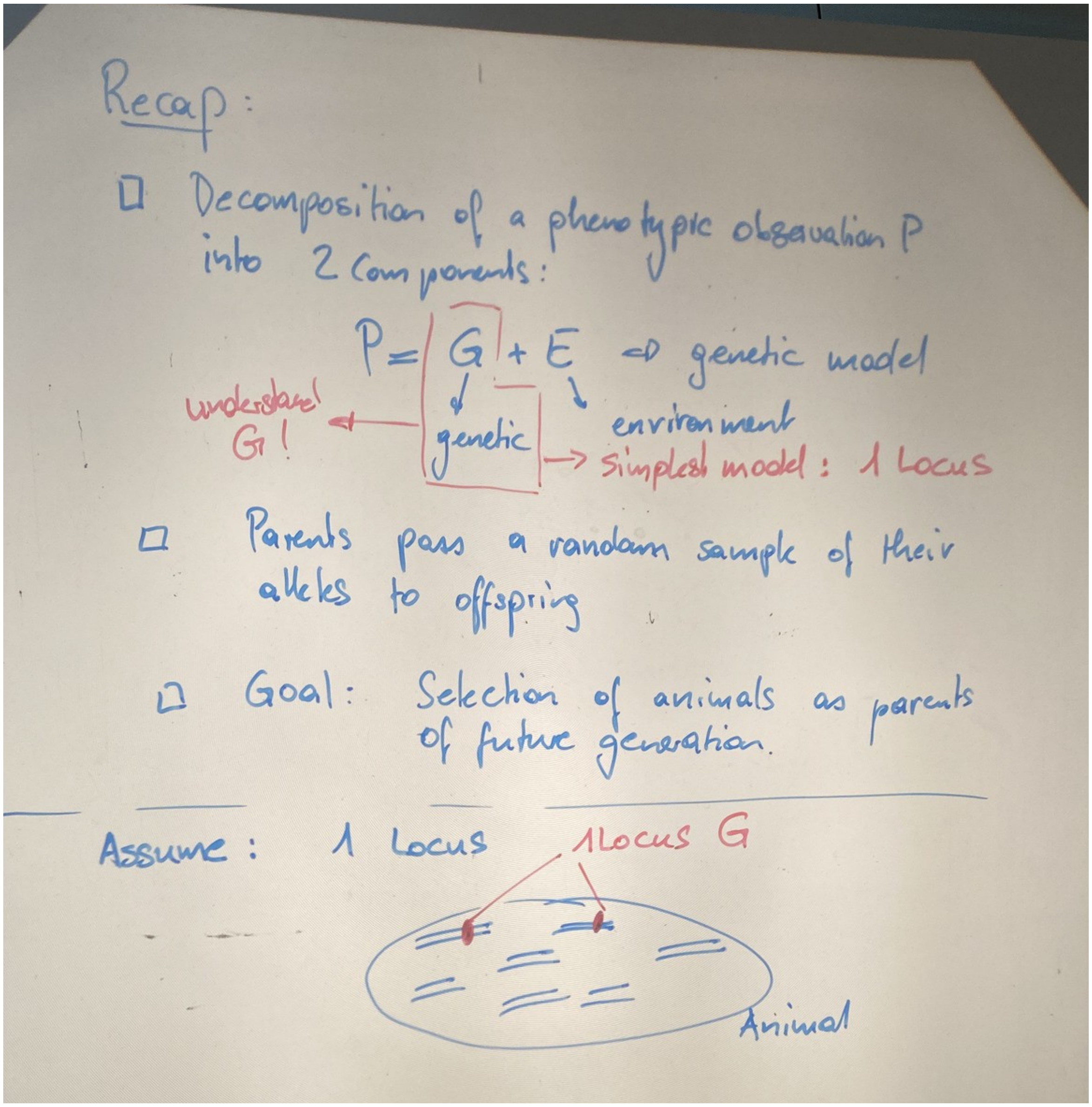
