Anthropology 1100

Introduction to Physical Anthropology

1

Homo sapiens

§ human variation photo
slidewords* Homo sapiens

Life History

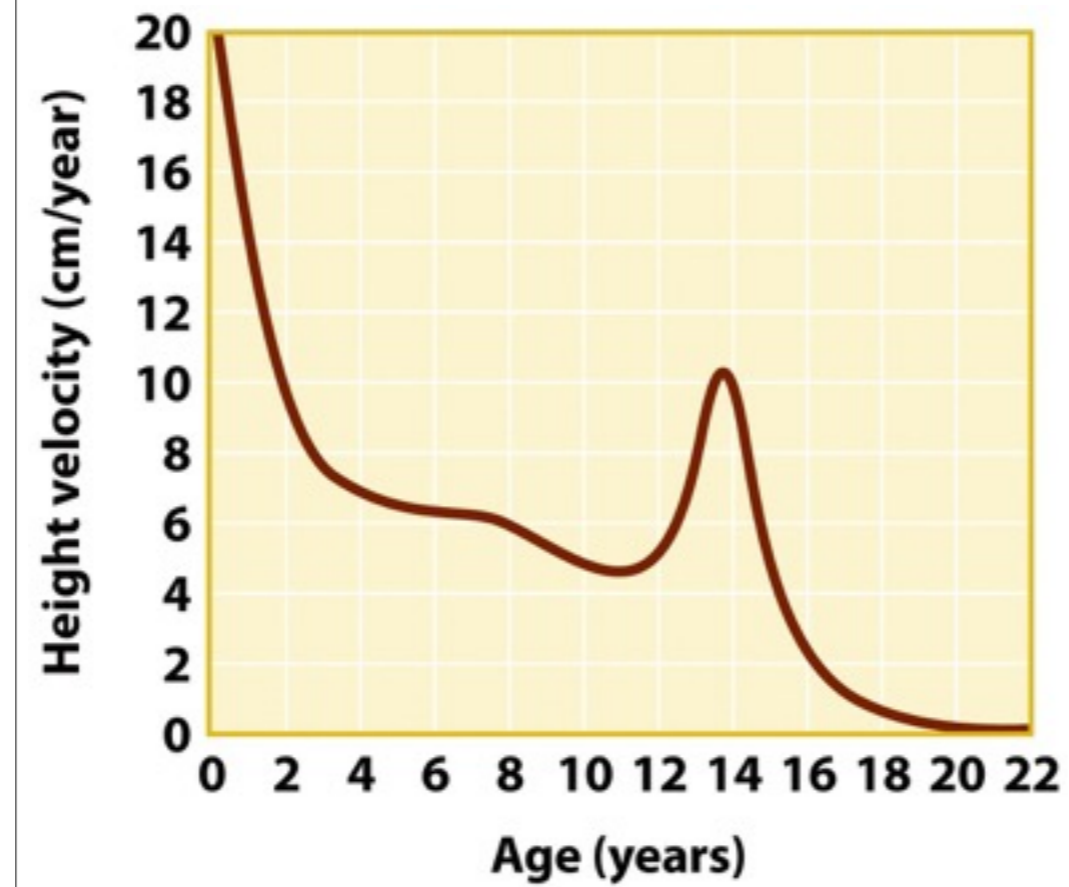prenatal
postnatal stage
adult
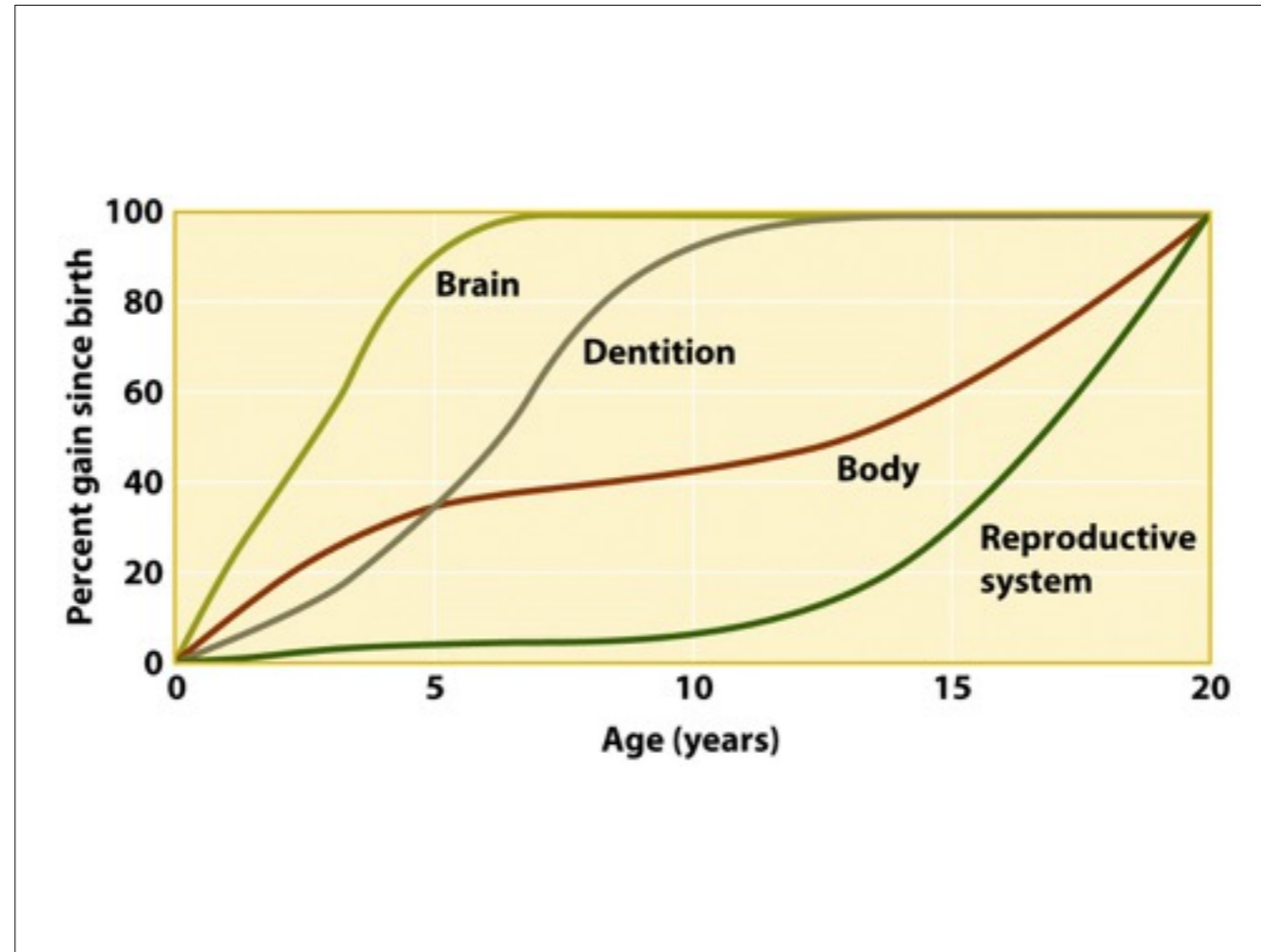
§
slidewords* Life History

