

Anthro 101:  
Human Biological Evolution

Lecture 19 & 20: Human Variation,  
Adaptation, & Race

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# What is Race

- <https://www.youtube.com/watch?v=85fr6nbiMT4>

# And Toni Morrison

- <http://thecolbertreport.cc.com/videos/9yc4ry/toni-morrison>

# What do you think?

- What is meant by; Race a social construct?
- What about it?

# Unpacking the definition of racism

- **Racism** = prejudicial belief that members of one ethnic group are superior to those of another



- Assumes that important qualities of an individual:
  - Intellect
  - Physical ability
  - Temperamentare biologically determined by his or her racial group  
= **stereotyping**

# Lets look at Science

Variations among humans can be due to:  
genetic differences or environmental differences

- Genetic variation
  - Differences caused by variation in genes inherited from parents
- Environmental variation
  - Differences caused by environmental factors
  - Differences caused by culture
- Both of these interact to generate our variation
- Difficult to distinguish between these two causes because parents and children share genes and environment

# Natural selection contributes to some of this genetic variation between groups

- Different environments favor different traits (genes)
- Lactose absorption
- Hemoglobin types
- Genetic diseases
- Sickle-cell anemia
- Skin color
- Body shape



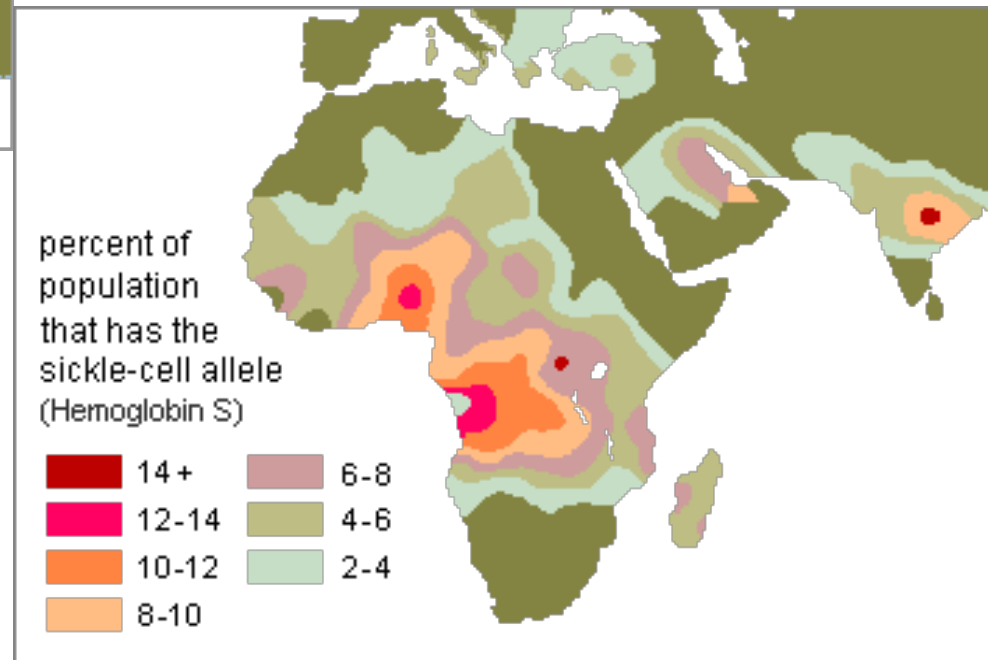
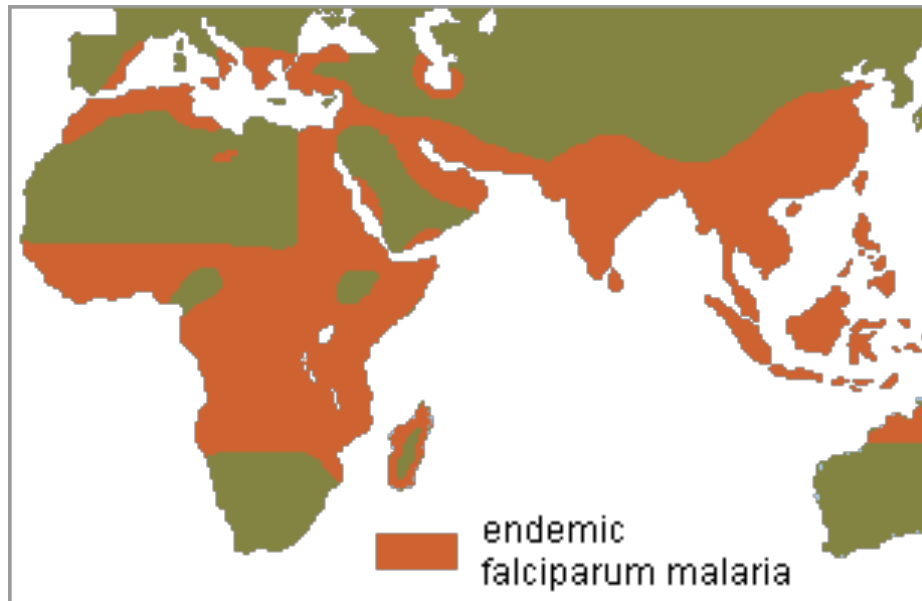


