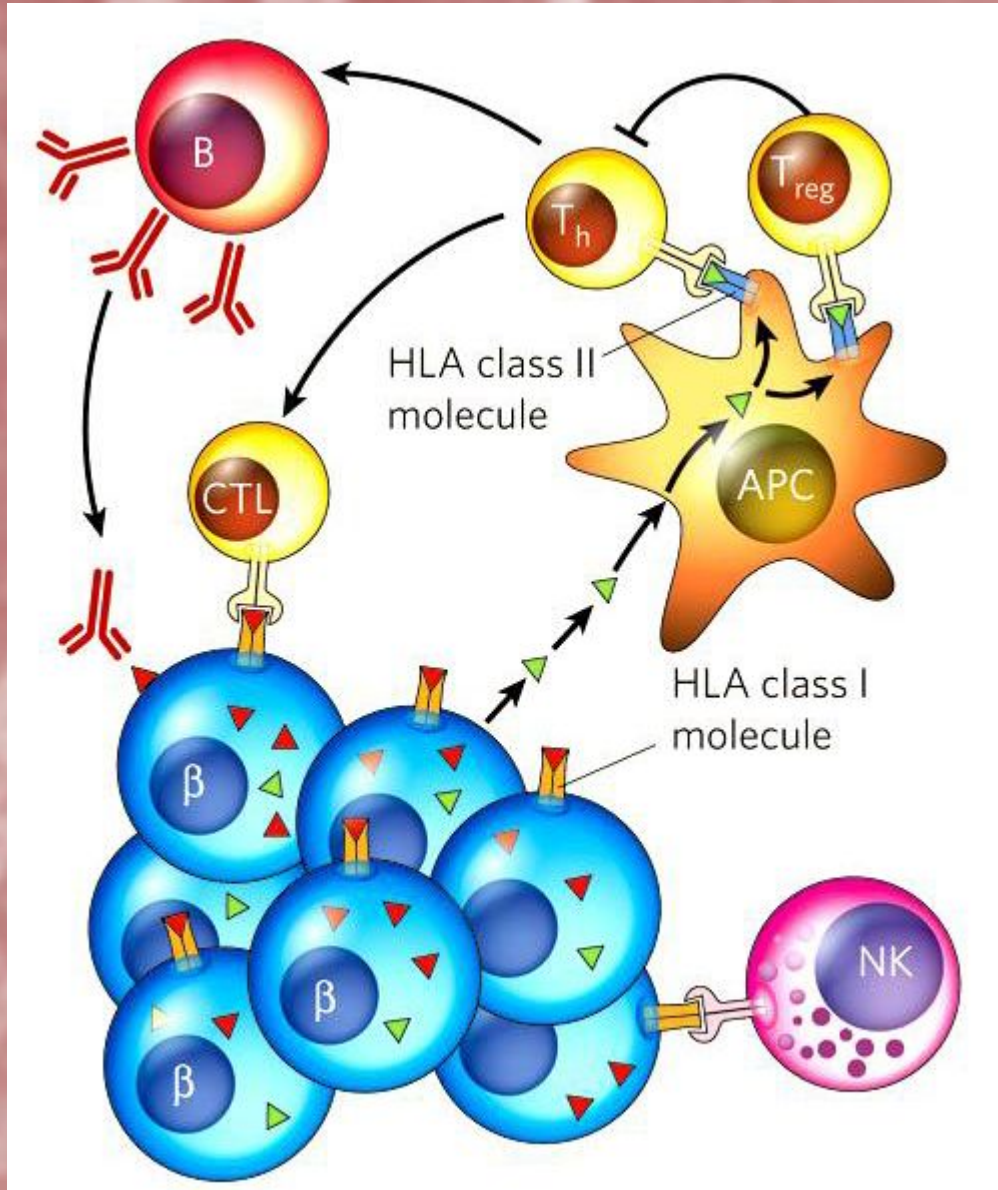


Father	Mother	Child
+	+	75% + 25% -
+	-	50% + 50% -
-	+	50% + 50% -
-	-	100% -

Rh blood group system



