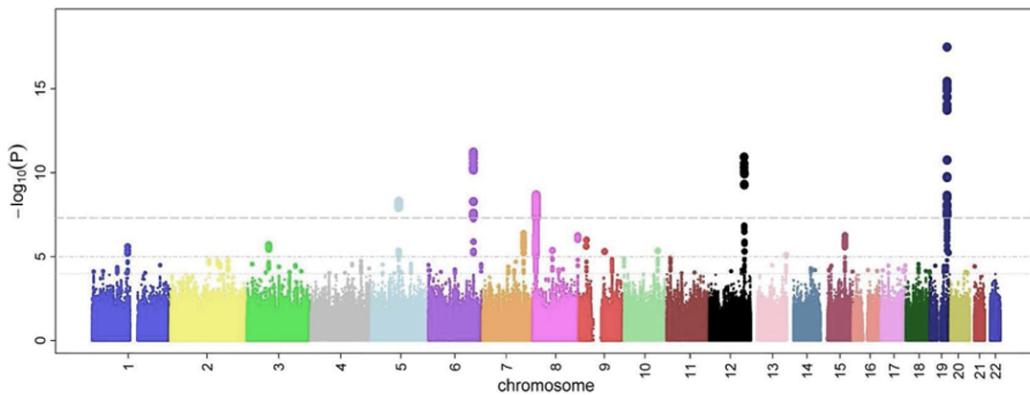


# **NGS – variant analysis**

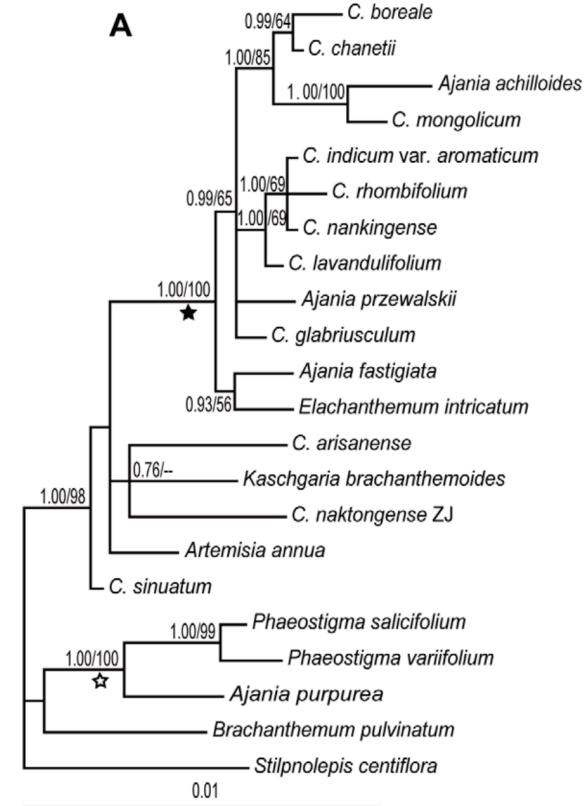
Introduction to variant analysis

# Why study variants?

- Find causes for phenotypic variation
- Understand relatedness

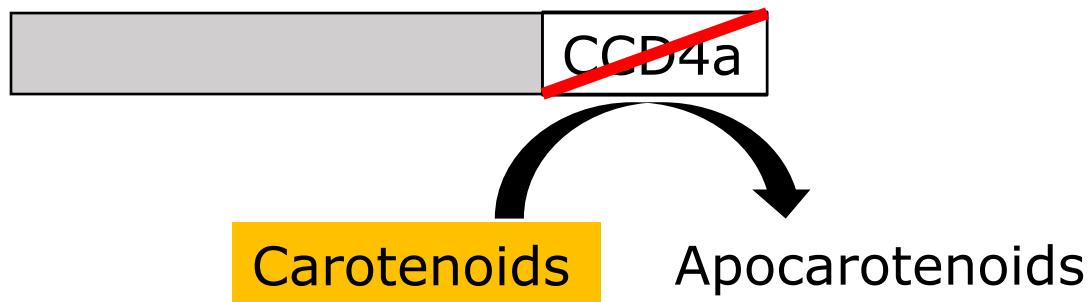


[https://en.wikipedia.org/wiki/Genome-wide\\_association\\_study](https://en.wikipedia.org/wiki/Genome-wide_association_study)