prenatal
postnatal stage
adult

Life History

§ Life history plot
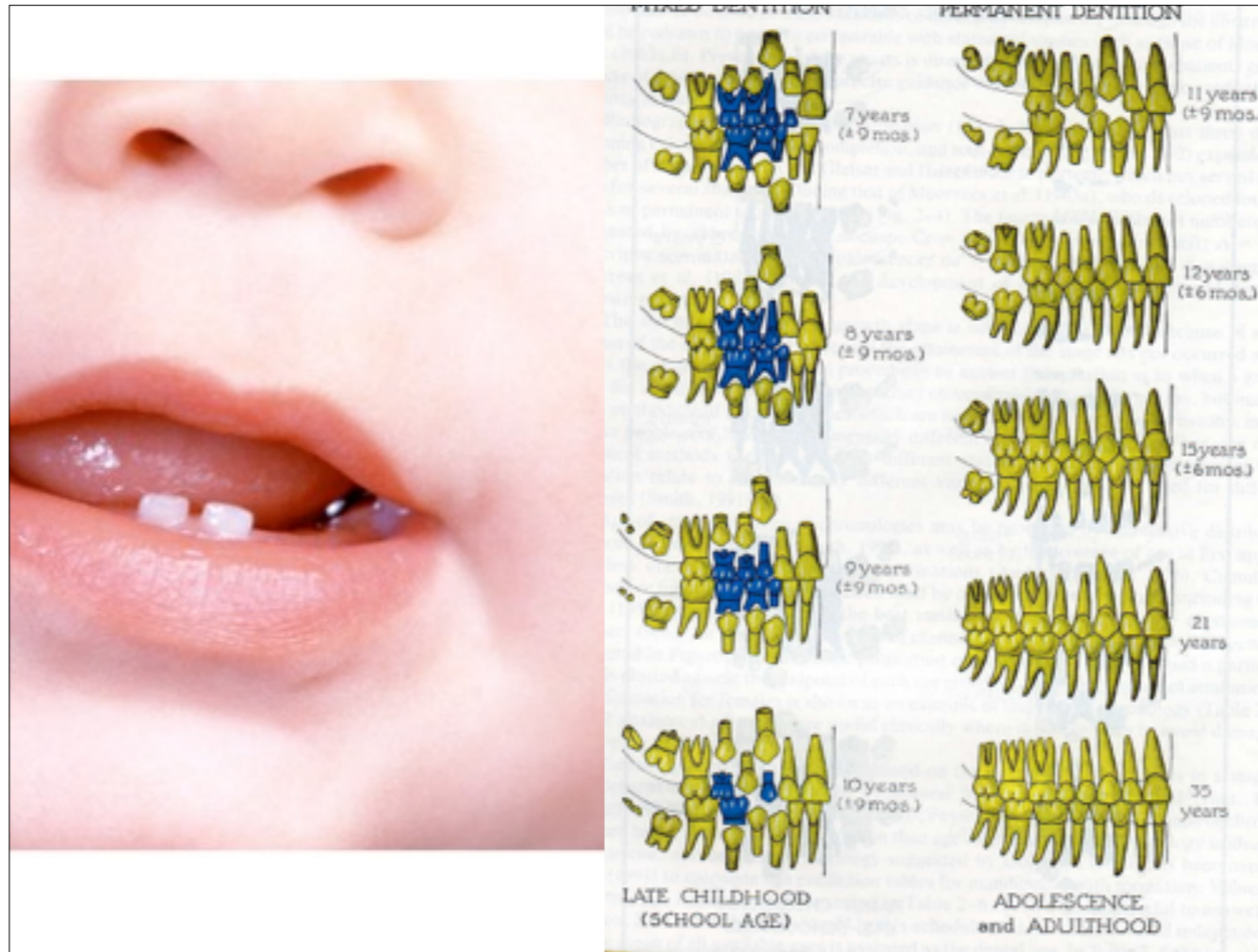slidewords*FIGURE 5.5 Human Growth Curve

During postnatal life, a human grows at different rates. The highest rate of growth (on this graph, 20 cm/year) occurs during the first few months following birth. Growth velocity decreases through the rest of life, apart from a mid-growth spurt (here, approaching 7 cm/year) around age eight and an adolescent growth spurt (10 cm/year) following the onset of puberty.

§ Human Growth plot
slidewords*FIGURE 5.7 Growth Curves of Body Tissues

This chart shows the varying growth curves of the brain, body, dentition, and reproductive system in humans. The brain grows the fastest, reaching full cognitive development around age six. In fact, humans have such a large brain that much of it needs to be attained after birth; if the brain reached full size before birth, women would not be able to pass newborns' heads through their pelvic regions. Dentition has the next highest growth velocity (see Figures 5.6 and 5.8). The body grows more slowly and continues until as late as age 20. The reproductive system does not begin substantial growth and development until the onset of puberty, but it reaches completion around age 20.

§ Human tooth growth chart

slidewords*FIGURE 5.6 Deciduous Teeth

Deciduous, or baby, teeth form in the fetus and erupt shortly after birth.

§ Knee joint ct-scan

slidewords*FIGURE 5.9a Long Bone Growth

(a) This MRI of a child's knee shows the joining of the femur, or upper leg bone, with the tibia, or lower leg bone. Long bones like these begin as three separate bones—the diaphysis, or shaft, and two epiphyses, or ends—separated by a growth plate.

Epiphyses
Diaphyses

§ knee joint, bone growth series
slidewords*FIGURE 5.9b Long Bone Growth

(b) In this photo of a child's knee joint, the epiphyses have not yet fused to the diaphysis. The line of union may be visible for several years after the attachment occurs; when it eventually disappears, the bone appears as a single element.
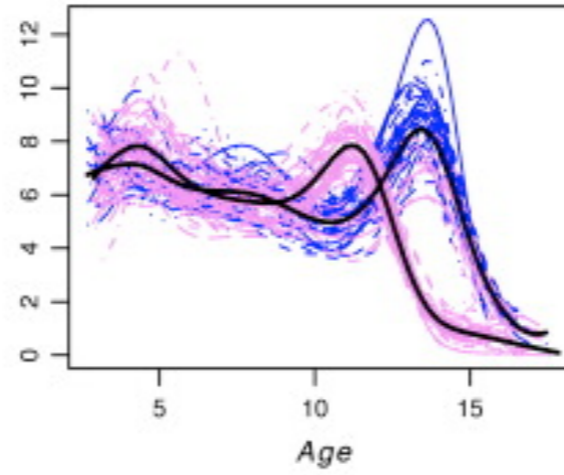
© Gwen Robbins, Appalachian State University
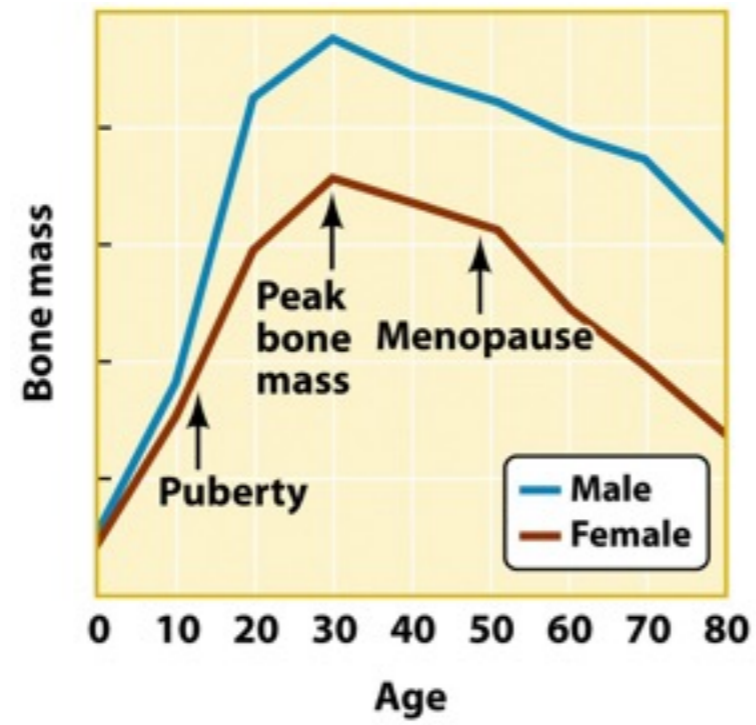
What are the major ways that humans vary?

