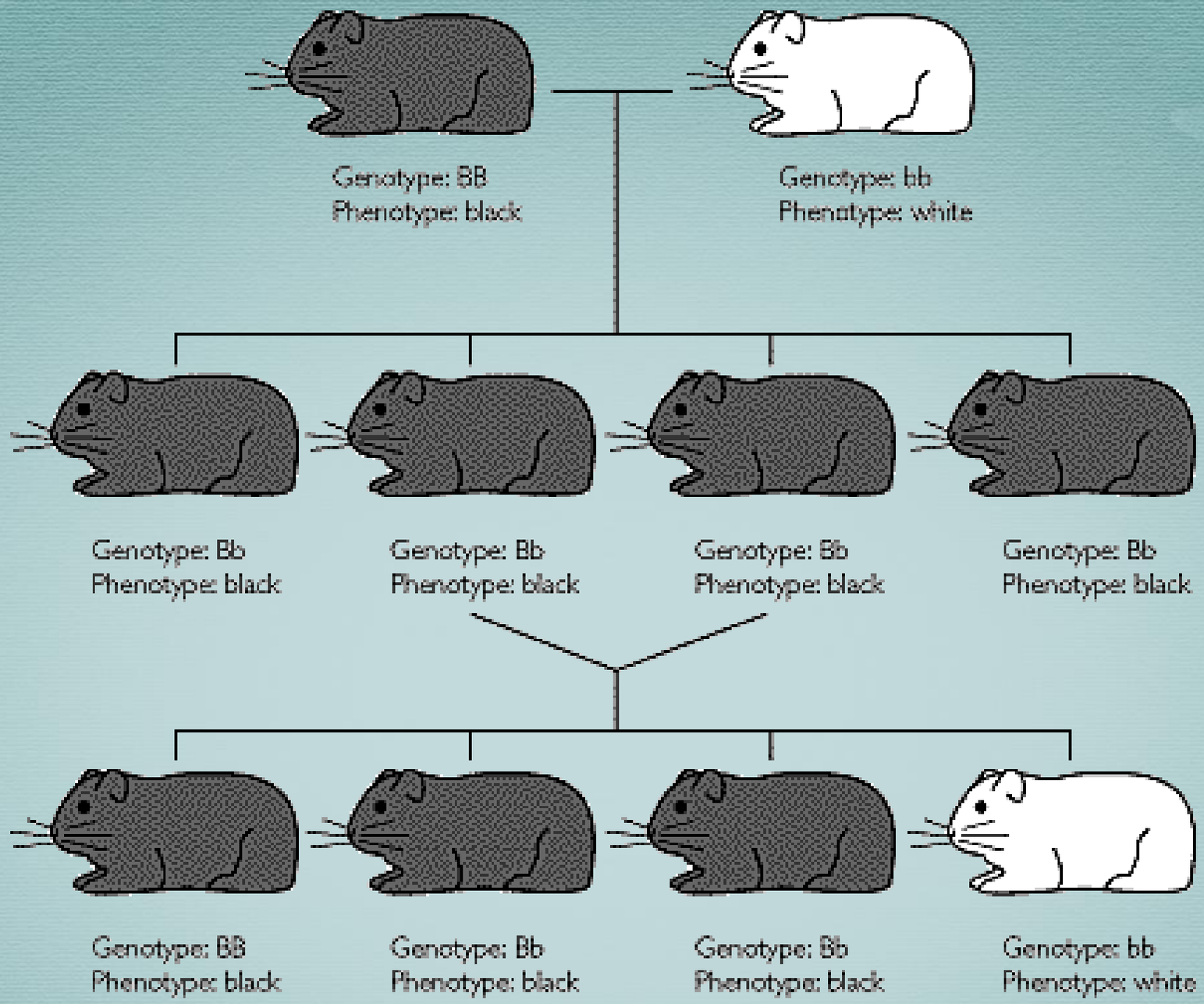


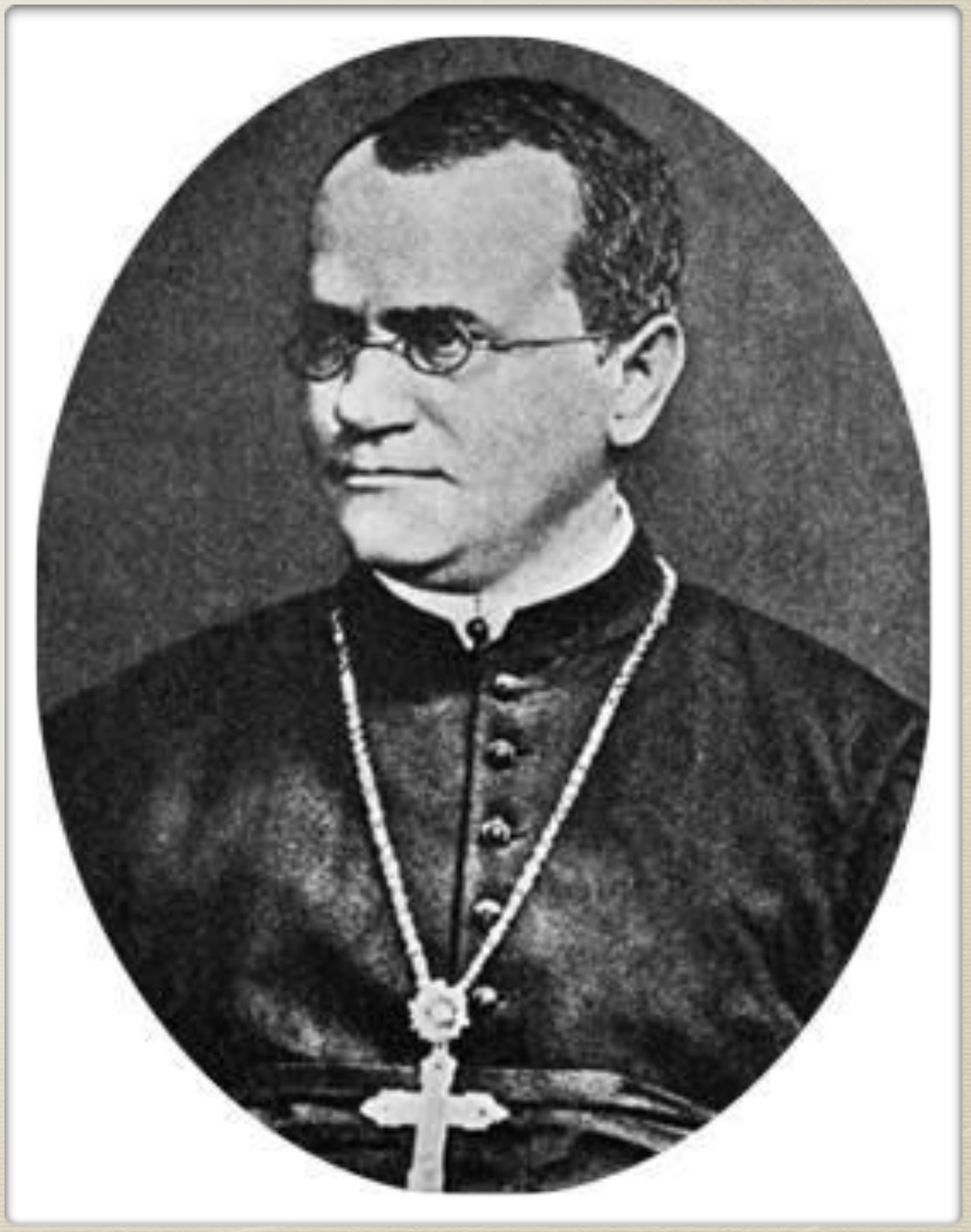
Inheritance

Inheritance vs. Genetics

- The passing of traits from parents to offspring
- Humans have known about inheritance for a very long time
- Genetics is the study of inheritance
