Department of anatomy

Population polymorphism and geographic variability of Homo sapiens

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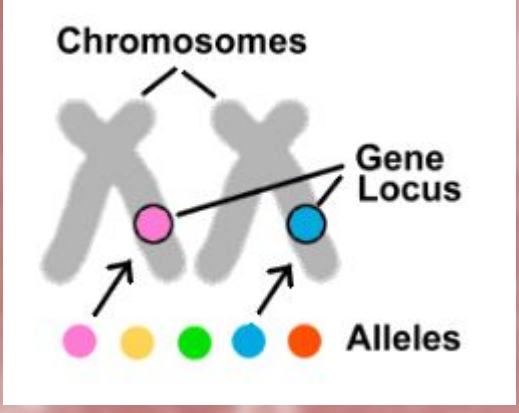
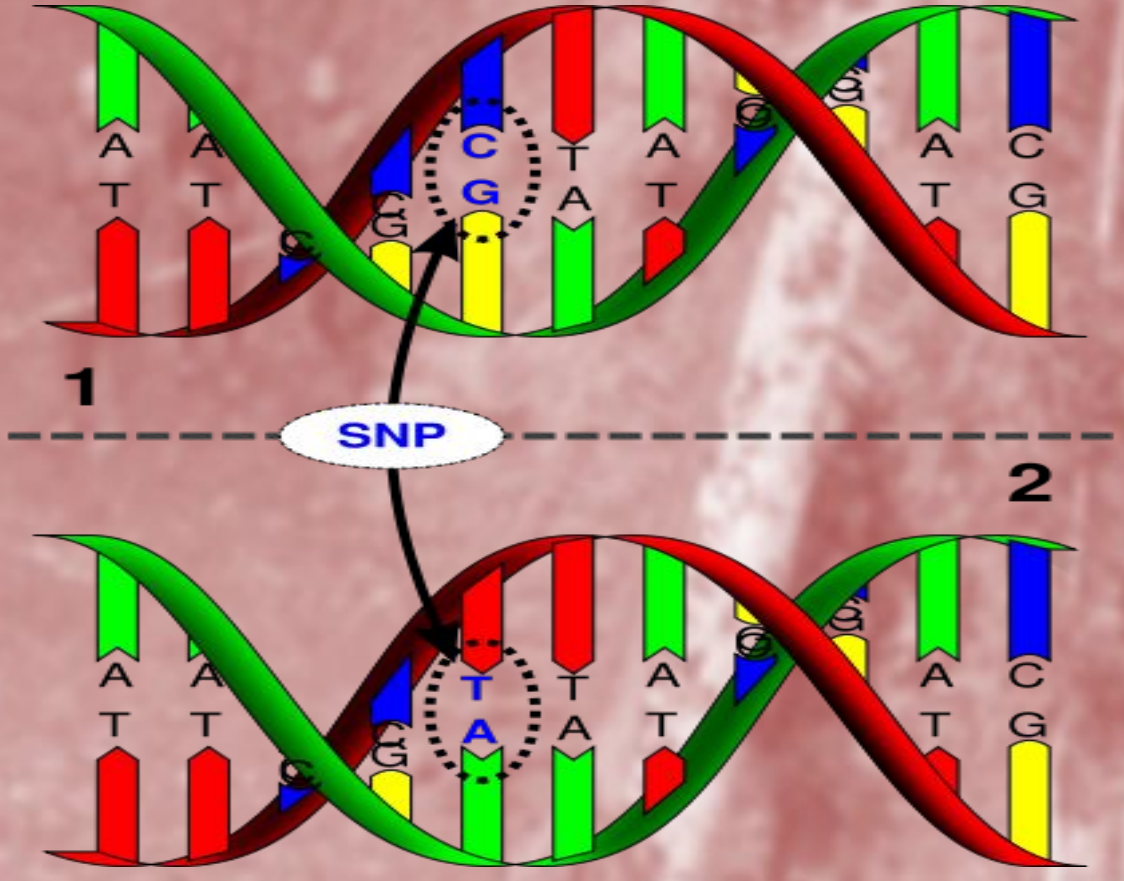
Genetic polymorphism

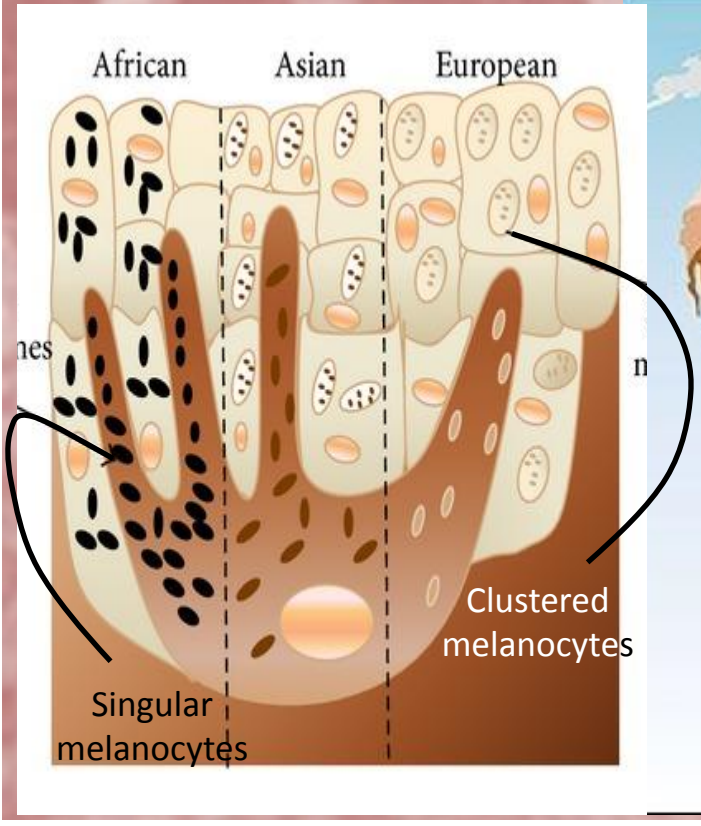
This is the presence of several alleles in the locus with sufficient frequency for their fixation in the population

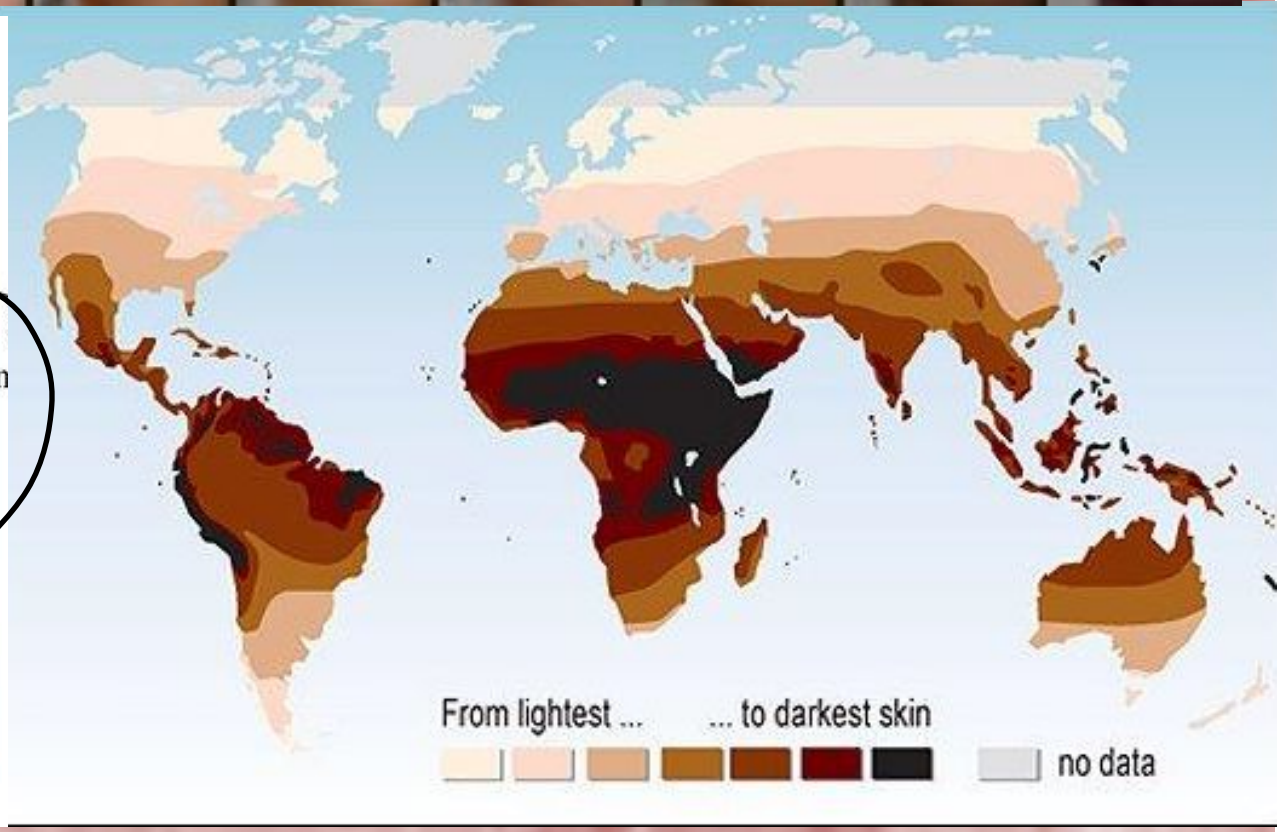




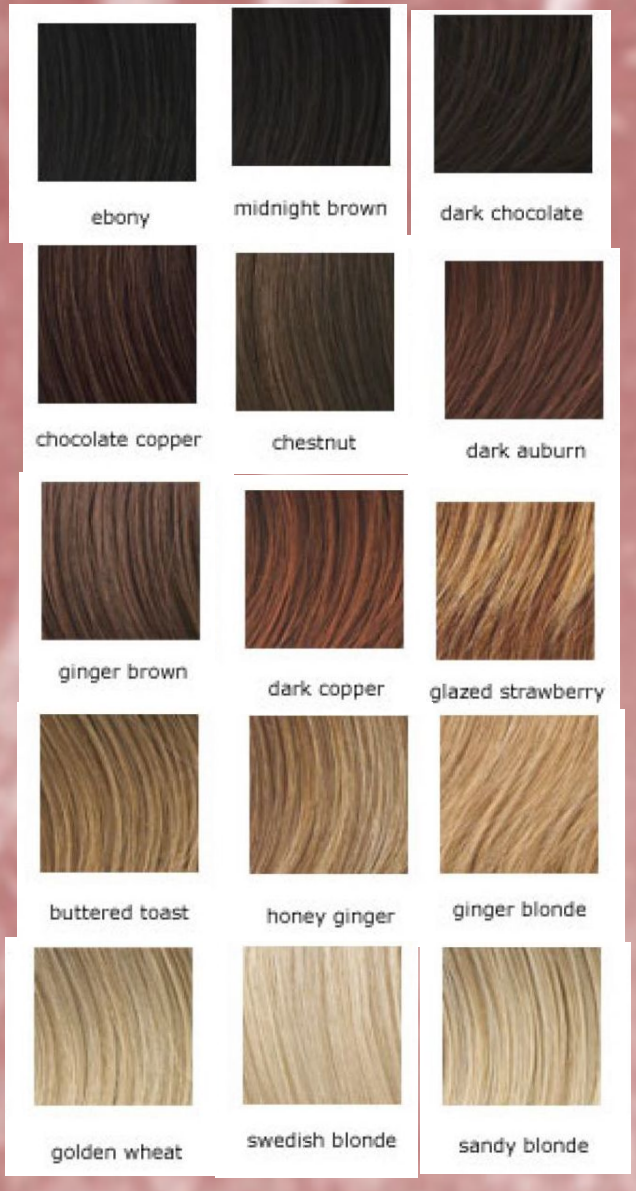
An allele is one of several sequences of a given gene