§
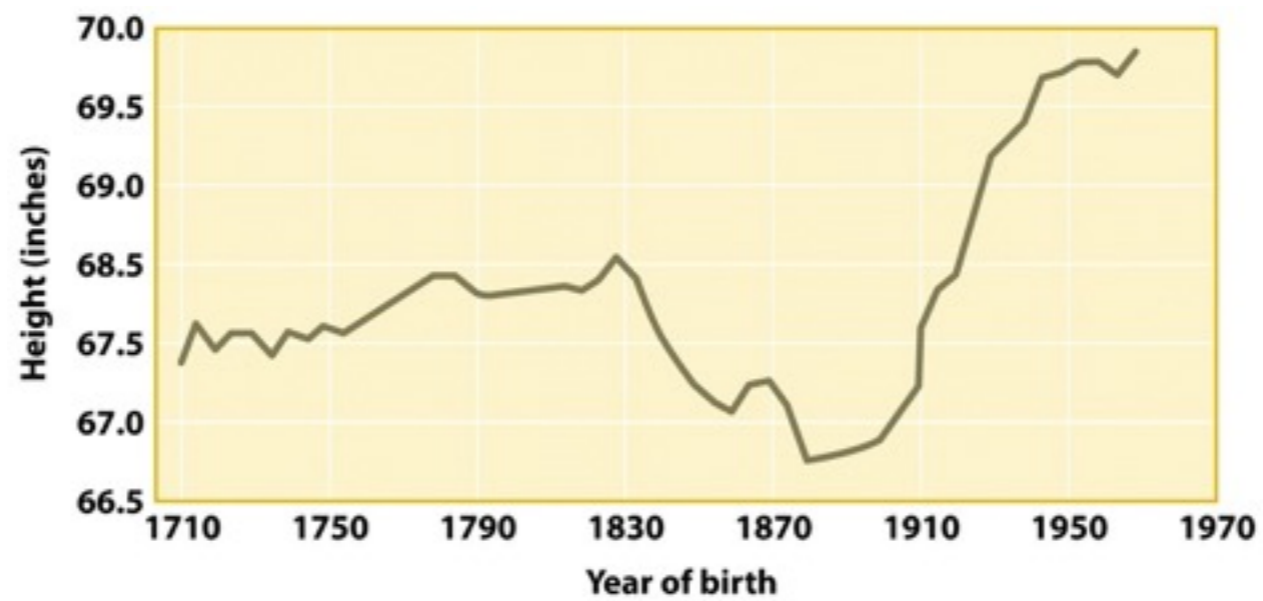slidewords* What are the major ways that humans vary?

Sexual dimorphism

§ Growth rate chart comparing males and females.
slidewords* Sexual dimorphism

Sexual dimorphism

§ male vs. female osteoporosis
slidewords*FIGURE 5.12a Osteoporosis

(a) As this graph shows, men and women reach their maximum bone mass around age 30.
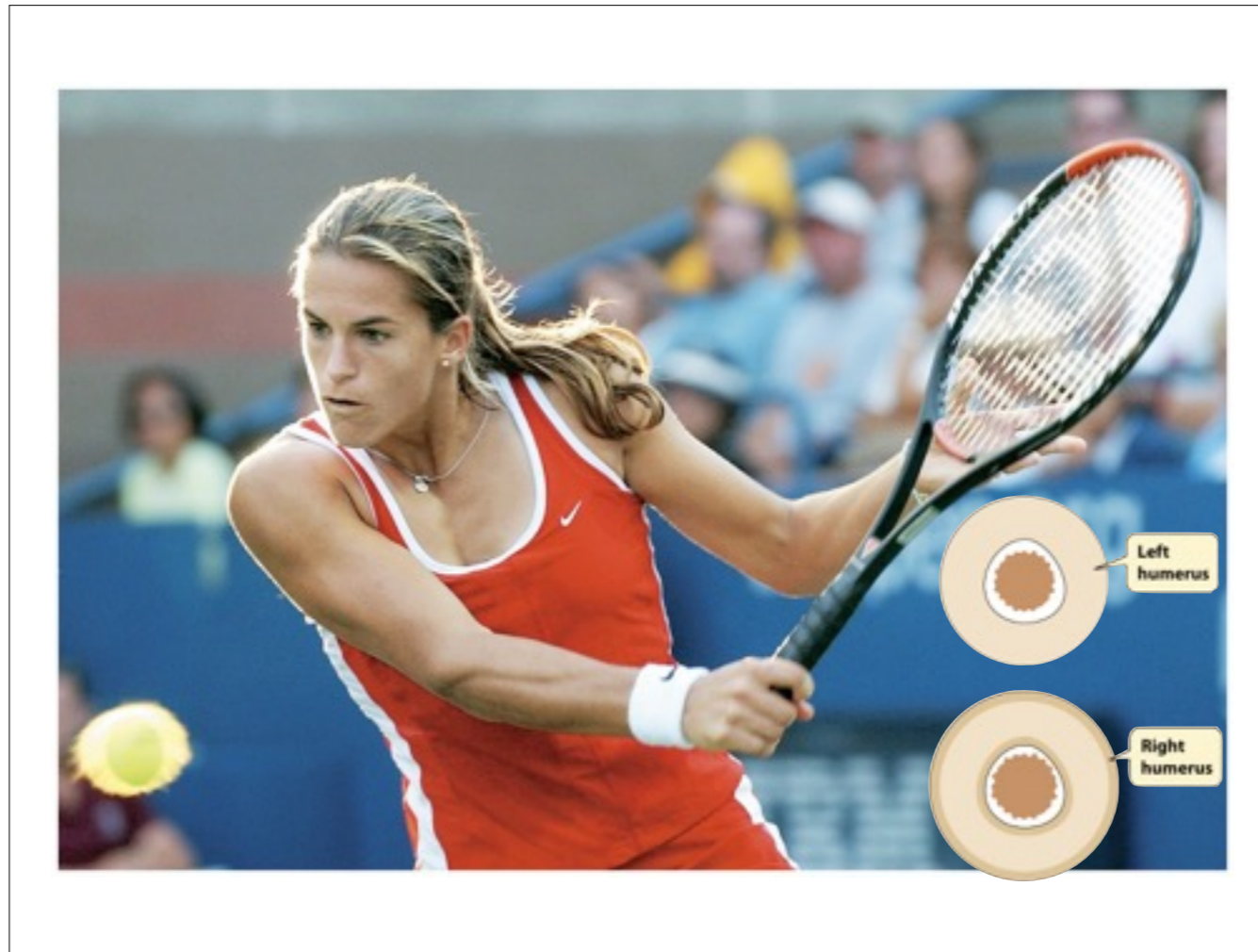
Understanding life history was one of the first major contributions of anthropologists to dispelling notions of physical inequity among human groups.

§ height chart by year of birth
slidewords*FIGURE 5.10 Changes in Height

Beginning in the 1700s, the heights of soldiers, students, and slaves were routinely collected for identification or registration purposes. By combining these data with subsequent figures, Costa and Steckel discovered patterns of increase and decline in the heights of American-born males of European descent. From about 67.5 inches in the early 1700s, heights rose to about 68.5 inches around 1830, then sharply declined by two inches per year over the next 70 years. After the late 1800s, heights increased by a couple of inches per year throughout the twentieth century. Simply, the extraordinarily poor sanitation and health conditions in nineteenth-century cities resulted in increased disease, stress, and attenuated growth. The subsequent increase in Americans' heights reflected improvements in sanitation, nutrition, and health.