# Mutation

Change in DNA sequence



# Mutations - causes

- Repair mistakes
- Unbalanced cell division
- Transposable elements



[https://nl.wikipedia.org/wiki/Springend\\_gen](https://nl.wikipedia.org/wiki/Springend_gen)

# Mutations - types

- cells – somatic mutation
- inherited – germline mutation

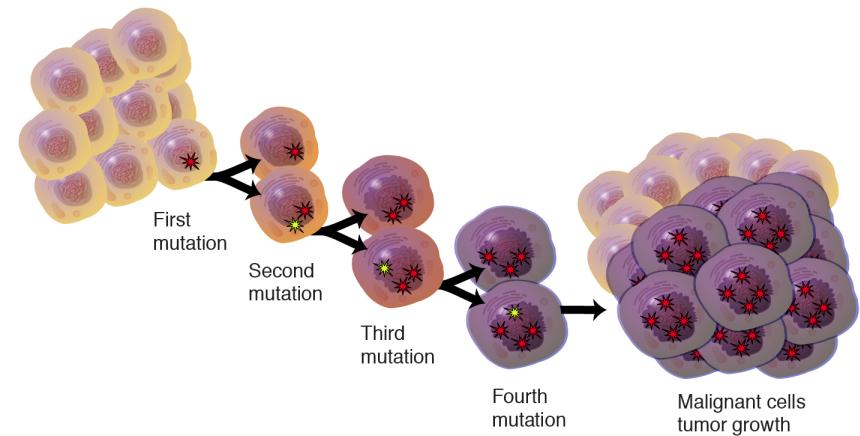
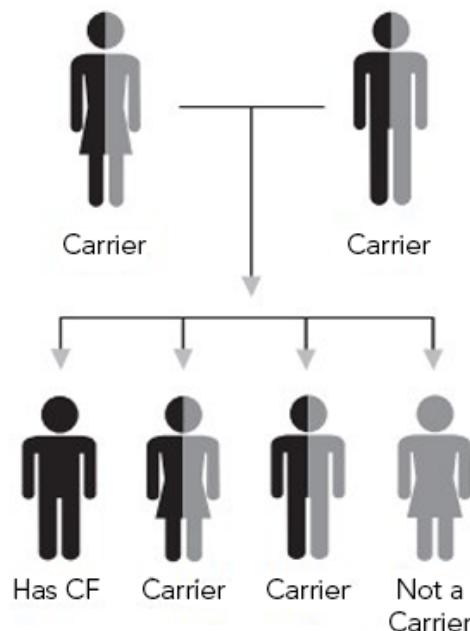
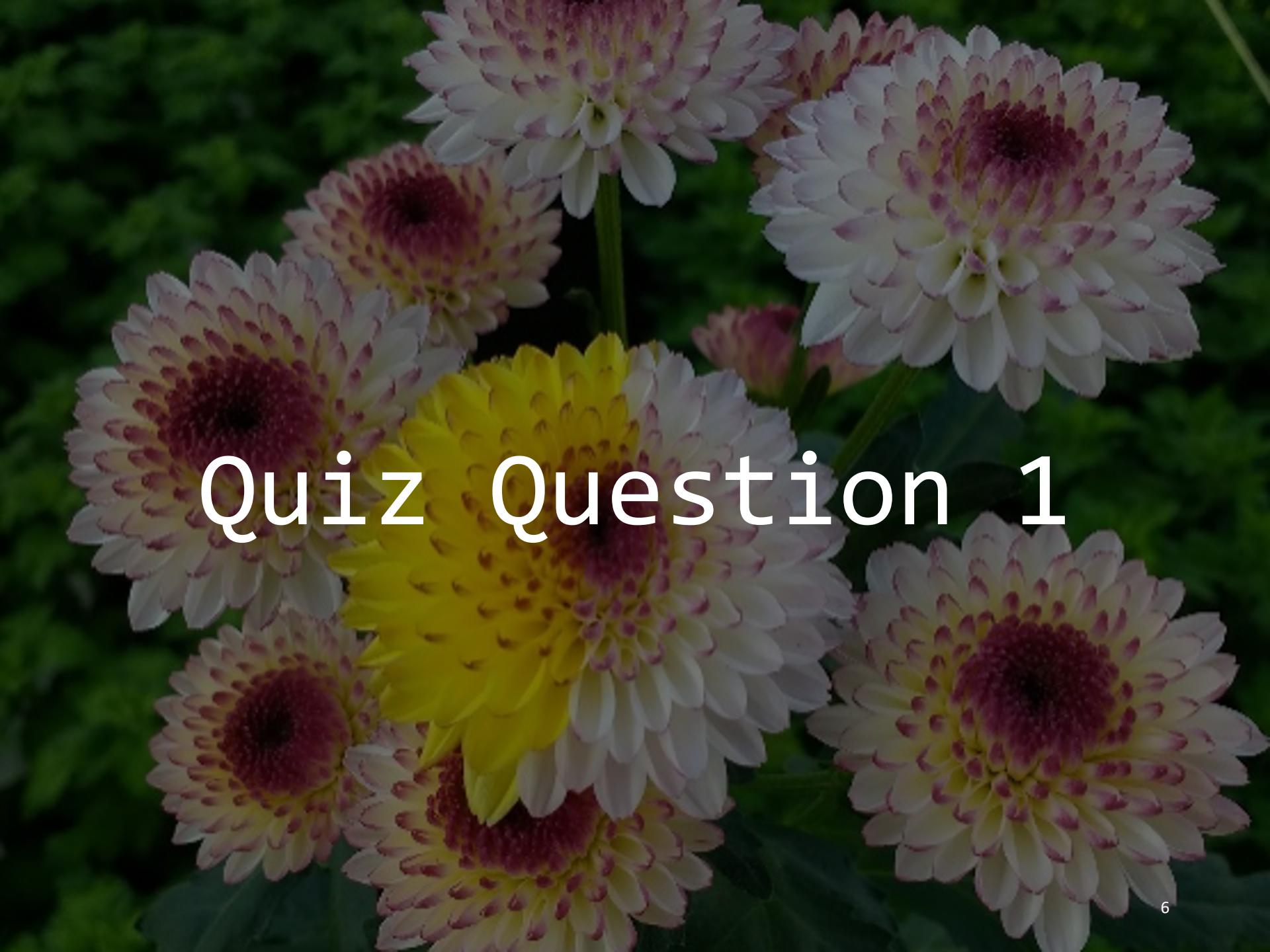