# Natural Selection & Heterozygote advantage can produce genetic variation between groups

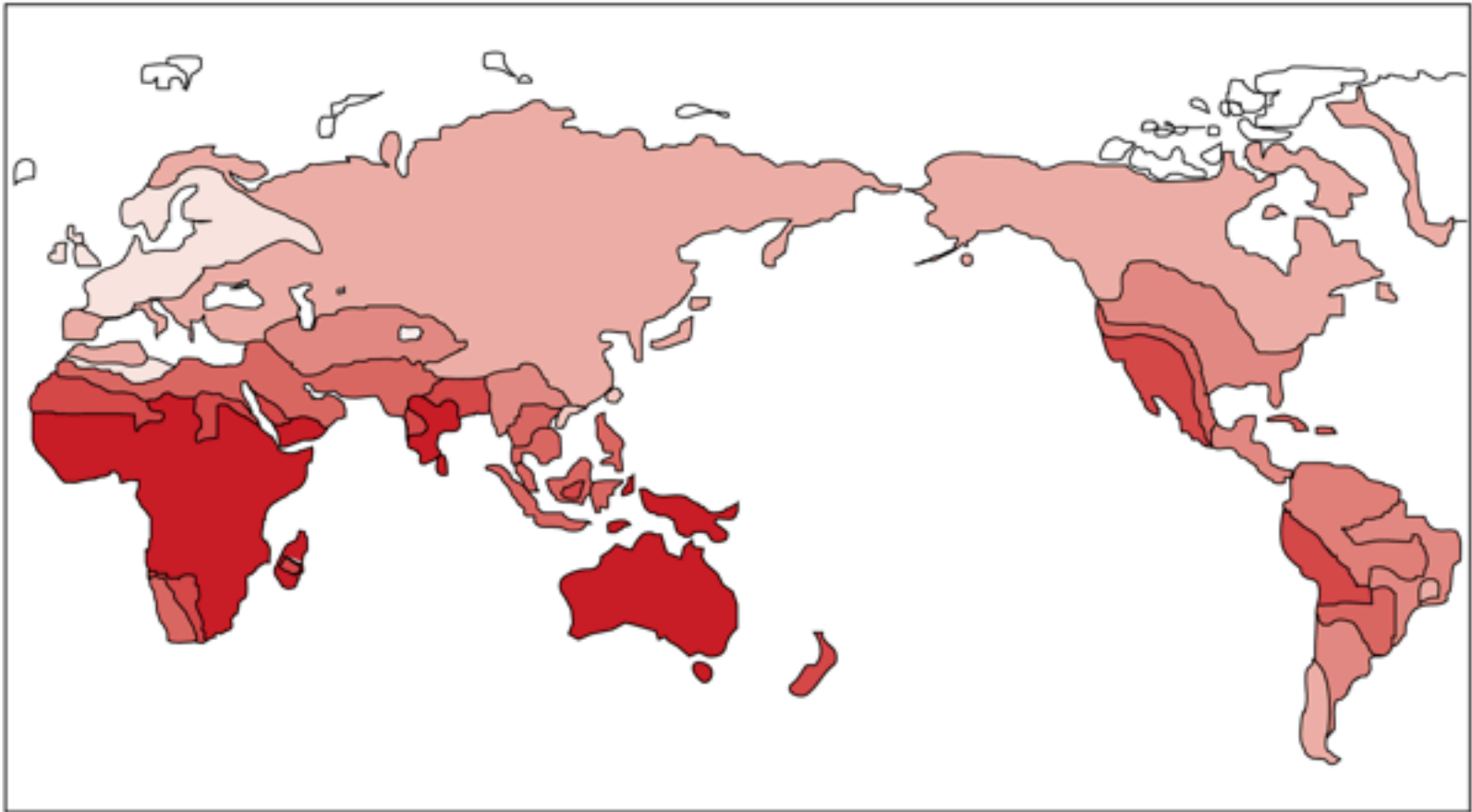
- Heterozygotes for sickle cell allele (AS) are partially protected against malaria
- Heterozygotes more likely to survive than homozygotes of either type
- Selection maintains *balanced polymorphism*
- Variation in genetic composition of population will be maintained



Presence of sickling gene is associated with the rate of malaria in different parts of the world



# Skin color varies across the globe



# Variation in skin color may reflect adaptations to local environment

- Chimpanzees have light-colored skin, covered by hair
- Pigment on faces and hands darkens with exposure to sun
- When *H. ergaster* moved out into the savanna, body proportions adapted to hot climate
  - may have lost hair and increased sweat glands to keep cool
  - Like chimps, skin may have darkened as it was exposed to sunlight



# Sunlight is necessary, but potentially harmful

- Sunlight necessary to start production of Vitamin D
  - Vitamin D is necessary for absorption of calcium
  - Vitamin D deficiencies cause rickets and other skeletal disorders
- Sunlight also has harmful effects
  - UV radiation damages DNA and causes skin cancer
  - UV destroys Vitamin B folate



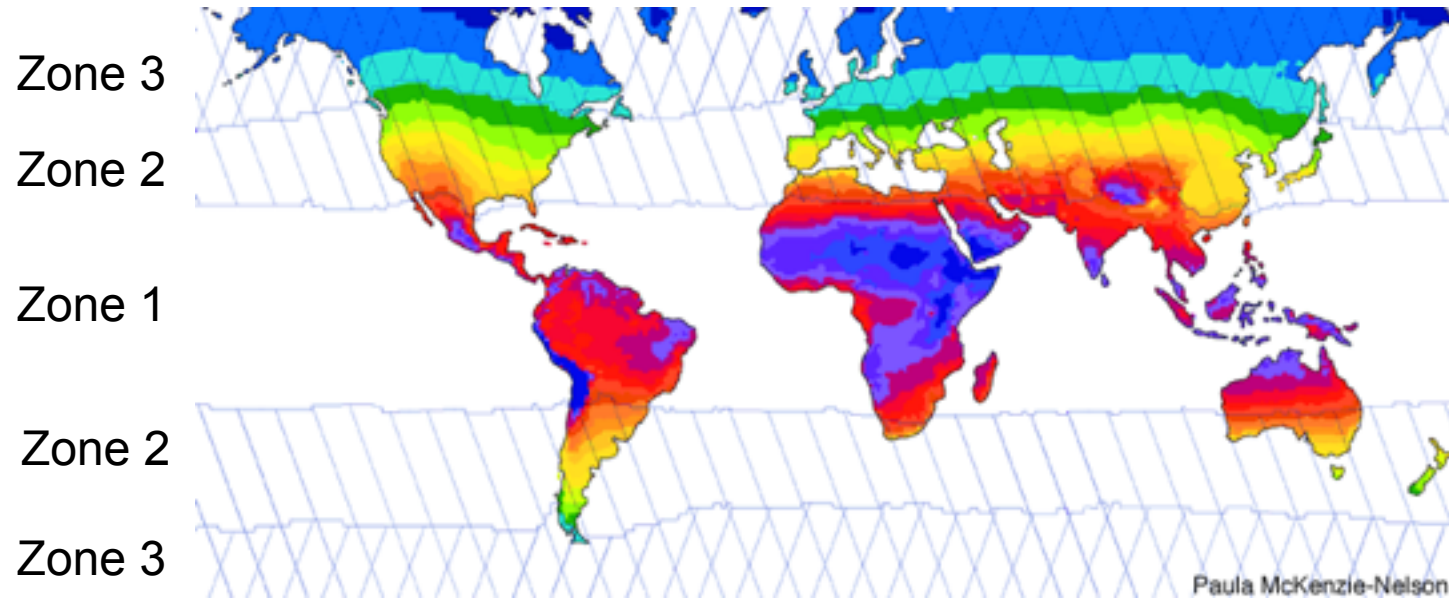
# Melanin is a natural sunscreen

- Skin contains melanocytes that synthesize brown melanin pigment
- Melanin prevents and repairs damage from UV rays
  - Absorbs UV rays and causes them to lose energy
  - Neutralizes free radicals that form after damage by UV rays
- Skin color may reflect adaptation to balance beneficial and harmful effects of sunlight

## Skin color may be adaptation to preserve B vitamin folate levels

- Often suggested that high concentrations of melanin were favored as adaptation against skin cancer
  - But, serious forms of skin cancer are uncommon and occur late in life
  - Selection against traits that occur after reproductive years is weak
- Sunlight causes reduction in folate levels
  - Folate deficits in pregnant women linked to neural tube defects, like spina bifida
  - Folate essential for DNA synthesis, new cell production, and sperm production
- Where sun is strong, dark skin protects folate levels