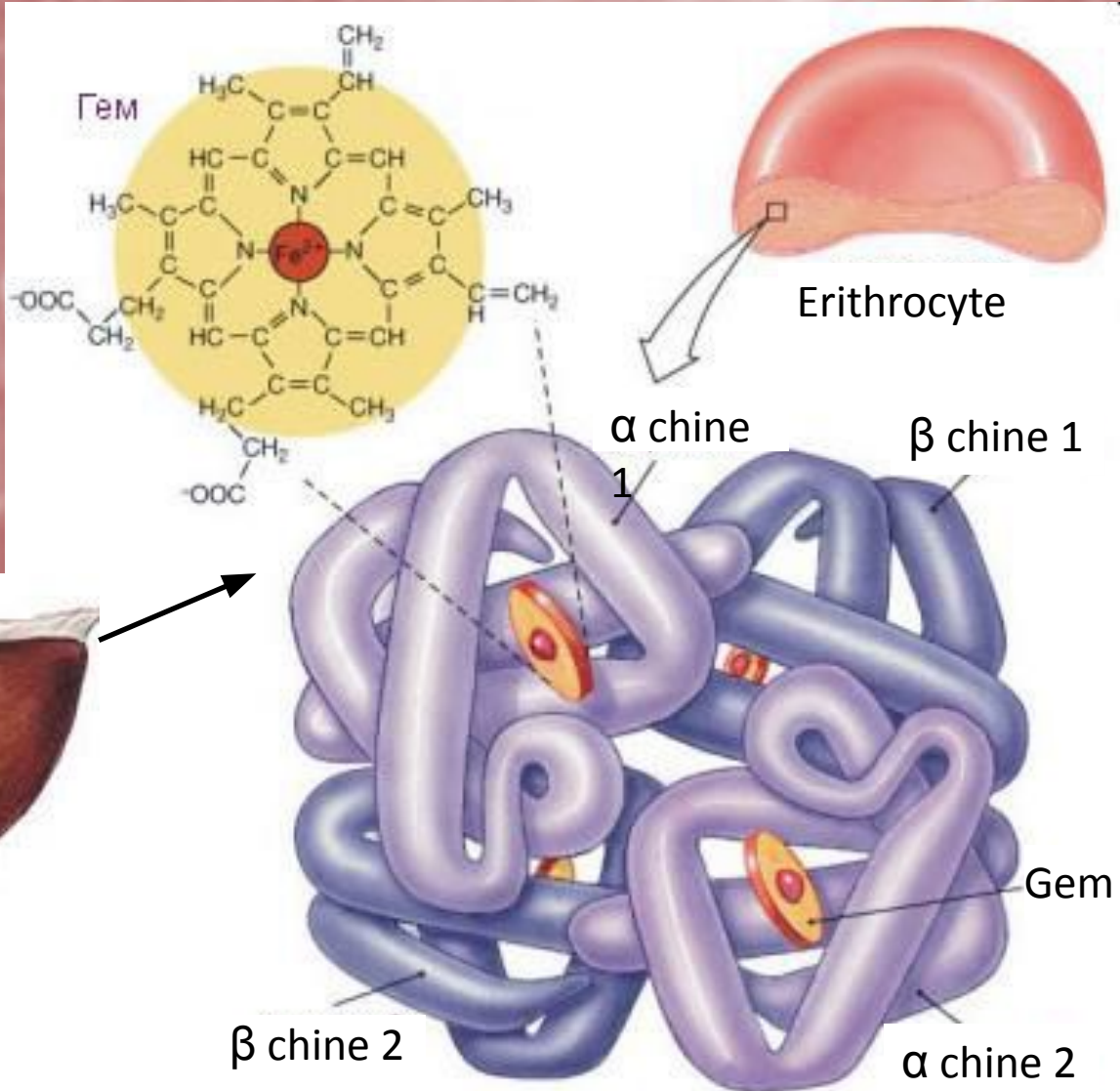
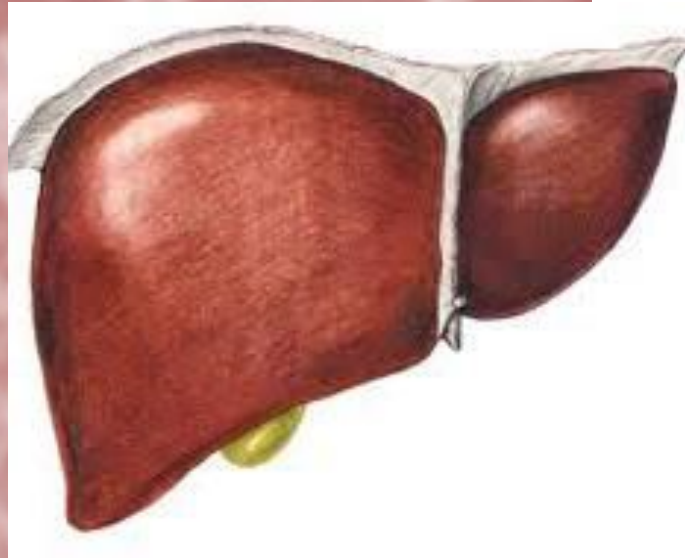
Discontinuous variability: **HLA system**