image sources

<https://www.cff.org/>

<https://www.genome.gov/genetics-glossary/Cancer>

A close-up photograph of several chrysanthemum flowers. The flowers are in various stages of bloom, with some showing bright yellow petals and others showing more pinkish-purple or white petals. The centers of the flowers are dark, textured clusters. The background is a soft-focus green, suggesting a garden setting.

# Quiz Question 1

# Detecting variants

- Phenotypic analysis
- Molecular analysis
  - Sequencing

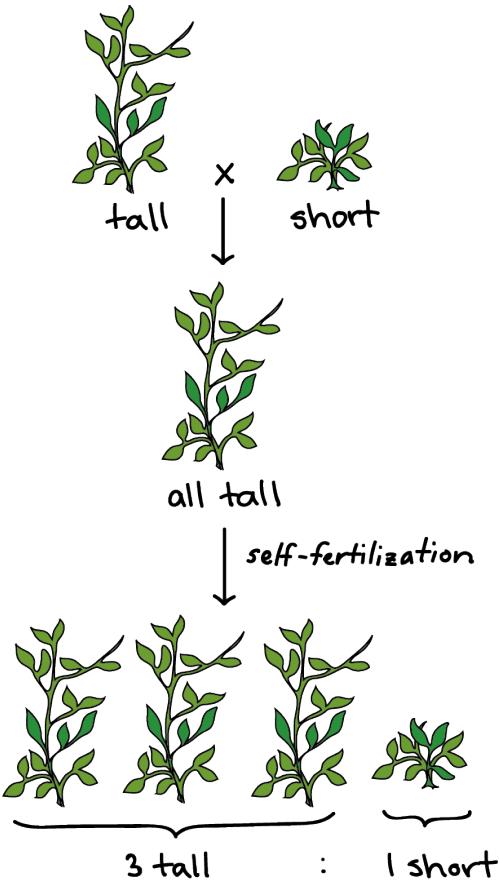
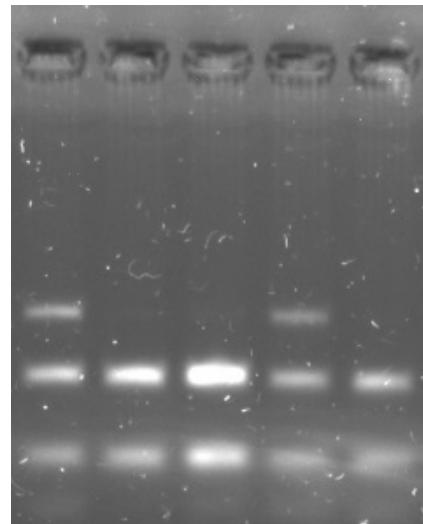
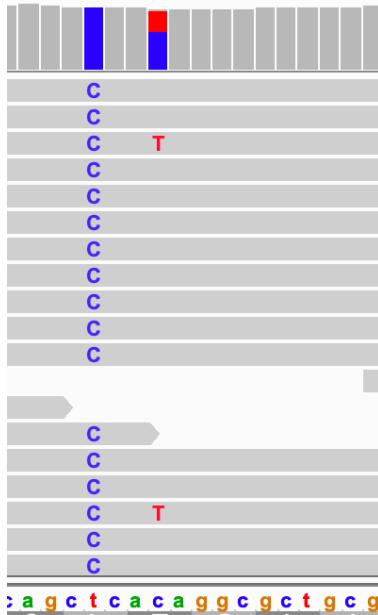


image: <https://www.khanacademy.org>

# Small variants

- Single nucleotide polymorphism (SNP)

ATCATG**A**CCGTCA

ATCATG**T**CCGTCA

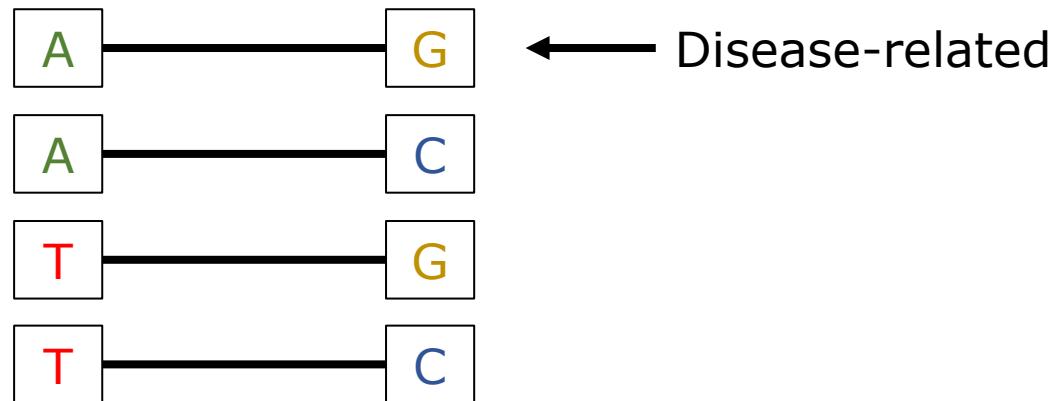
- Insertion/deletion (INDEL)