# Skin color is related to exposure to UV



- Map shows exposure to UV radiation (red = high, blue = low)
  - In Zone 1, people can have dark skin and still produce enough Vitamin D
  - In Zone 2, people need lighter skin during some parts of the year to produce sufficient Vitamin D, and people's skin color changes seasonally
  - In Zone 3, people need light skin year-round to absorb enough Vitamin D, and do not tan



## Some exceptions to general pattern are informative

- Inuit are darker than expected based on their location
  - Migrated to N. America fairly recently, and/or
  - Diet very rich in Vitamin D from fish
- Peoples on western side of Red Sea have very dark skin, while people on the eastern side have lighter skin
  - Peoples on the western side have been there longer than peoples on the eastern side
  - Peoples on the eastern side have adapted culturally (garments that cover bodies, tents for shelter from sun)



# Most Americans think about human variation in terms of racial groups

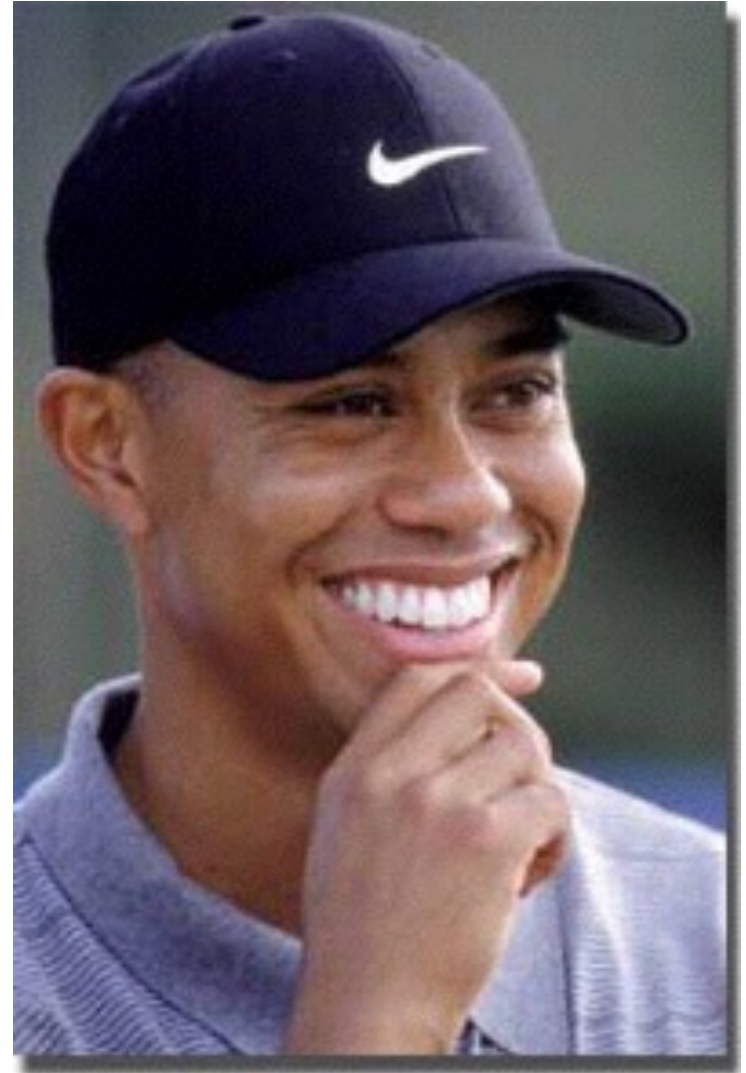
There are three common assumptions that Americans make about race:

1. Human species falls neatly into small number of discrete categories
2. Differences between races are due to differences in biological heritage
3. Members of different races are different in important ways.

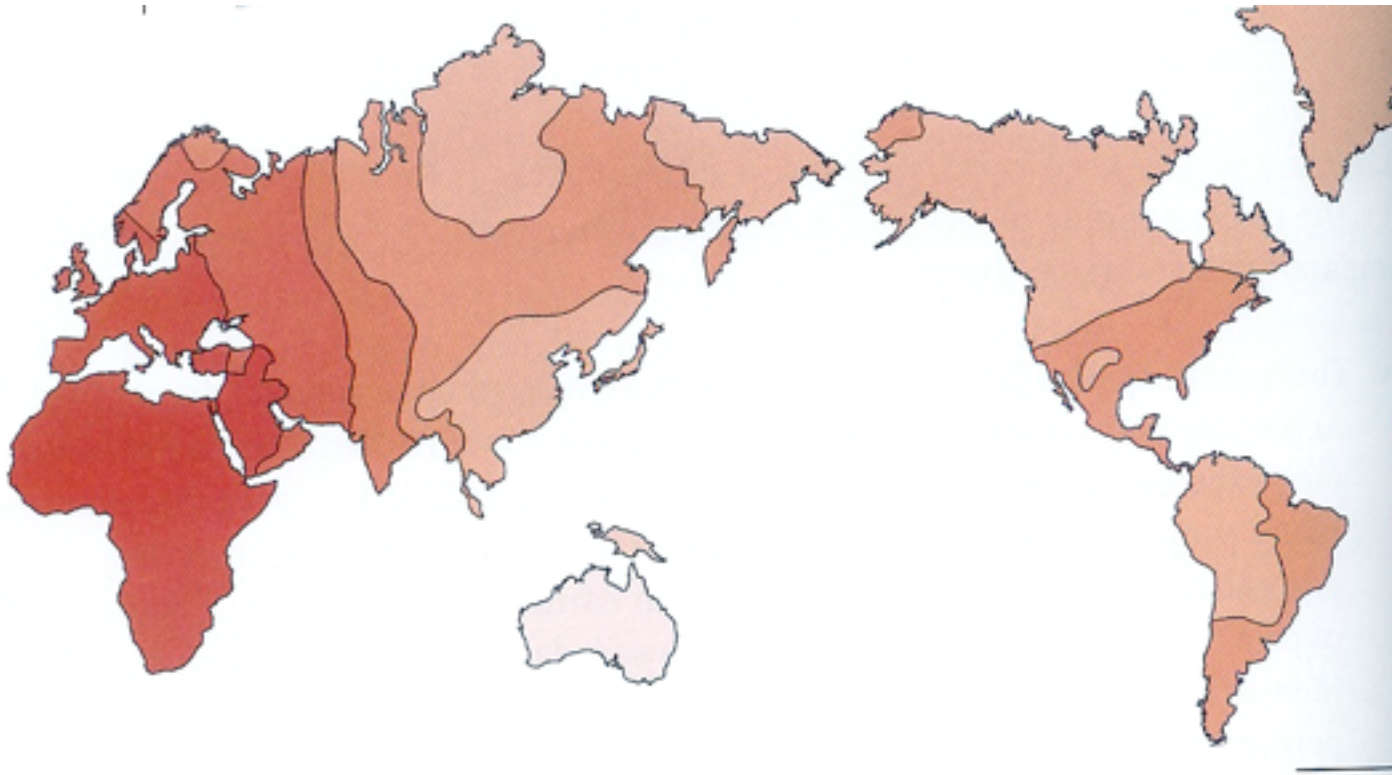
*All three of these assumptions are fundamentally flawed.*