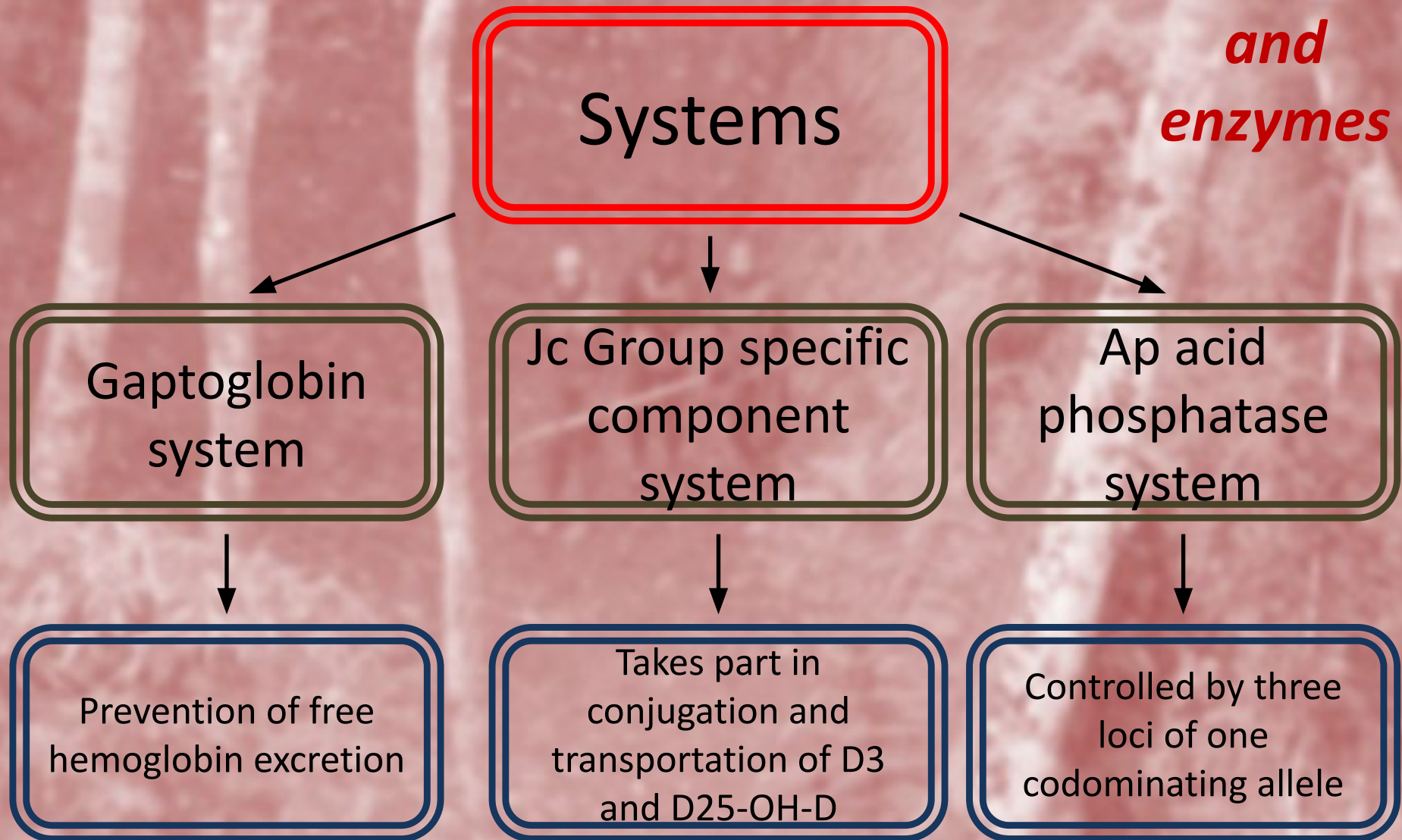
The human leukocyte antigen (HLA) system or complex is a group of related proteins that are encoded by the major histocompatibility complex (MHC) gene complex in humans. These cell-surface proteins are responsible for the regulation of the immune system.

