

CS 68: BIOINFORMATICS

Prof. Sara Mathieson
Swarthmore College
Spring 2018



Outline: May 2

Remind me to hand back Lab 6

- Overview of how DNA is used as forensic evidence
- 6 groups each with a different discussion question (option to go outside)
- Jigsaw groups
- Regroup as a class

Notes:

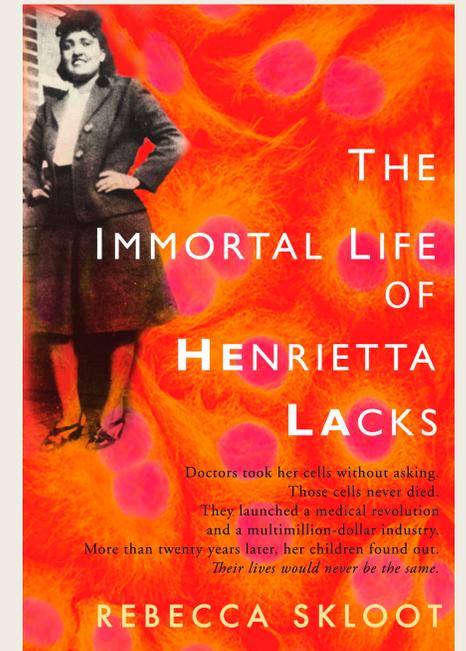
- Office hours TODAY 1-3pm
- Final presentation guidelines posted
- Project meetings in lab on Thursday
- Make sure to LOG OUT of lab machines

Uses of DNA information

Big question: who owns DNA information?

- Early example: 1951, cells from Henrietta Lacks were immortalized (HeLa cells)
- These cells have been used extensively in research
 - *20 tons of cells grown*
 - *Involved in 11,000 patents*
- In 1990, court ruled that discarded tissue/cells are not the person's property and can be commercialized

Further reading:



Recently: companies offer DTC genetic testing

- 23andMe now has SNP data from 5 million individuals
- They offer both ancestry and health related information
- They ask users to answer survey questions (health history, physical traits, etc)
- Partnering with drug companies, as well as creating therapies in-house

