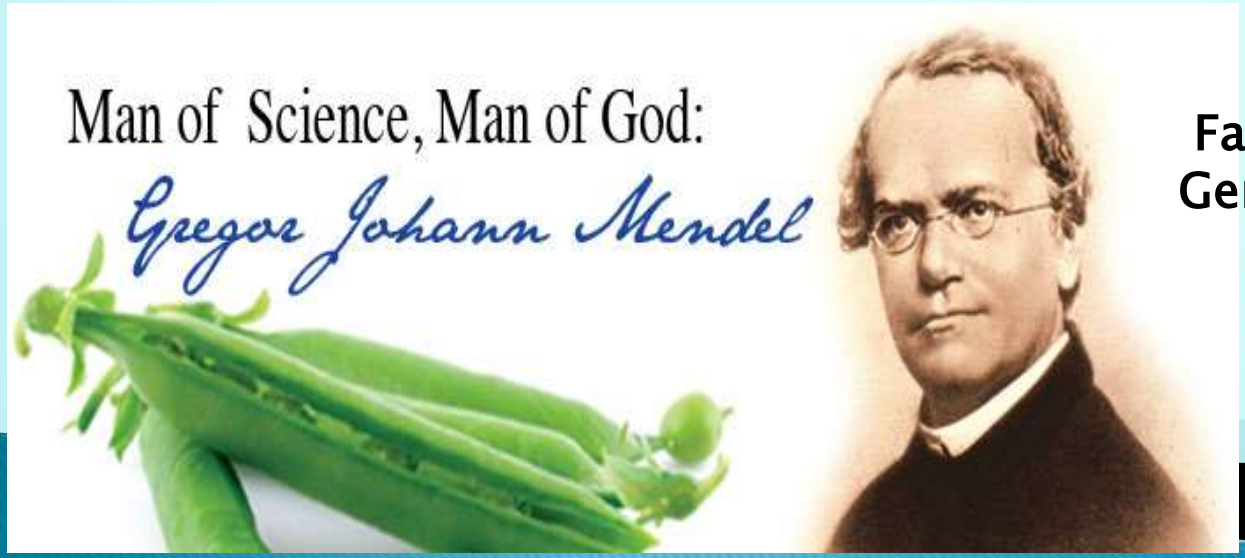
PRINCIPLES OF INHERITANCE AND VARIATION

Gregor Johann Mendel



Father of Genetics

Mendel‘s experimental material
Pisum sativum
(garden pea plant)

Pisum sativum

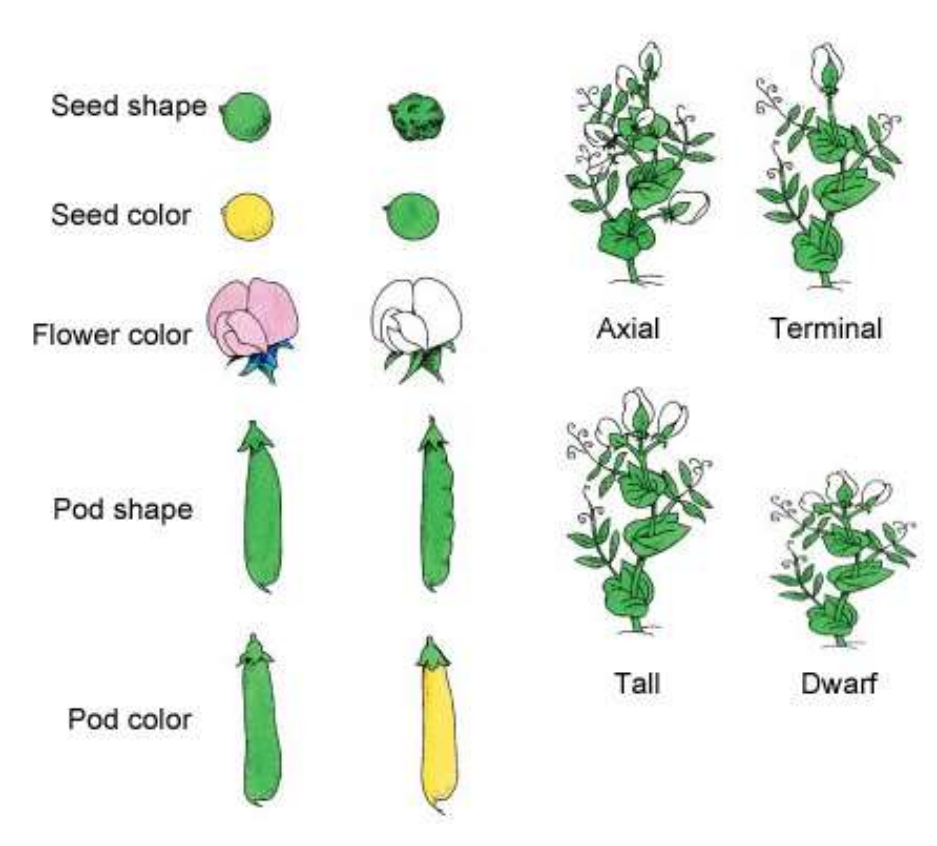
Contrasting traits studied by Mendel in pea plant