- Genetics is relatively new science (around 150 years)

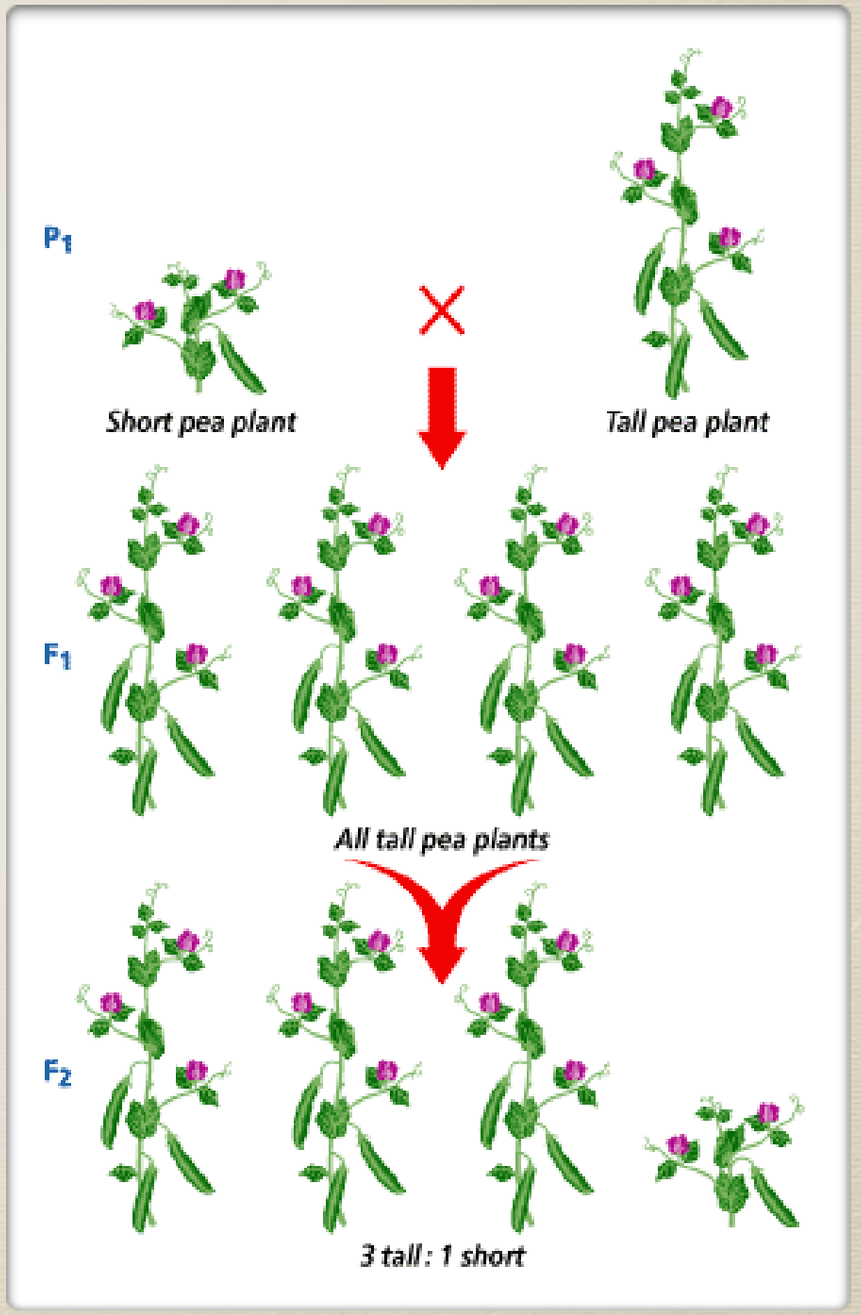
Gregor Mendel

- Considered the Father of Modern Genetics
- Was a monk in Austria in the 1800s
- Did his research from1856-1863
- Used pea plants to study heredity



