



Basic single-gene inheritance

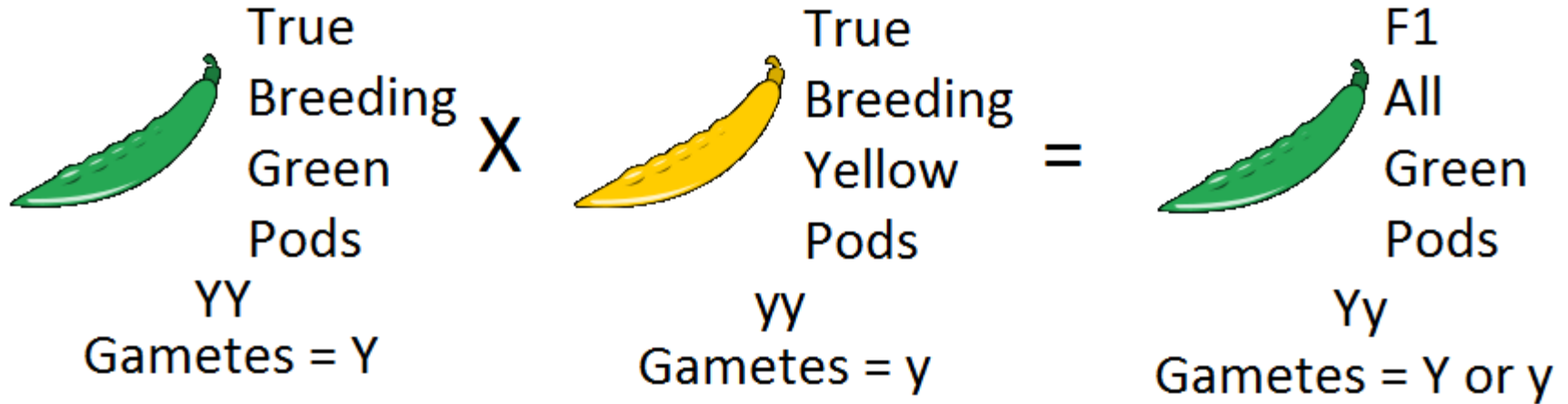


Meiosis + fertilization needed for Mendelian inheritance



Gregor Mendel
Austrian monk
1822-1884

Identified simple rules of inheritance

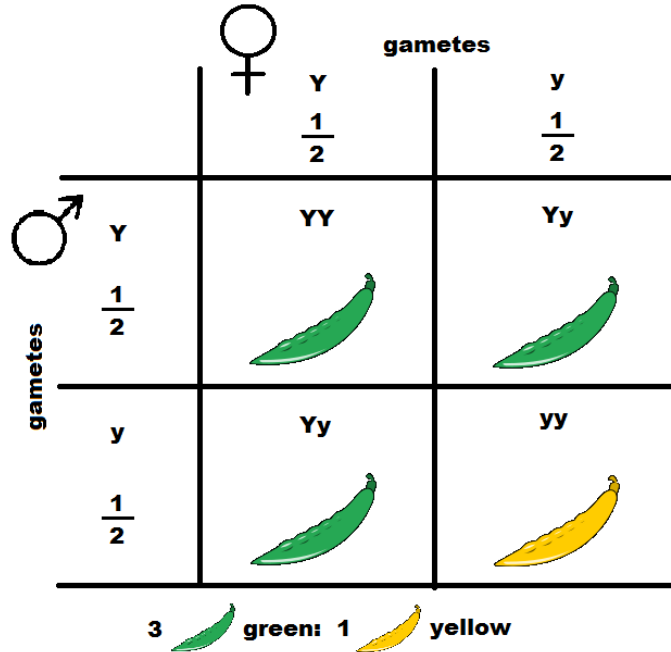


Masking of yellow color by green color copy (Y) is called “dominance” of Y.

Green (Y) is dominant, yellow (y) is recessive.

What happens when breed F_1 s?

- Yy are called heterozygous” since have both alleles.
- Can use “Punnett square” to follow inheritance.



Mendel got 428 green and 152 yellow peas from this cross.