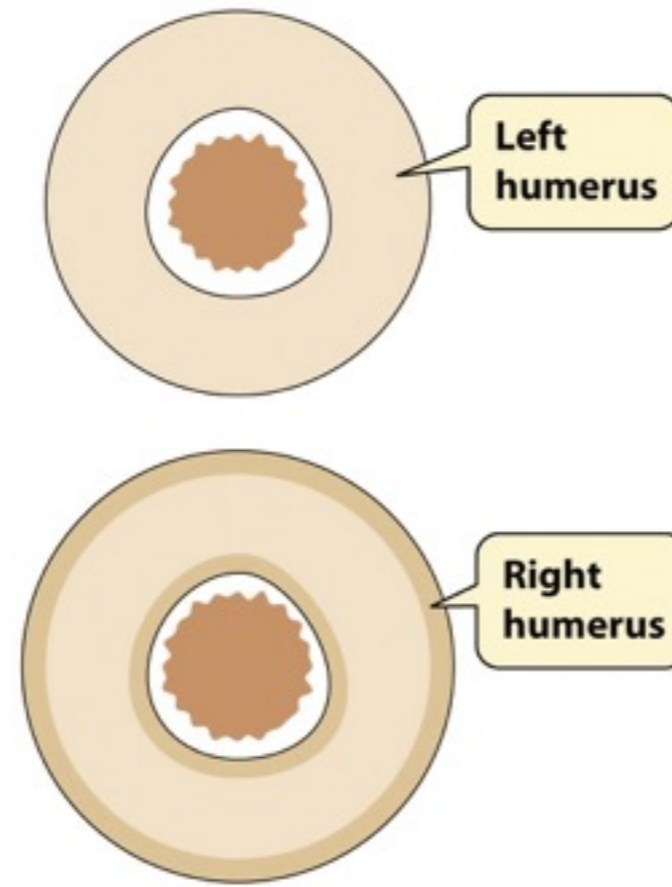§ arm bone in tennis player

slidewords*FIGURE 5.25a Skeletal Remodeling and Athletics

The "playing" arms of athletes in certain sports undergo remodeling as a result of stress. **(a)** A baseball pitcher or a tennis player (such as, here, the professional player Amelie Mauresmo) typically has a dominant arm, which is used to a much greater degree than the nondominant arm.
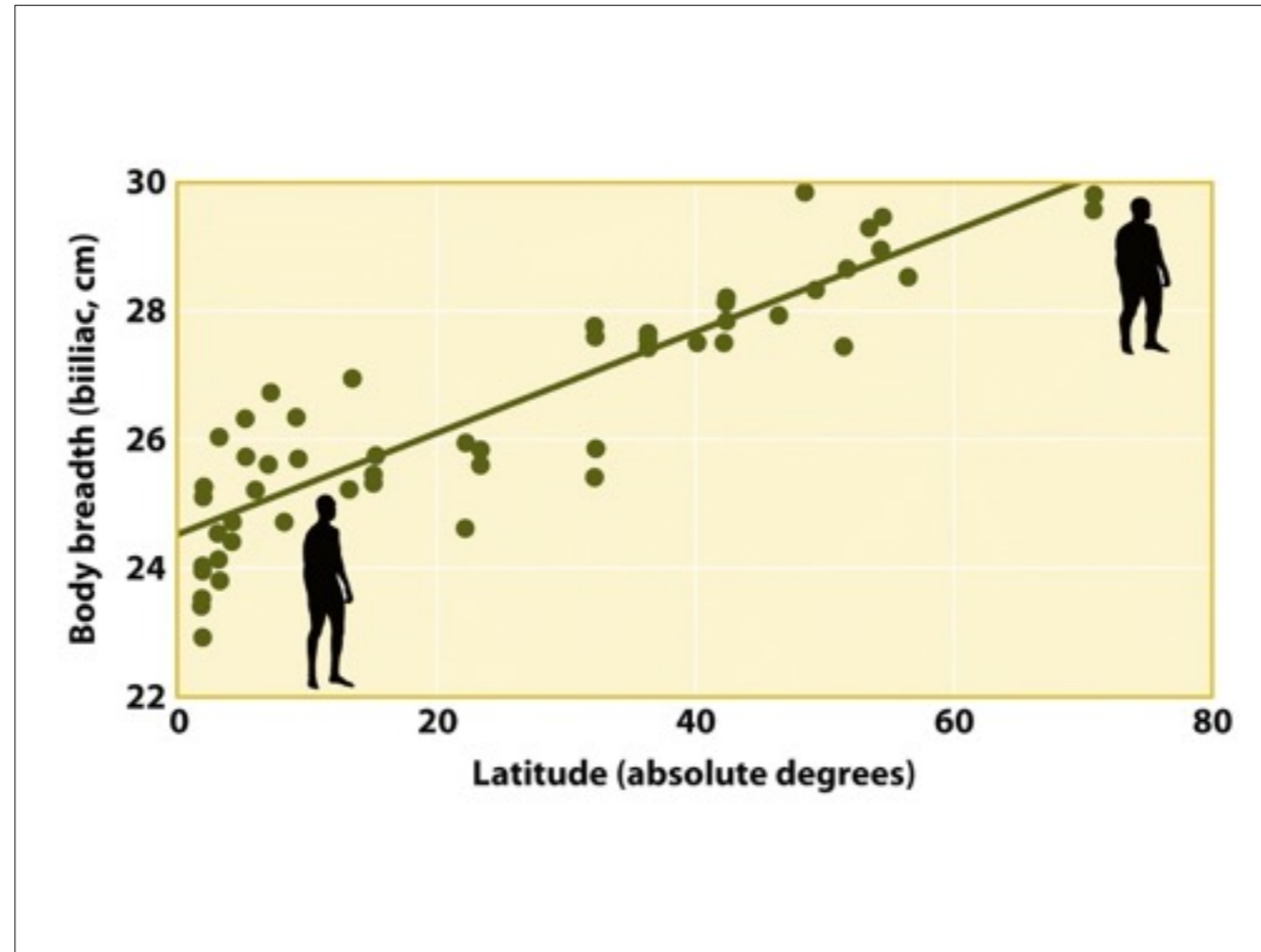
© Associated Press

§ arm bone cross section diagrams
slidewords*FIGURE 5.25b Skeletal Remodeling and Athletics

(b) The upper arm bone, or humerus, of the dominant arm may be much stronger than that of the nondominant arm. In these cross-sections, note the greater diameter of the right humerus.
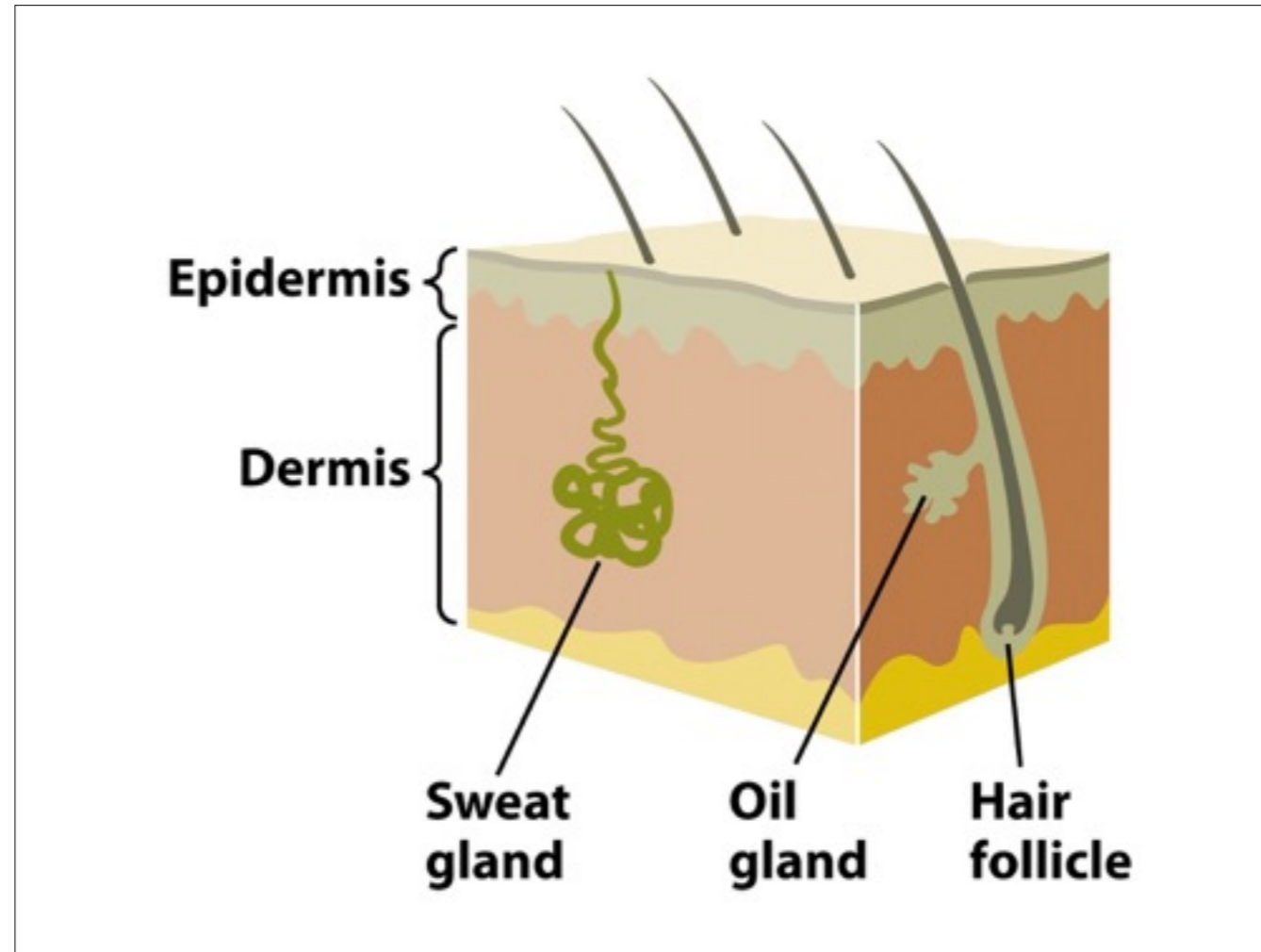
Human Evolutionary Adaptations

§ Human height compared to latitude of human ancestry

slidewords*FIGURE 5.14 Bergmann's Rule

This graph illustrates Carl Bergmann's biogeographic rule: as latitude increases (and temperature decreases), body breadth (as measured by the maximum breadth between the pelvic bones) also increases. Bergmann's Rule applies to all warm-blooded animals (including humans), which need to maintain a constant body temperature. Physically and physiologically, humans can adapt to a wide range of climates, but since humans are able to move about the earth, human body size may not strictly adhere to the latitude in which a person is living.

