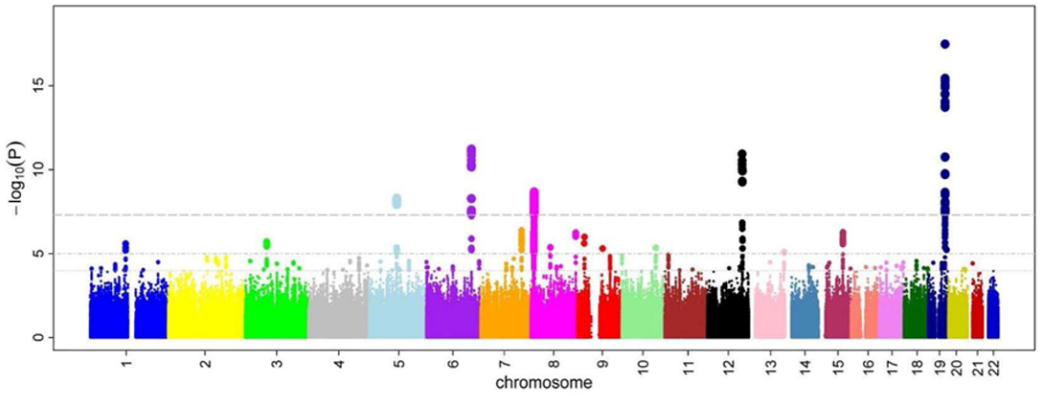
NGS – variant analysis

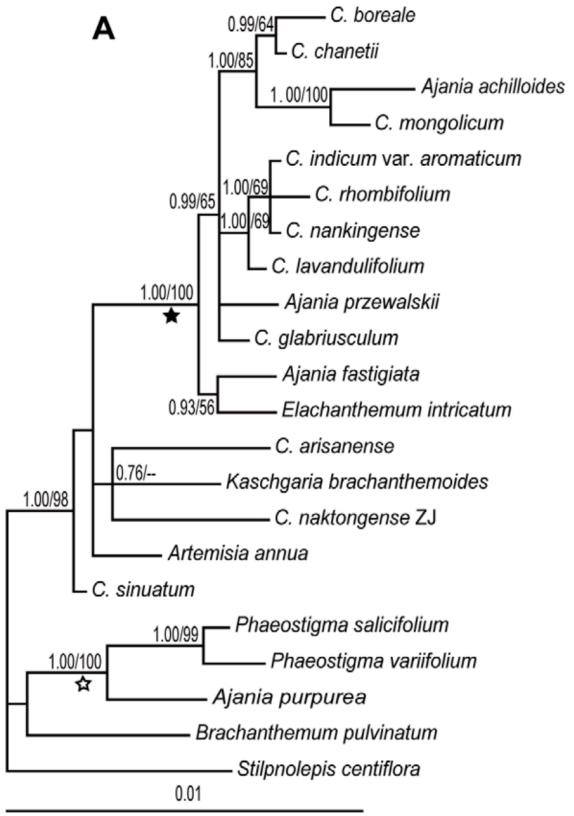
Introduction to variant analysis

Why study variants?

- Find causes for phenotypic variation
- Understand relatedness



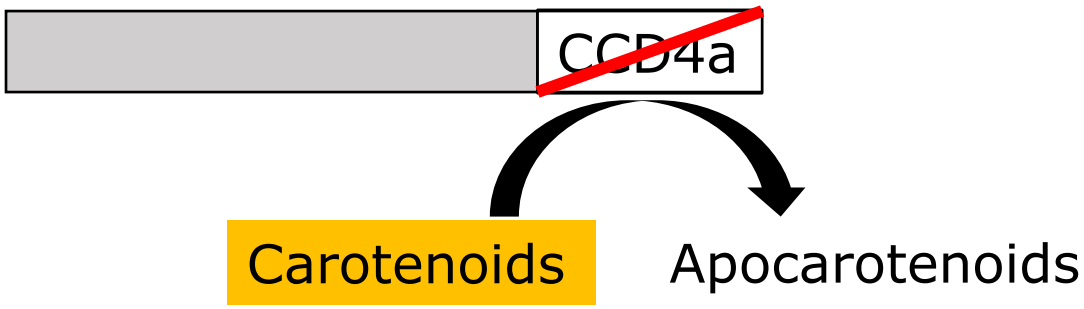
https://en.wikipedia.org/wiki/Genome-wide_association_study