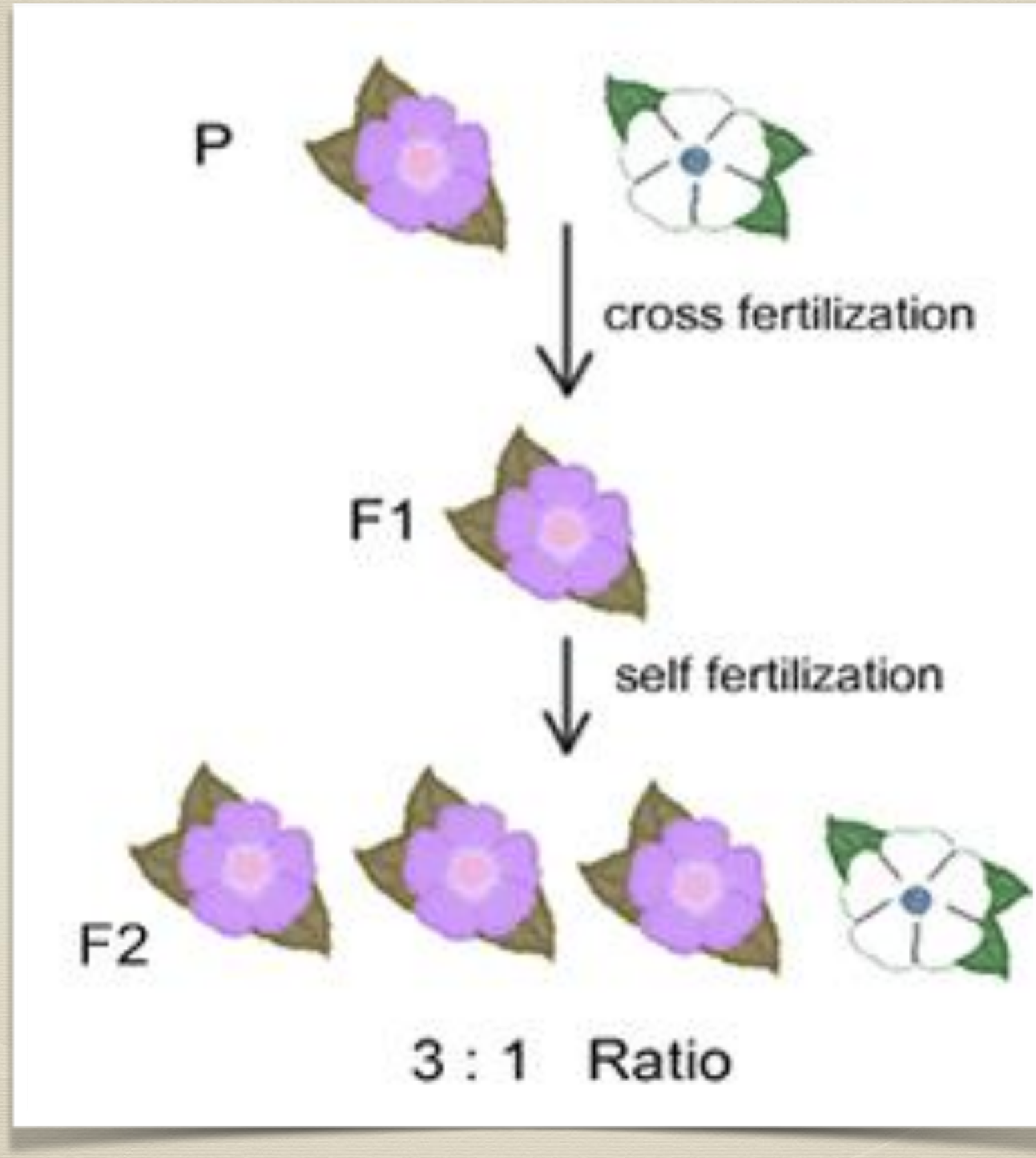
Why use peas?

- Grow quickly
- Many traits known
- Self-pollinating
- Results in pure bred plants
- Identical to parent
- Many varieties



Mendel's Peas

- Used seven characteristics of the peas: flower color, seed color, seed shape, pod shape, flower position, and plant height
- Studied one characteristic at a time
- Applied math to his research
- P generation - the parental generation
- F1 - first generation
- F2 - second generation