S.No.	Characters	Contrasting Traits
1.	Stem height	Tall/dwarf
2.	Flower colour	Violet/white
3.	Flower position	Axial/terminal
4.	Pod shape	Inflated/constricted
5.	Pod colour	Green/yellow
6.	Seed shape	Round/wrinkled
7.	Seed colour	Yellow/green

Contrasting traits studied by Mendel in pea plant

Contrasting traits studied by Mendel in pea plant

S.No.	Characters	Contrasting Traits
1.	Stem height	Tall/dwarf
2.	Flower colour	Violet/white
3.	Flower position	Axial/terminal
4.	Pod shape	Inflated/constricted
5.	Pod colour	Green/yellow
6.	Seed shape	Round/wrinkled
7.	Seed colour	Yellow/green



TODAY'S BIG WORDS

- GENE
- ALLELE
- DOMINANT
- RECESSIVE
- HOMOZYGOUS
- HETEROZYGOUS
- GENOTYPE
- PHENOTYPE

GENES

- **“Genes are the units of inheritance which contain the information for the expression of a particular trait in an organism.”**

Alleles

- Genes which code for a pair of contrasting traits are known as alleles. ie they are slightly different forms of the same gene .

Dominant character

- • The character which is expressed in one generation is called dominant character.
- • The dominant gene is named by the first letter of the dominant character in capital form.
- • Eg. The character height or tall is expressed by the symbol ‘T’.
- • Dominant alleles for height are TT and Tt

Recessive character

- • The character which is not expressed in one generation is known as recessive character.
- • The recessive gene is named by the first letter of the recessive character in small form.
- • Eg . The character height or tall is expressed by the symbol ‘t’
- • The recessive allele for height is tt

Homozygous alleles

- The identical pair of alleles is called homozygous alleles.
- Eg ; TT represents tall
- Tt represents dwarf

Heterozygous alleles

- The contrasting pair of alleles is called heterozygous alleles.
- Eg ; Tt has both dominant and recessive allele

- **Phenotype**
- The external appearance of an organism is called phenotype
- Eg . tall , dwarf , red flower , violet flower , round seed , wrinkled seed, axial flower ,
- terminal flower etc.

Genotype

- The genetic make up of an organism is the genotype.
- Eg ; TT and Tt express the tall genotype.

- GENE- Units of inheritance
- ALLELE – One form of a gene
- DOMINANT – Trait that always shows up
- RECESSIVE – Trait that can hide
- HOMOZYGOUS – Has the same alleles
- HETEROZYGOUS – Has different alleles
- GENOTYPE – GENE TYPE (the letters)
- PHENOTYPE – WHAT IT LOOKS LIKE

Monohybrid cross

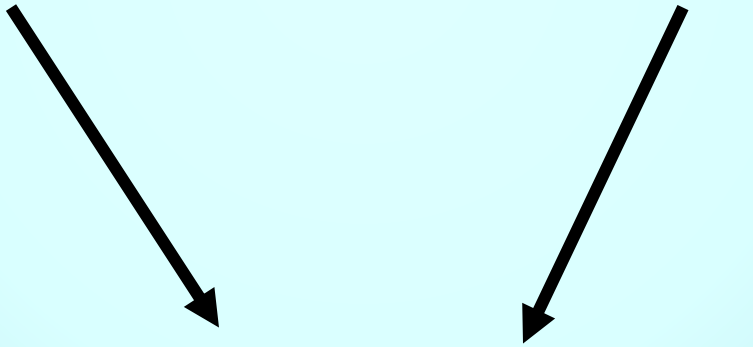
- • A cross involving two plants differing in one character pair is called monohybrid cross.
- Mendel crossed a homozygous tall plant with a homozygous dwarf plant