ATCATG**A**CCGTCA

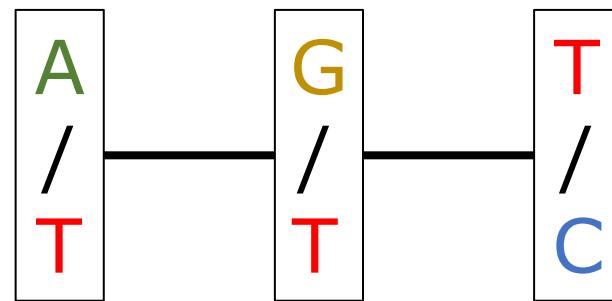
ATCATG---GTCA

# Haplotypes

- NGS variants: mostly SNP
- Most SNPs are bi-allelic e.g. [A/T], [G/C]
- Genetic variation is often multi-allelic

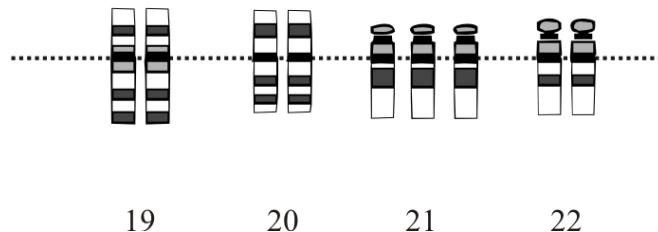


# Quiz Question 2



# Large variants

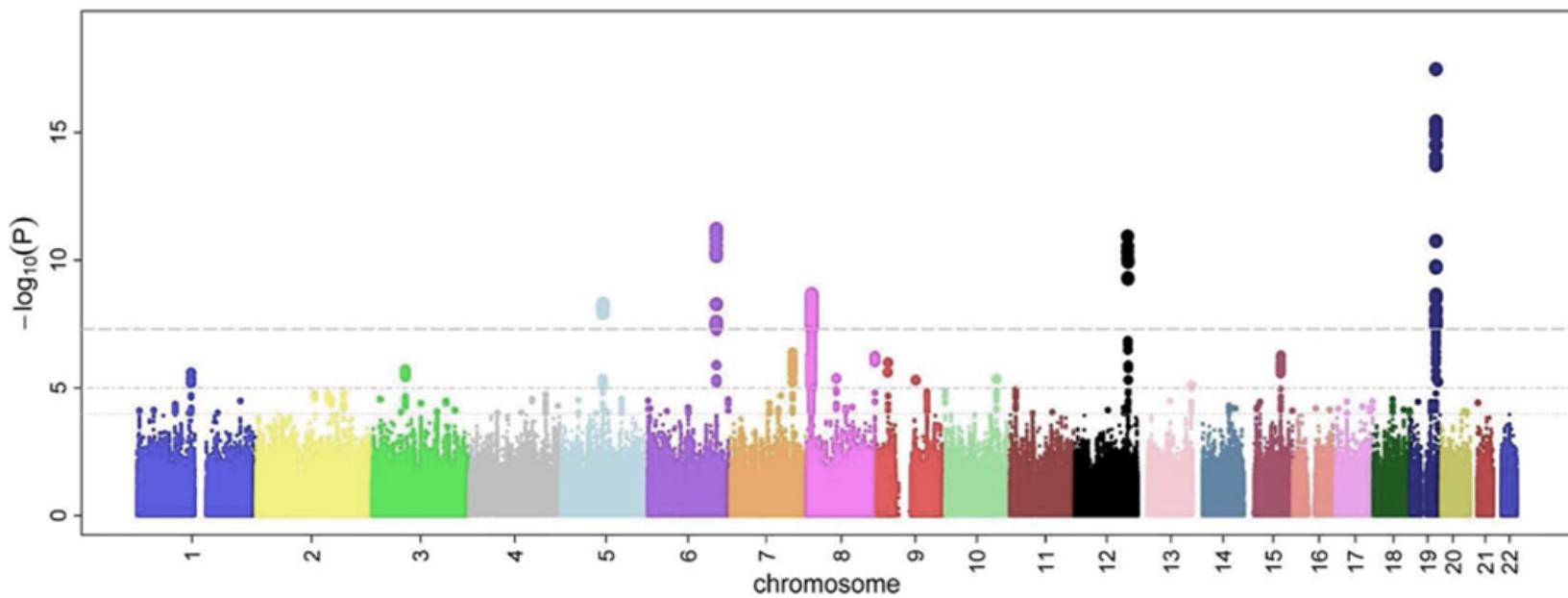
- Structural variance (> 1,000 base pairs)
  - Copy number variation
  - Translocations
  - Inversions
  - Deletions/insertions
- Chromosomal aberration