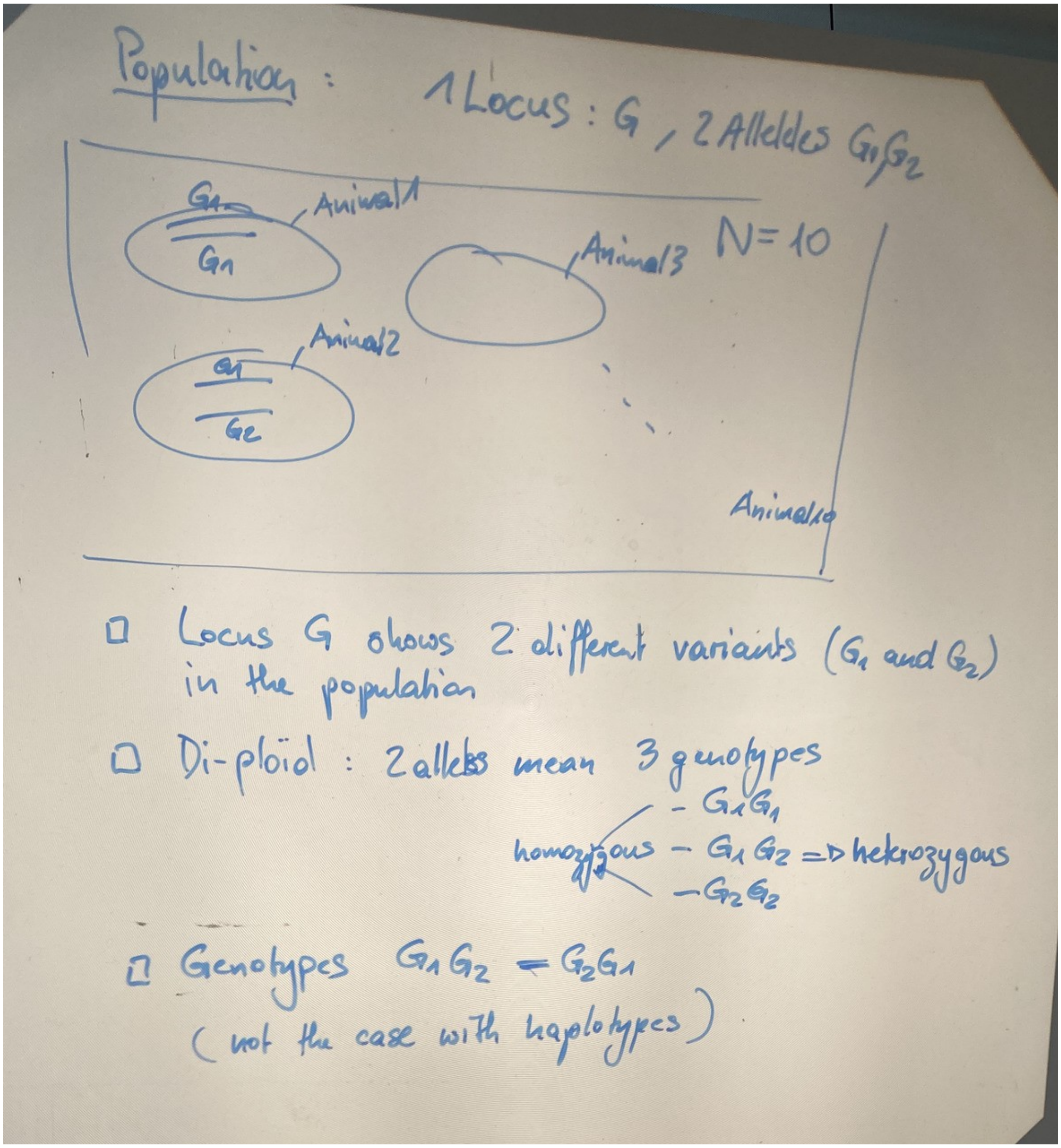
OHP Picture 1



