

Knox Adult Faith Formation

Race and Genetics

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Sunday, 10/20/19 and 10/27/19
10:10 – 10:50 AM

What we will cover in this class

- Genetics basics
- Genetics and race
- Discussion
 - What do the scriptures say
 - Race and culture in a mobile, interconnected world
 - Role of people of faith

How different?



How different?



Fraternal
twins born
to a mixed
race couple

Human genome project (HGP)

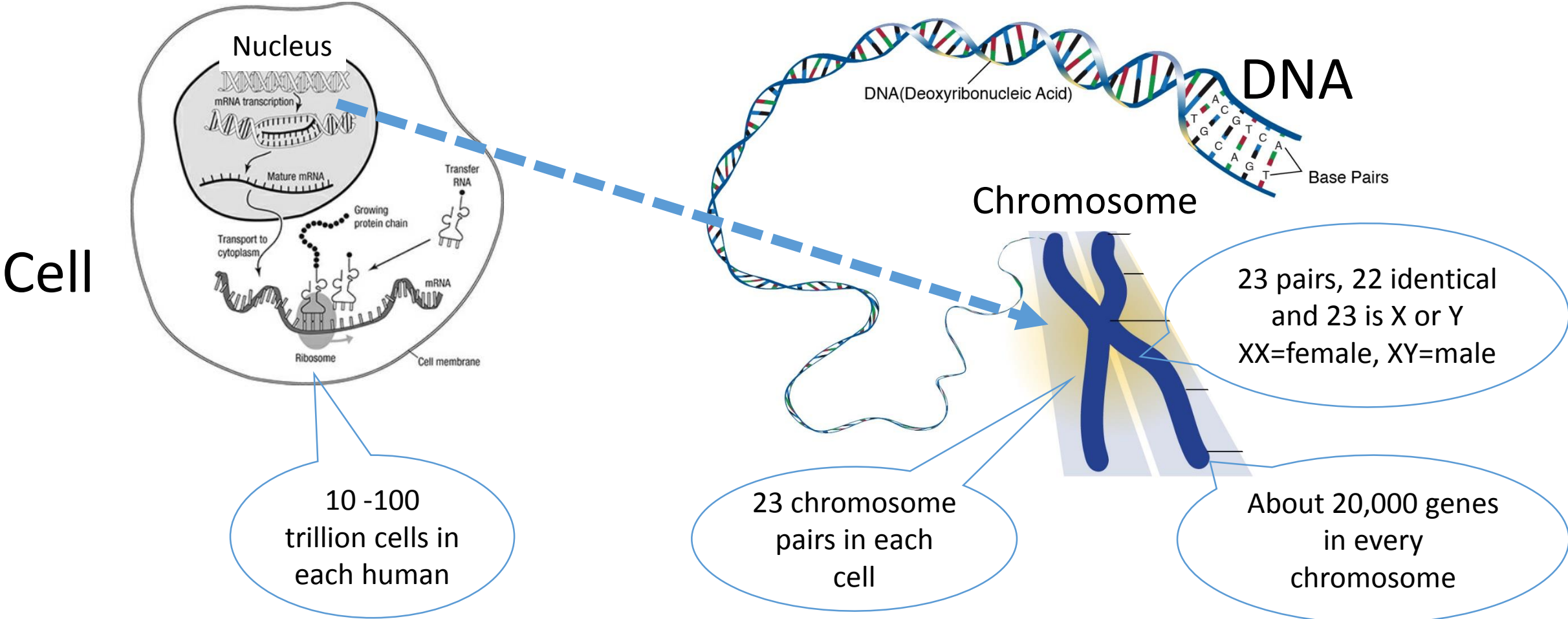


Drs. Craig Ventner and Francis Collins
Co-leaders of the human genome project

Human Genome Project (HGP)

- Cost over one billion and nearly 15 years
- Started in ~1990 and completed in 2003
- Today, we can sequence in days for under \$1000
- We are able to sequence and look for very small differences and similarities in human and other species
- HGP is changing our understanding of biology
- We must discard some of the pre-HGP science and other social beliefs