Discontinuous variability:

Hemoglobin



Discontinuous variability: *Serum proteins and enzymes*



Discontinuous variability:

*Other
types*

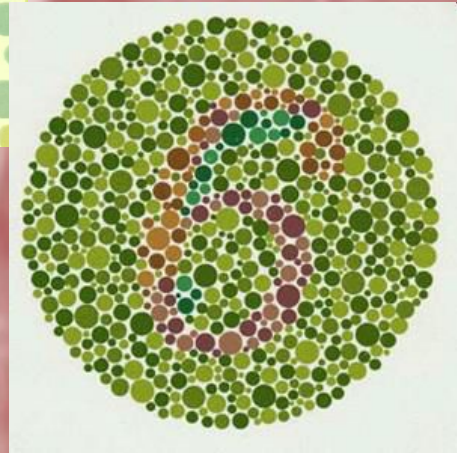
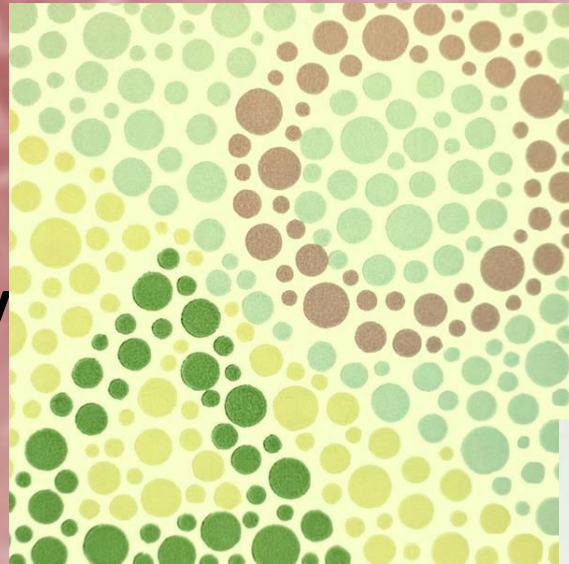
❖ Taste sensitivity to phenylcarbamide

(PTC)