Monohybrid Cross

PARENTS TALL X SHORT

TT tt

T GAMETES t

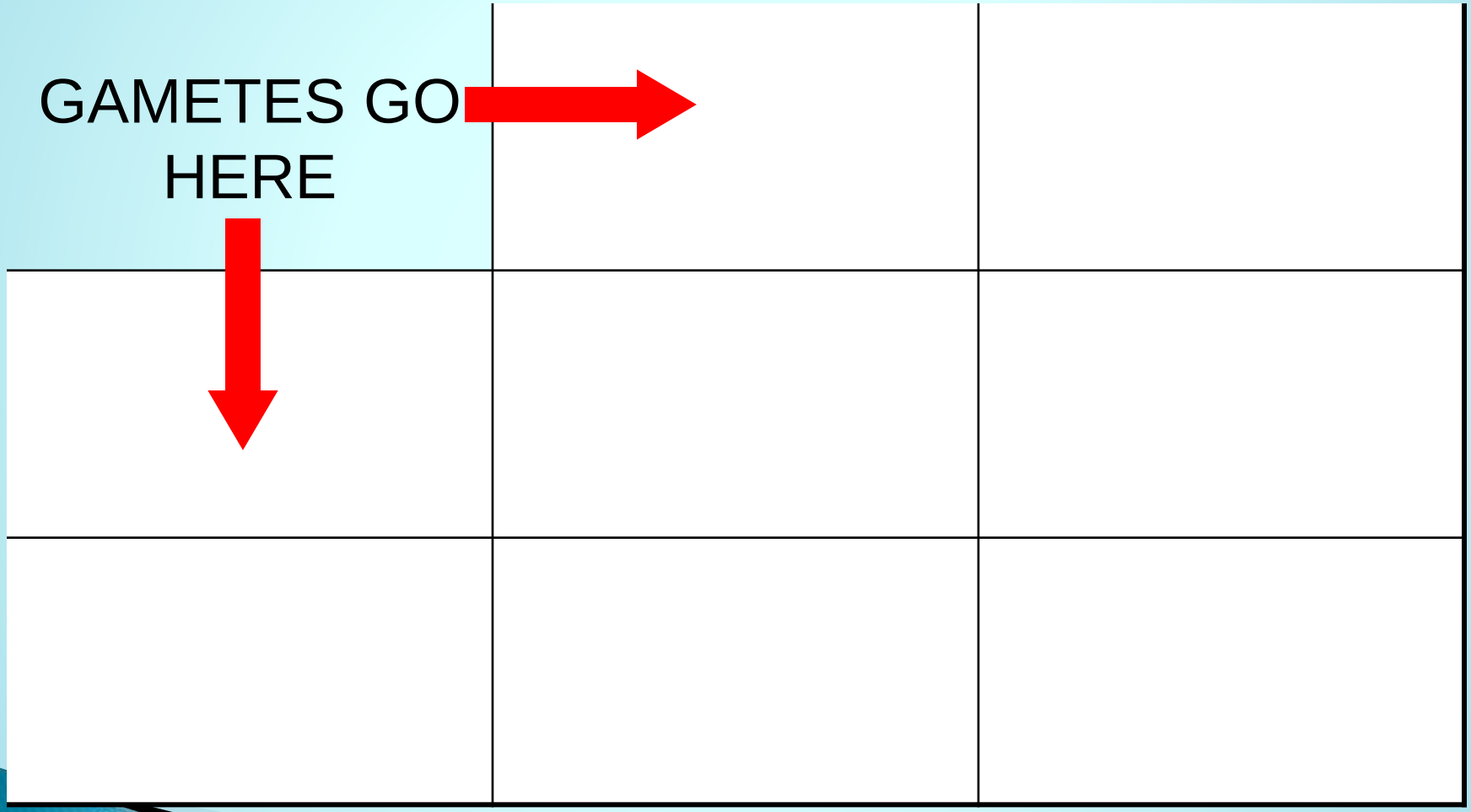


OFFSPRING ALL TALL