P
cross fertilization
F1
self fertilization
F2
3 : 1 Ratio

×

parents

×

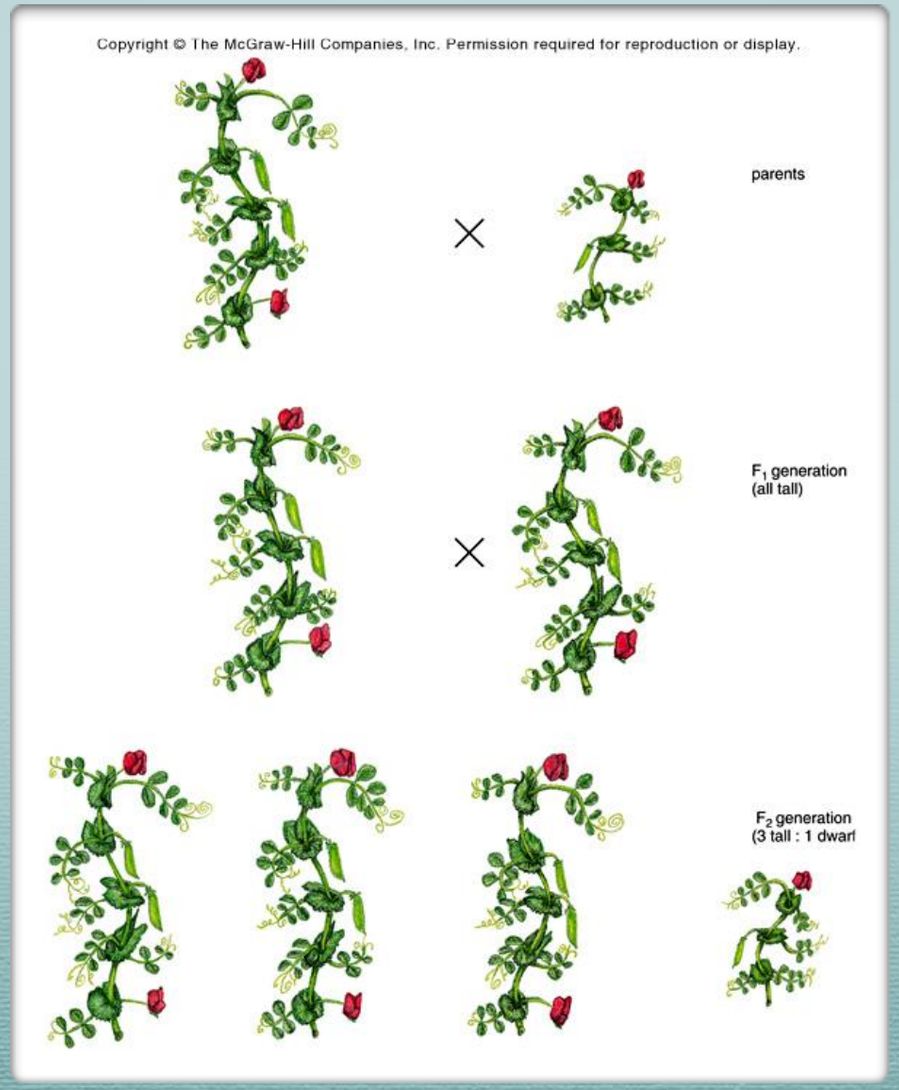
F_1 generation
(all tall)

F_2 generation
(3 tall : 1 dwarf)