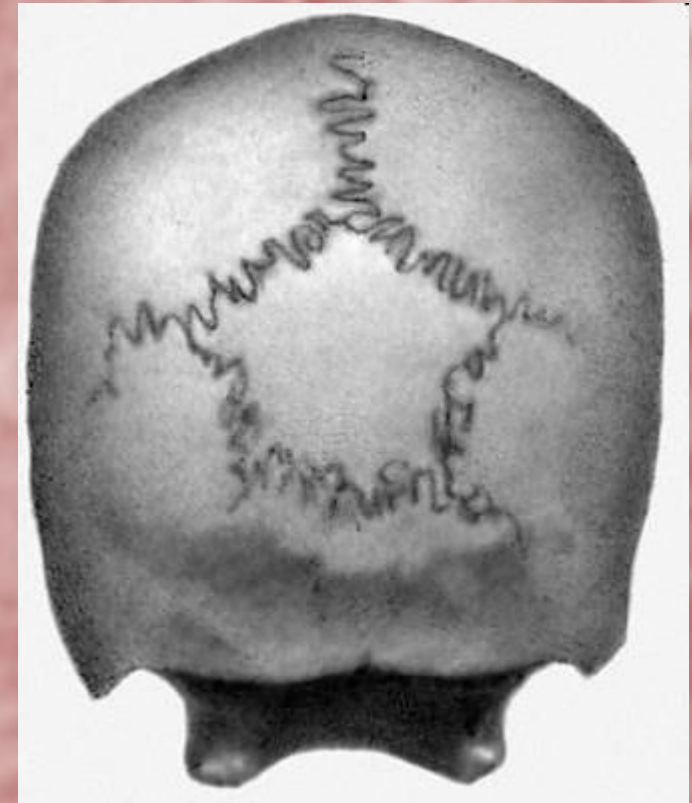
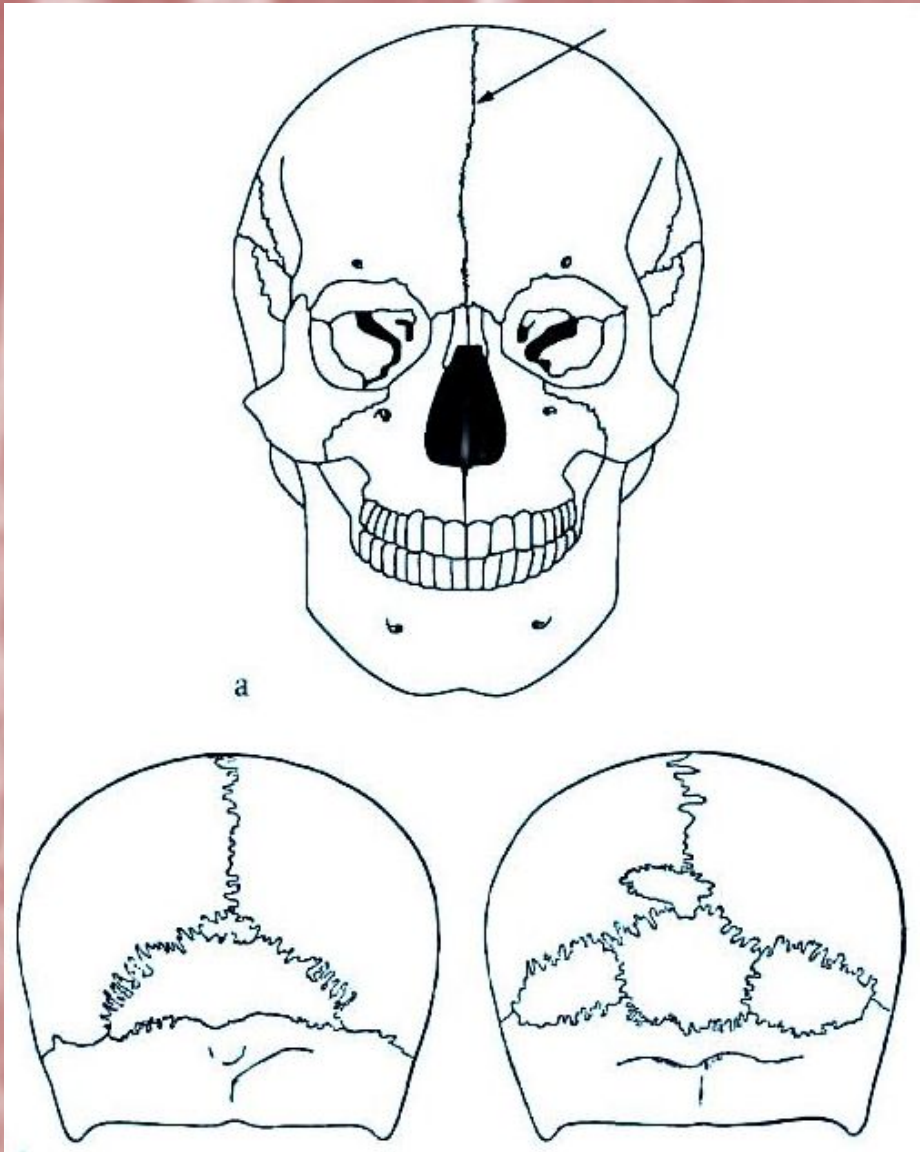
❖ Olfactive sensitivity