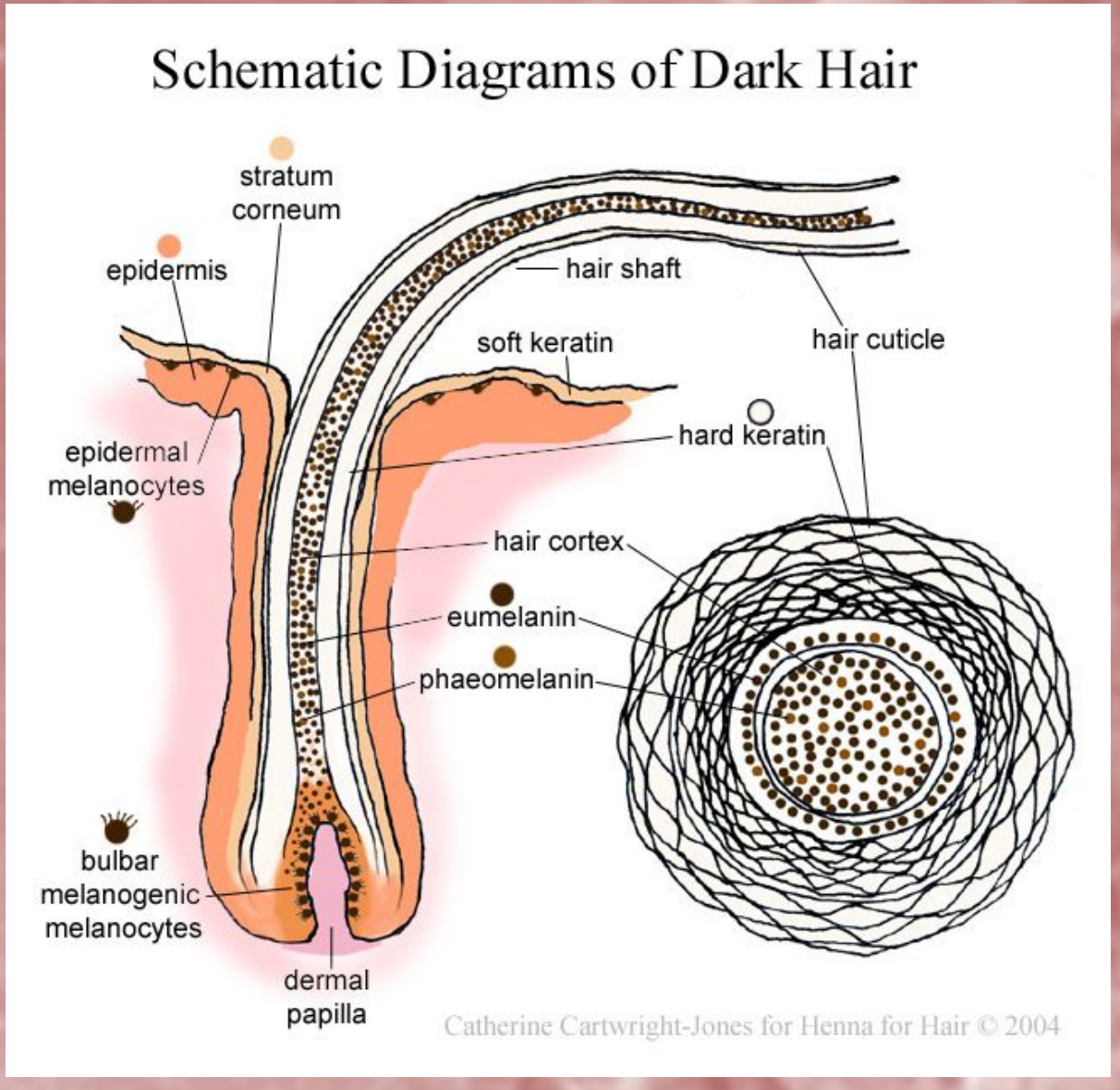
Continuous variability: *Pigmentation*



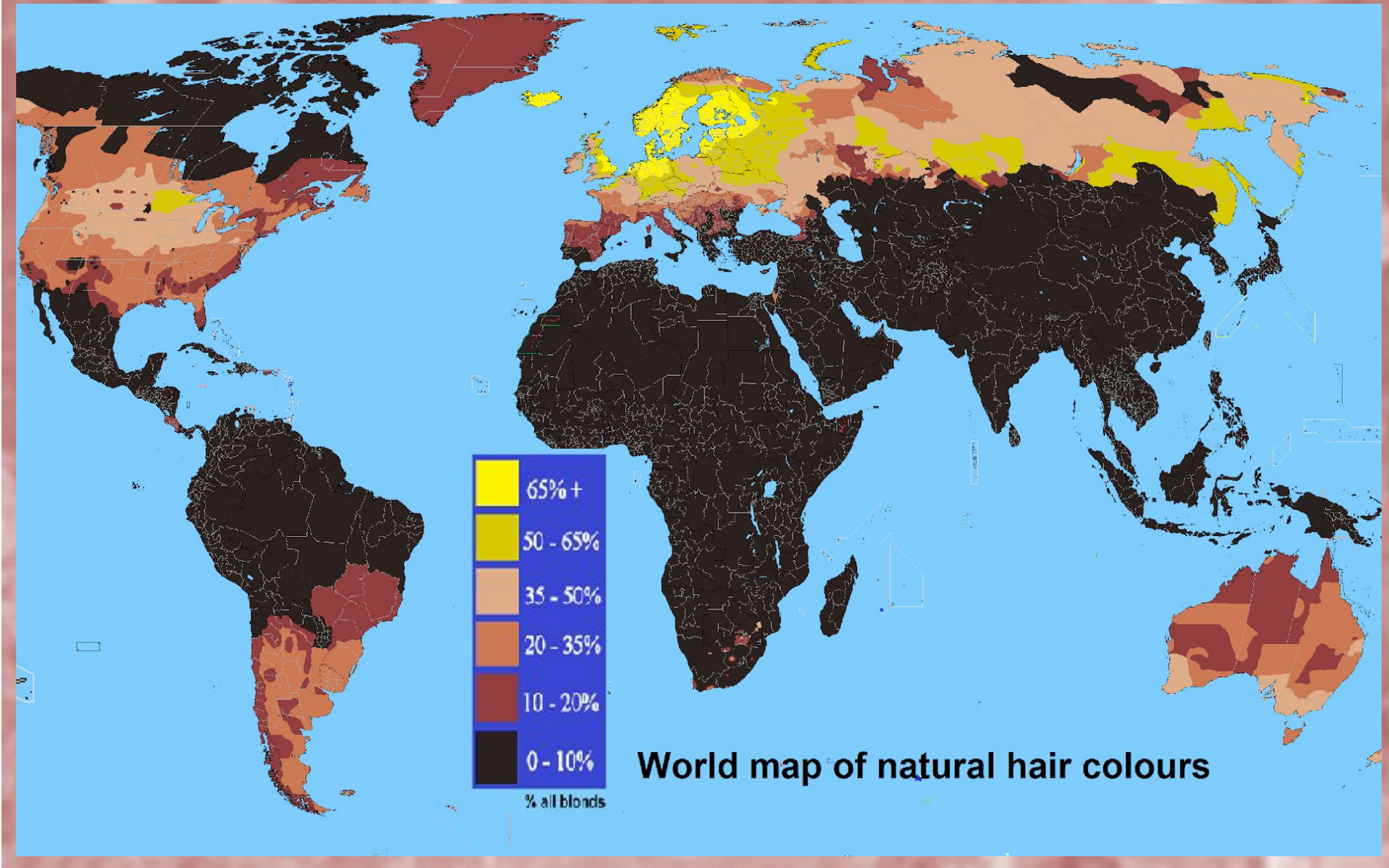


Continuous variability: *Hair color*

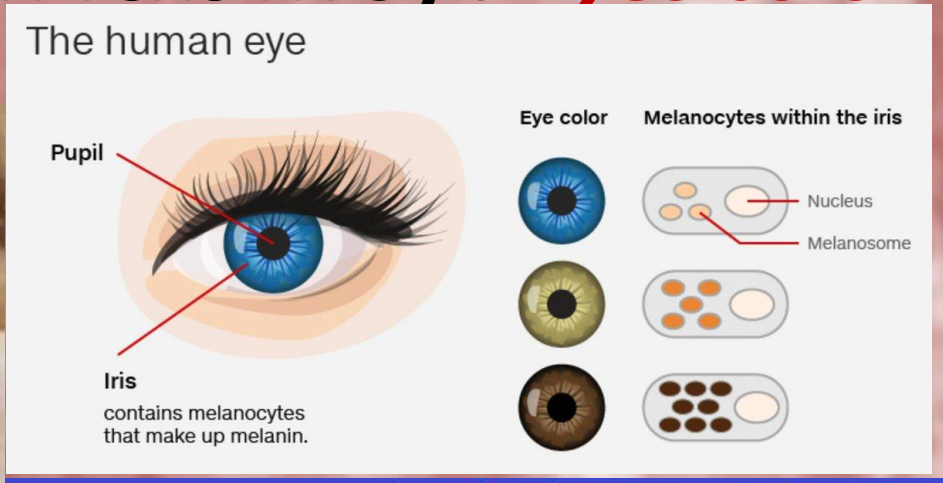


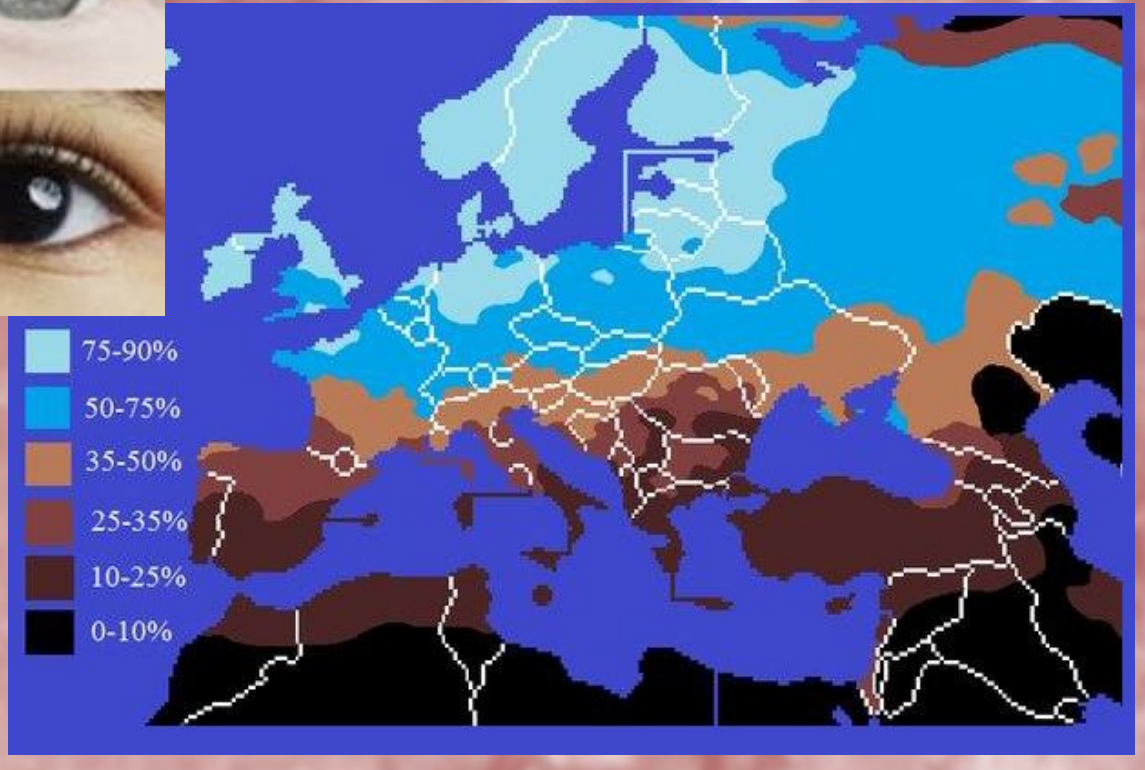


Continuous variability: *Hair color*



Continuous variability: *Eyes color*

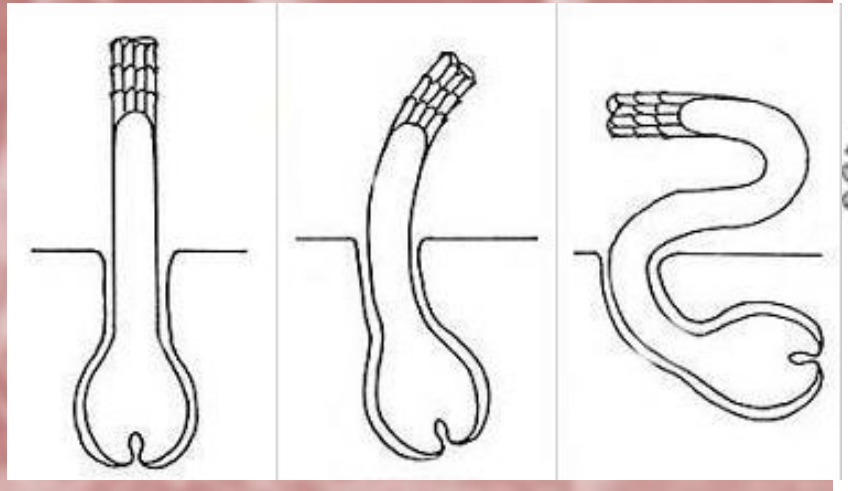




Continuous variability: *Hair texture*

coarse straight | (fine) straight | wavy | curly | tight curly | kinky | pepperc orn

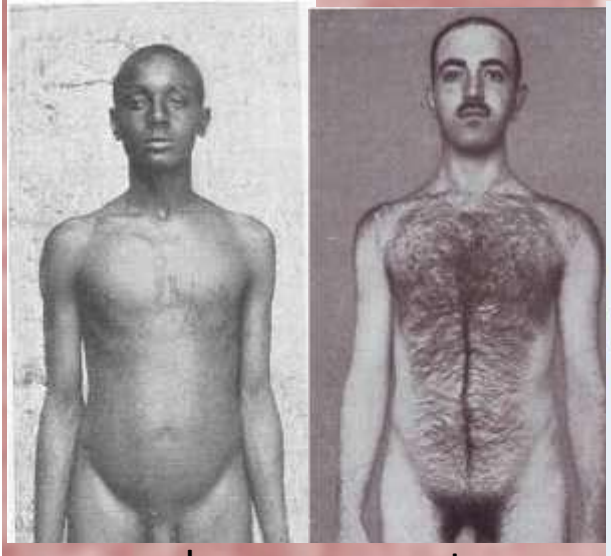
http://humanphenotypes.net/metrics/texture.html



straight | wavy | curly

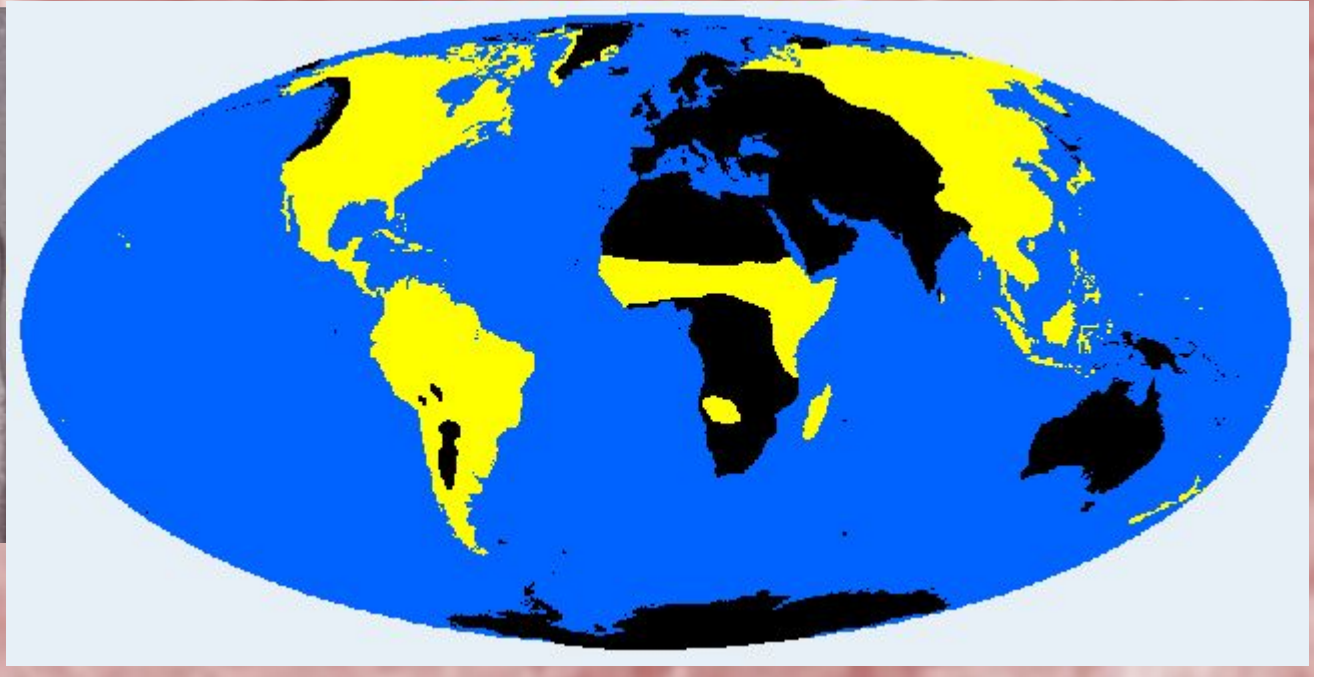
Continuous variability: ***Body hair***

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 Pacifids and Huarpids of South America show stronger hair growth



weak body hair

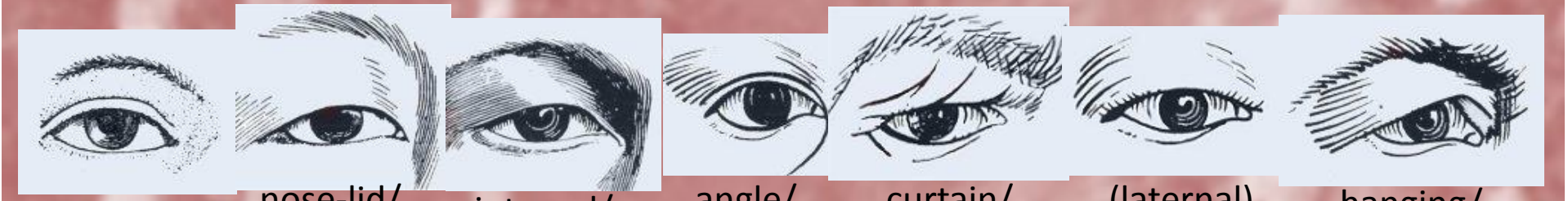
strong body hair



Continuous variability: ***Beard***

Very weak Weak Medium Prominent Very prominent

Continuous variability: *Face morphology*



no fold | nose-lid/ Mongolian fold | internal/ Indian fold | angle/ epicanthus | curtain/ Hottentot fold | (laternal) external/ Negroid fold | hanging/ Nordic fold