# Assumption: People fall naturally into a small number of distinct groups

- Americans tend to classify people into 3 groups
  - People of European ancestry
  - People of Asian ancestry
  - People of African ancestry
- These schemes ignore the complexity of human variation

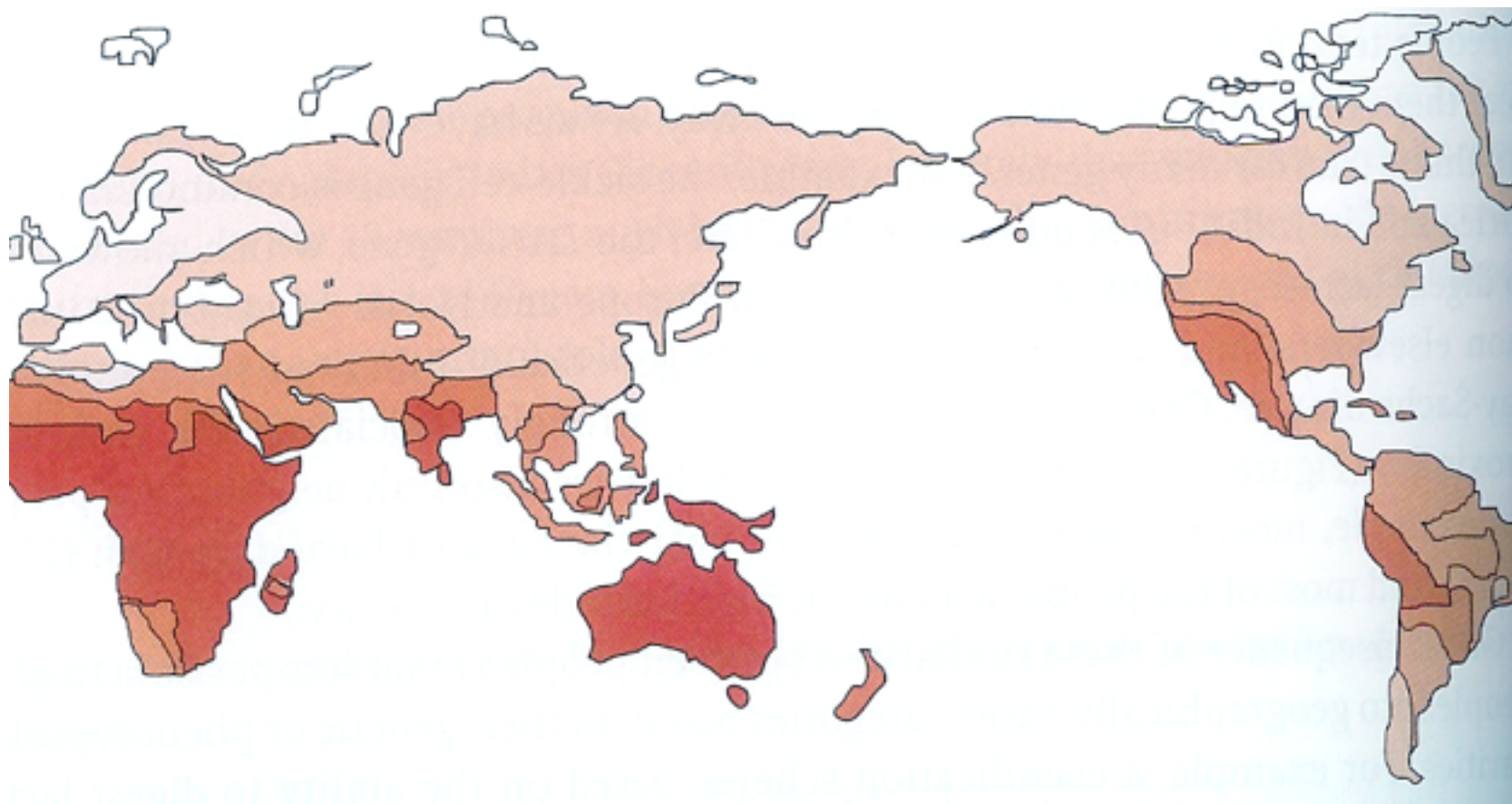


People who live near one another tend to be similar genetically



Distribution of genetic similarity (120 genes)

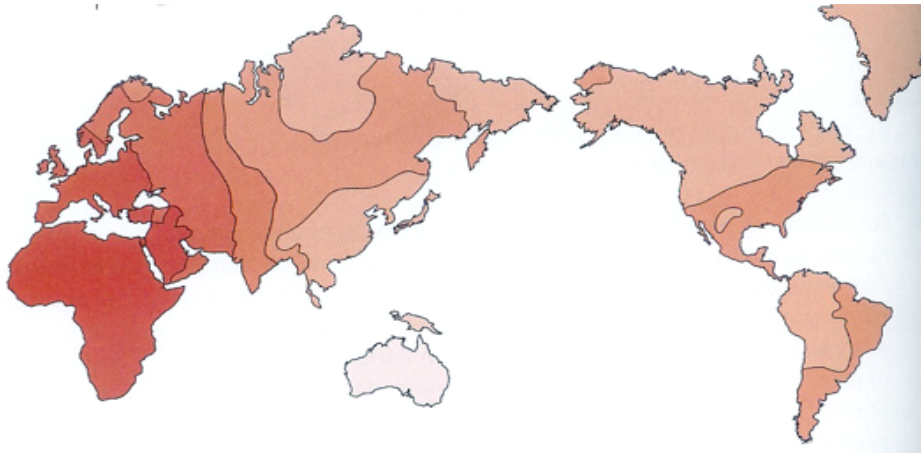
People who live near one another also tend to be similar morphologically