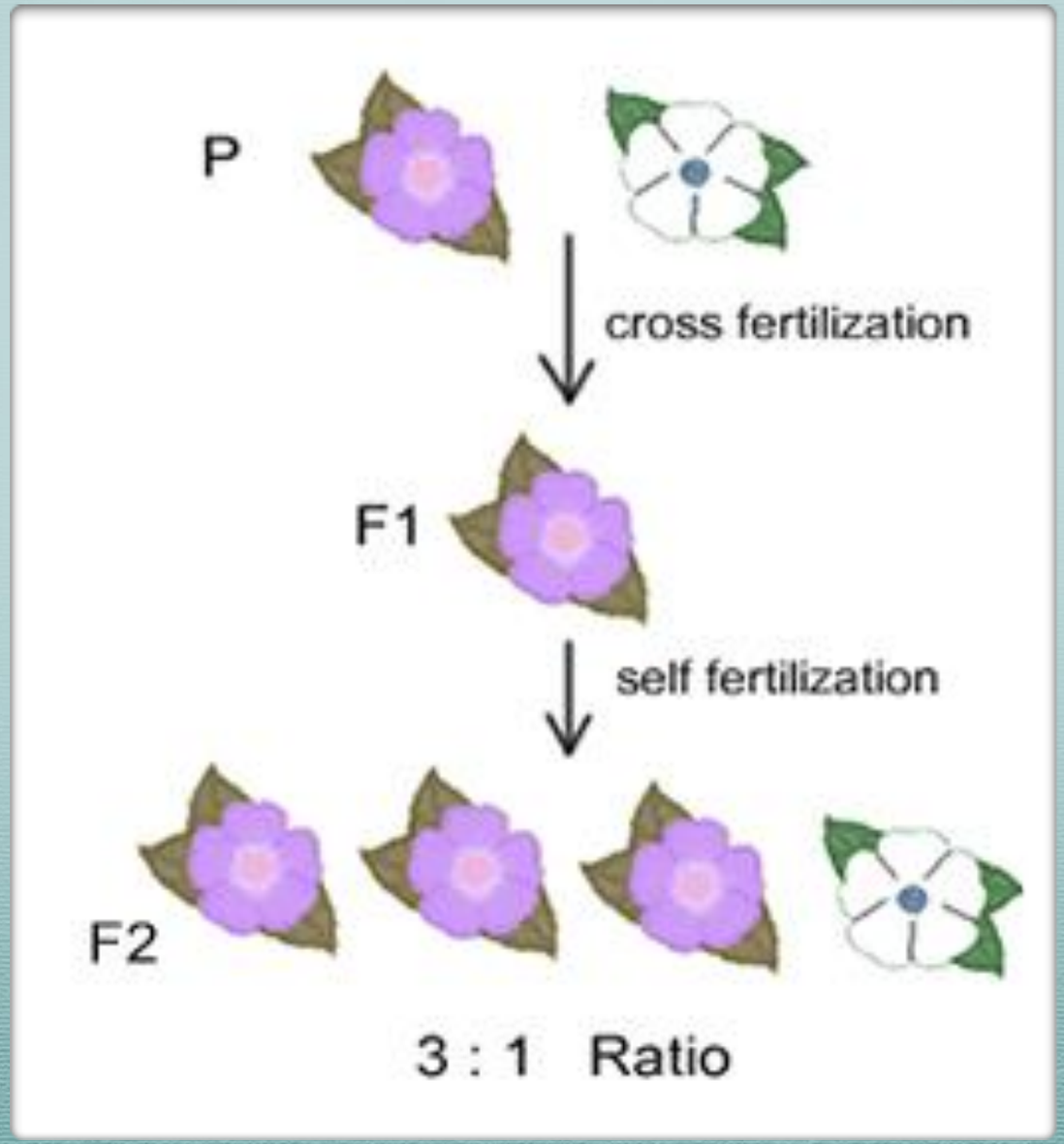
Mendel's Ideas

- Genes have alternate versions called alleles
- Each offspring inherits two alleles, one from each parent
- If the alleles differ, the dominant allele is expressed
- The recessive allele remains hidden unless the dominant allele is absent

Which is dominant tall or short allele?



Which is the recessive gene purple or white allele?



Vocabulary

- Phenotype: the physical appearance of the individual
- Genotype: the genetic makeup of the individual usually shown in a code (ie: T= tall and t= short)
- Homozygous: when the two alleles are the same (TT)
- Heterozygous: when the two alleles are different (Tt)

Phenotype		Genotype	
Purple		*PP* (homozygous)	1
Purple		*Pp* (heterozygous)	2
Purple		*Pp* (heterozygous)	
White		*pp* (homozygous)	1
Ratio 3:1		Ratio 1:2:1	

Which is the genotype?

Tt Height

Bb Brown eyes

Cc Red hair

which are heterozygous?