§Skin histology diagram
slidewords*FIGURE 5.15a Structure of Skin

(a) Skin's two main layers are the epidermis, which is external, and the dermis, which is internal. The epidermis makes the skin waterproof and contains keratinocytes, building blocks that manufacture the protein keratin, and melanocytes, specialized cells that produce the skin pigment, melanin. The dermis, a thicker layer of tissue, contains hair follicles, sweat glands, blood vessels, and oil glands.

Melanin

- The chemical responsible for dark skin pigmentation that helps protect people from ultraviolet radiation

- Exposure to sunlight increases the amount of melanin, darkening the skin.

18

§ melanocyte histology
slidewords* Melanin
The chemical responsible for dark skin pigmentation that helps protect people from ultraviolet radiation
Exposure to sunlight increases the amount of melanin, darkening the skin.

Folate (folic acid) production affected negatively by solar radiation.

§ Low-melanin baby with cleft palate
slidewords* Folate (folic acid) production affected negatively by solar radiation.

Rickets

Melanin interferes with vitamin D production

- lighter skin is an adaptation to less exposure to solar energy

20

§ High melanin child with rickets
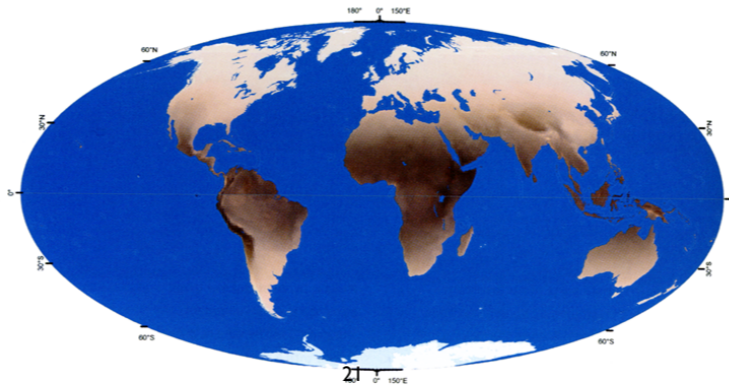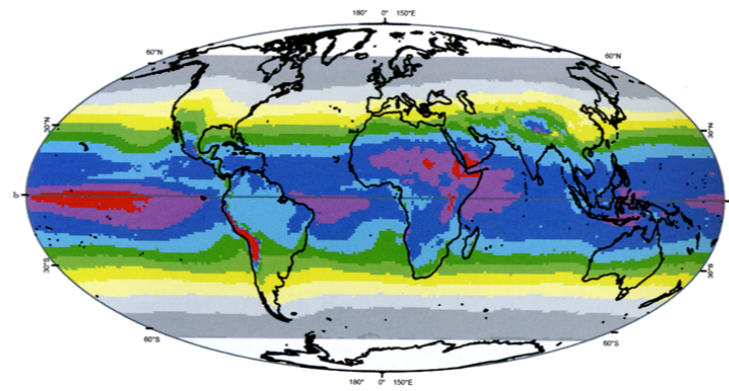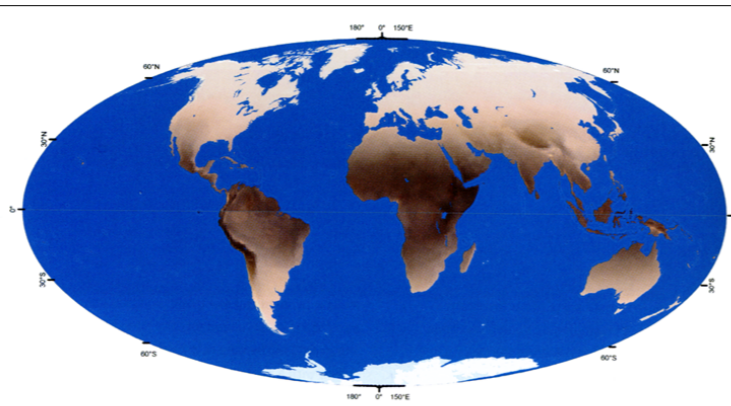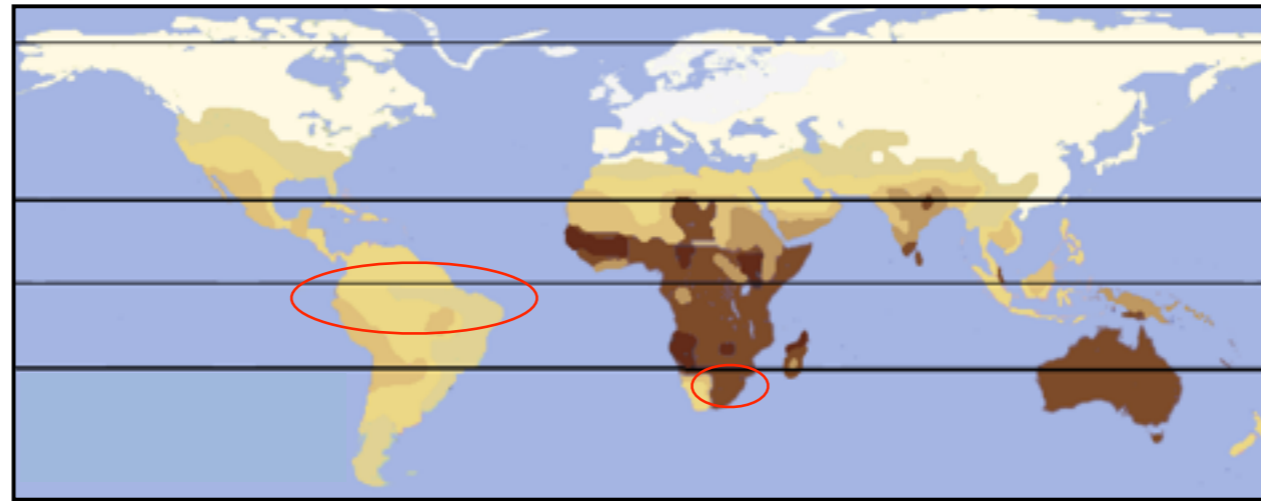slidewords* Melanin interferes with
vitamin D production
lighter skin is an adaptation to less exposure to solar energy
Rickets

§ maps of solar radiation
slidewords*

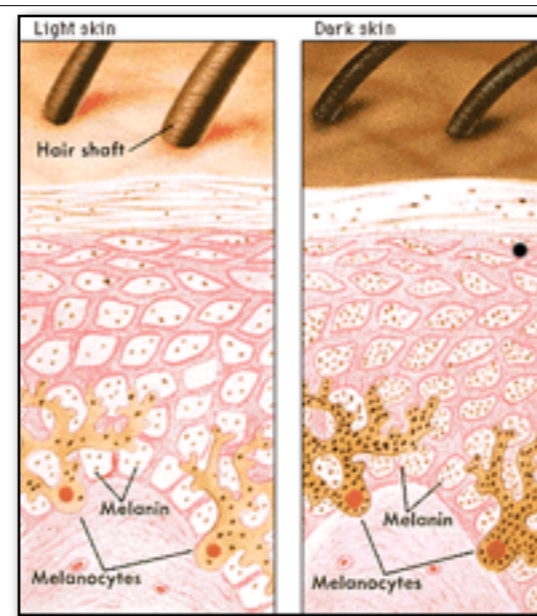Distribution of Human Skin Pigmentation Before 1492