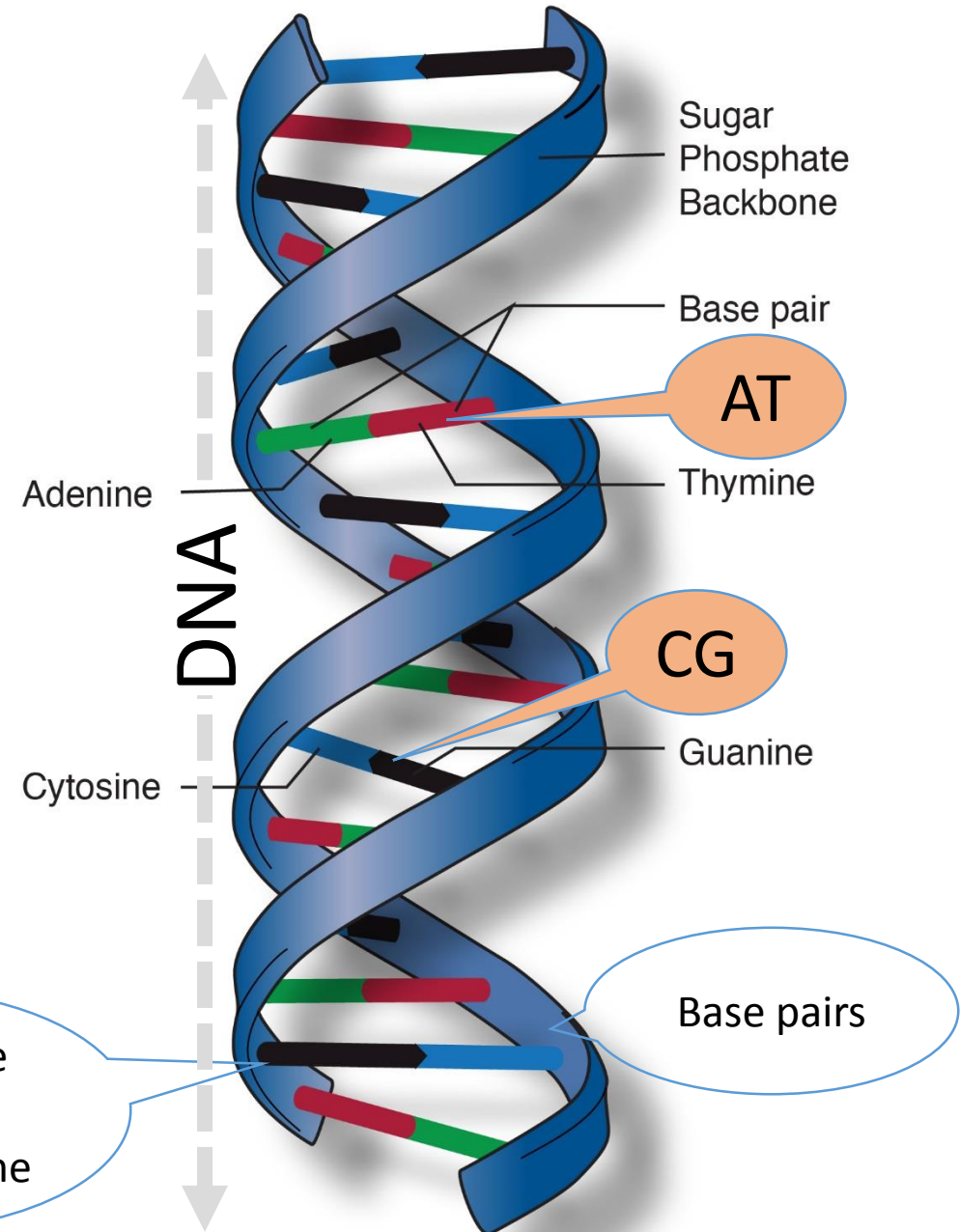
Cell, Chromosome and Genes



DNA and Gene

- Adenine (A) and Thymine (T) make a base pair. Cytosine (C) and Guanine (G) make another base pair
- The order of AT and CG and the repeating sequence of ATs and CGs makes up the DNA molecule which is like a long string
- Example sequence.....ATCGATATCG....
- Genes represent sections of the long DNA molecule – one DNA molecule contains multiple genes
- Genes can vary greatly in length, from several hundred to several thousand base pairs