OHP Picture 2



OHP Picture 3

Locus G is characterized within our population by the following quantities:

- Genotype frequency: Rate of occurence of each genotype in the population:

$$f(G_1G_1) = \frac{\#G_1G_1\text{-genotypes}}{N} = \frac{4}{10} = 0.4$$

$$f(G_1G_2) = \qquad = \frac{3}{10} = 0.3$$

$$f(G_2G_2) = \qquad = \frac{3}{10} = 0.3$$

- Allele frequency:

$$f(G_1) = \frac{\#G_1\text{-alleles}}{2 \cdot N} = \frac{2 \cdot 4 + 3}{20} = \frac{11}{20} = 0.55$$

$$f(G_2) = \qquad = \frac{3 + 2 \cdot 3}{20} = \frac{9}{20} = 0.45$$

OHP Picture 4

- Genotype- and Allele-frequencies give a description of the current status of a population with respect to a given locus.

- What happens from parents to offspring?

  Assume: $f(G_1) = p$; $f(G_2) = q = 1-p$

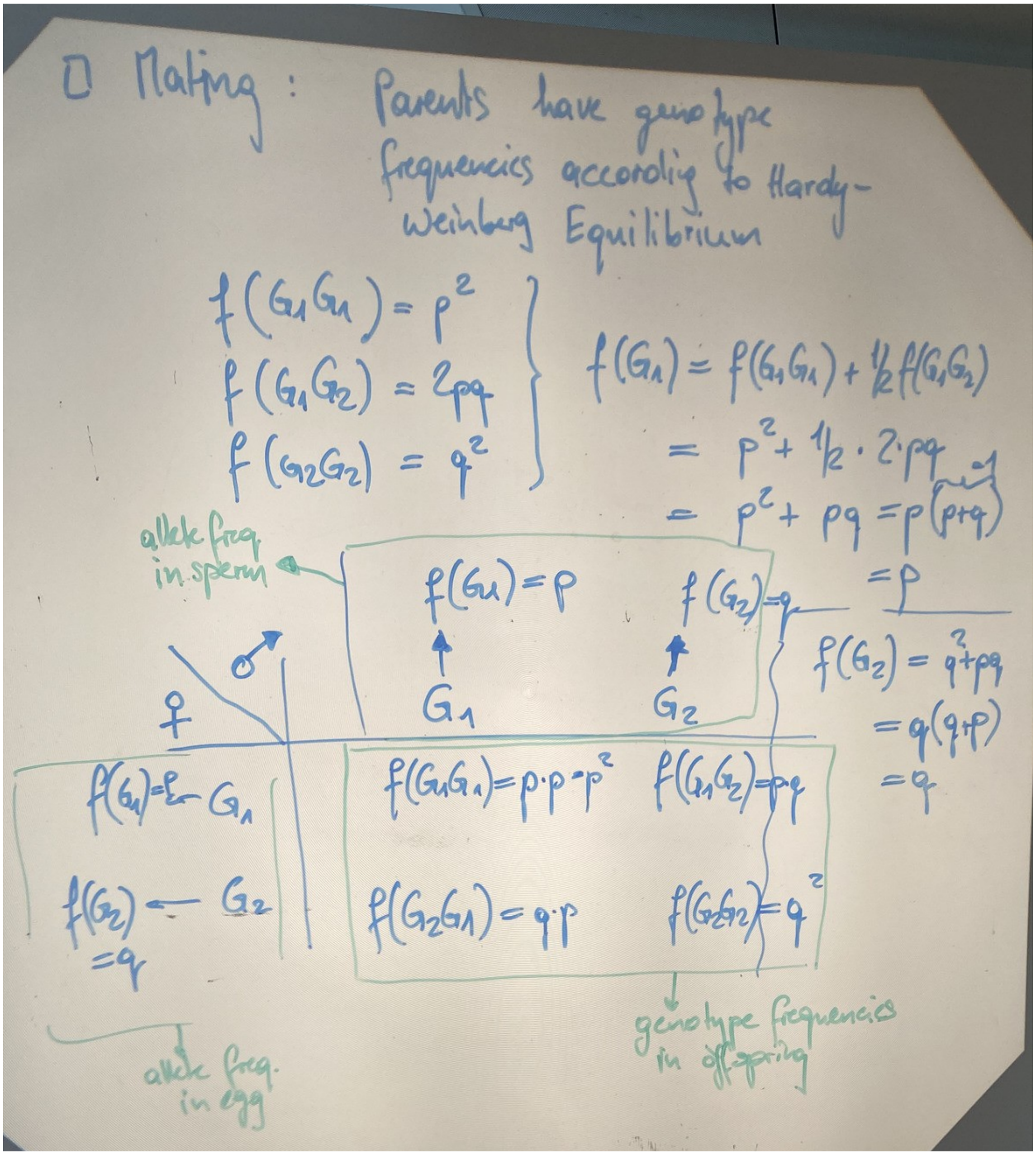
  Random mating: (Idealized population of infinite size)