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

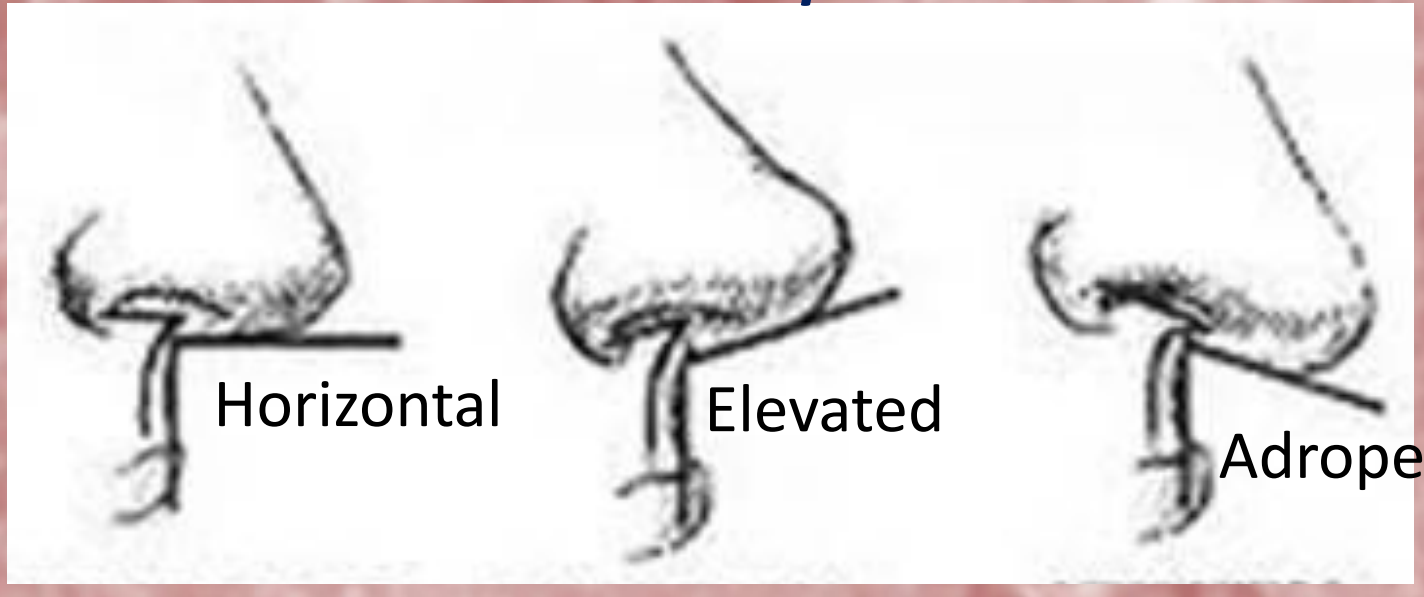
Thickness of the lips: from thin to thick

Landgraf et al., 2013

Continuous variability: *Nose*

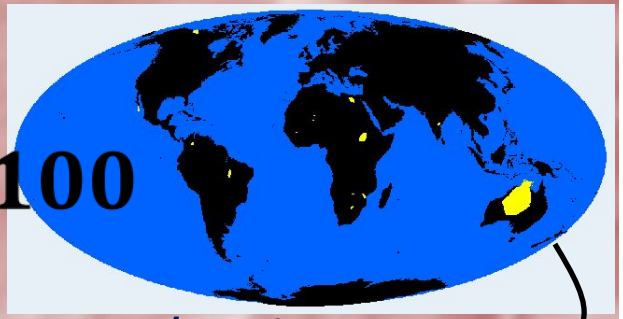
Ridge of the nose

Nose tip



Continuous variability: *Cephalic index*

$$Cephalic\ index = \frac{l_{breadth}(cm)}{l_{length}(cm)} x100$$

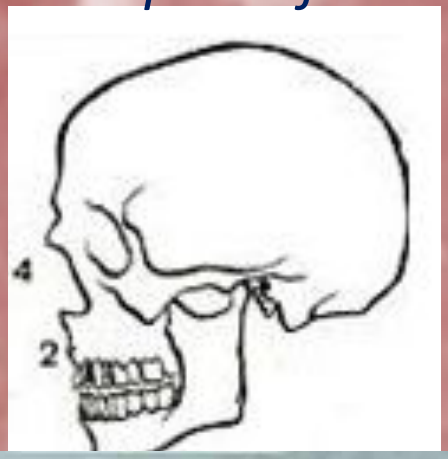


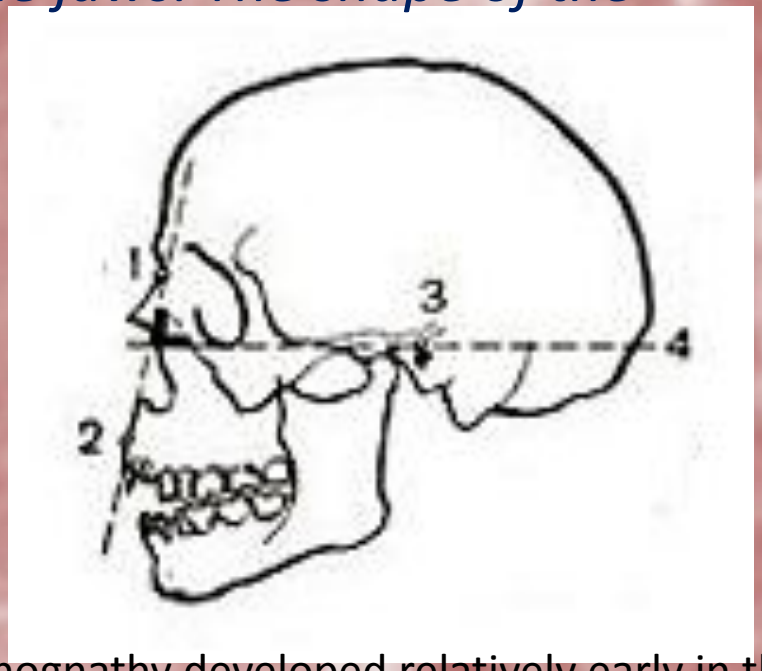
Hyperdolichocephaly was found in some early humans, but is rare today on the population level. The largest area of hyperdolichocephalic dominance is found from Central Australia to North Australia

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

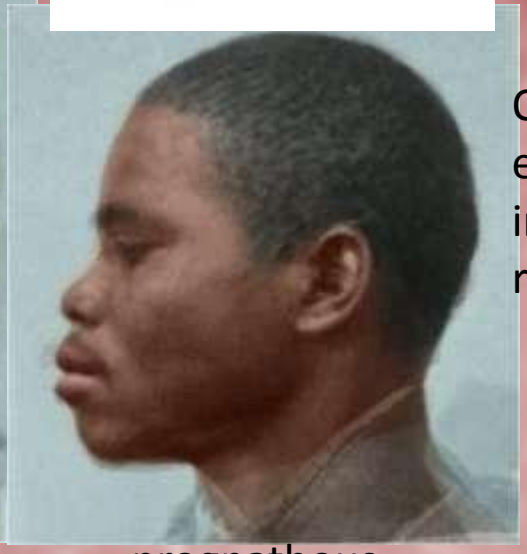
Continuous variability: ***Progmatism***

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



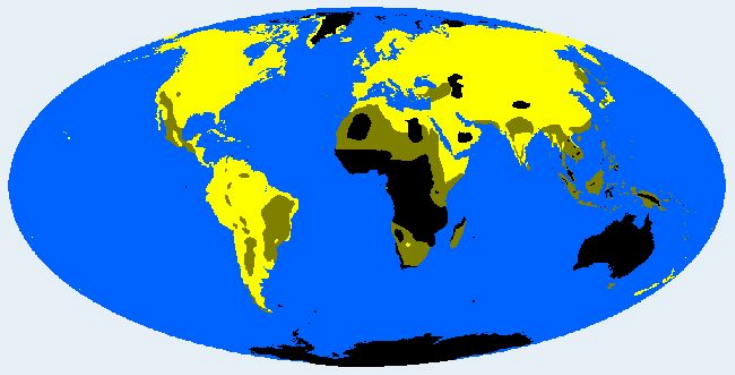


orthognathous



prognathous

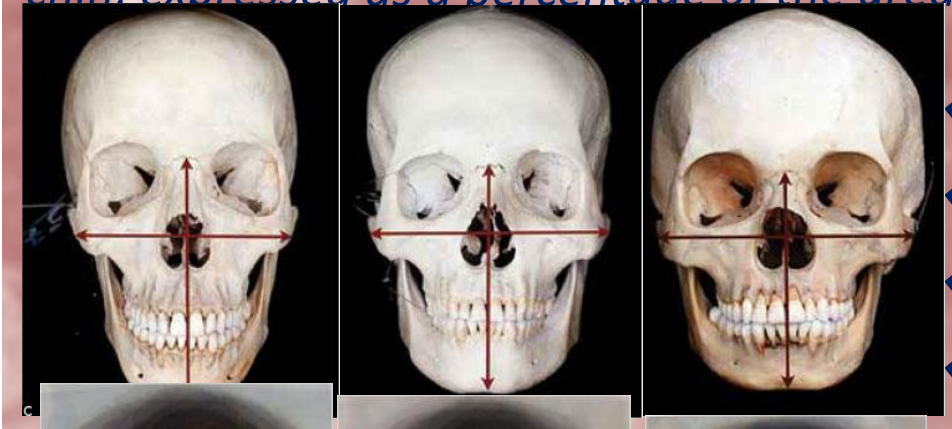
Orthognathy developed relatively early in the evolution of Homo sapiens and continuously increased in frequency, especially in colder regions.



Continuous variability: *Facial index*

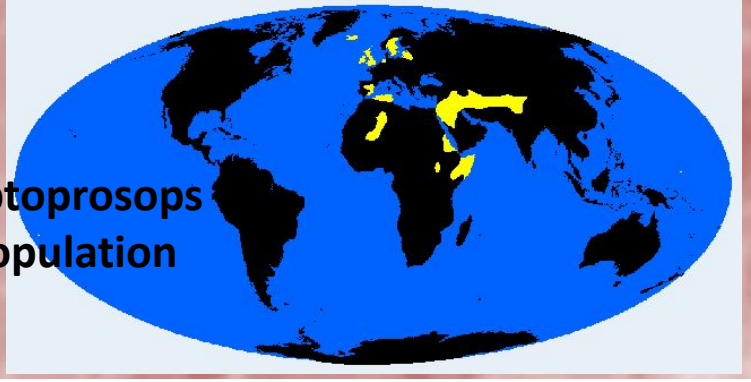
$$Facial\ index = \frac{l_{facial\ skull\ length}(cm)}{l_{bizygomatic\ diameter}(cm)}\ x100$$

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.

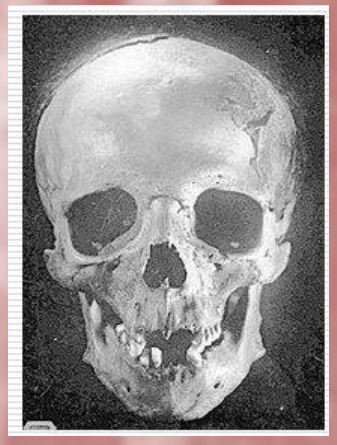


leptoprosop mesoprosop euryprosop

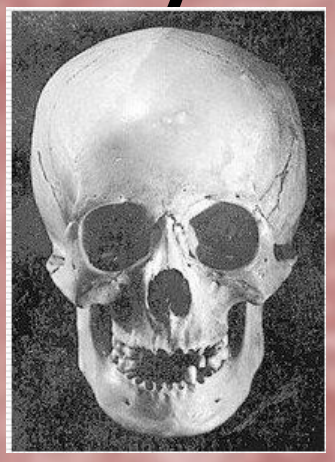
- *Hyperleptoprosops (> 95%)*
- *Leptoprosops (90-94,9%)*
- *Mesoprosops (85-89,9%)*
- *Euryprosops (80-84,5%)*
- *Hypereuryprosops (<79,9%)*



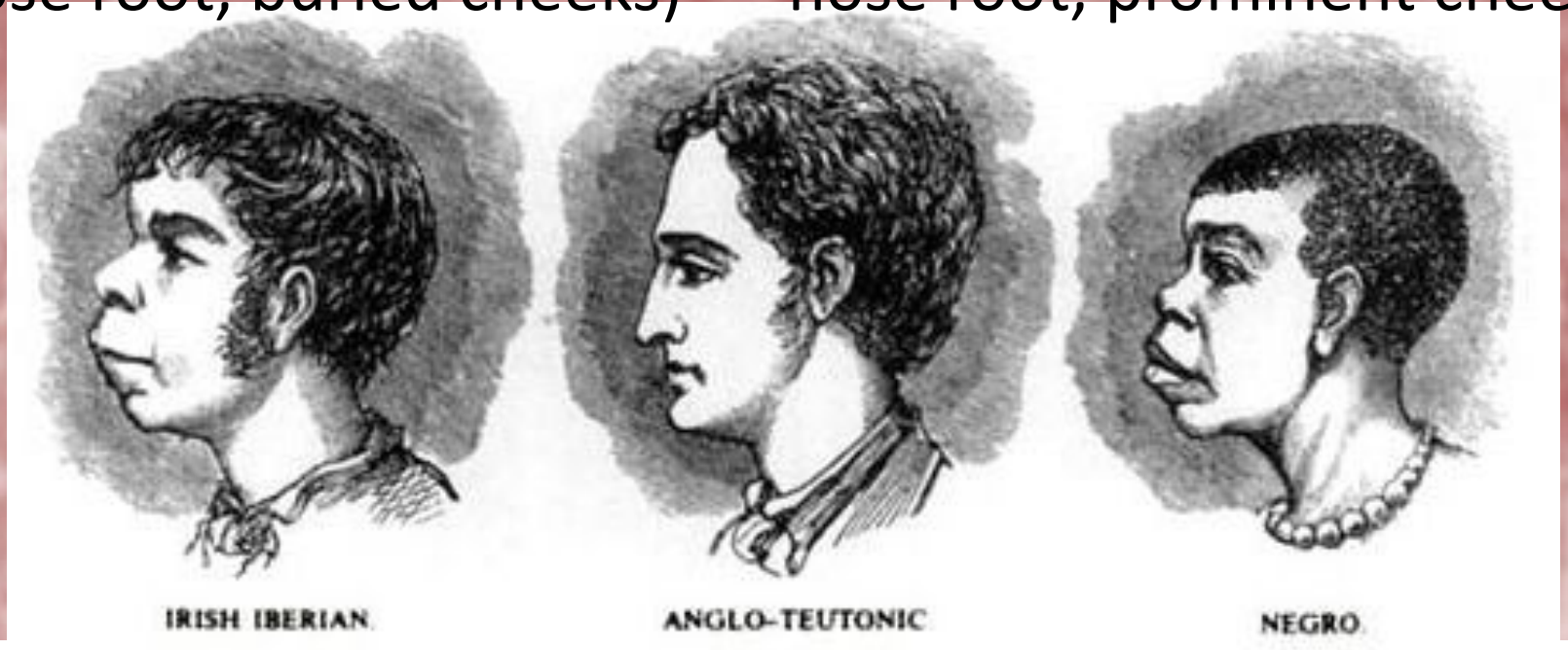
Continuous variability: *Facial prolofereation*



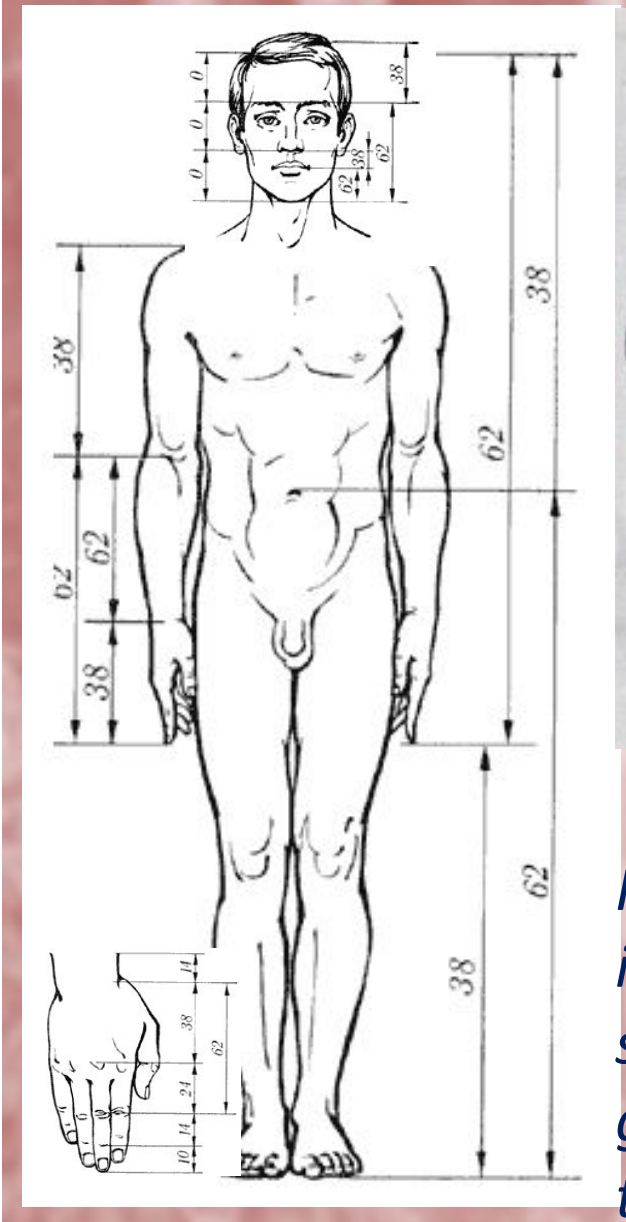
Well proliferated face (high nose root, buried cheeks)