3 billion base pairs in a human genome

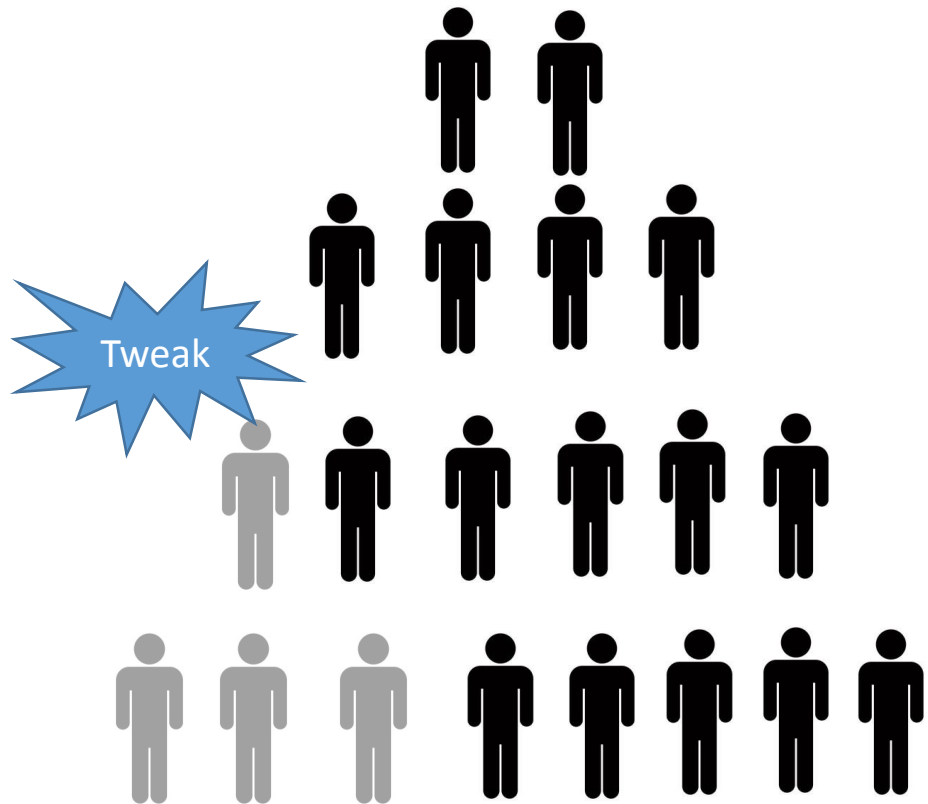


Cell division and mutation



- As cells divide, the DNA is copied to each cell
- Mutations are small differences in the base pairs
- Mutations can occur due to
 - Natural tweaking of the DNA
 - Mistakes in cell replication
 - Damage to DNA from chemicals, radiation, free radicals
 - Many other factors
- Some mutations (usually beneficial ones) are retained generation to generation and others are discarded
- Changes in appearance of humans is the result of tweaks to the DNA.