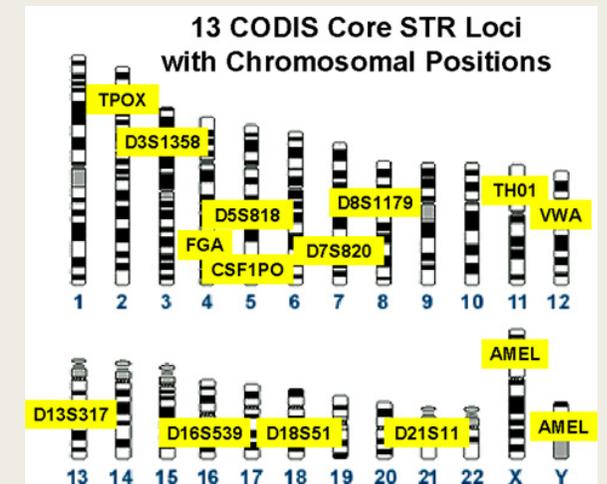


Forensic uses of DNA

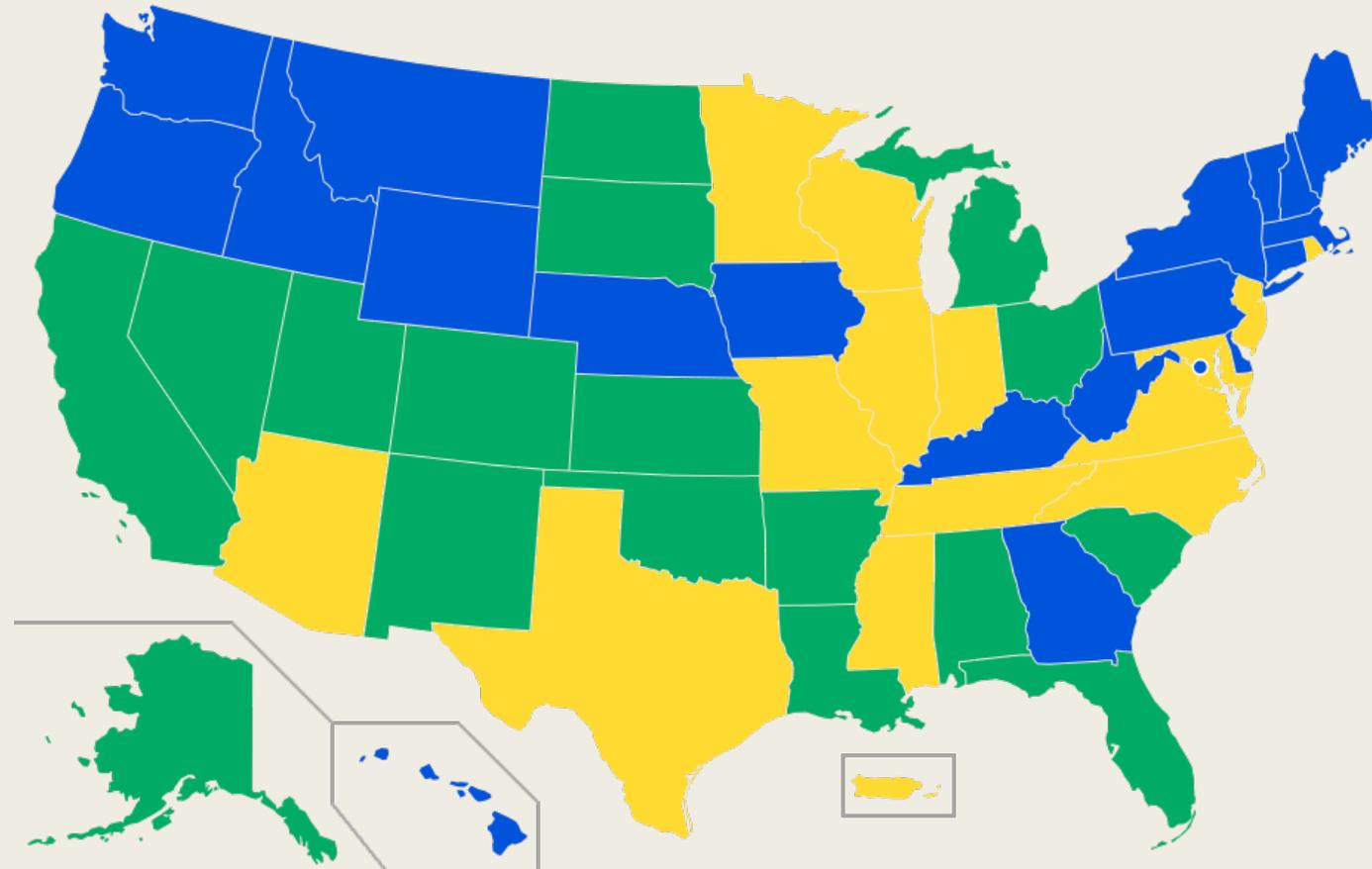
- Current technology uses short tandem repeats (STRs) for identification
- Repeats are typically 2-6bp long
- DNA from a crime scene is taken and then matched against an existing database of previously collected samples
- Even if existing samples are not linked to people, matches can indicate the crime was committed by the same unknown person

Combined DNA Index System (CODIS)

- U.S. National DNA database, maintained by the FBI
- Each profile has 13 STR (short tandem repeat) loci
- 13 million offender profiles, 3 million arrestee profiles
- Aided over 390,000 investigations
- False matches are rare, but occur more frequently in closely related individuals



U.S. arrestee collection laws as of 2017



■ Collection upon conviction only ■ Collection from some felony arrests ■ Collection from all felony arrests