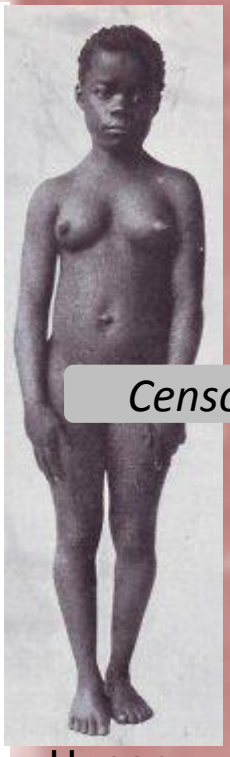


Poor proliferated face (low nose root, prominent cheeks)



Continuous variability: *Osteological traits*

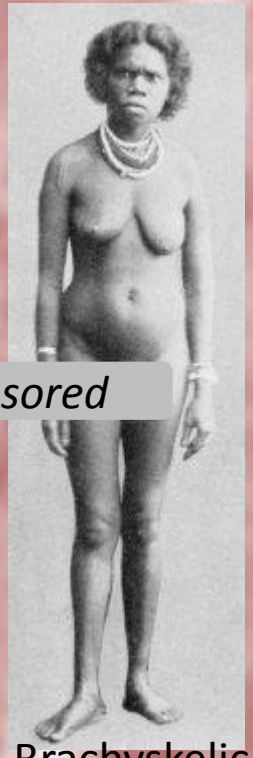




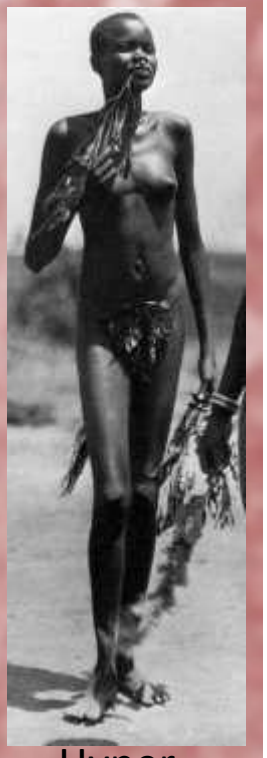
Hyper-

Macroskelic

Mesoskelic



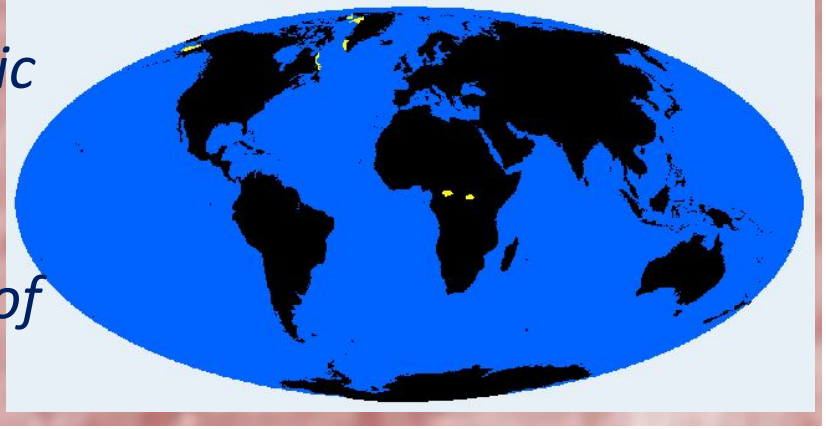
Brachyskelic



Hyper-

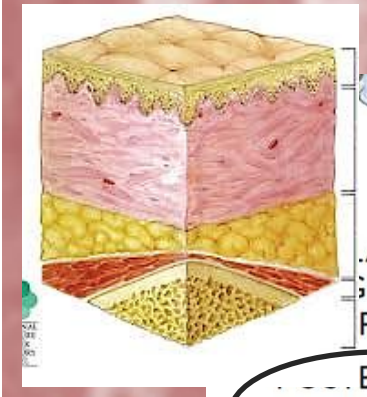
Censored Censored Censored Censored

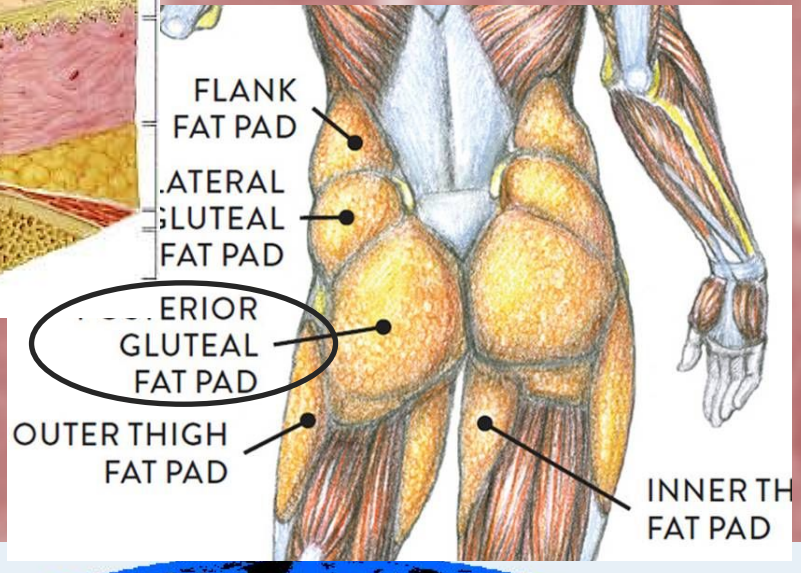
In hypermacroskelic individuals the sitting height is greater than 55% of the overall height.