Liu PL et al. PLoS One (2012) 7:e48970

Mutation

Change in DNA sequence



Mutations - causes

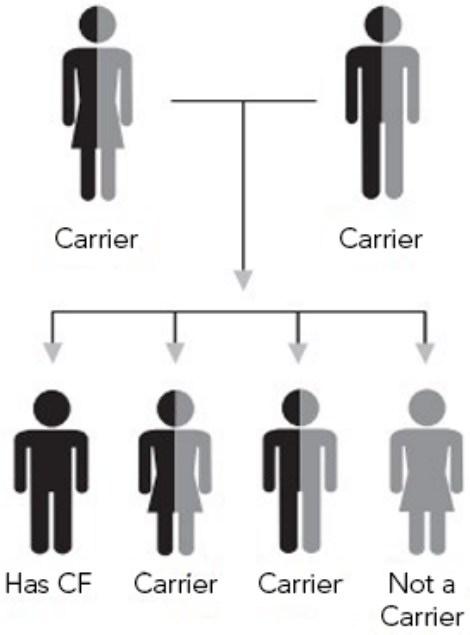
Change in DNA sequence

- Repair mistakes
- Unbalanced mitosis
- Transposable elements

https://nl.wikipedia.org/wiki/Springend_gen

Genomic variation

- inherited – germline mutation
- cells – somatic mutation



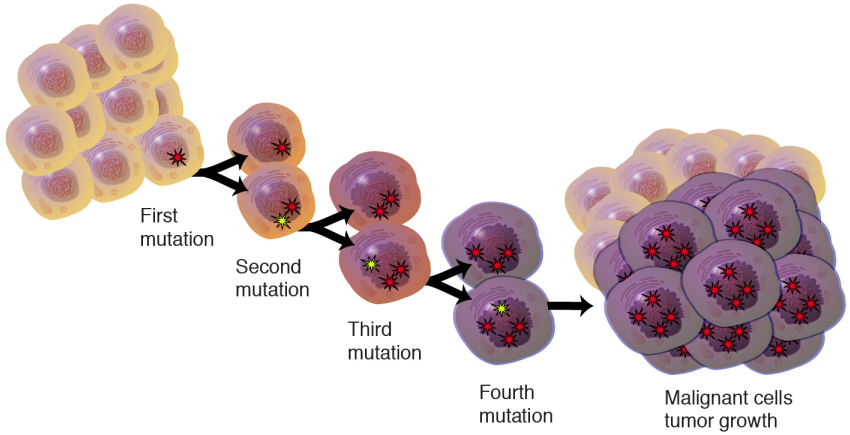


image sources
https://www.cff.org/
https://www.genome.gov/genetics-glossary/Cancer

Question 1

What kind of mutation has caused the flower to turn yellow?