❖ Chromatic vision

❖ Cranial epigenetic signs

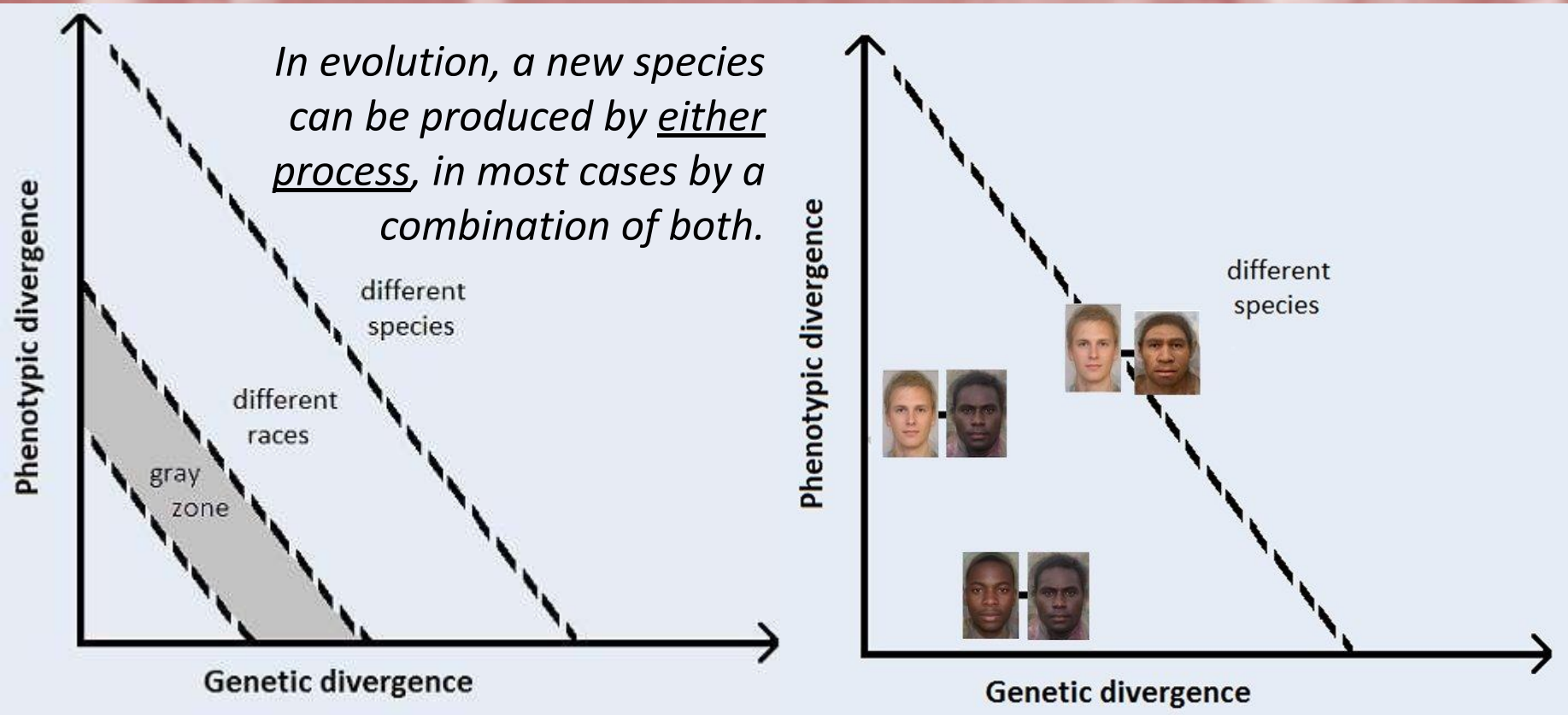


Discontinuous variability: *Cranial epigenetic signs*

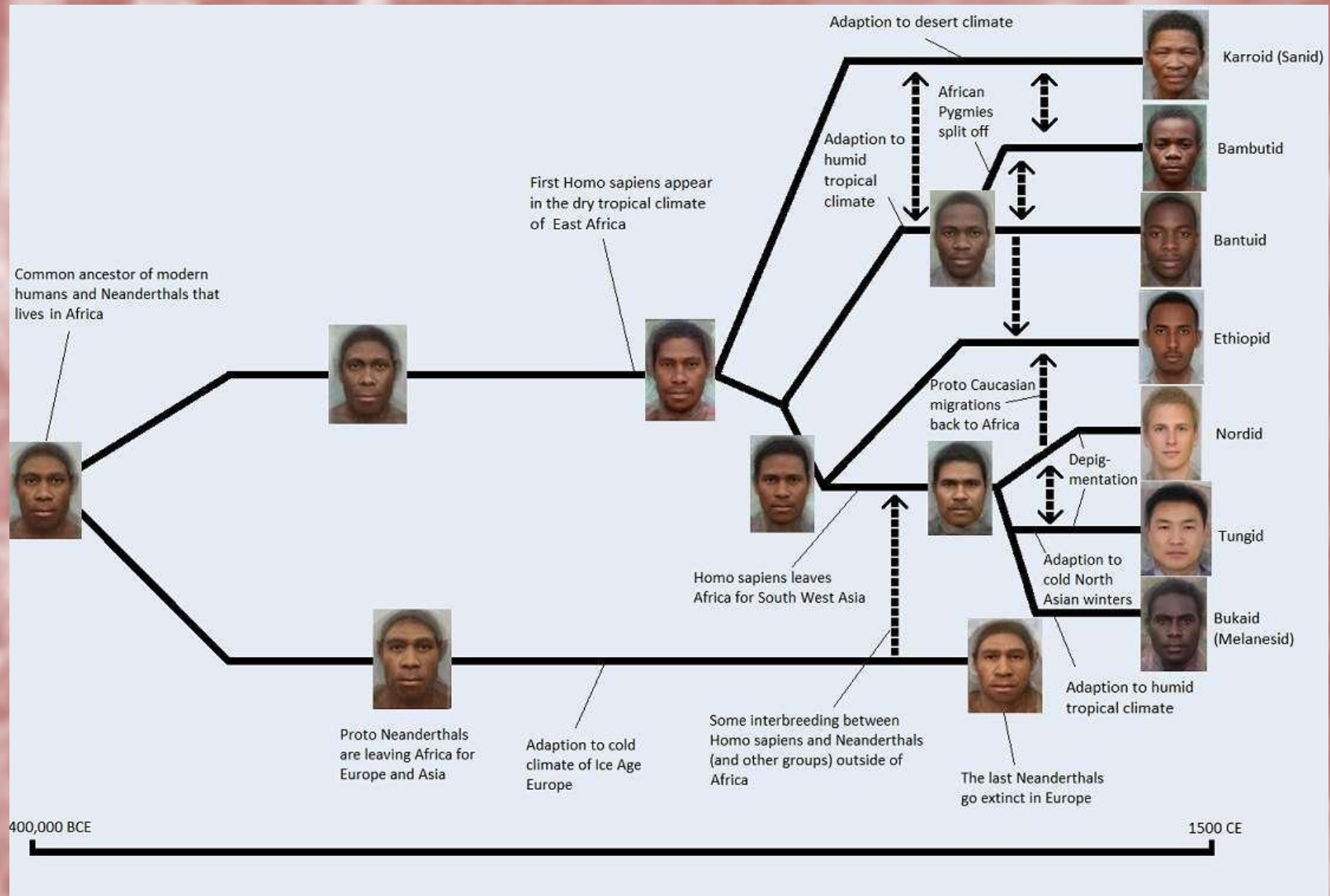


Why are phenotypes important?

Differences in humans are not only driven by genetic divergence, but also by phenotypic divergence caused by adaptive pressure.