Alleles	G_1	G_2
→ G_1	$f(G_1G_1) = p \cdot p = p^2$	$\boxed{f(G_1G_2) = p \cdot q}$
→ G_2	$\boxed{f(G_2G_1) = q \cdot p}$	$f(G_2G_2) = q \cdot q = q^2$

- Summary: $f(G_1G_1) = p^2$; $f(G_1G_2) = 2 \cdot p \cdot q$

  $f(G_2G_2) = q^2$

OHP Picture 5



OHP Picture 6

☐ Summary: Hardy Weinberg Law

1. Relationship between allele frequencies and genotype frequencies is given by

$$f(G_1) = p \; ; \; f(G_2) = q$$

$$f(G_1G_1) = p^2 \; ; \; f(G_1G_2) \; 2 \cdot pq \; ; \; f(G_2G_2) = q^2$$

2. Under random mating, genotype frequencies and allele frequencies stay constant from generation to the next one.

OHP Picture 7

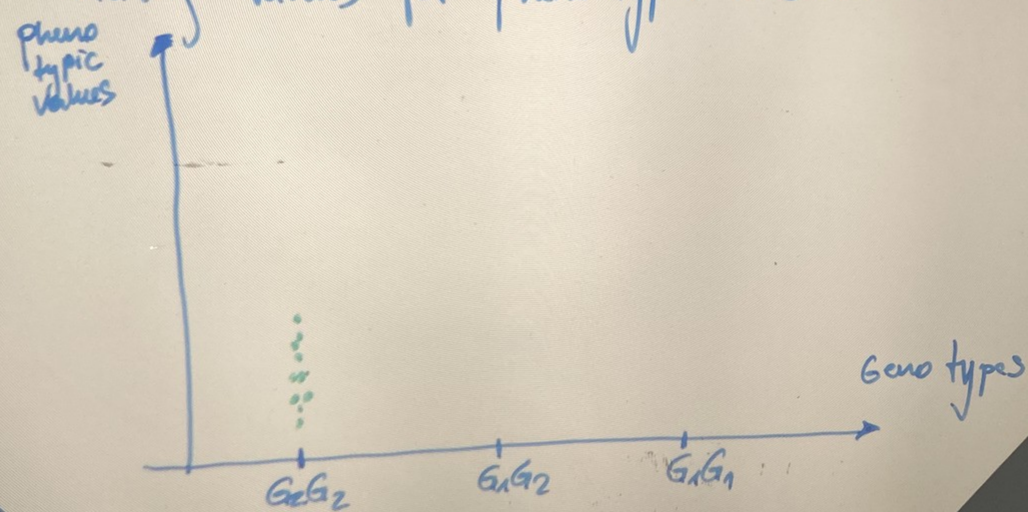
1. Relationship between allele frequencies and genotype frequencies is given by