Bb

GG

TT

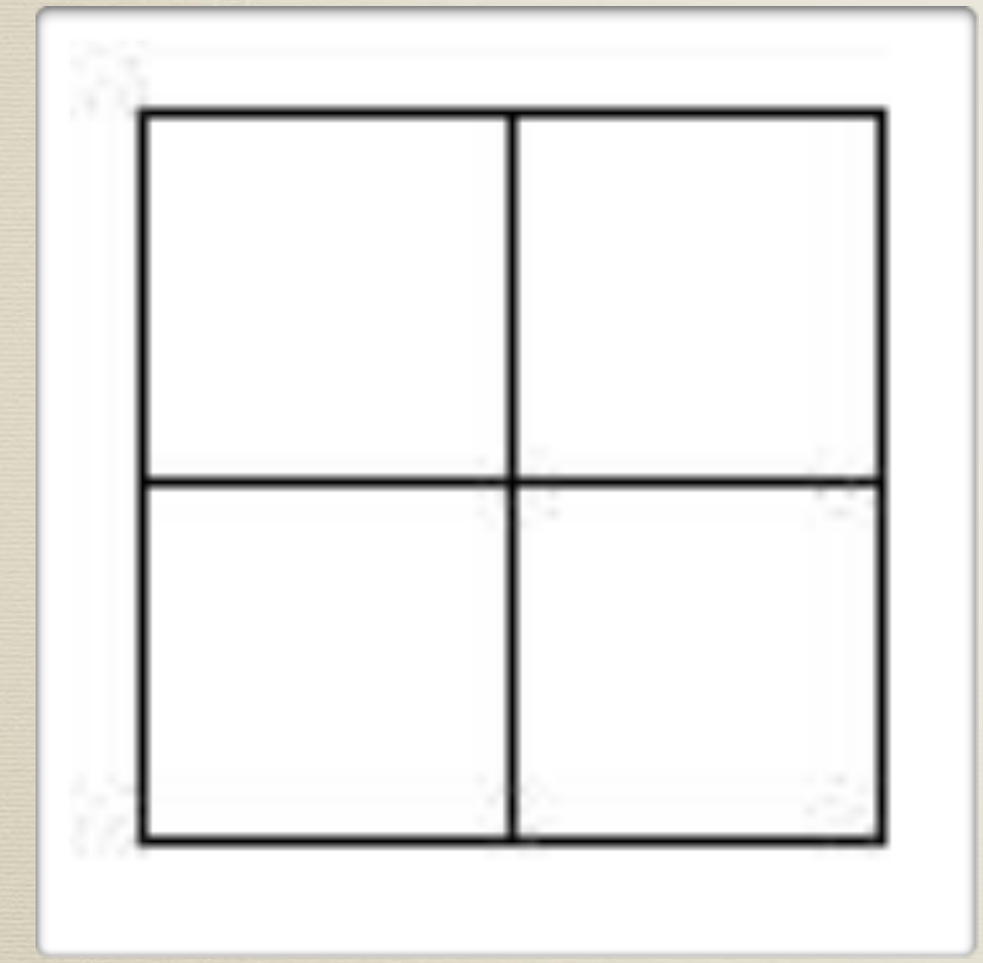
tt

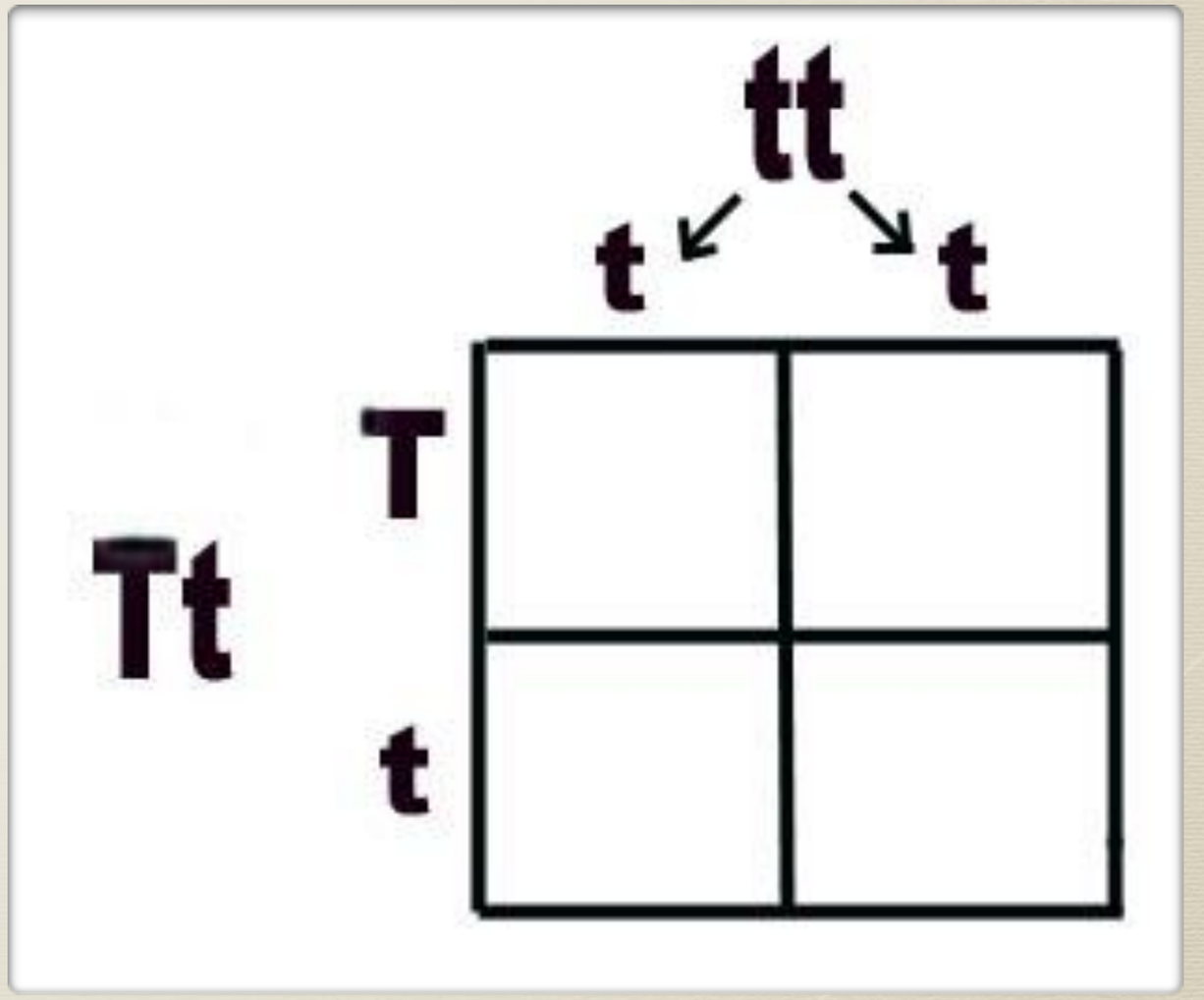
Ll

Punnett Squares

- Used to show all possible combinations of alleles
- Dominant traits are shown with a capital letter
- Recessive traits are shown with a lower case letter
- Genotype is needed to complete