Example of gene variation – or tweak

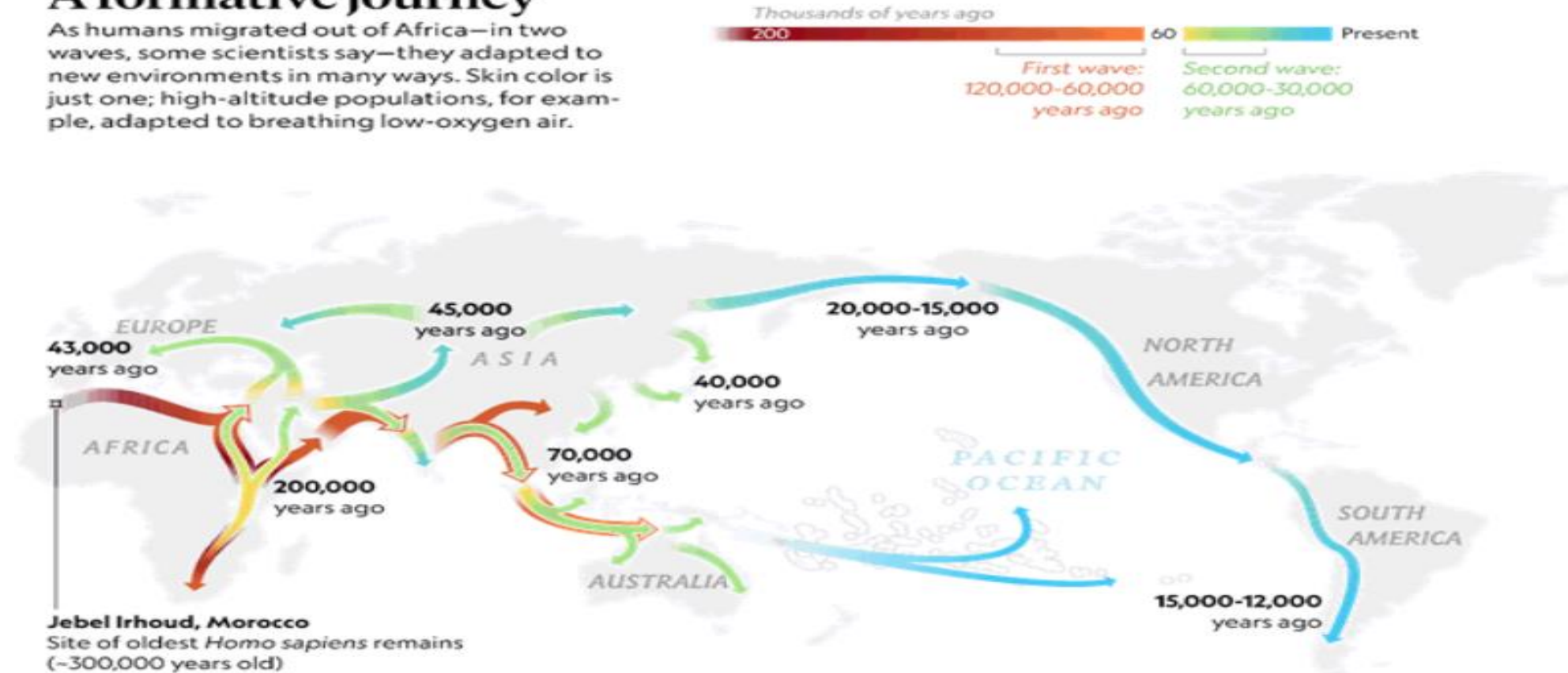


- White skin resulted from a tweak in a gene (SLC24A5) to produce vitamin D with less sunlight as populations moved further from equator.
- The tweak was just substitution of a G for A in one location in a 20,000 base pair gene

Human migration and adaptation

A formative journey

As humans migrated out of Africa—in two waves, some scientists say—they adapted to new environments in many ways. Skin color is just one; high-altitude populations, for example, adapted to breathing low-oxygen air.



Humans are a young species on earth

- Homo sapiens 200,000 – 300,000 years
- Human like species 2-4 million years
- Common ancestor of mammals – 83 million years
- Some of the oldest species on earth
 - Cyanobacteria 2.8 billion years
 - Jelly fish 550 million years
 - Sponges. 580 million years
 - Sturgeon. 200 million years

Genetics and race

- Humans vary, but at genetic level, the differences among humans are about 0.1%
- 90% of the differences (of the 0.1%) are within groups. Only 0.01% of differences can be attributable to different groups
- Groups have been mixing and continue to mix even more
- Race cannot be considered a biological classification
- Race is mostly a social construct

To be continued

On October 27, 2019

Genetics and race – from last class

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Pre-genome race science


- Dr. Samuel Morton, first half of 19th century. Believed humans could be classified into 5 races, each created from a separate act of creation
- Believed in a divinely determined race hierarchy, with Negroes at the bottom
- Used crude methods to measure cranial cavity size to associate it with intelligence differences among the 5 races
- Ideas were quickly picked up in US south to justify slavery
- From his obituary in Charleston (SC) Medical Journal.....was praised for **“giving to the Negro his true position as an inferior race”**
- Others, like in the eugenics movement also used faulty science to rationalize their beliefs about racial superiority and inferiorities