22

§Solar radiation

slidewords*This is a derivative work from the free-use map I found on Wikipedia of Biasutti's skin color chart of the world Image:Map of skin hue equi.png. I recolored it in accordance with Image:Félix von Luschan Skin Color Chart.JPG. The original map was off since it made-up red and green colors to distinguish human skin color. This made it seem like some people had green skin color. My map uses the actual skin colors Luschan measured. It is unlabeled because I plan to use it in a template with floating labels.--_Dark_Tea 21:18, 19 December 2006 (UTC)

Some background info, from a highly verified source:

As natural historians and human geographers—mostly from Europe—ventured into Asia, Africa, Australia, and the Americas and began to study the indigenous human populations in detail, maps depicting the worldwide distribution of human skin color were slowly assembled. The best known of these maps is that composed by the Italian geographer Renato Biasutti, which was based on the von Luschan skin color scale. This map has gained broad circulation in several widely distributed publications (Barsh 2003, Lewontin 1995, Roberts 1977, Walter 1971), despite the fact that, for areas with no data, Biasutti simply filled in the map by extrapolation from findings obtained in other areas (Robins 1991). A more accurate and exhaustive compilation of the skin colors of indigenous peoples based only on published skin reflectance measurements is now available (Jablonski & Chaplin 2000). (**Source**: Nina G. Jablonski, "THE EVOLUTION OF HUMAN SKIN AND SKIN COLOR," _Annu. Rev. Anthropol._ 2004. 33:600.)

The improved map is in Jablonski NG, Chaplin G. 2000. The evolution of skin coloration. J. Hum. Evol. 39:57–106.--Carwil 22:18, 13 February 2007 (UTC)

Tyrosinase

• Converts amino acid tyrosine into compound that forms melanin

• Present in sufficient quantity in all humans to make them very dark-skinned, but deactivated in those with lighter skin.

§ Tyrosinase histology

slidewords* Converts amino acid tyrosine into compound that forms melanin

Present in sufficient quantity in all humans to make them very dark-skinned, but deactivated in those with lighter skin.
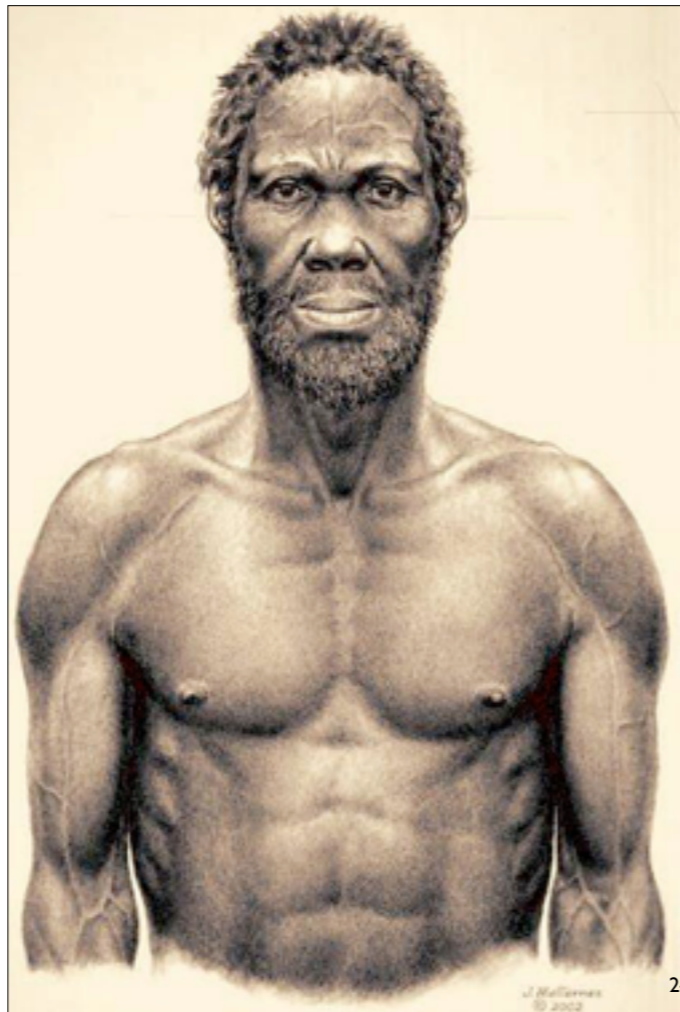
Tyrosinase

Tyrosinase

- Common ancestor almost certainly dark-skinned.

§ **ALL** of our dark skinned African ancestor
slidewords* Common ancestor almost certainly dark-skinned.
Tyrosinase

Heat	Vasodilation, sweating, exhaustion	Metabolic changes	Narrow body long arms
Cold	Vasoconstriction, shivering	Metabolic changes	Wide body short limbs
UV	Sunburn	Tanning, Skin thickening	lower Melanin production in areas with low UV
Altitude	Hypoxia symptoms	Cardiovascular Pulmonary changes	Higher oxygen saturation in Hemoglobin

§
slidewords*
A. Heat
B. Cold
C. UV
D. Altitude

____

A. Vasodilation, sweating, exhaustion
A. Metabolic changes
A. Narrow body long arms

_____

B. Vasoconstriction, shivering
B. Metabolic changes
B. Wide body short limbs

Most recent positive selection in some *Homo sapiens*

- Genes for facial bone remodeling.

- Alleles associated with skin de-pigmentation in native Eurasian populations

- Genes for carbohydrate metabolism: milk and agriculture products.

- Genes for disease resistance.

§
slidewords* Genes for facial bone remodeling.
Alleles associated with skin de-pigmentation in native Eurasian populations
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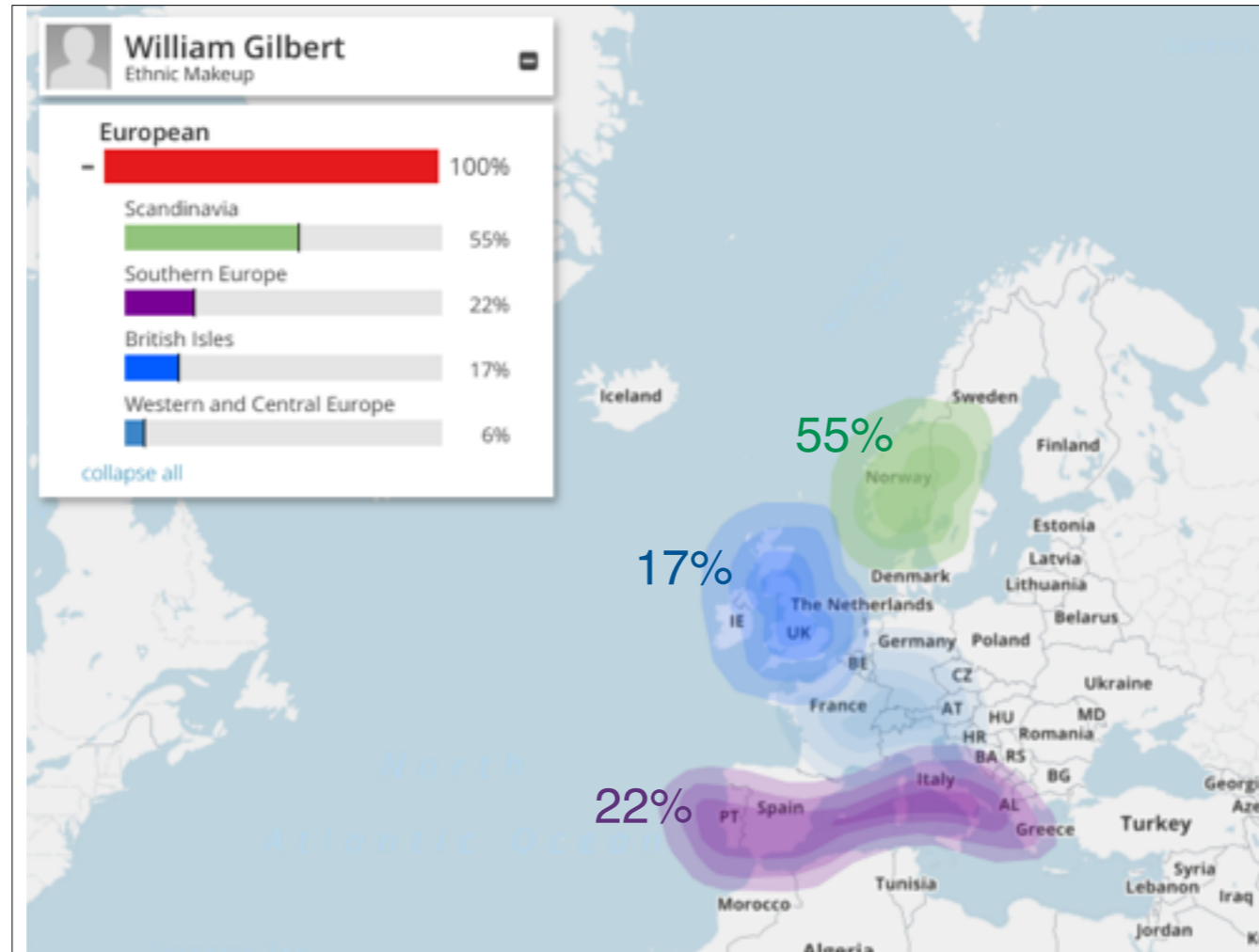Most recent positive selection in some Homo sapiens