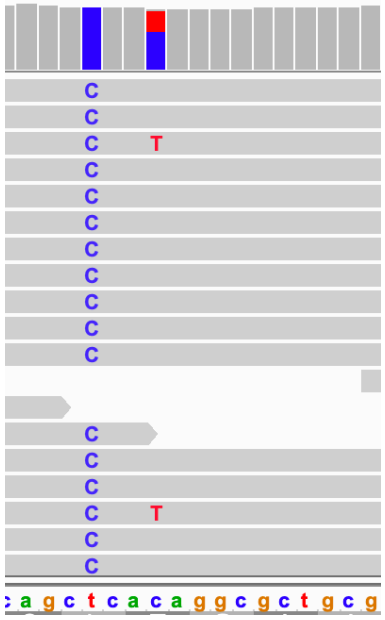
A. Somatic mutation

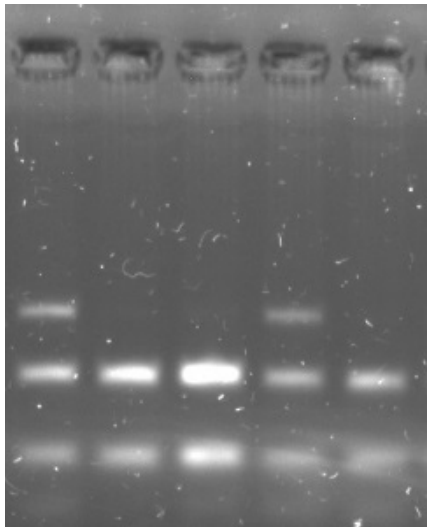
B. Germline mutation

C. Both

Detecting mutations

- Phenotypic analysis
- Molecular analysis
- Sequencing





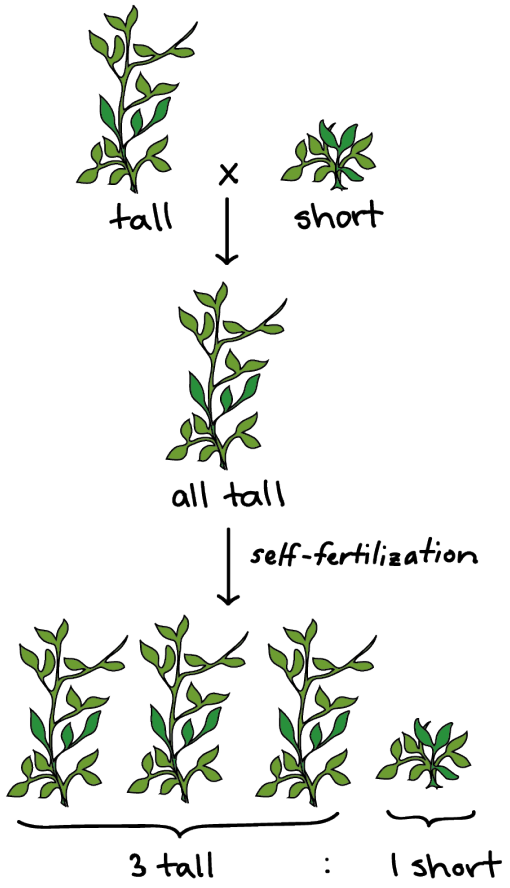
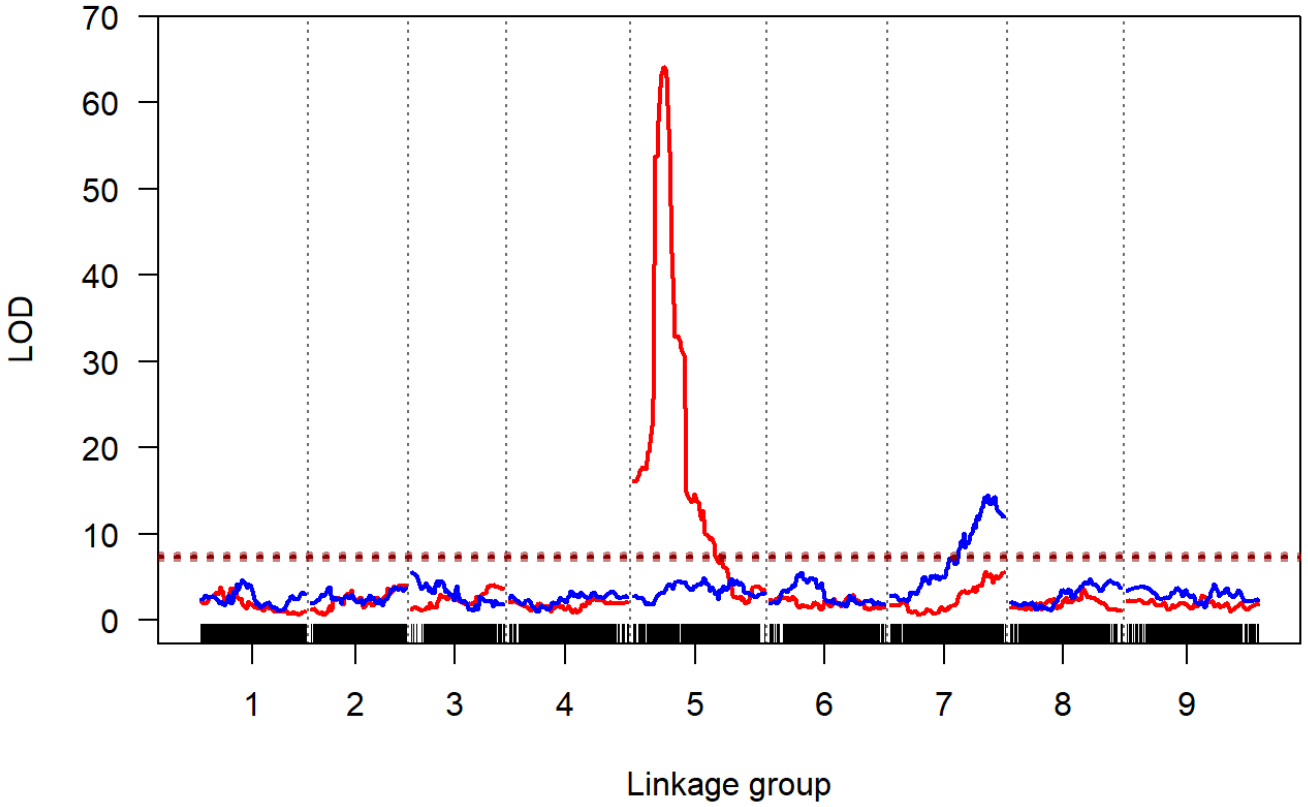