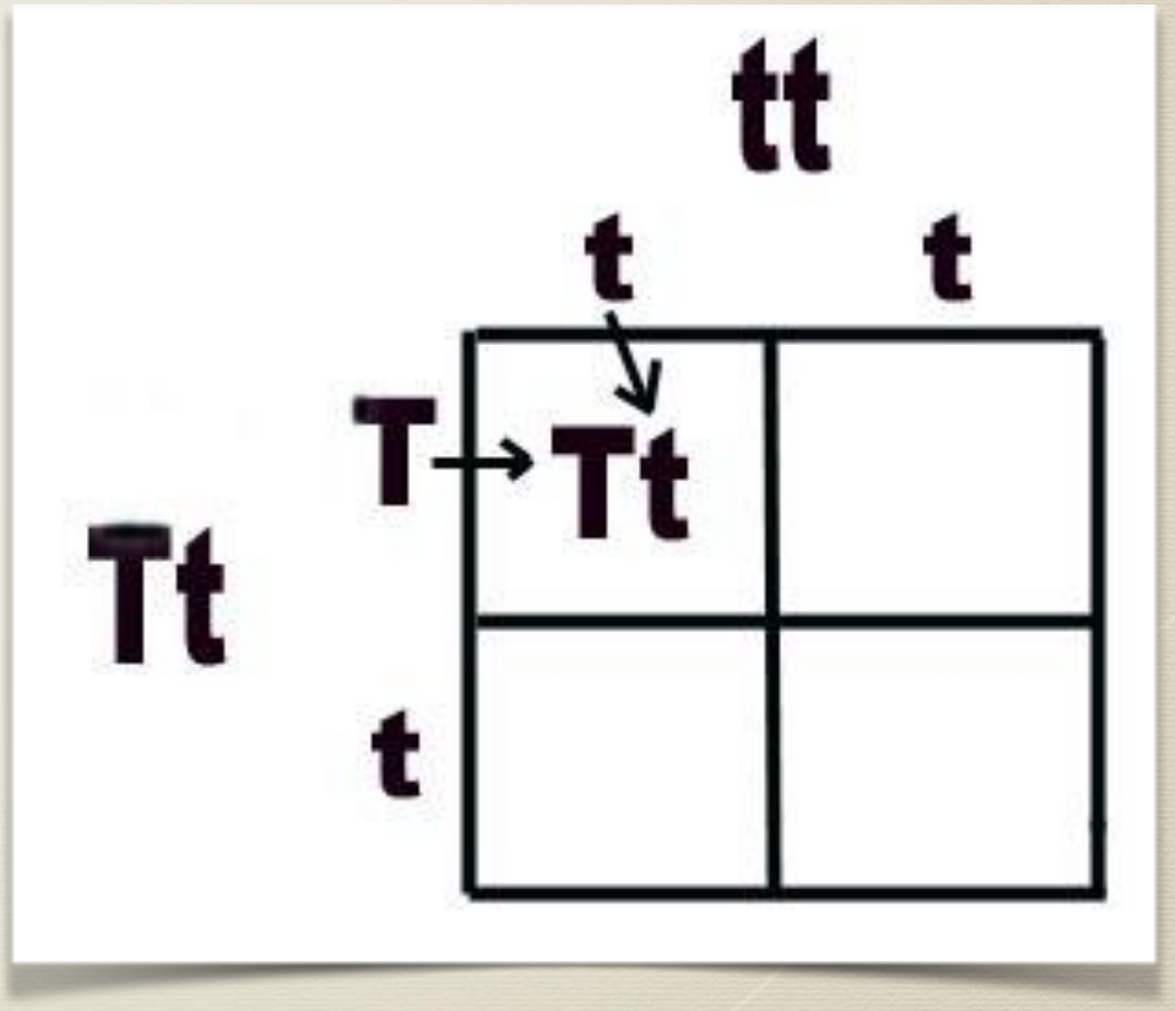
Filling Punnett Squares





Filling Punnett Squares

- Draw the squares
- Put the parents on the top and the left side
- Take each letter in each column and combine it with each letter from each row