Distribution of skin color

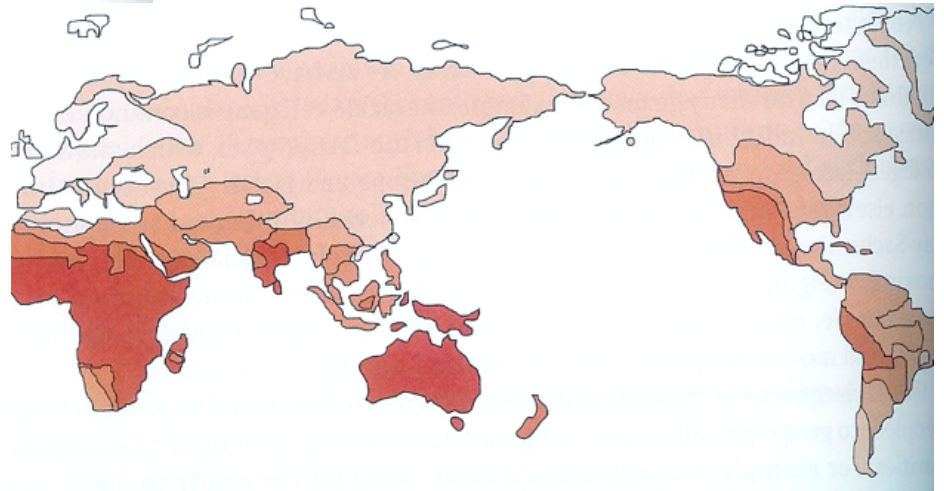


# Genetic clines are vertical while morphology clines are horizontal

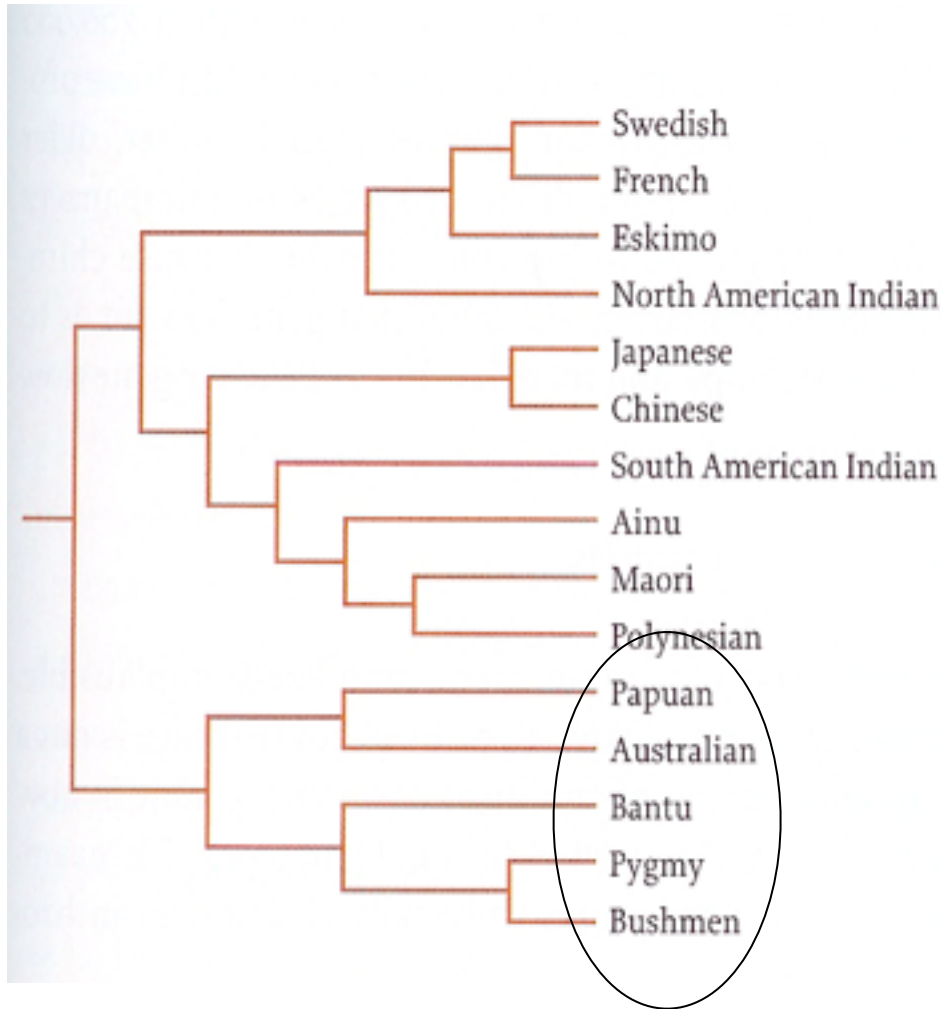


No sharp boundaries between groups

***Cline*** = distribution of an allele or phenotypic trait across geographical space

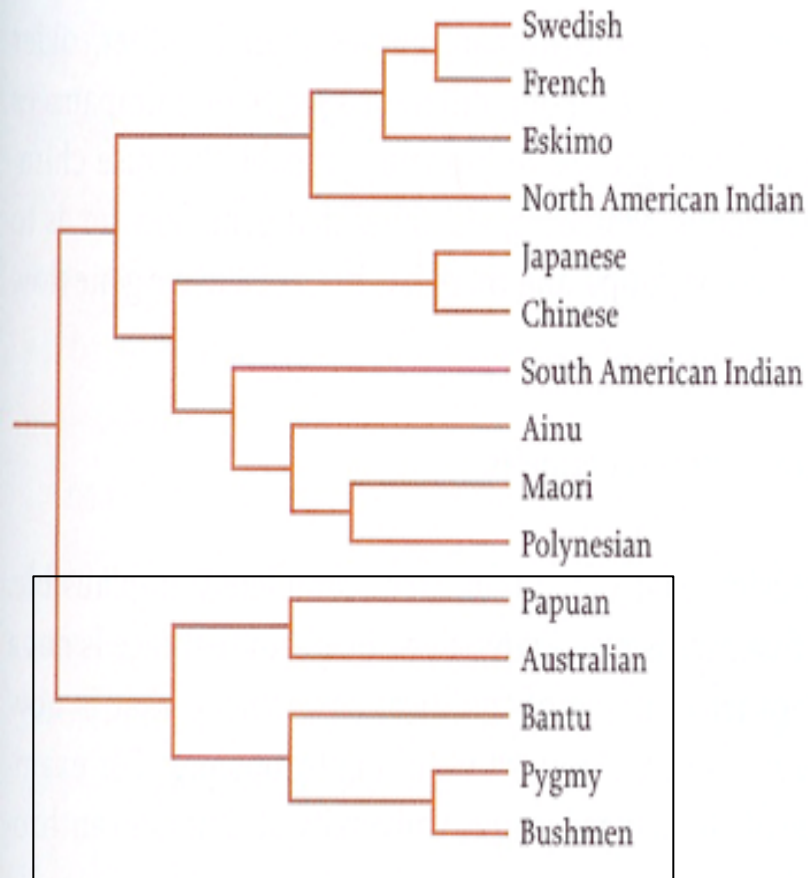


# Classifications based on morphology link together people from