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

Hair type

Epicantus +/-

Approx. cephalic type

Nose shape

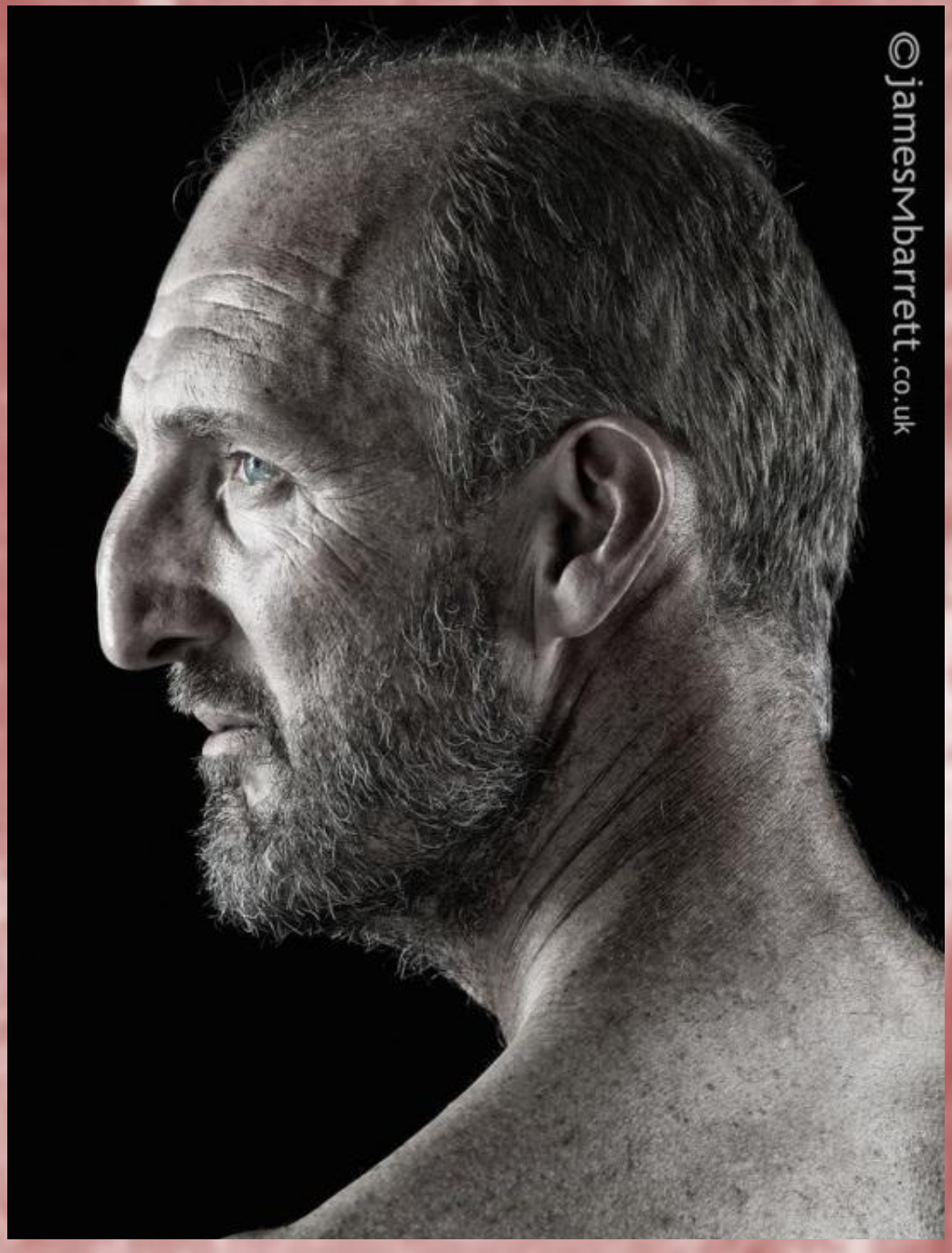
Lip thickness

Beard hairiness

Progmatism

Guess the nation

Afro-American

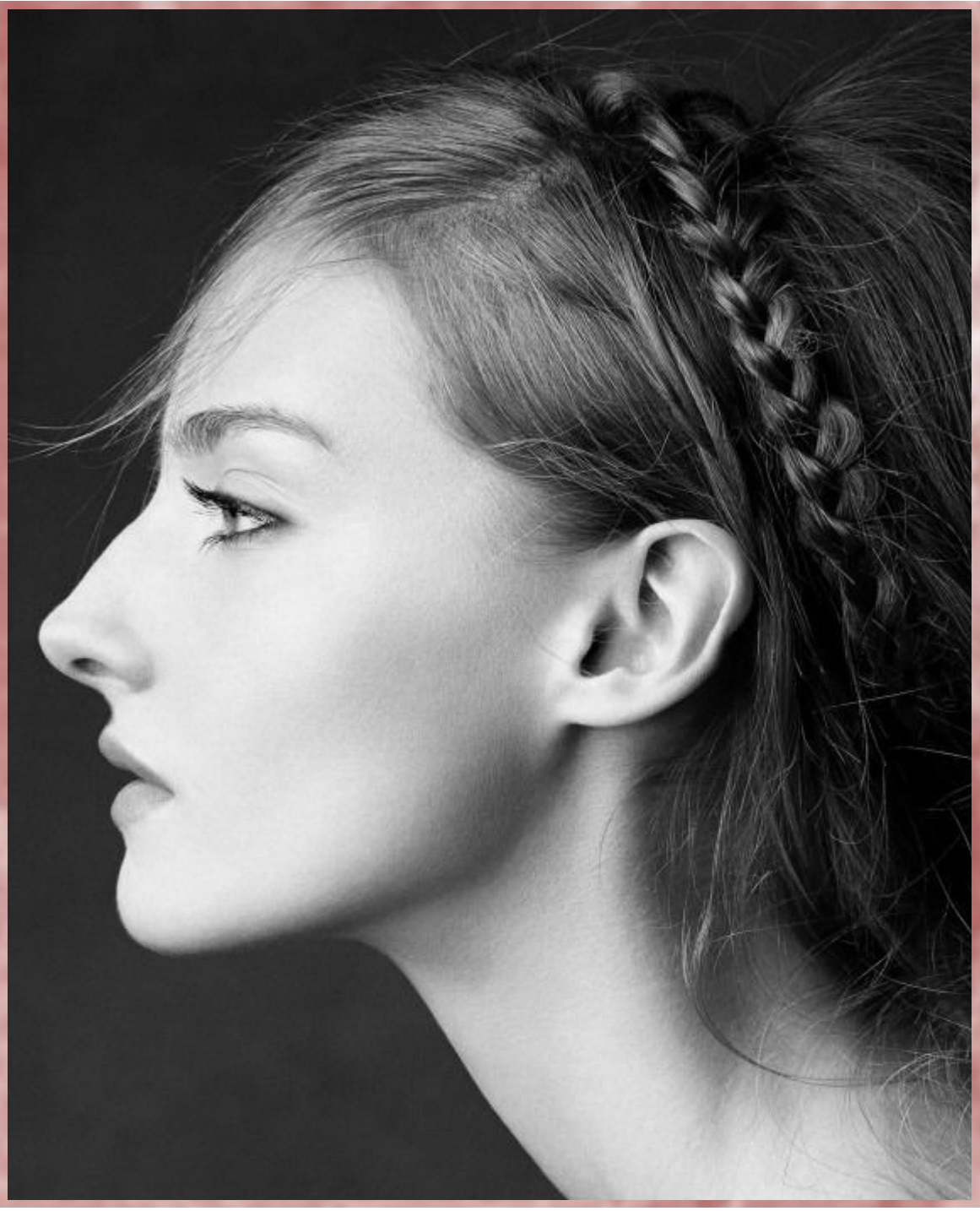


British

Afro-American

Chineese

Afro-american



British

Chineese

Afro-American

Turkish

Peruvian

Australian aborigine

Eskimo

Turkish

Peruvian

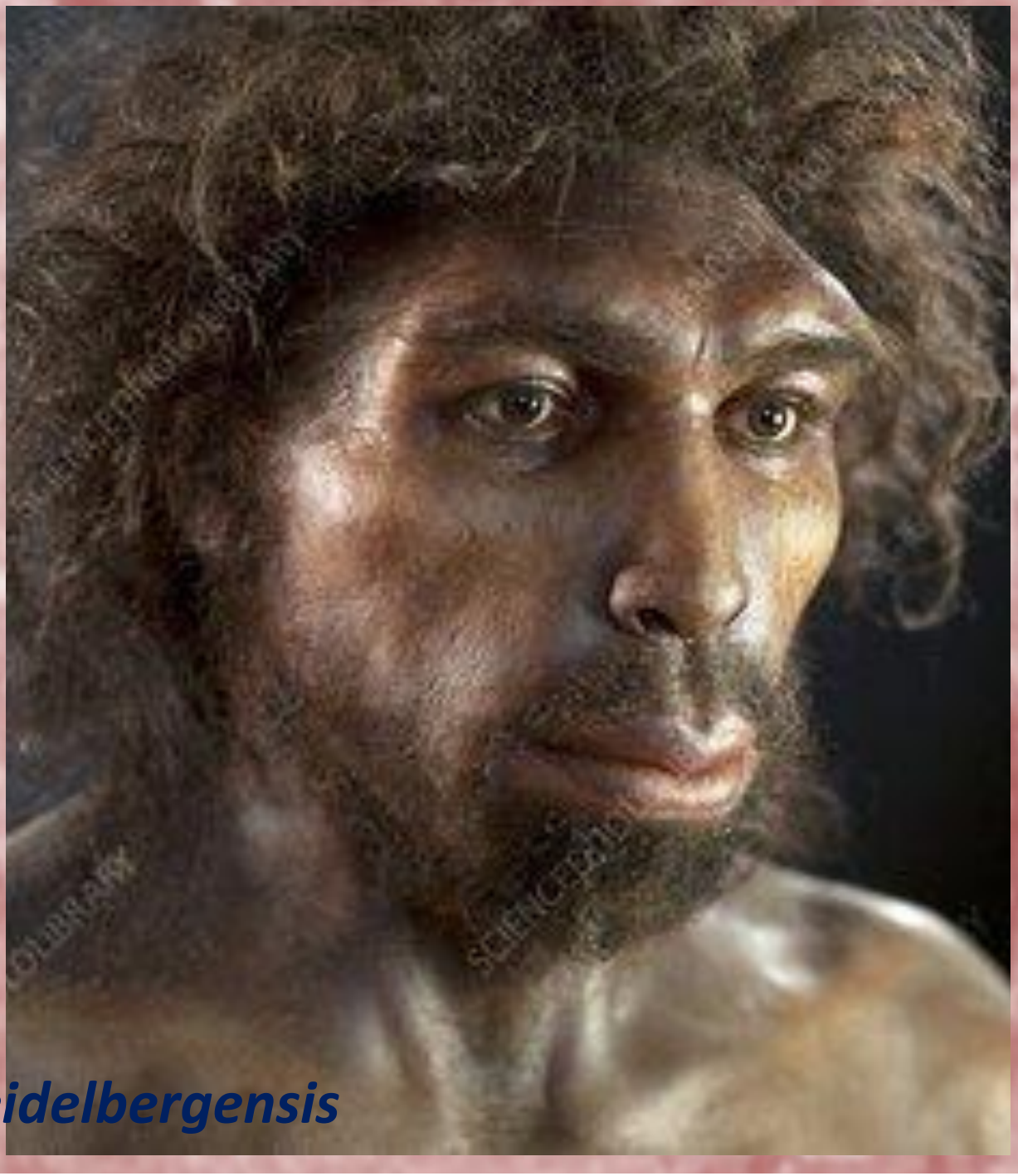
Australian aborigine

Eskimo

Ethiopian

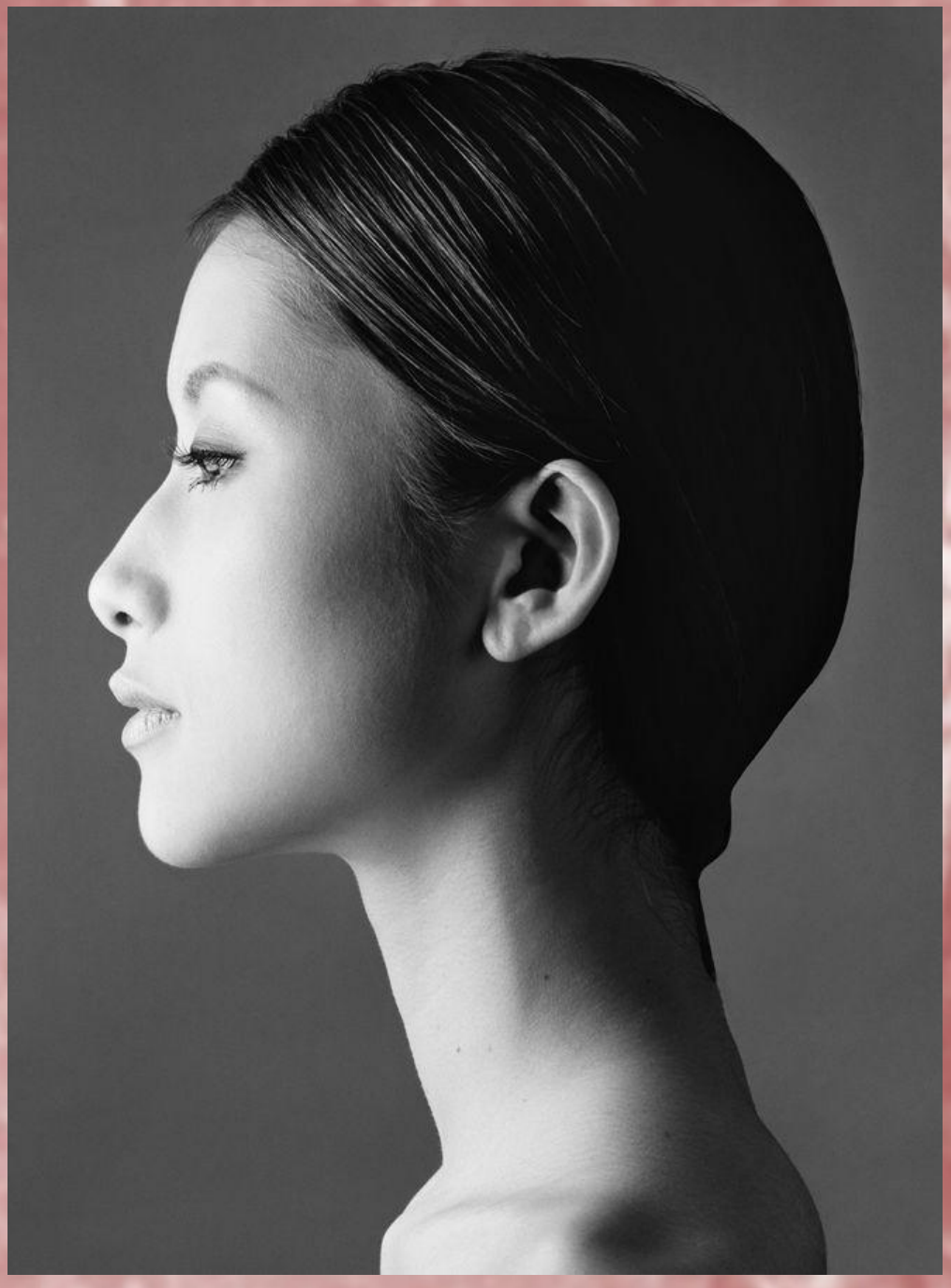
German

Indonesian

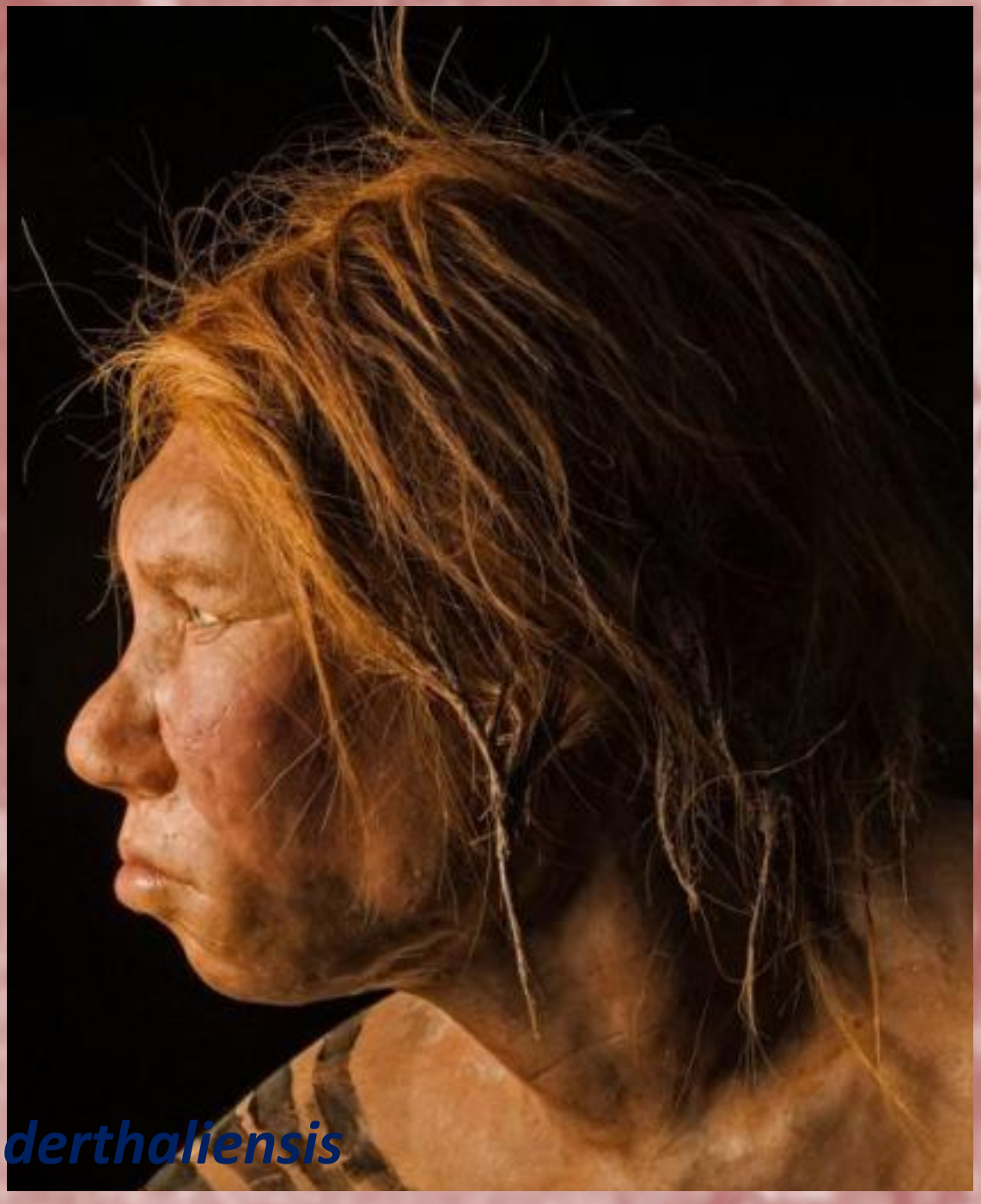


Homo heidelbergensis

Philipino



Japanese

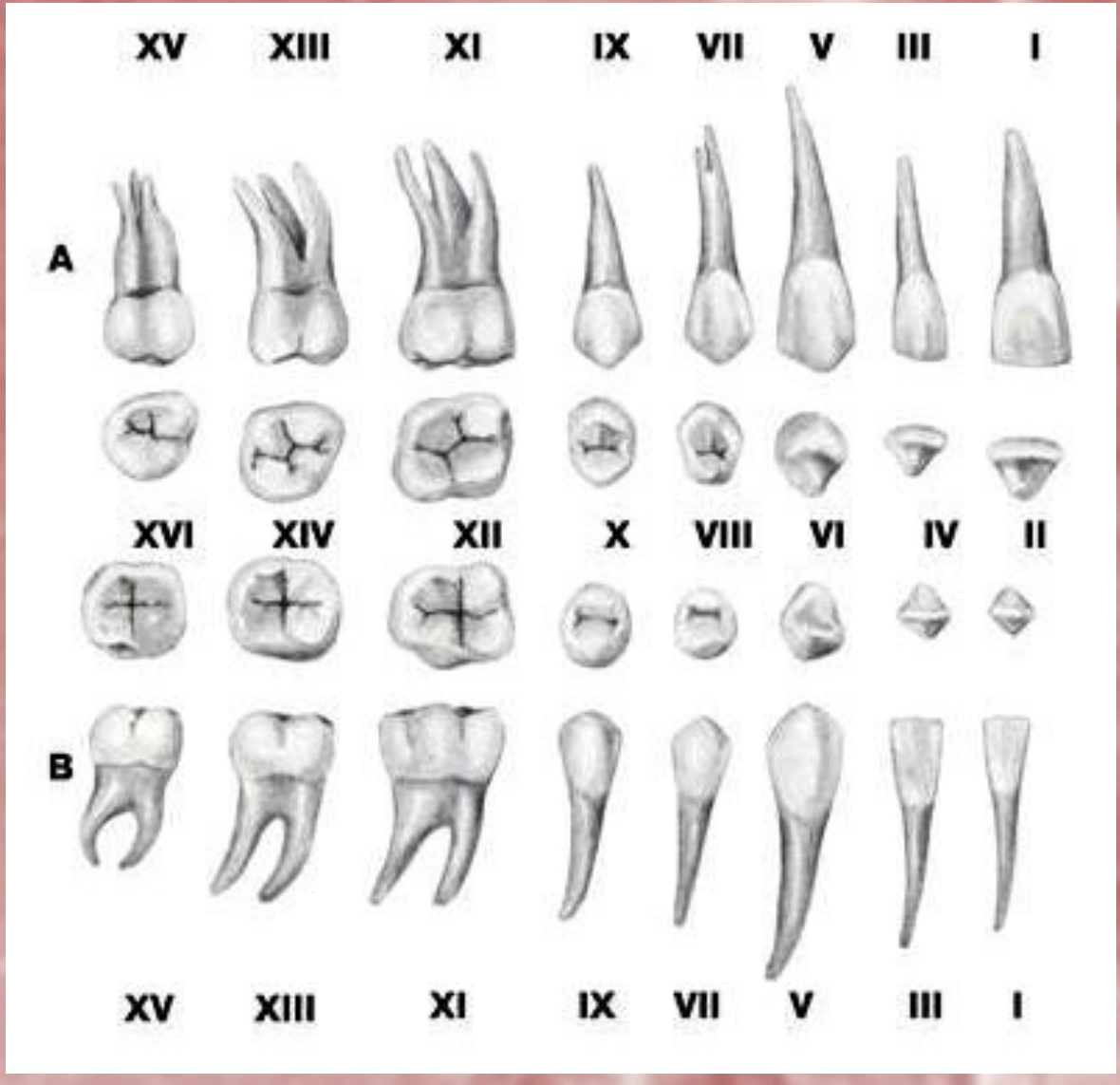


Homo neanderthaliensis

Arabic (UAE)

Continuous variability: *Odontoglyphical traits*

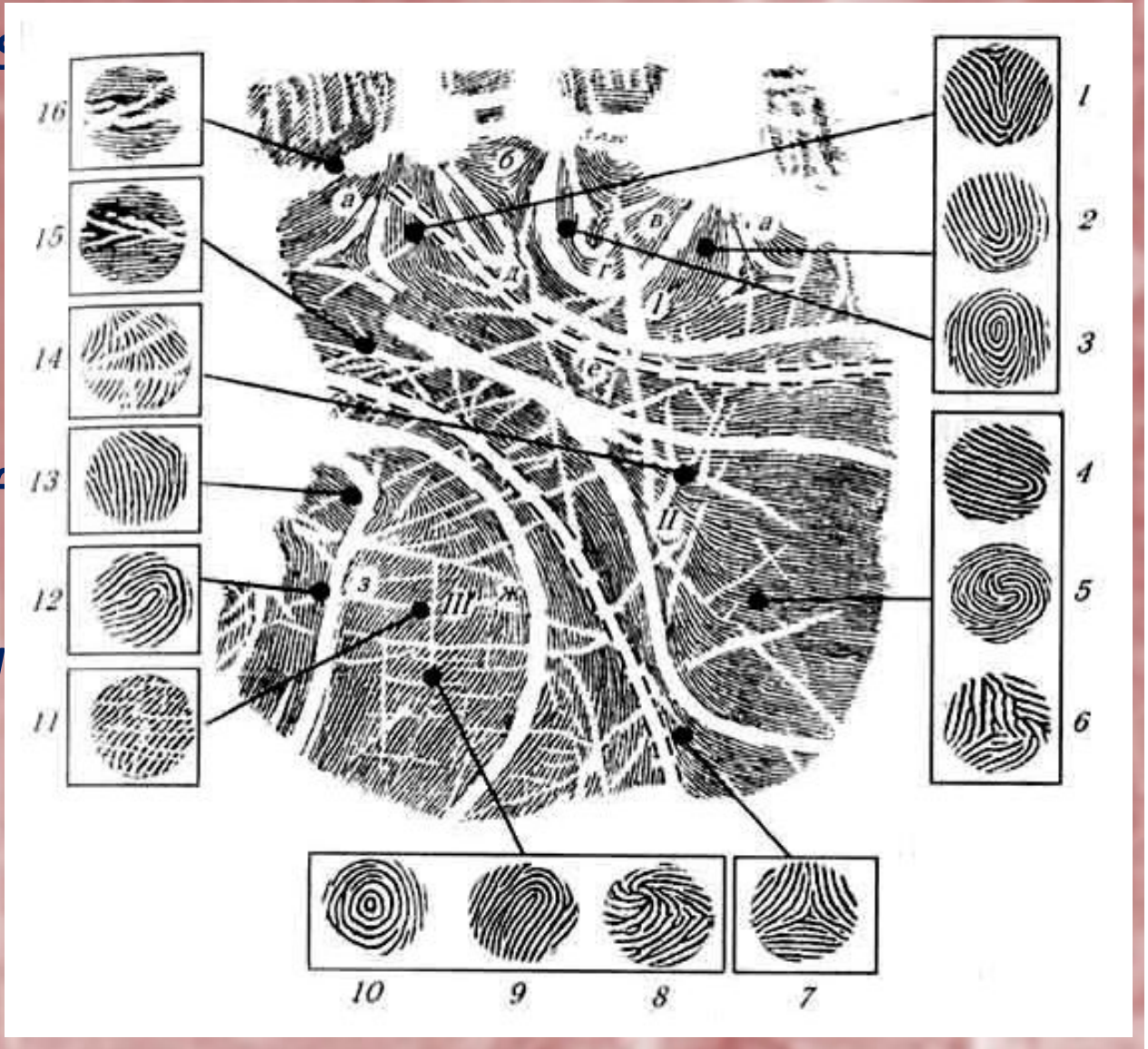
Odontoglyphics is the method of classification of the molar grooves defined in an individually distinctive pattern like that of fingerprints.