Tt

THE PUNNETT SQUARE

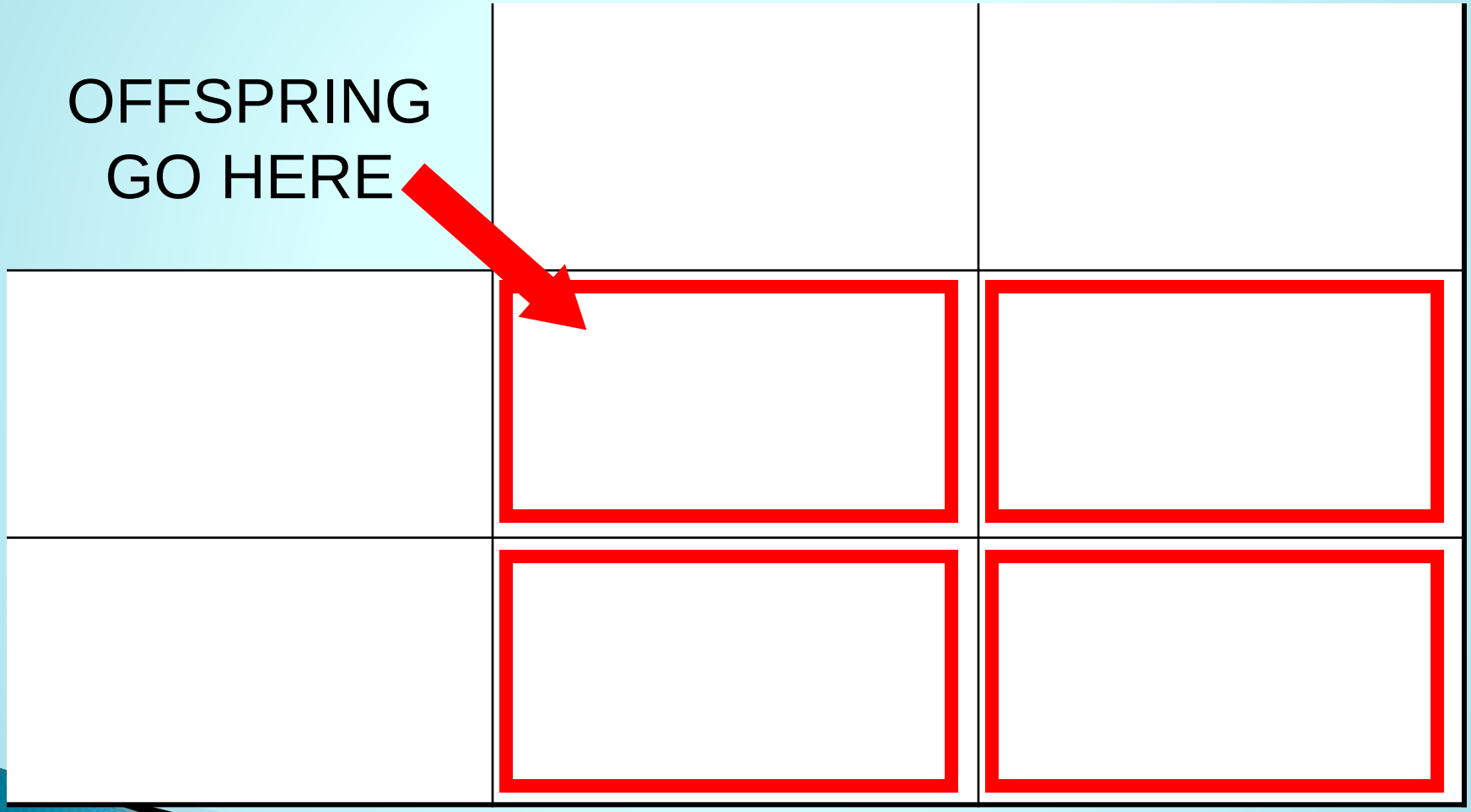
– developed by British geneticist, Reginald C Punnett)