Africa, Australia, & New Guinea

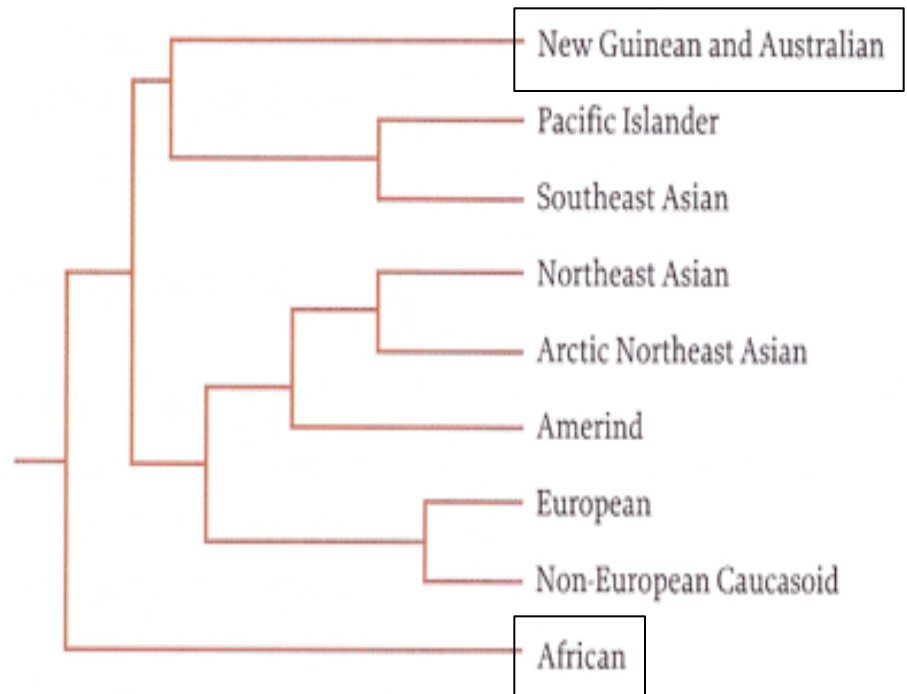


Morphology

# Similarity based on morphology doesn't reflect similarity based on genes



Morphology



Genes

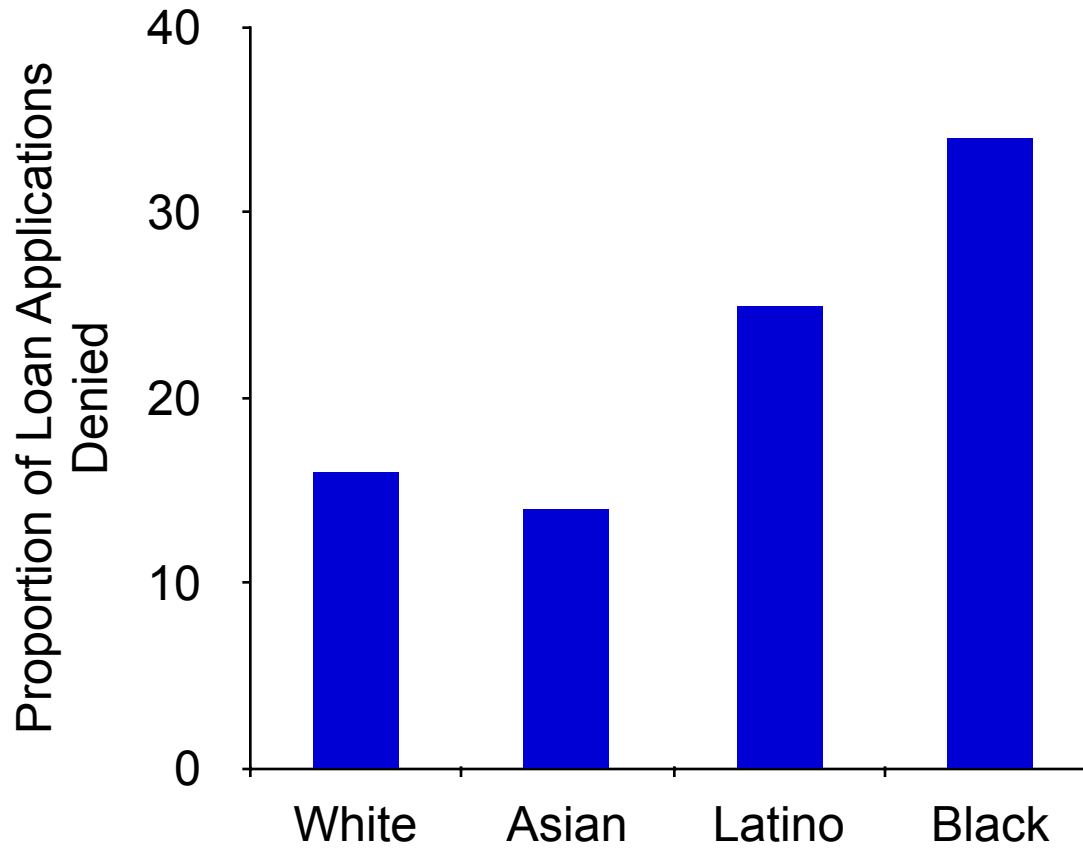


Race is not a meaningful biological category, but *racism exists*



Brown vs Topeka Board of Education  
US Supreme Court 1954  
“Separate educational facilities are inherently unequal”