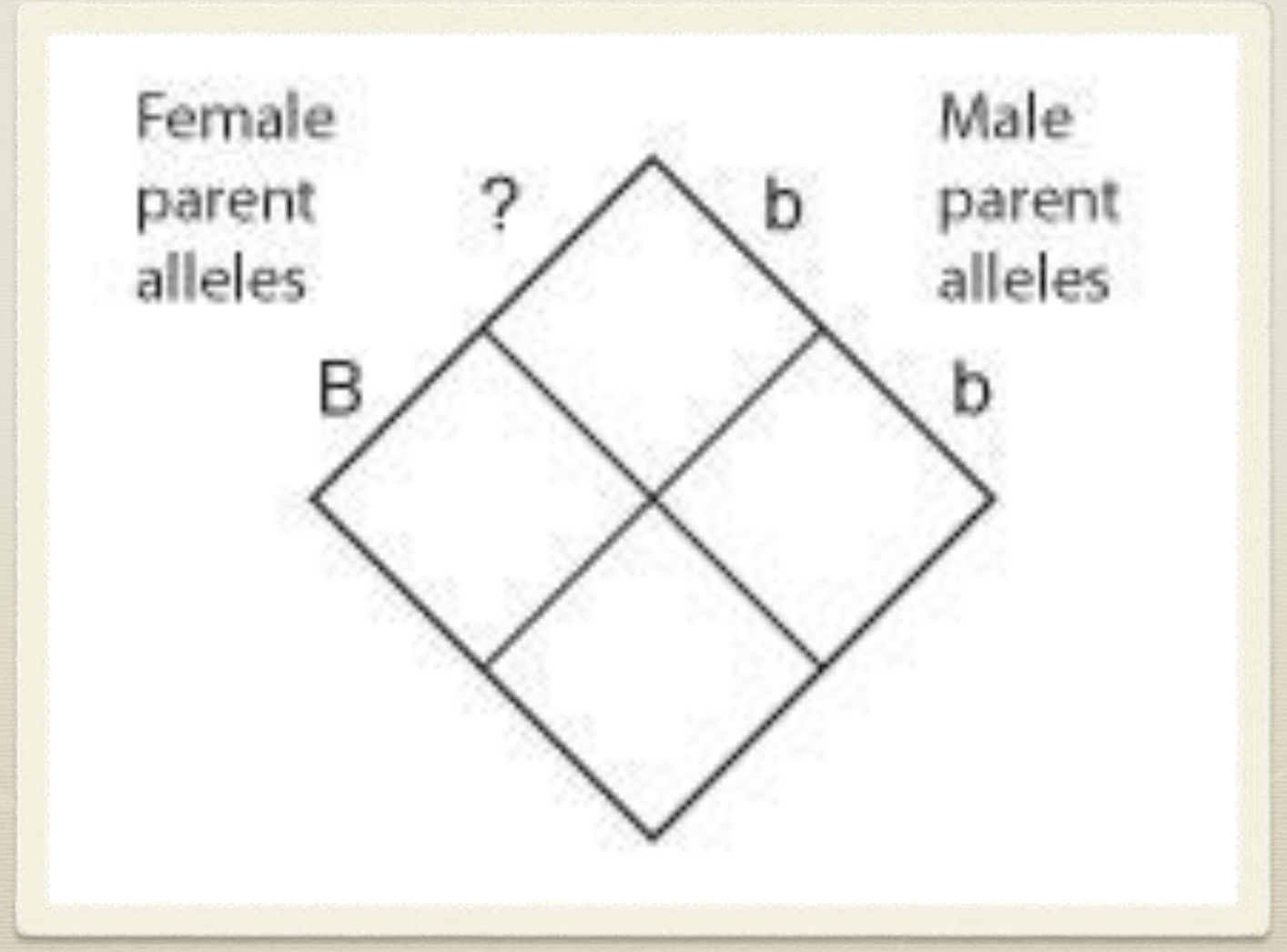


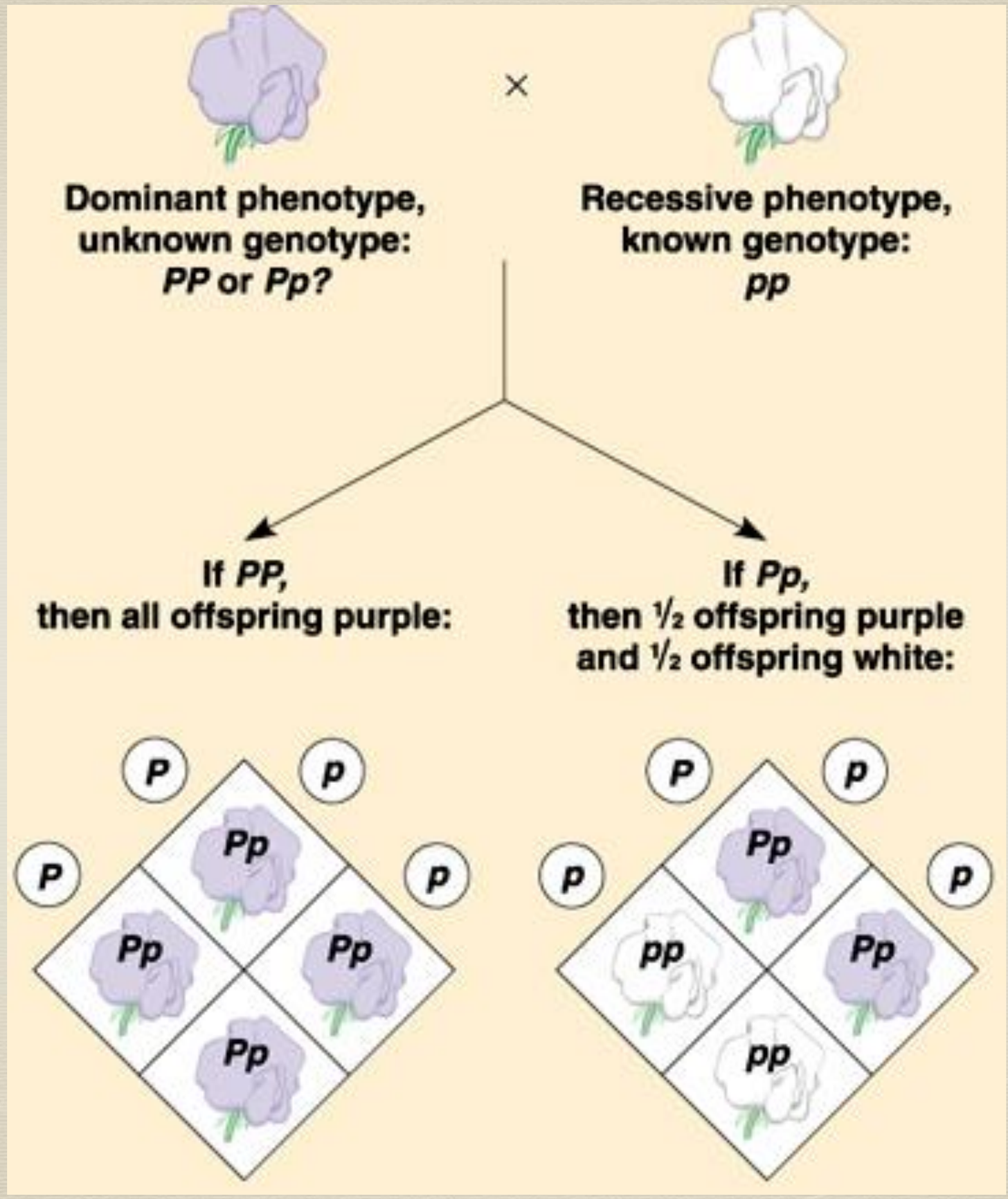
Filling Punnett Squares

	B	b
b	Bb	bb
b	Bb	bb

Filling Punnett Squares

- You can also use a Punnett square to figure out an unknown allele




Dominant phenotype, unknown genotype: PP or Pp?
×
Recessive phenotype, known genotype: pp
If PP, then all offspring purple:
If Pp, then ½ offspring purple and ½ offspring white:
P
p
Pp
pp

Do a Punnett square for a cross between a homozygous recessive r and a mystery allele and a dominant R when all the offspring are dominant.

Genetic Probability

- Probability: the chance that an event will occur out of the total number of possible events
- Phenotype ratios are actually the probabilities of random fertilization
- Example: 3:1 means a 75% chance of dominant and a 25% chance of recessive

rw X rw

	r	w
r	rr	rw
w	rw	ww

$^1/_4$ rr - red

$^1/_2$ rw - pink

$^1/_4$ ww - white

	y	y
Y	Yy	Yy
y	yy	yy