Race

Often students are taught to distinguish between 'race' and **ethnicity**. Often are are taught that 'race' is biological and **ethnicity** is cultural. This distinction, while rightly equating most human differences to culture rather than biology, does not adequately deconstruct the biological aspect of human variation. A 'race' is a sociopolitical grouping of people that emerges when superficial aspects of a person's physical appearance reinforce preconceived cultural divisions in a pluralistic society. The appearance of hair, skin, and other cosmetically-relevant aspects of human phenotype gets caught up in the set of symbols used in group identity. While this *does* mean that 'race' has a biological component (which *does* have major sociopolitical implications), 'races' are not 'evolutionarily' real in that they only characterize a small part of human genetic variation and do not reflect the actual genetic lineages or migration patterns of people with integrity. 'Race' is biologically real in that it can often be used to determine the geographic origin of ones recent ancestors. It does not, however, do a very good job in showing the way that groups and individuals are overall genetically related.

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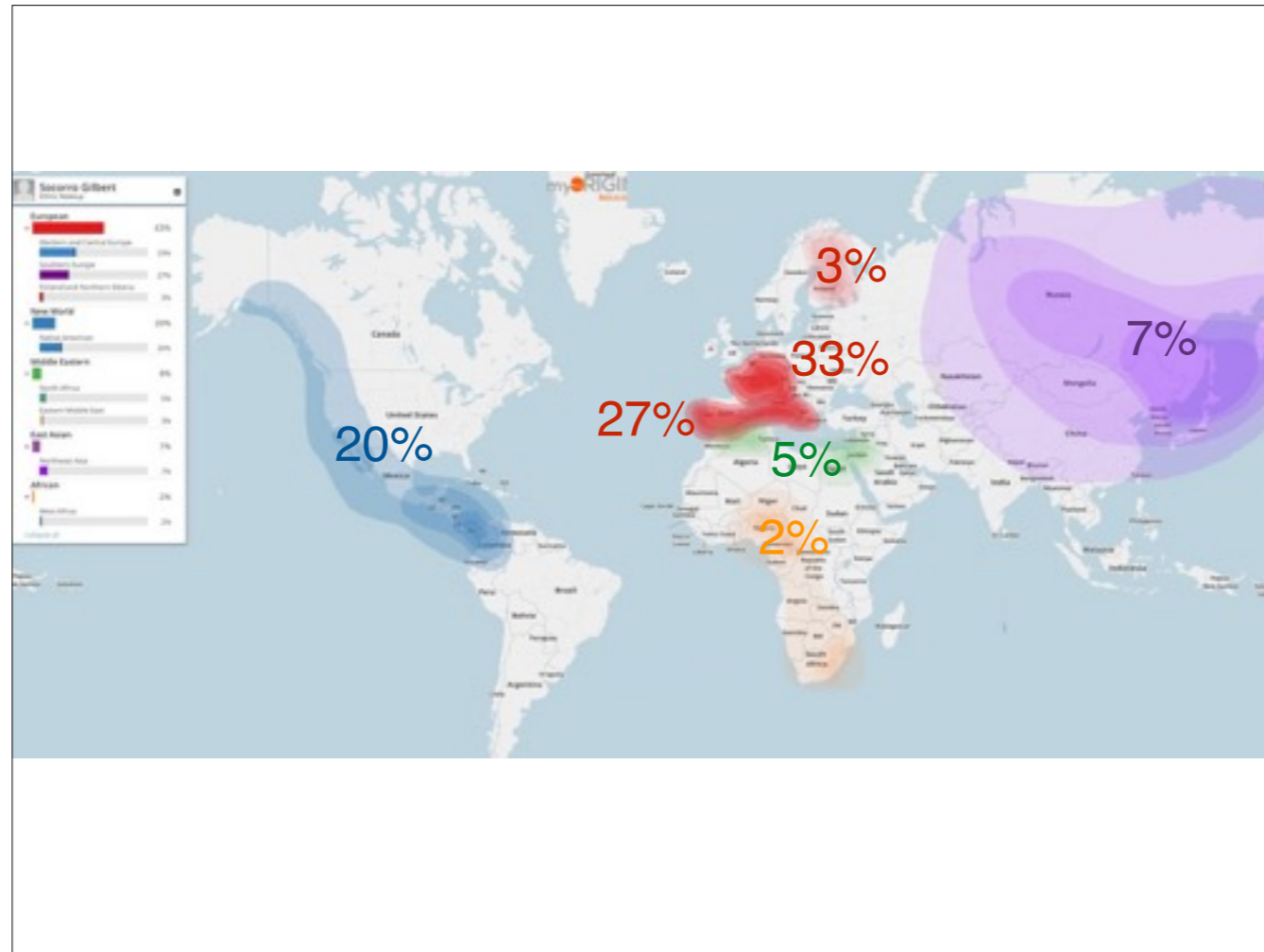
§ gene map of professor
slidewords*

§ Gene map of professors wife
slidewords*

§professors kids
slidewords*

Even thought it is obviously still a sociopolitical reality, 'Races' are not scientific categories. The flawed term is thus ALWAYS conflated with ethnicity.

Please check one or more of the boxes below that best describes your race/ethnicity heritage and enter the indicated letter(s): ____ ____ ____ ____

If Hispanic check below:	Racial Groups	If Asian, check below:	If Pacific Islander, check
[Note: Hispanic does not include persons of Portuguese or Brazilian origin or persons who acquire a Spanish surname.]	E. ☐ White	I. ☐ Japanese	P. ☐ Ha waiian
	F. ☐ Black/African American	J. ☐ Chinese	Q. ☐ Samoan
A. ☐ Mexican, Mexican/American, Chicano	G. ☐ Filipino	K. ☐ Korean	R. ☐ Guamanian/ Chamorro
B. ☐ Puerto Rican	H. ☐ American Indian/Nat American	L. ☐ Vietnamese	T. ☐ Other Pac Islander
C. ☐ Cuban	N. ☐ Eskimo	M. ☐ Asian Indian	
D. ☐ Any Other Spanish/Hispanic	O. ☐ Aleut	S. ☐ Other Asian	X. ☐ Other Racial Group

Please check the method of identification   ☐ Self-identification   ☐ Department Identification [This is only used if the employee does not self-identify.]

§ Census questions on race

slidewords* Even thought it is obviously still a sociopolitical reality, 'Races' are not scientific categories. The flawed term is thus ALWAYS conflated with ethnicity.