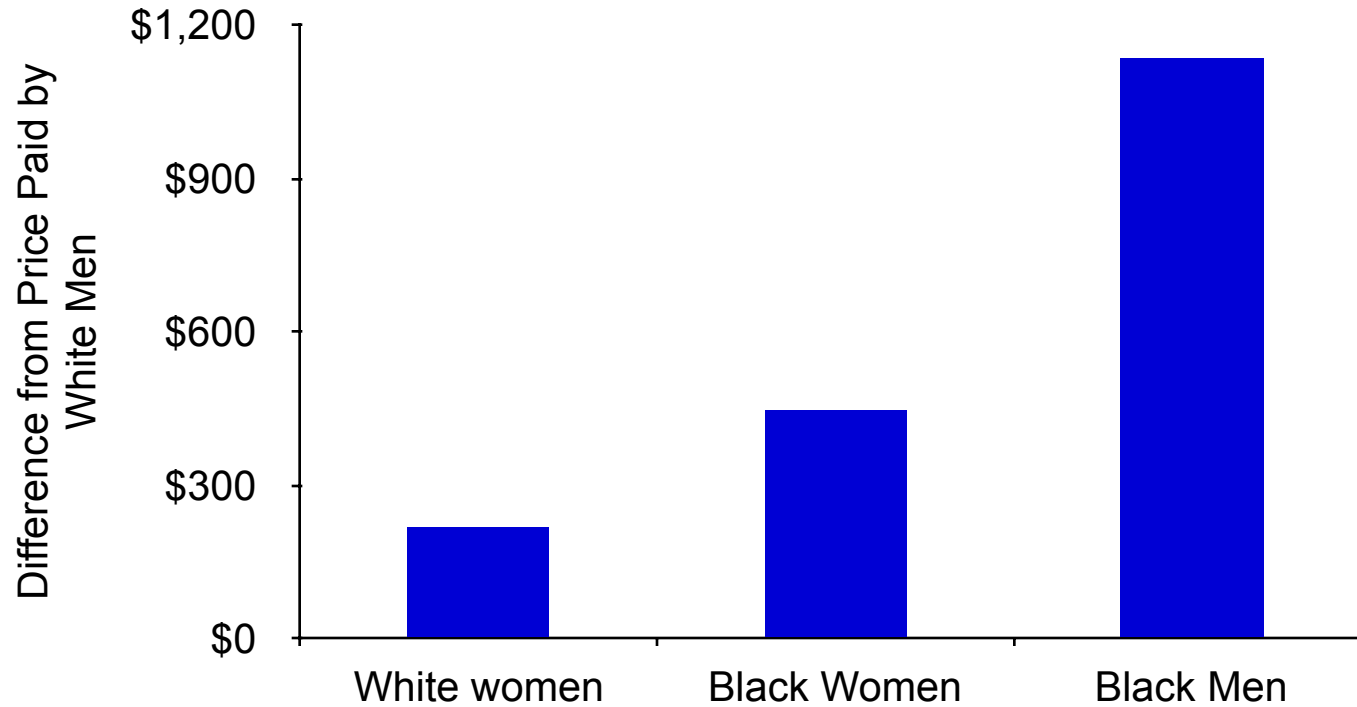
# Housing discrimination in the USA



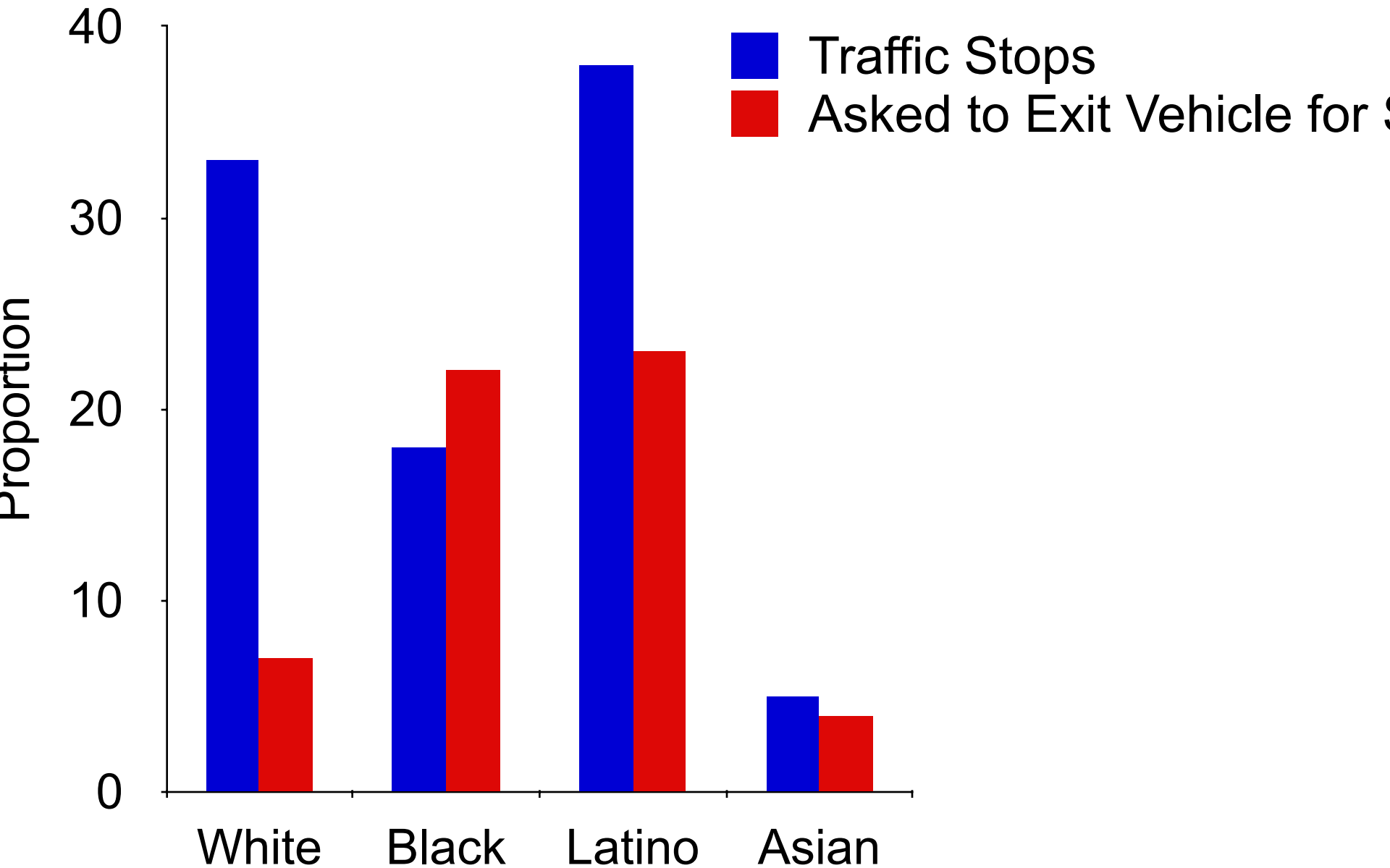
USA, 1993  
Sidanius & Pratto 1999

# Retail discrimination in USA

Price differential for Buying New Car, USA 1990's



# Recent statistics released by LAPD suggest race affects treatment after routine traffic stops



# These kinds of social experiences could contribute to differences in health

- People act on perceptions about race
- These have real consequences for individuals

For example:

- Discrimination →
  - education & job opportunities →
  - Socioeconomic status →
  - dietary options & preferences →  
→ stress → hypertension