Using SNPs instead of STRs

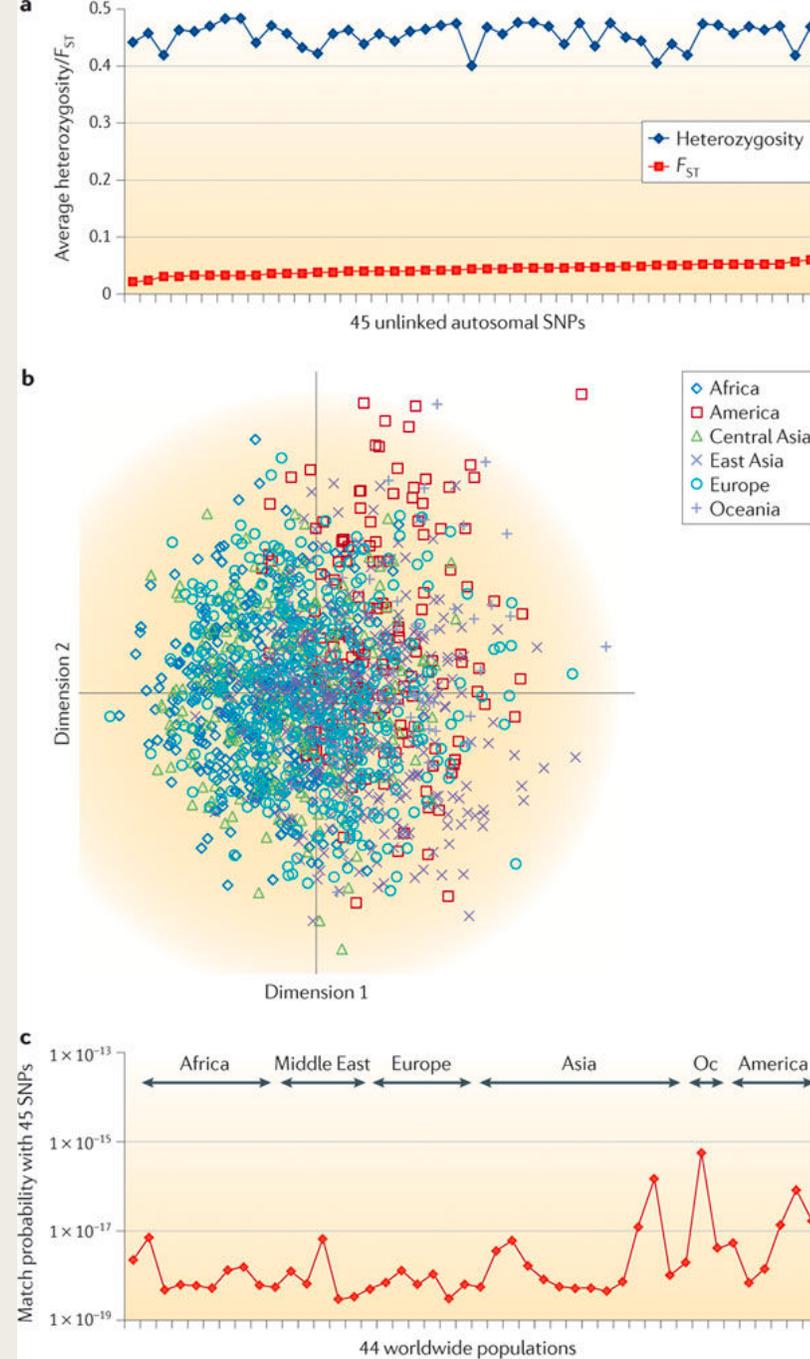
Review Article

Improving human forensics through advances in genetics, genomics and molecular biology

Manfred Kayser & Peter de Knijff

Nature Reviews Genetics **12**, 179–192 (2011)

Published: 18 February 2011



Beyond database hits: reconstructing appearance with DNA

“Current DNA-based appearance prediction includes group-specific traits such as eye colour, hair colour and age with categorical prediction accuracies suitable for practical applications, and additional group-specific traits such as skin colour, hair morphology or baldness may follow. Individual-specific DNA-based facial morphology prediction would be most appreciated for finding unknown persons, but is currently beyond our level of genetic knowledge.”

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“IrisPlex” eye color prediction from DNA alone

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Recent news: police capture criminal by using a fake DNA profile

- Uploaded a DNA sample from 1980 to the site GEDmatch
- Several relatives matched, which led the investigators to an address
- Joseph James DeAngelo, 72, now currently under arrest