Simplified human phylogenetic tree



Homework



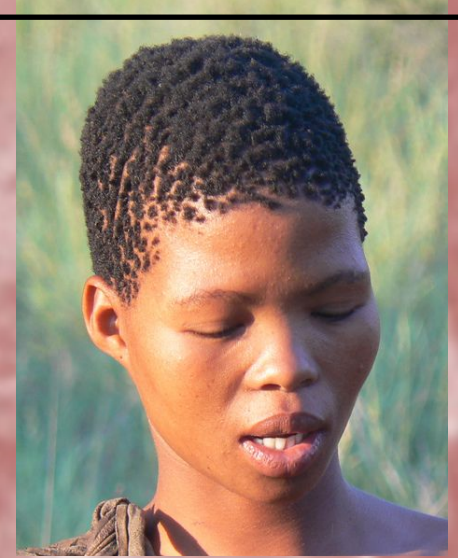
Australoid



Melanesian



Central African



South African



Indo-Mediterranean



Balcano-Caucasian



Atlanto-baltic

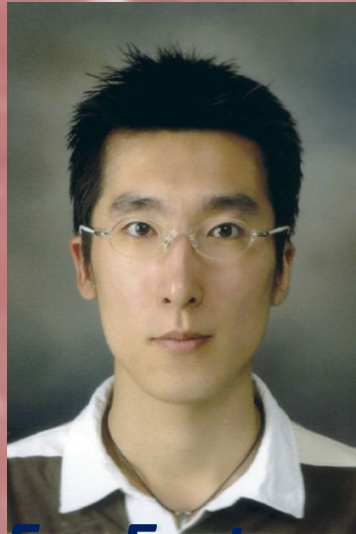


Uralic

Homework



Arctic



Far Eastern



South Asian



American



Polinesians



Kurilian



South Indian



Ethiopian