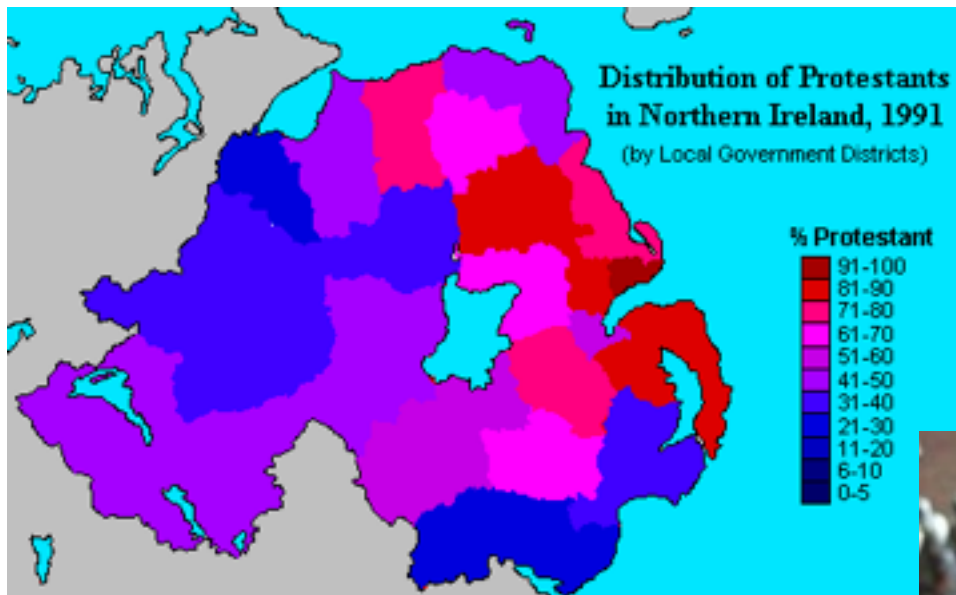
# Not all societies focus on skin color or race to categorize and discriminate

- In 1990's conflict among Hutus and Tutsi's in Rwanda
  - Hutus are farmers, shorter and stockier
  - Tutsis are pastoralists, taller and thinner
  - Conflict over political power
- More than 1,000,000 died



Tutsi woman and adopted child of unknown ethnicity

# In Northern Ireland, conflict between Protestants and Catholics has lasted for generations





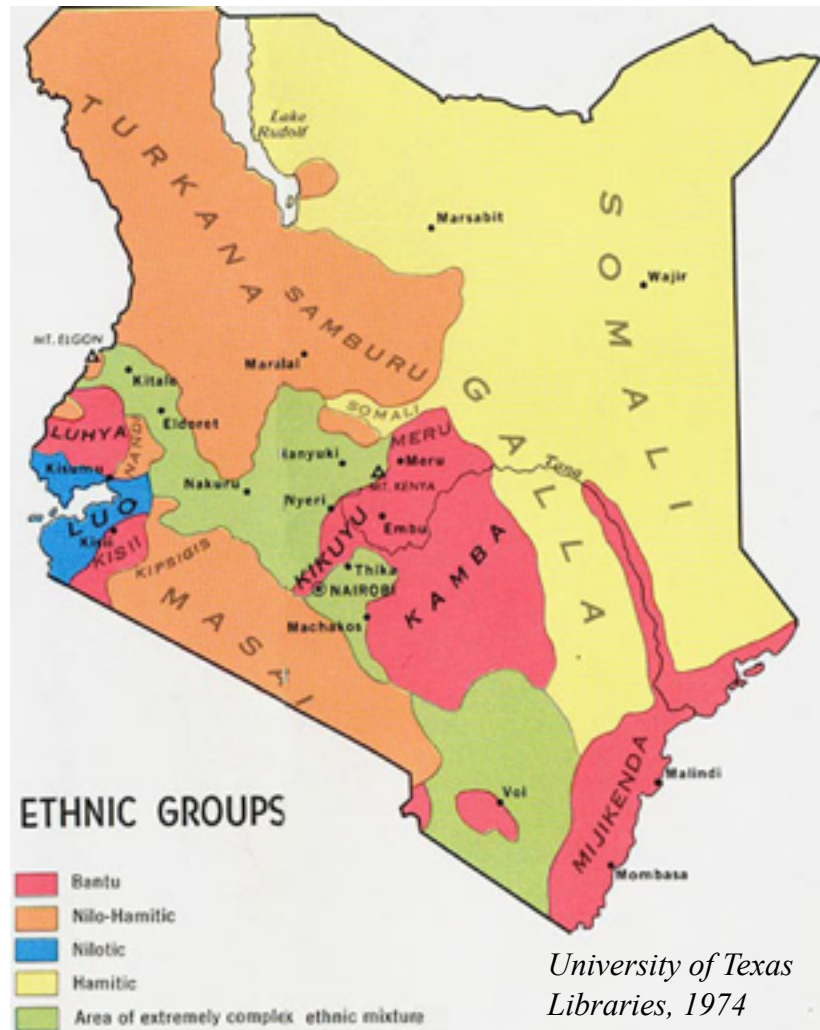
# Ethnic animosities led to violence after disputed elections in Kenya



Opposition supporters brandish weapons during protests in Nairobi December 31, 2007. Reuters.



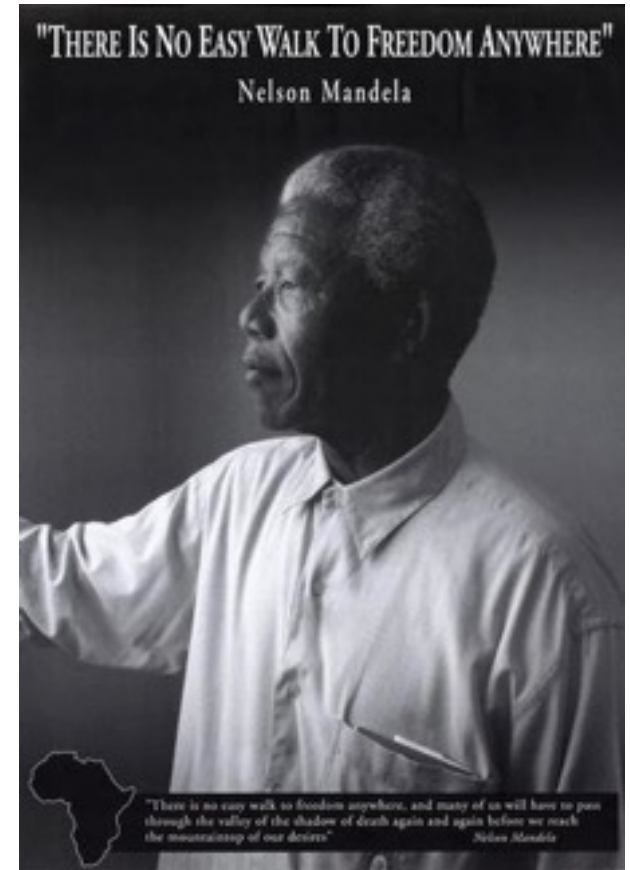
*The Economist*. Jan. 10, 2008





So, we have to deal with a contradiction between the biology and the culture of rac(ism)

- There is more genetic variation **within** human groups than **between** them
- Racial categories are based on a small number of superficial traits
- Phenotype is poor measure of ancestry
- Racial and ethnic categories are **culturally** constructed
- Racism and ethnic prejudice have real consequences on people's lives



# Finally Log onto the website

- Click on the last article