From Dr. Morton's collection of skulls from 5 "races"

Pre-genome racial classifications

- Pre-genome biology classified all species based on physical attributes (also called taxonomy)
- The taxonomy approach was used for Humans also
- Mid 20th century classification of humans into 5 races
 - Caucasoid (White) race
 - Negroid (Black) race
 - Capoid (Bushmen/Hottentots) race
 - Mongoloid (Oriental/Amerindian) race
 - Australoid (Australian Aborigine and Papuan) race
- In US census, a human with dark skin would be classified as black though they may be genetically closer to whites. E.g., President Obama born of a white mother is classified as black



5 is mostly an arbitrary number

Us - Them - Tribalism

- We are programmed to fear outsiders (“them”). Was vital for survival during pre-civilization hunter/gatherer days
- Tribalism continued as humans settled into groups, agrarian communities and kingdoms
- Fear of “other” is less necessary in a civil society of laws
- In modern society with mobile and mixing populations, distinguishing “us” and “them” is much harder
- Human traits for fear and tribalism can be exploited via race, religion, nationalism, meritocracy and other means

Nature (genetic) vs nurture (social)

- Every cell has a full copy of the genome and cell replication makes copies of the genome. Gene mutations can occur during replication
- Genes have the templates or instructions for production of proteins which then become cells, tissues and organs
- Environment affects gene expression
 - Environment = natural conditions, social, pollution and more
 - Gene + environment = traits in the organism (or creature)
- Humans are social creatures programmed and shaped by our social environment
 - Gene + social conditions = person (with abilities and achievement)
 - Illustrated well by studies on identical twins separated at birth

Creation narrative versus genetics

- Creation narrative in Genesis is a metaphor (or story) versus a statement of fact
- It represents human affirmation and wonder of the beauty and grandeur of the created world
- Biblical passages have been used to justify racism also
- Many passages in the Bible, particularly in the new testament affirm the oneness of humanity in line with our current understanding of humanity from modern genetics

Sample of new testament passages

Ephesians 4:25

....let each one of you speak the truth with his neighbor, for **we are members one of another.**

Galatians 3:28

There is neither Jew nor Greek, there is neither slave nor free, there is no male and female, for you are all **one in Christ Jesus.**

1 Corinthians 12:15-19

For just as the body is one and has many members, and **all the members of the body, though many, are one body, so it is with Christ....** For the body does not consist of one member but of many. If the foot should say, “Because I am not a hand, I do not belong to the body,” that would not make it any less a part of the body. And if the ear should say, “Because I am not an eye, I do not belong to the body,” that would not make it any less a part of the body. ...

Our response as community of faith

- Believe in the equality of all humans regardless of skin color or other physical attributes
- Dispel outdated beliefs on race wherever we see them
- Envision a human community that is unified by values that transcend cultures, religions and geography
- Cherish and celebrate the richness of diversity – human physical attributes, cultures, arts and more
- Engage and interact with the “them” and celebrate our common genetics and richness of diversity

Takeaways from this class

- Race is not biological and humans cannot be classified on a genetic basis
- Humans are diverse – physical, personality, intelligence, talents, predisposition to diseases and more
- Diversity enriches the human species. Society is richer when the gifts of all humans are expressed and tapped
- Nature strongly favors diversity and cross breeding. Inbreeding is generally detrimental

Thank you

References

- NIH – National Genomics Research Institute. An authoritative and easy to understand site. Excellent search functions—just type any term you want to know more about
<https://www.genome.gov/About-Genomics/Introduction-to-Genomics>
- National Geographic, April 2018. Entire issue on race -- excellent and concise . You can find back issues in the library or order from National Geographic. www.nationalgeographic.com
- The Gene: An intimate history by Siddhartha Mukherjee
- A Brief History of Everyone Who Has Ever Lived: The Human Story Retold Through Our Genes by Adam Rutherford and Siddhartha Mukherjee.
- Youtube
 - there are multiple TED talks and others. Type Race and Genetics and several talks will come up
 - https://www.youtube.com/playlist?list=PL1ay9ko4A8skLYfn8d9nlp_oO9LLVky3P -- a collection of videos from a symposium at National Genomics Research Institute