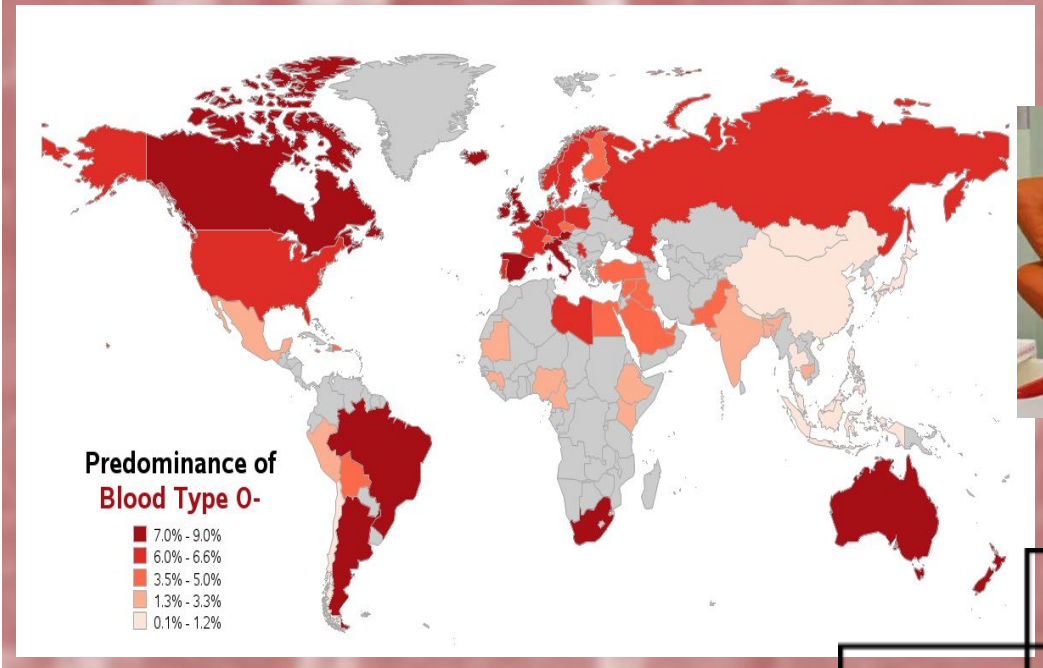
Continuous variability:

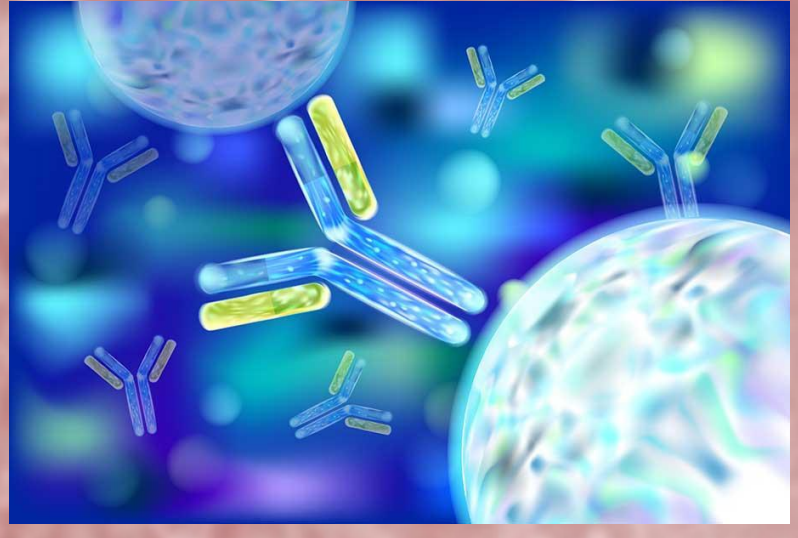
Dermatoglyphical traits

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*

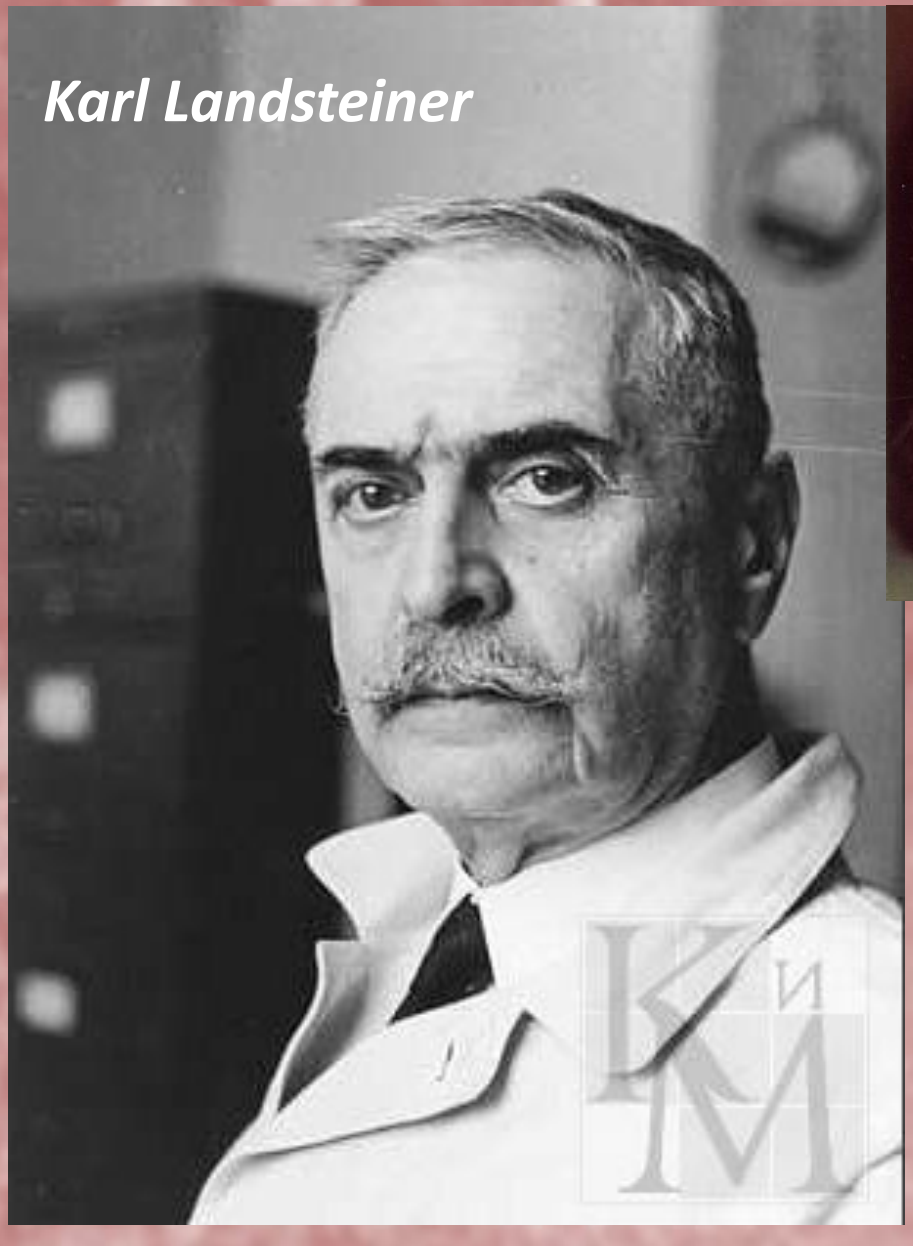




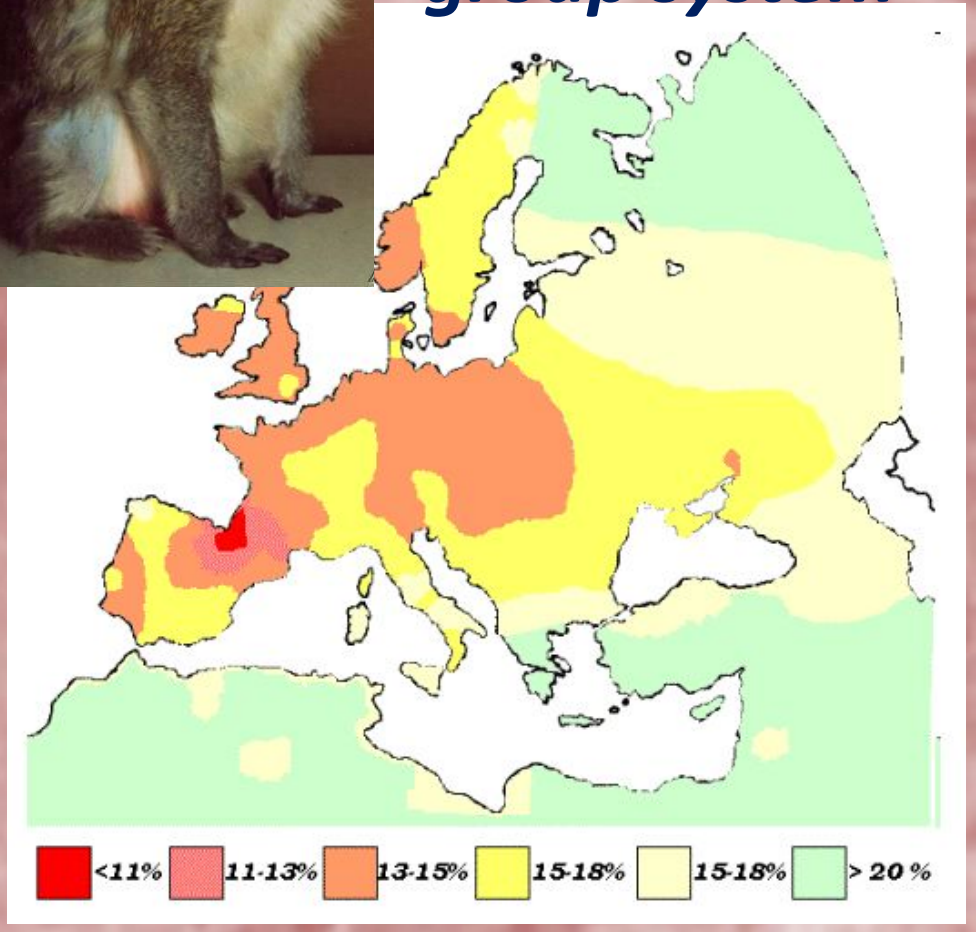
II *III* *IV* *I*

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

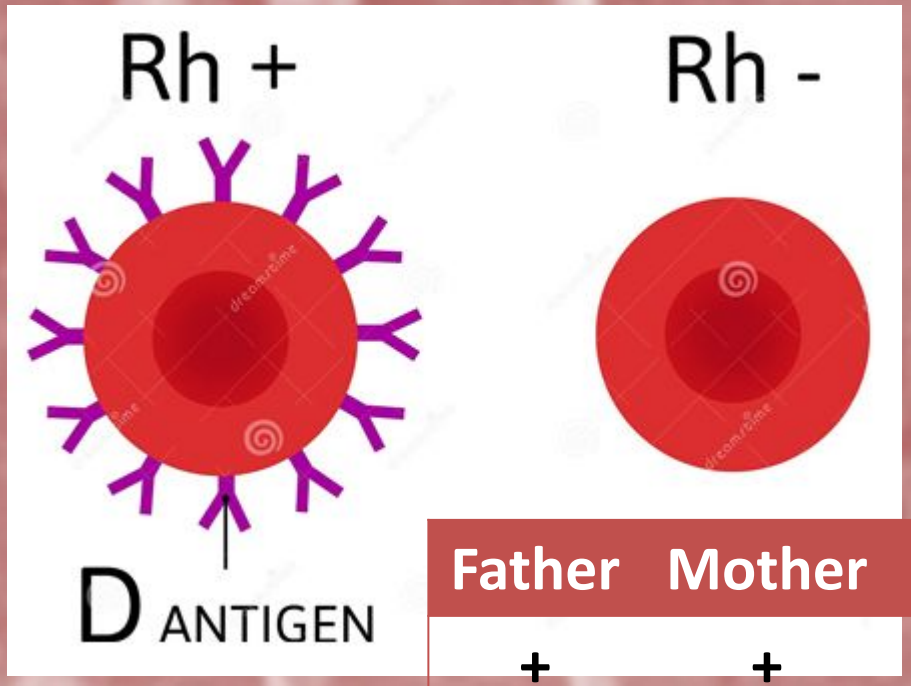
Discontinuous variability: Blood types



Rh blood group system

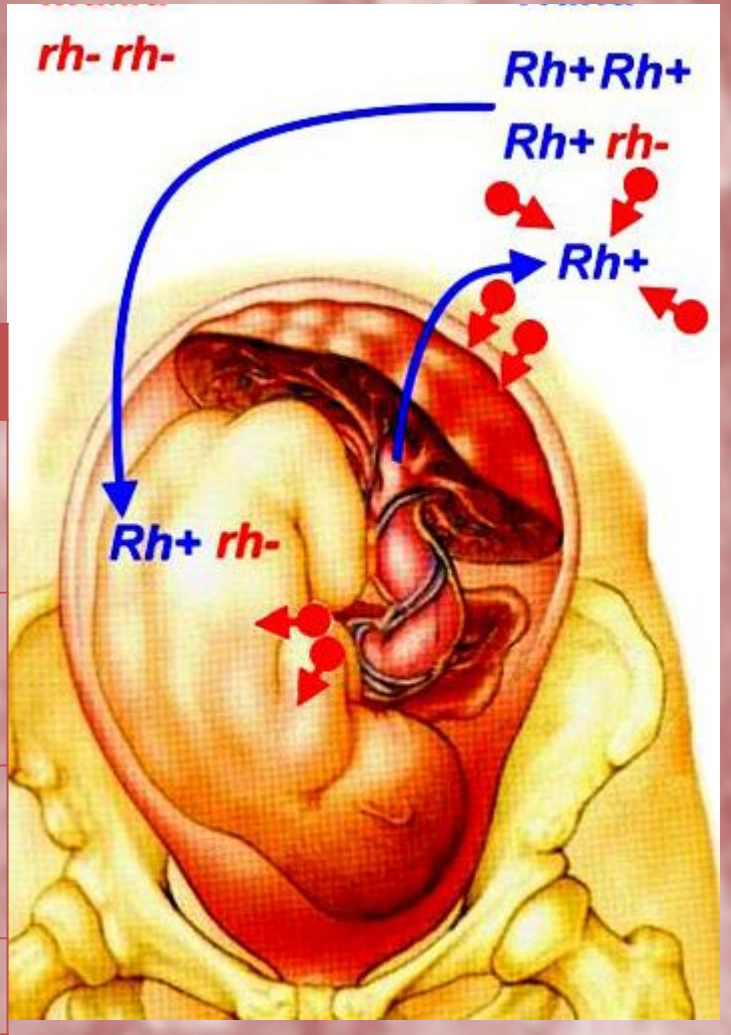


Discontinuous variability: *Blood types*

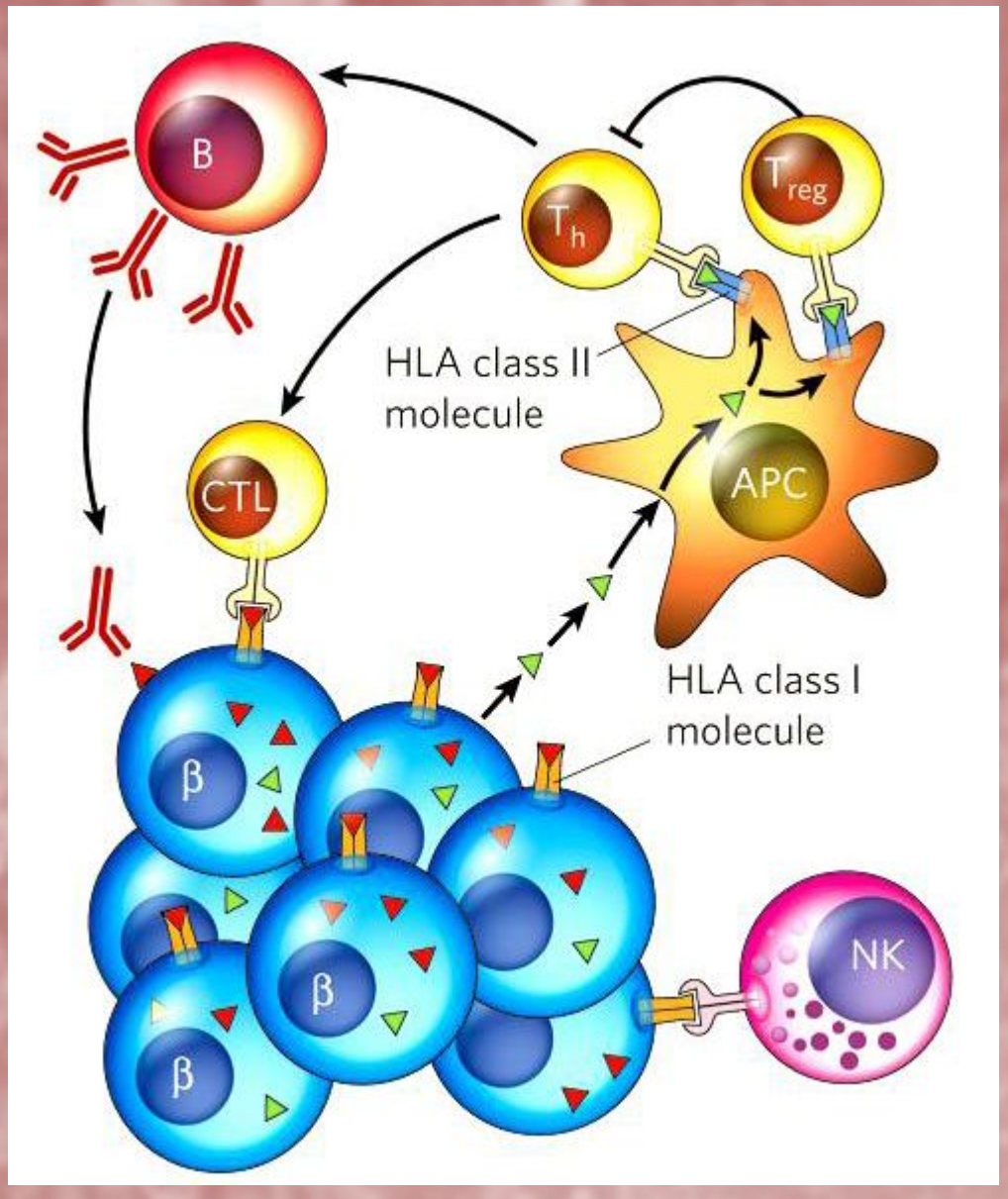


Father	Mother	Child
+	+	75% + 25% -
+	-	50% + 50% -
-	+	50% + 50% -
-	-	100% -

Rh blood group system



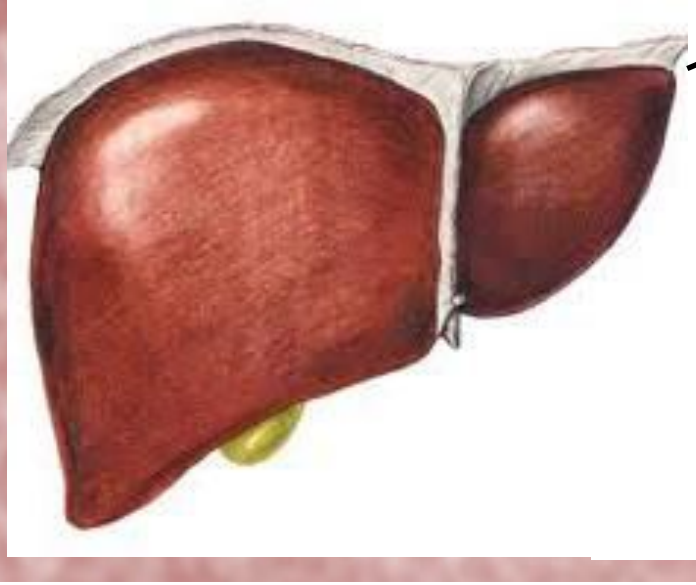
Discontinuous variability: ***HLA system***

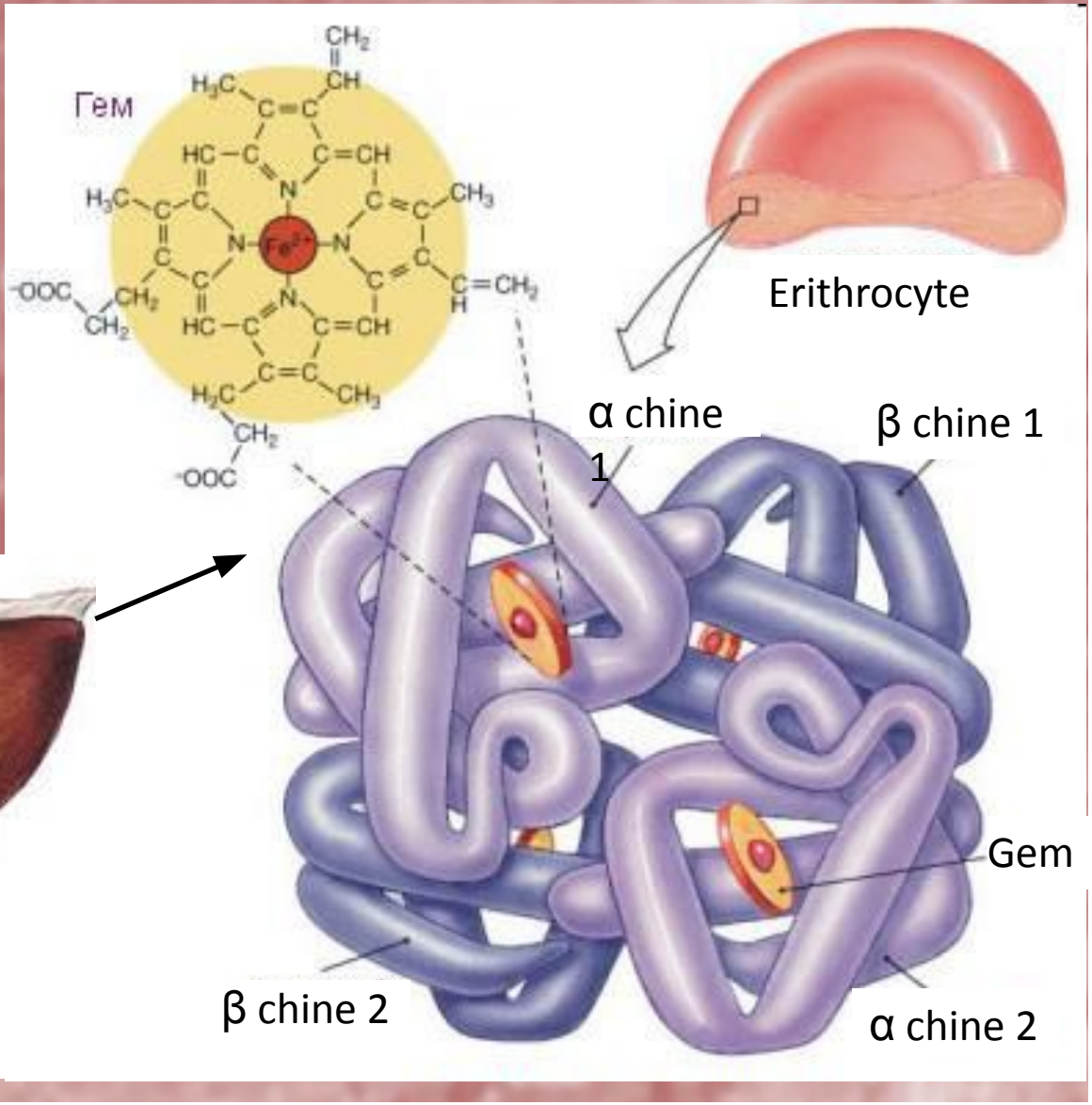


The human leukocyte antigen (HLA) system or complex is a group of related proteins that are encoded by the major histocompatibility complex (MHC) gene complex in humans. These cell-surface proteins are responsible for the regulation of the immune system.

Discontinuous variability:

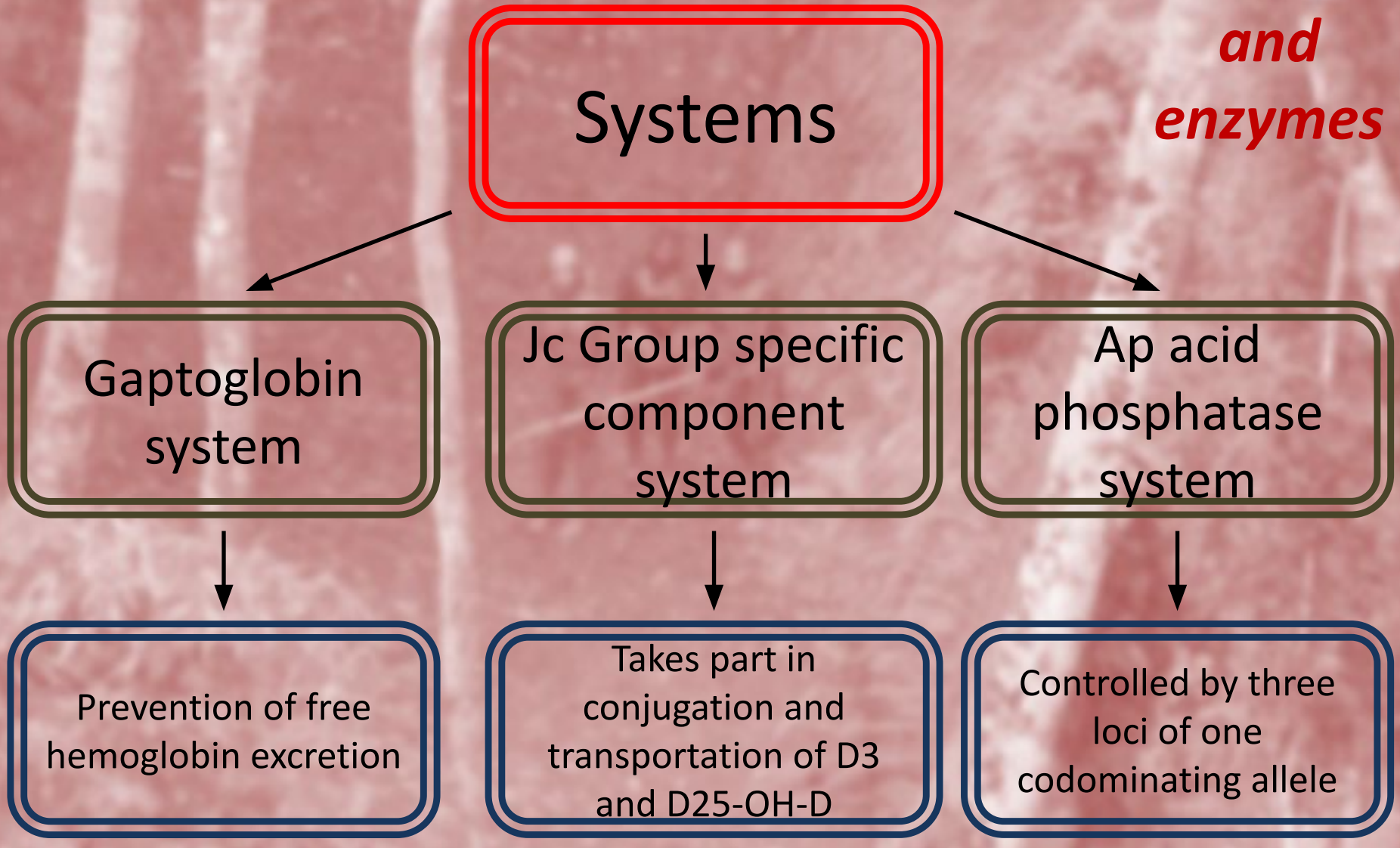
Hemoglobin





Discontinuous variability:

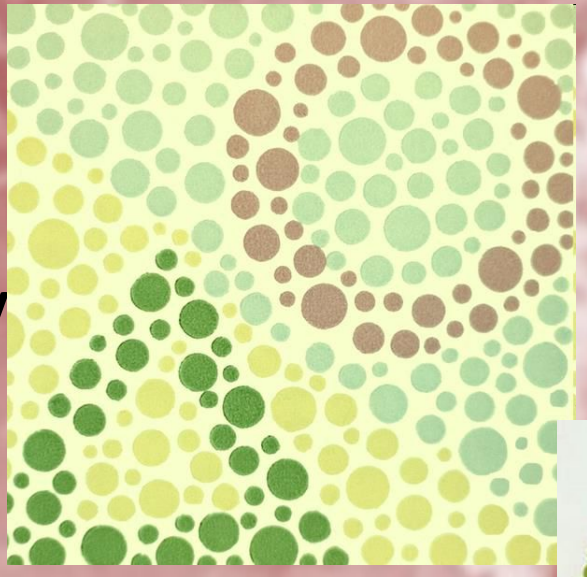
Serum proteins and enzymes

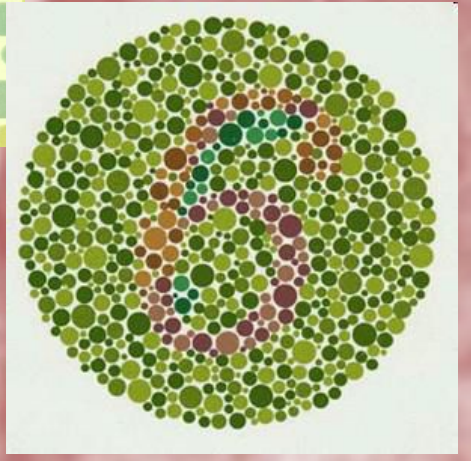


Discontinuous variability:

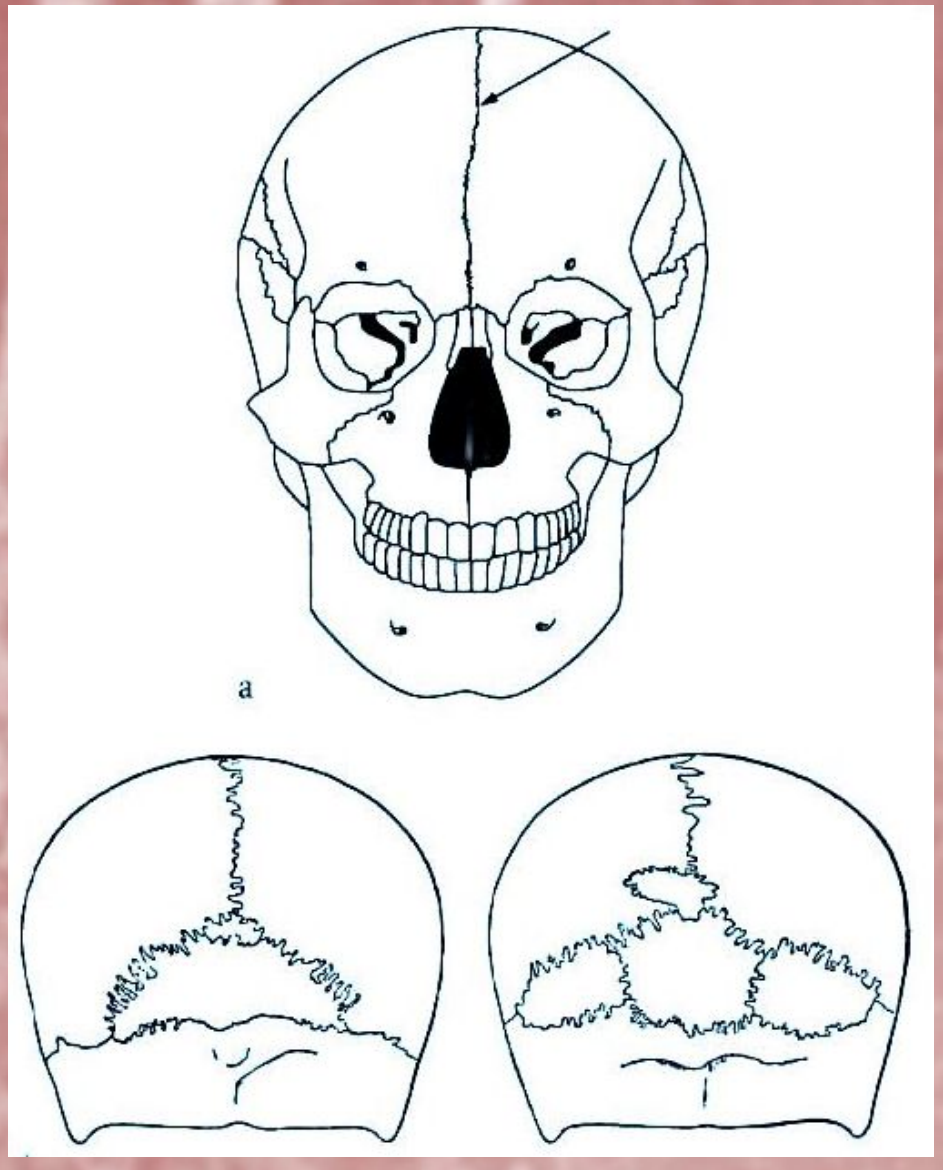
Other types

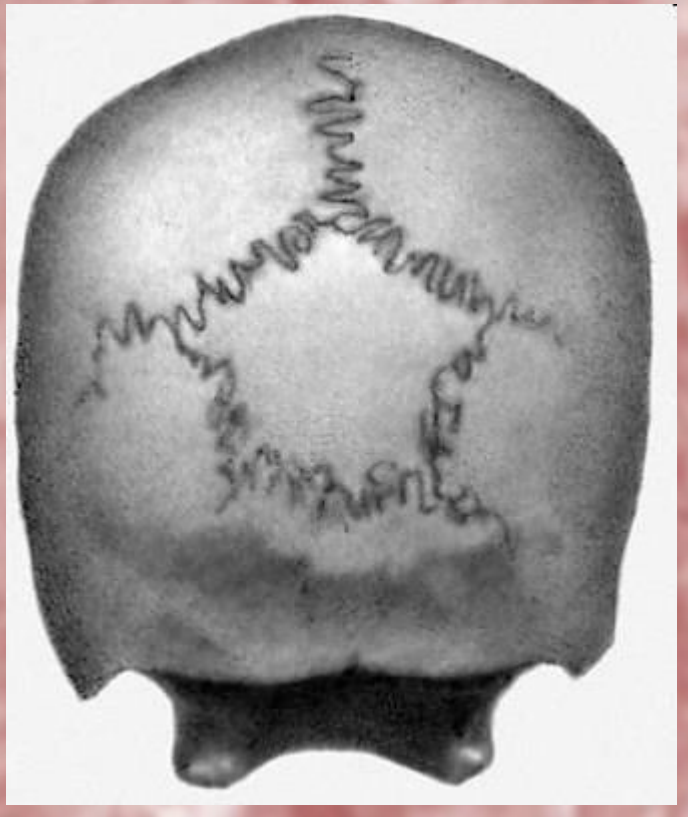
- Taste sensatitivity to phenylcarbamide (PTC)
- Olfactive sensitivity
- Chromatic vision
- Cranial epigenetic signs





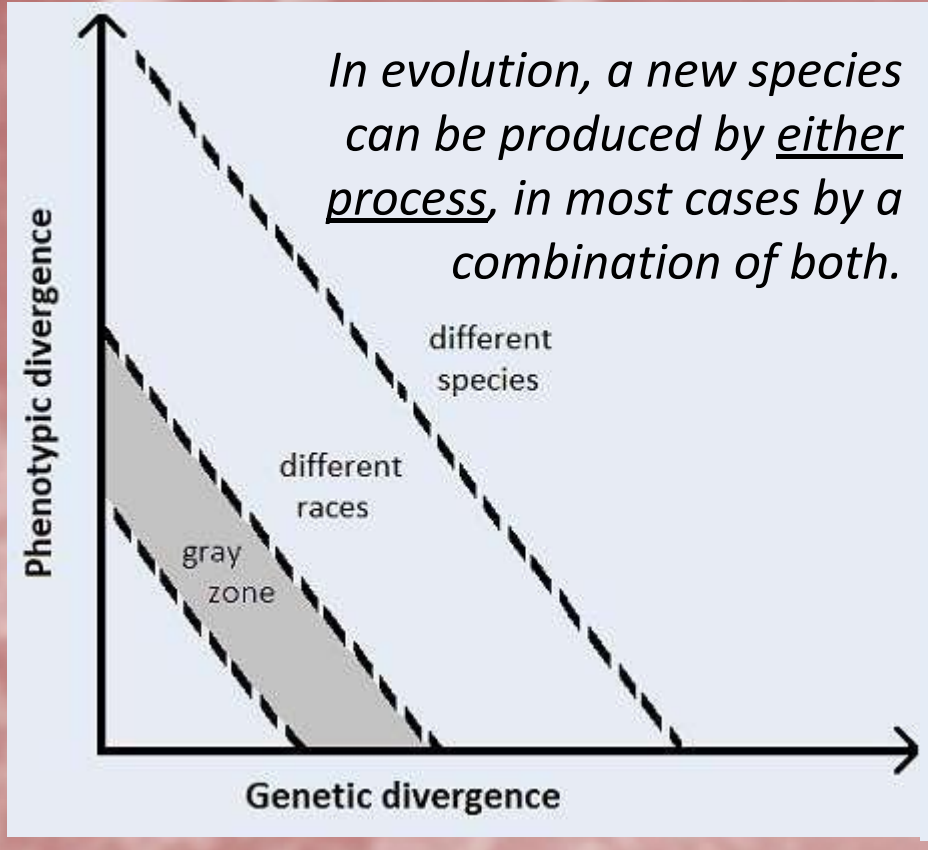
Discontinuous variability: *Cranial epigenetic signs*

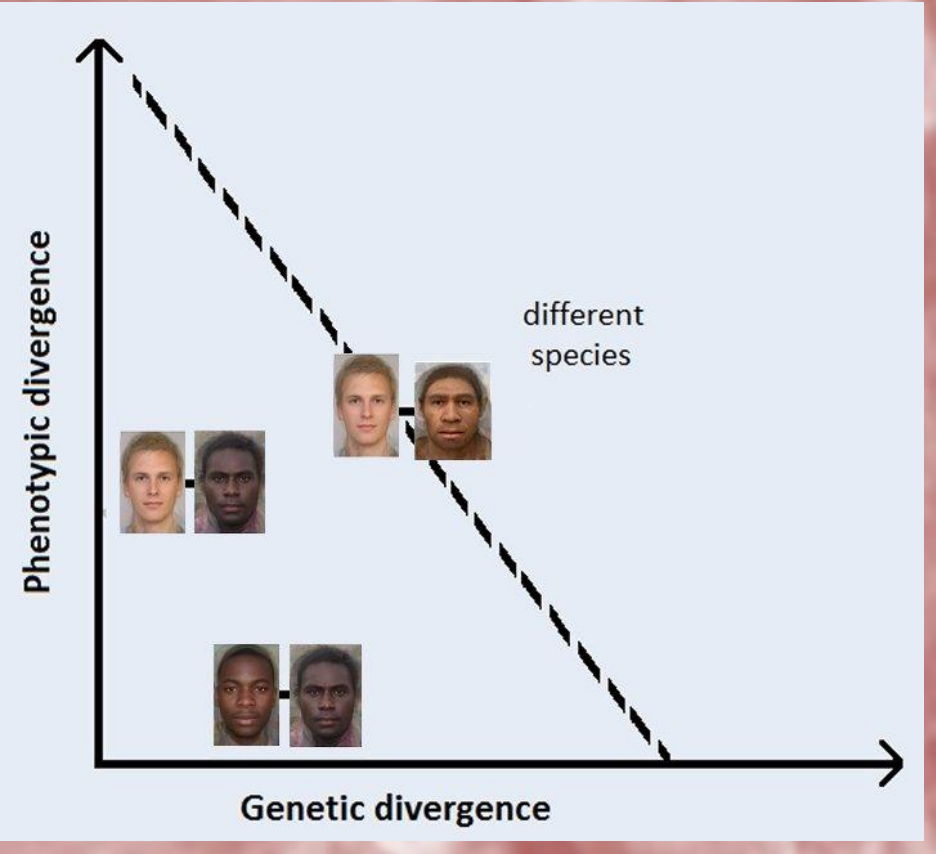




Why are phenotypes important?

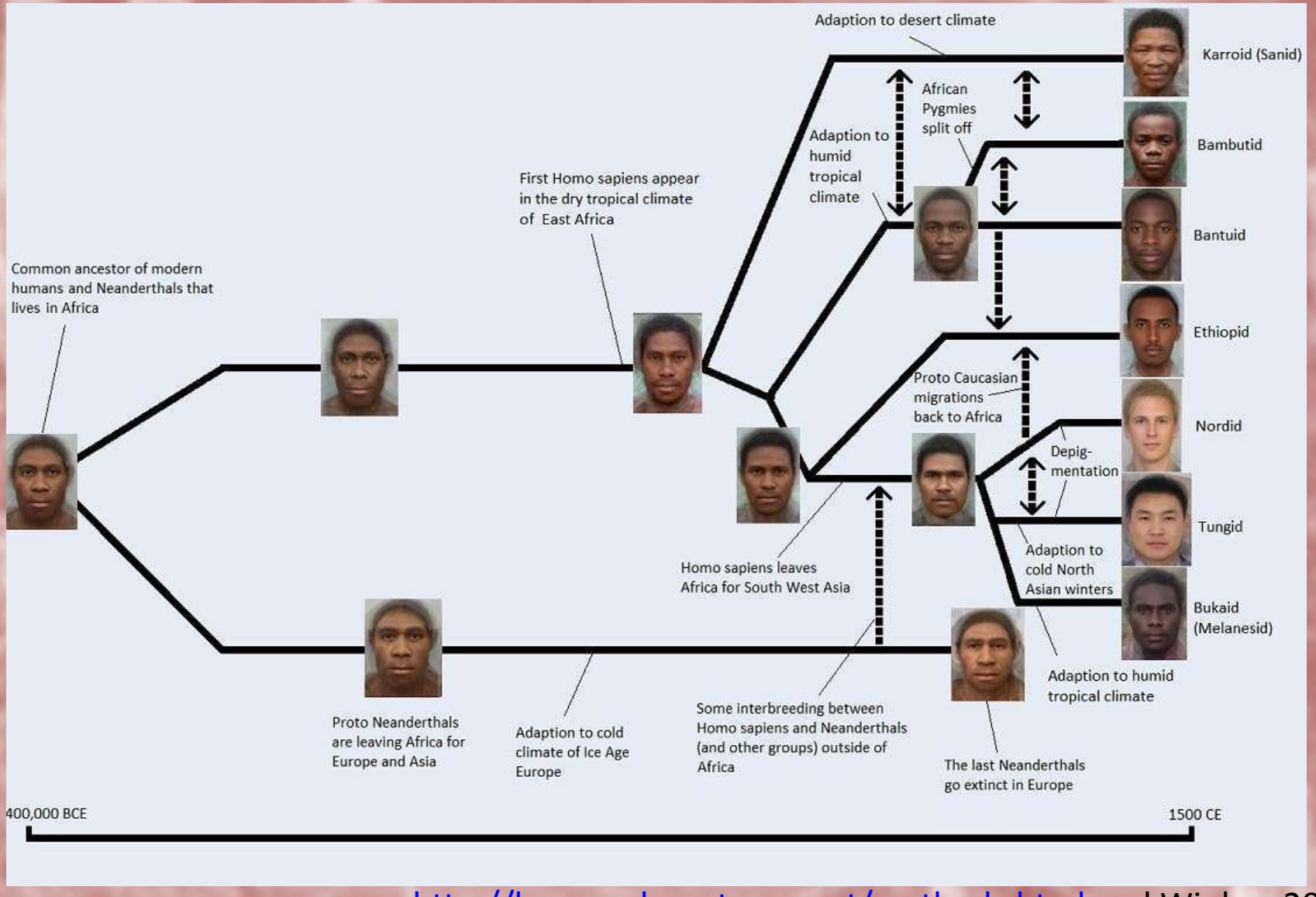
Differences in humans are not only driven by genetic divergence, but also by phenotypic divergence caused by adaptive pressure.





http://humanphenotypes.net/methods.html and Winker, 2009

Simplified human phylogenetic tree



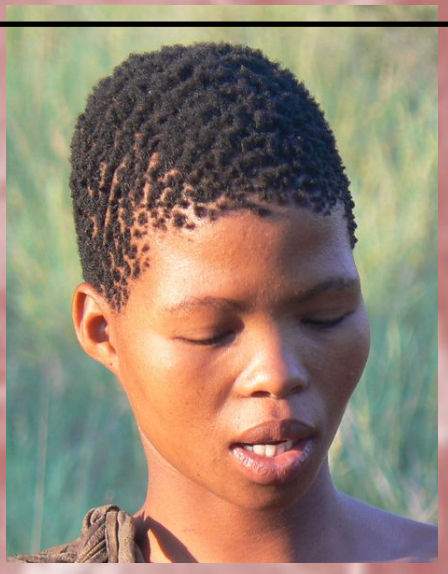
http://humanphenotypes.net/methods.html and Winker, 2009

Homework

Australoid

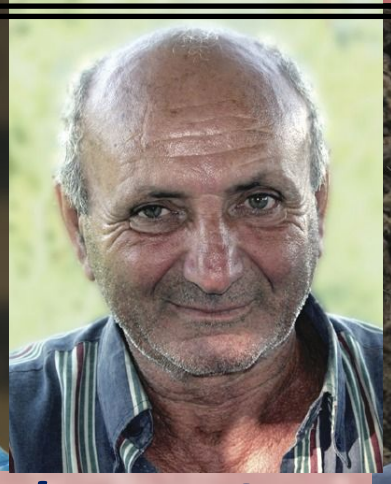
Melanesian

Central African

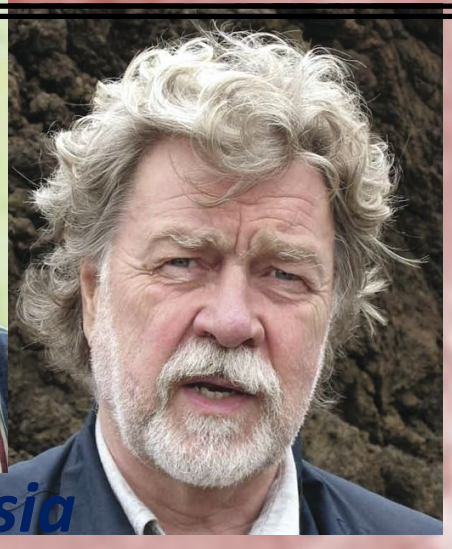


South African

Indo-Mediterranean



Balcano-Cocasian

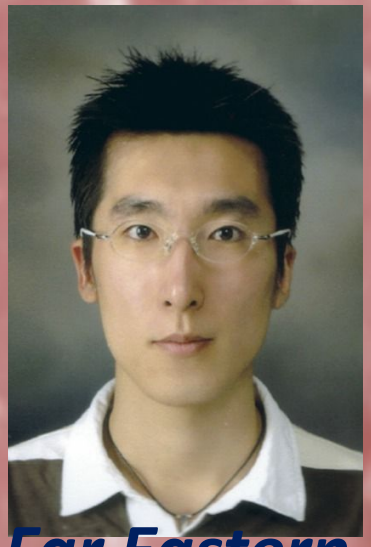


Atlanto-baltic

Uralic

Homework

Arctic



Far Eastern

South Asian

American

Polinesian

Kurilian

South Indian

Ethiopian