image: https://www.khanacademy.org

Genetic association



Small mutations

- Single nucleotide polymorphism (SNP)

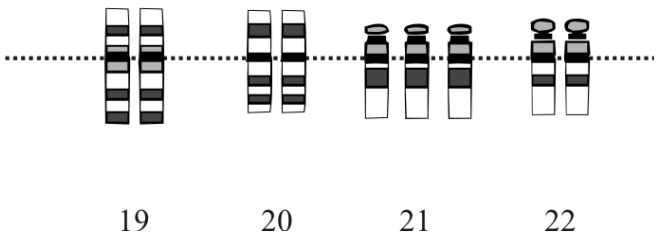
```
ATCATGACCGTCA
ATCATGTCCGTCA
```

- Insertion/deletion (INDEL)

```
ATCATGACCGTCA
ATCATG---GTCA
```

Large mutations

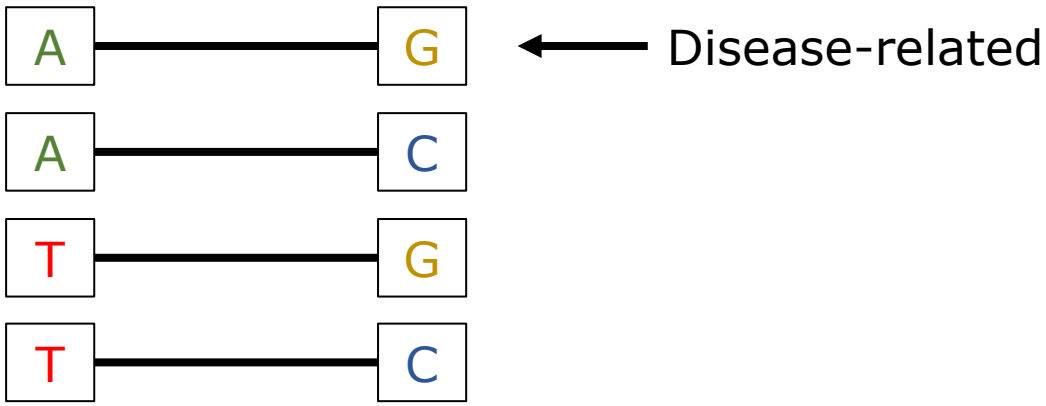
- Structural variance (> 1,000 base pairs)
  - Copy number variation
  - Translocations
  - Inversions
- Chromosomal abberation



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

Haplotypes

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



This course

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