$f(G_1) = p$; $f(G_2) = q$

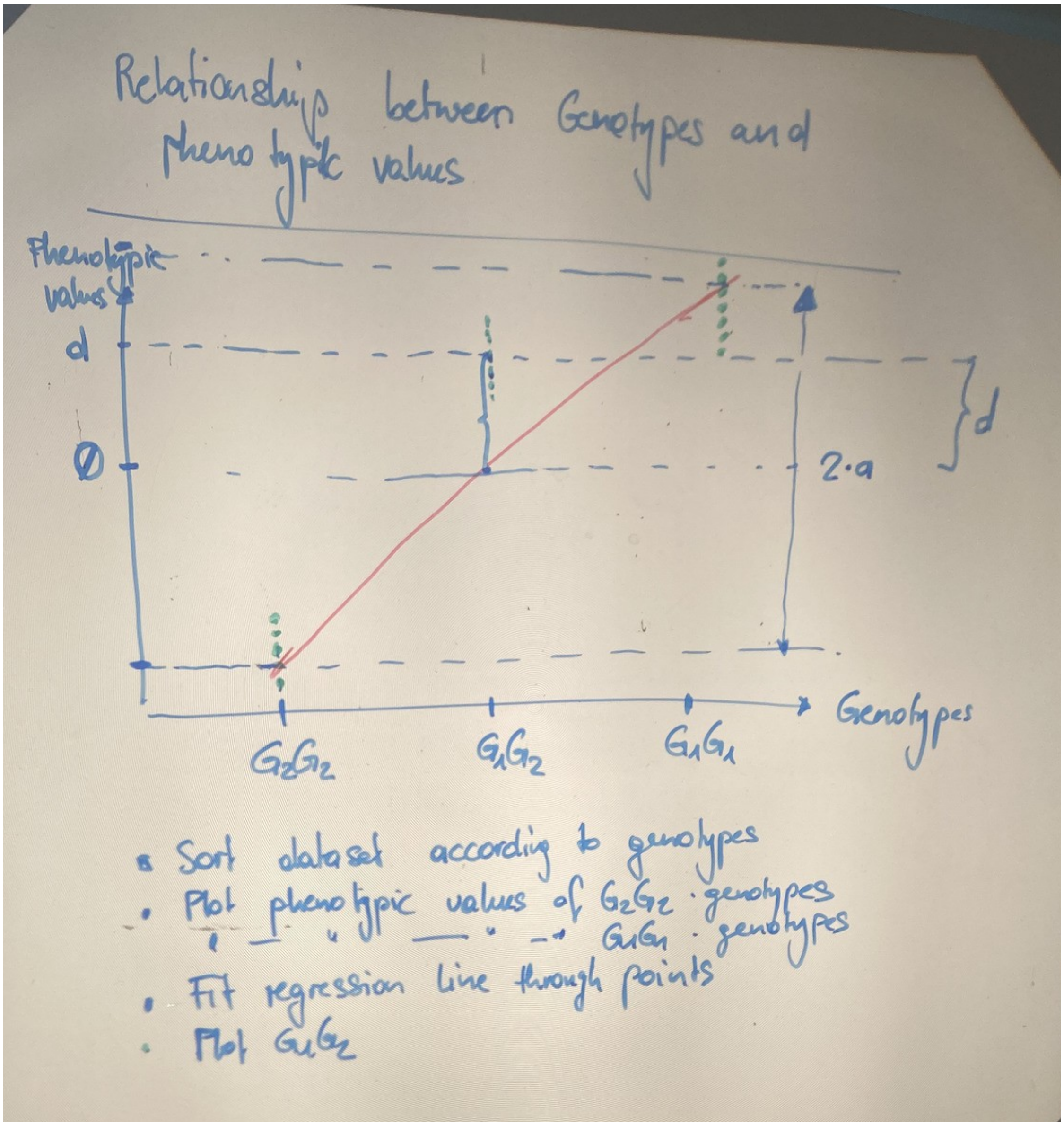
$f(G_1G_1) = p^2$; $f(G_1G_2)$ $2 \cdot pq$; $f(G_2G_2) = q^2$

2. Under random mating, genotype frequencies and allele frequencies stay constant from generation to the next one.

Adding values for phenotypic observations



OHP Picture 8



OHP Picture 9

Genotypic Values

Genotype	Genotypic Value (V)
G_1G_1	$+a = V_{11}$
G_1G_2	$+d = V_{12}$
G_2G_2	$-a = V_{22}$

Population

- V is a discrete random variable
- Expected value of V:

$$E(V) = V_{11} \cdot f(G_1G_1) + V_{12} \cdot f(G_1G_2) + V_{22} \cdot f(G_2G_2) \rightarrow \text{Hardy-Weinberg}$$

$$= a \cdot p^2 + d \cdot 2pq + (-a) \cdot q^2$$

$$= (p^2 - q^2) \cdot a + 2pqd$$

$$= (p-q)a + 2pqd$$

$$= \underbrace{\mu \text{ (mu)}}_{\text{Population Mean}}$$

$$(p^2 - q^2) = (p+q)(p-q) = (p-q)$$

OHP Picture 10