Mendel's First Law: Three Postulates



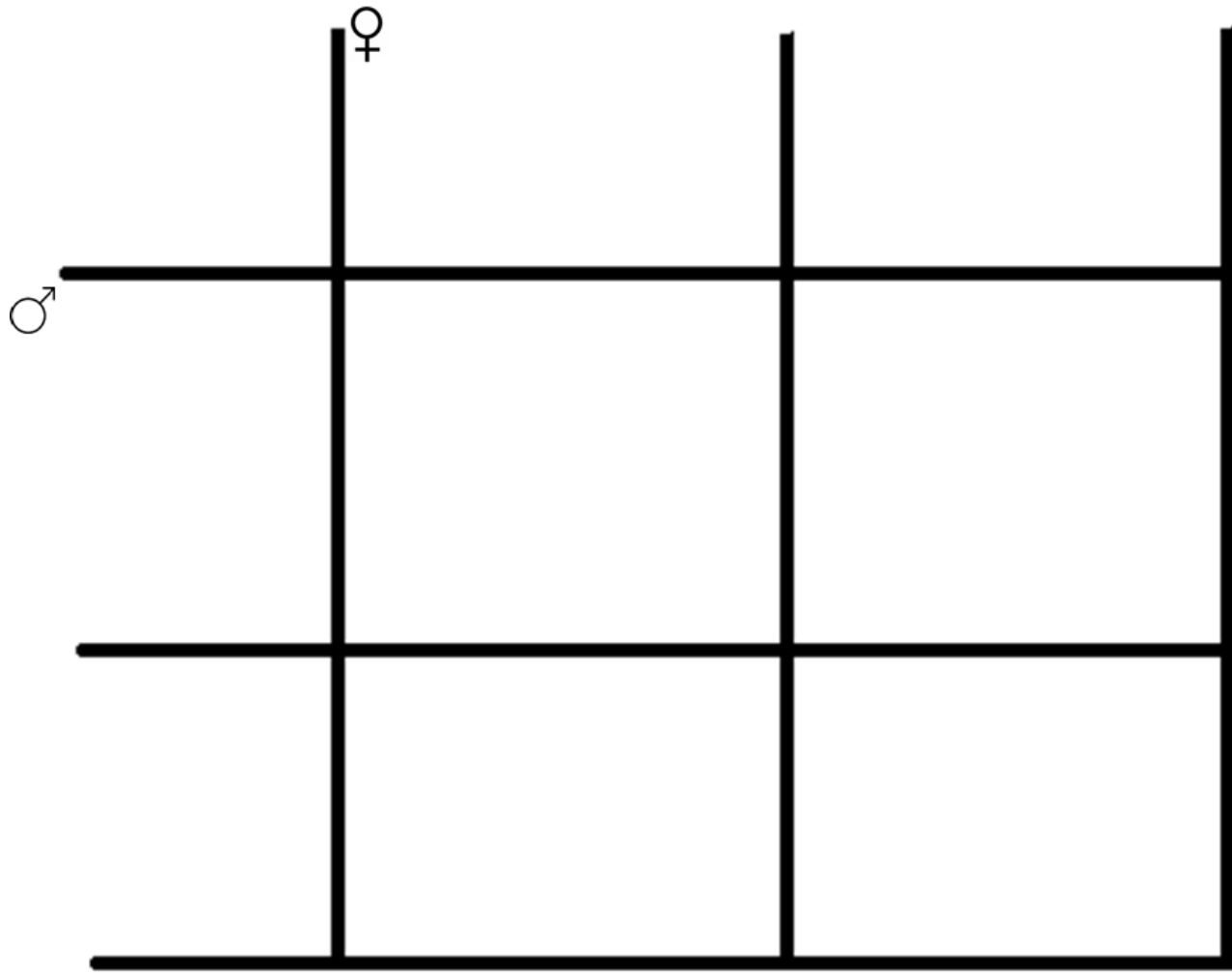
- Unit factor in pairs (diploid)
 - Get one “allele” from mom, one “allele” from dad
- Dominance/ recessivity
 - Don't always see this- sometimes F_1 is intermediate.
- Equal segregation in gametes
 - Paired factors separate, and equally likely to transmit either one to offspring



Try this...



- You are a farmer working on corn.
- You have pure-breeding **TALL** and **short** strains of corn, and you've heard the difference is caused by a single gene.
- You cross the **TALL** and **short** strains together, and you get strains that are **Intermediate** in height.
- You cross these **Intermediate** height corns together. What will you see?