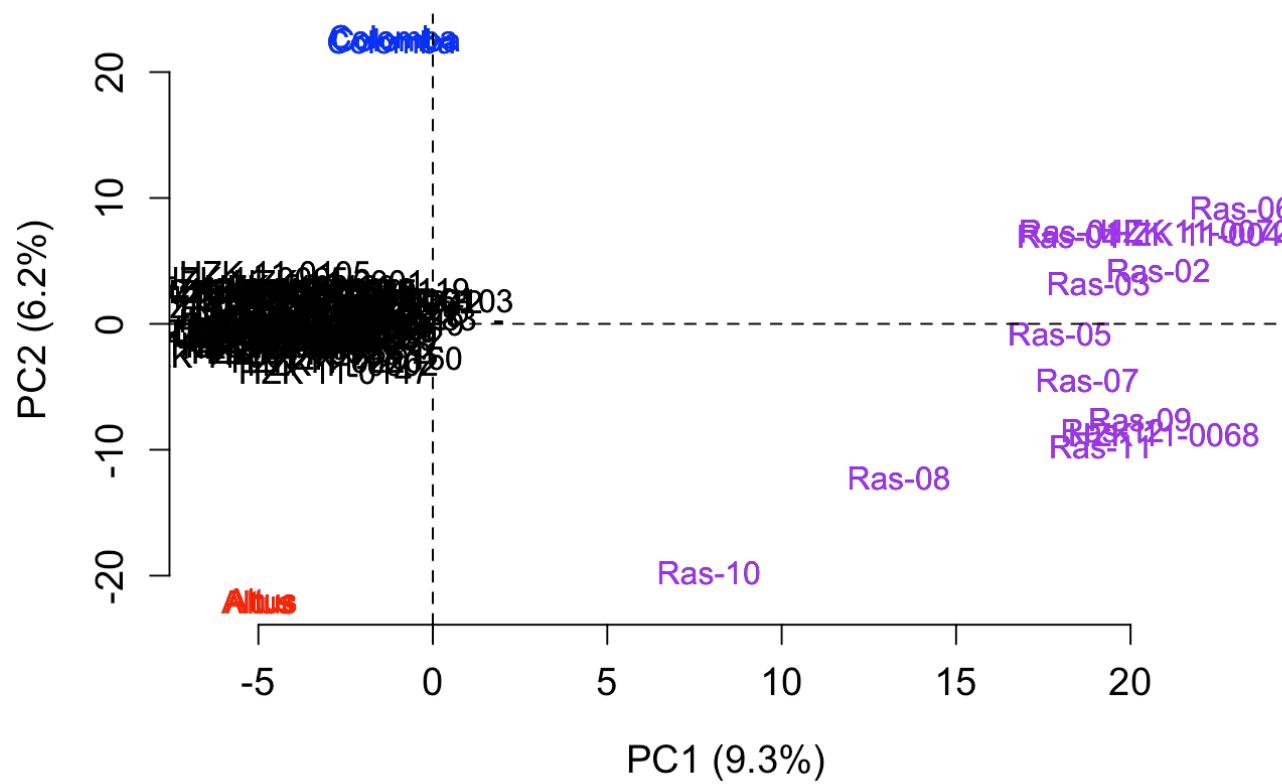
<https://en.wikipedia.org/wiki/Aneuploidy>



# Genetic association



# Relatedness



# This course

- Inherited (germline) small variants
- Detection by next generation sequencing (NGS)