2 randomly chosen chimps differ in about ~1 in 500 base pairs.

population size: ~150,000

2 randomly chosen humans differ in about ~1 in 1,000 base pairs.

population size: ~7,00,000,000

§ Human evolution diagram
slidewords*

The Meaning of Race

Concept of race develops in state level societies
where different phenotypes contrast

§ Egyptian hieroglyphic of races
slidewords* Concept of race develops in state level societies where different phenotypes contrast
The Meaning of Race

§ Race in Muslim West Africa

slidewords* Construction of racial conception in Western Africa BEFORE rise of Atlantic slavery

Construction of Western racial conception before the science of human biological variation

§ Race in the time of slavery
slidewords* Construction of Western racial conception before the
science of human biological variation

Age of the Earth (3): Experiments

- In 1760, Buffon measured the cooling time of red-hot iron balls of different sizes
- He scaled up to the size of the Earth (75,000 years to cool)

One of Buffon's iron balls

Comte de Buffon (1707-1788)

Buffon
Nomenclature of the Apes
1766

Compares humans and apes. Classifies all humans as one species and differentiates them from apes.

BUFFON
1707-1788

§ Statue of Buffon, illustration of Buffon's bowling ball experiment…
slidewords* Buffon
Nomenclature of the Apes
1766

Compares humans and apes. Classifies all humans as one species and differentiates them from apes.

Blumenbach
On the Natural Variety of Mankind
1775

Agrees that humans are one species. Classifies 5 races:
- the Caucasian race
- the Mongolian race
- the Malayan race
- the Ethiopian race
- the American race.

Blumenbach argued that physical characteristics like skin color, cranial profile, etc., were depended on geography and nutrition and custom.

"Finally, I am of opinion that after all these numerous instances I have brought together of negroes of capacity, it would not be difficult to mention entire well-known provinces of Europe, from out of which you would not easily expect to obtain off-hand such good authors, poets, philosophers, and correspondents of the Paris Academy; and on the other hand, there is no so-called savage nation known under the sun which has so much distinguished itself by such examples of perfectibility and original capacity for scientific culture, and thereby attached itself so closely to the most civilized nations of the earth, as the Negro."

§ Blumenbach
slidewords* Blumenbach
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With all of the talk of a unified humanity, the slave industry was open to ideas of 'scientific' inequality. These ideas were NOT evolutionary

Europe early 1800's, British Empire 1807, Mexico 1810

Abolition of slavery in the southern USA: late!! 1861-64

§
slidewords* With all of the talk of a unified humanity, the slave industry was open to ideas of 'scientific' inequality. These ideas were NOT evolutionary

Abolition of slavery in the northern USA: late 1861-64, British Empire 1807, Mexico 1810, Europe early 1800's

'Scientific' racism

- Samuel Morton

1839 <u>Crania Americana</u>

[Profile of Negro, European, and Oran Outan.]

Morton argued against the single creation story of the Bible and instead supported a theory of multiple racial creations. Morton claimed the Bible supported 'polygenism,' and within working in a biblical framework his theory held that each race had been created separately and each was given specific, irrevocable characteristics.

After inspecting three mummies from ancient Egyptian catacombs, Morton concluded that Caucasians and Negroes were already distinct three thousand years ago. Since the Bible indicated that Noah's Arc was only a thousand years ago before this, Morton claimed that Noah's sons could not possibly account for every race on earth. According to Morton's theory of polygenesis, races have been separate since the start

§ Image of faces from Crania Americana
slidewords* 'Scientific' racism
Samuel Morton
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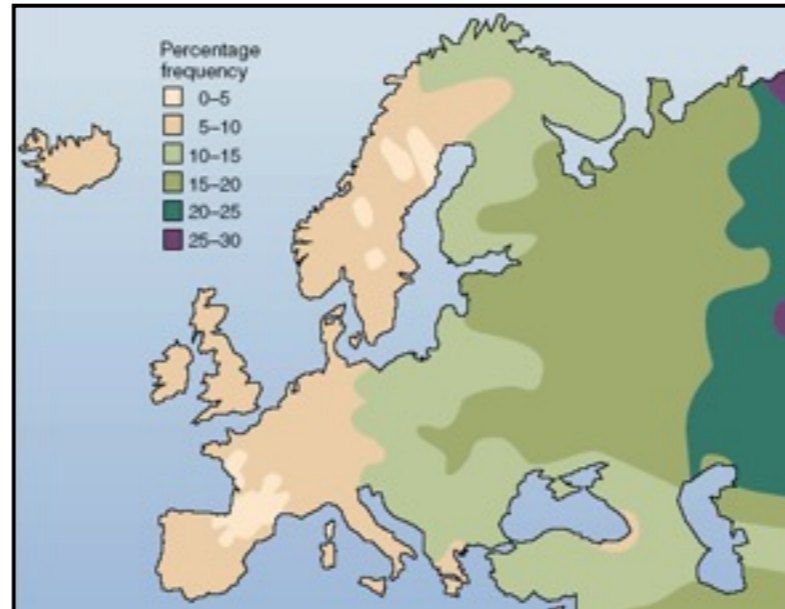
1839 Crania Americana

The Meaning of Race

- 19th and early 20th Century scholars classified *Homo sapiens* into races based on geographic location, skin color, body size, head shape, and hair texture.

§ Late 1800's racial map of Europe
slidewords* The Meaning of Race
19th and early 20th Century scholars classified Homo sapiens into races based on geographic location, skin color, body size, head shape, and hair texture.

Many aspects of human clinal variation are distributed across different gradients than skin color is.

East-west gradient in frequency of type B Blood in Europe

§
slidewords* East-west gradient in frequency of type B Blood in Europe
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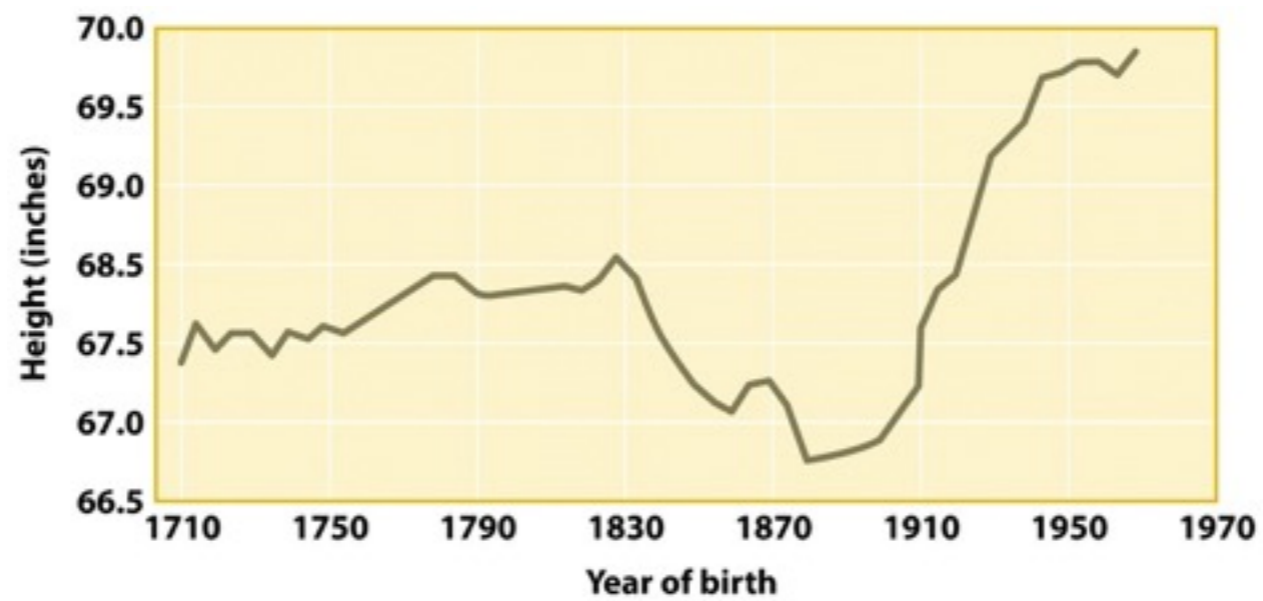
**Boas
late 1800's early
1900's**

**Argues that 'races'
are mutable,
environmentally
influenced, and thus
improperly
characterized as
distinct types.**

§ Franz Boas
slidewords* Boas
late 1800's early 1900's

Argues that 'races' are mutable, environmentally influenced, and thus improperly characterized as distinct types.

Understanding life history was one of the first major contribution of anthropologists to dispelling notions of physical inequity among human groups.

§ Average height by year of birth

slidewords*FIGURE 5.10 Changes in Height

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