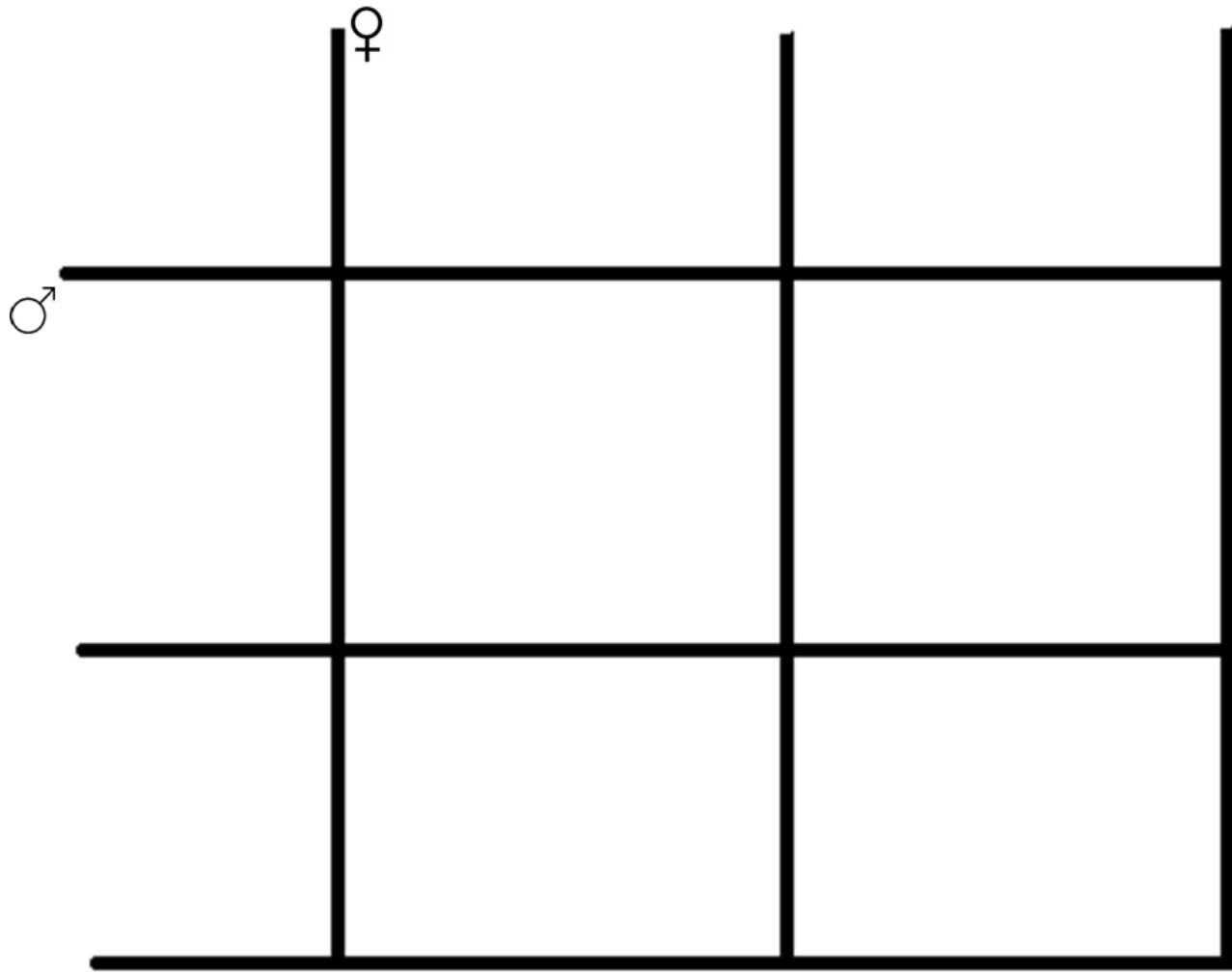




Try this 2...







- You are a farmer working on corn.
- You have pure-breeding **TALL** and **short** strains of corn, and you've heard the difference is caused by a single gene.
- You cross the **TALL** and **short** strains together, and you get strains that are **Intermediate** in height.
- You cross the **Intermediate** height corn to **TALL** corn. What will you see?



Important insight

- Dominance matters in how the offspring will **LOOK**.
- Dominance does NOT matter in how the gametes will **pair**.
- You can always use a Punnett square for single-gene transmission genetics.

		pollen ♂	
		B	b
pistil ♀	B	 BB	 Bb
	b	 Bb	 bb

Medical example

- $1/8$ (~12%) of women get breast cancer
- Known mutations in ***FGFR2*** gene associated with increased risk of breast cancer
 - Let's call “nonmutant” form **FF**: ~**12%** risk
 - Heterozygote **Ff**: ~20% higher, so ~**15%** risk
 - Homozygote **ff**: ~60% higher, so ~**19%** risk



You meet someone who you discover has an *FGFR2* mutation

- Let's assume you're FF
- Your potential hubby is Ff
- What is the probability that your daughters could get breast cancer?



FF: 12%

Ff: 15%

ff: 19%

	♀		
♂			

Can do the same type of cross with unknowns and infer the parents

- Albinism is inherited as recessive in humans
- What if a **non-albino** mom and **albino** dad have 8 kids, of which **4** are albino
- Genotypes of parents?



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