THE PUNNETT SQUARE

	T	t
T		
t		

THE PUNNETT SQUARE



PHENOTYPES

	T	t
T	TT tall	Tt tall
t	Tt tall	tt short

GENOTYPES

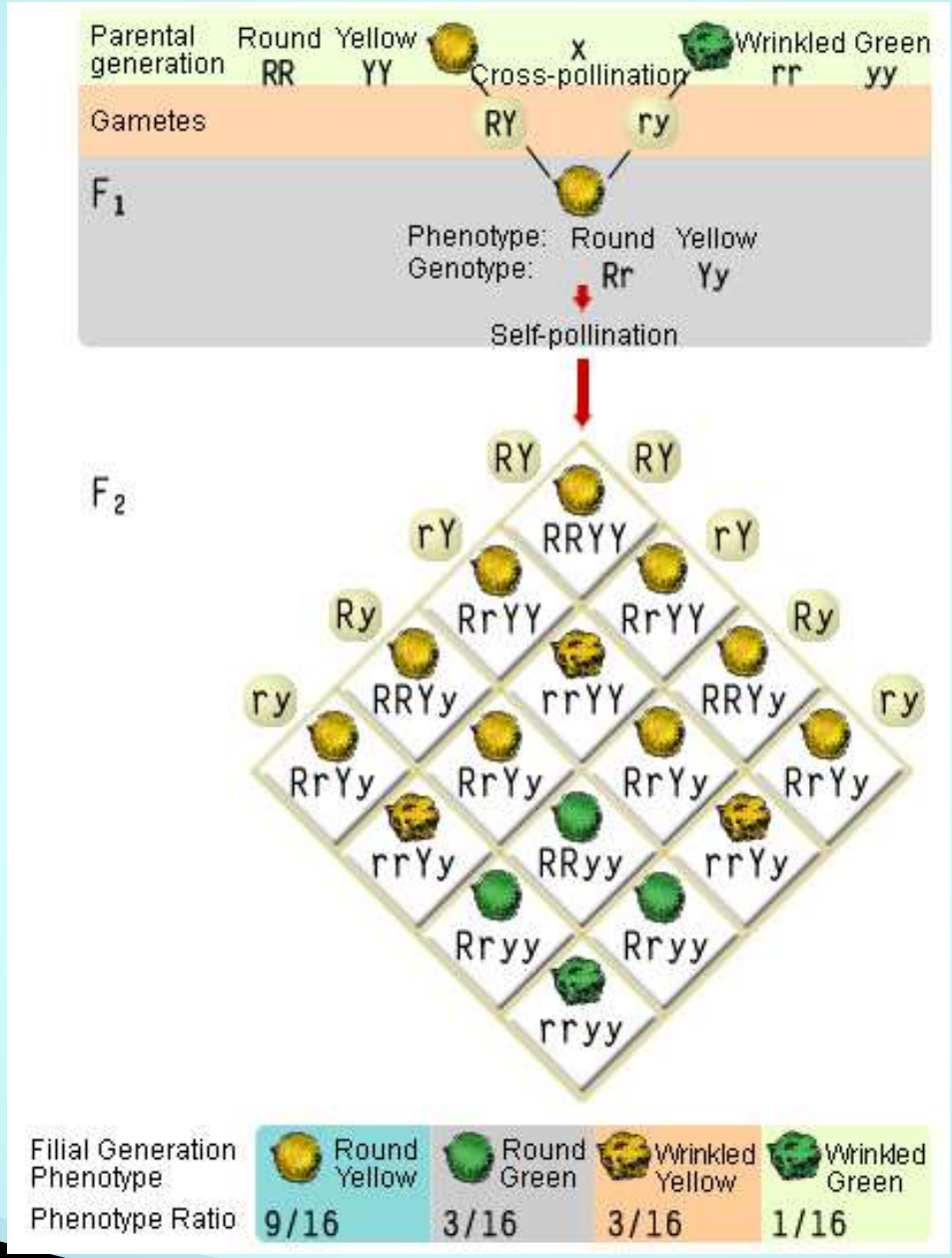
	T	t
T	TT Homozygous dominant	Tt Heterozygous
t	Tt Heterozygous	Tt Homozygous recessive

Monohybrid Cross

Genotypic ratio 1TT: 2Tt :1tt (1:2:1)

&

Phenotypic ratio 3Tall: 1Dwarf (3:1)


Parental generation
Round
RR
Yellow
YY
x
Cross-pollination
Wrinkled
rr
Green
yy
Gametes
RY
ry
F1
Phenotype: Round Yellow
Genotype: Rr Yy
Self-pollination
F2
RY RY
rY rY
Ry Ry
ry ry
RRYY
RrYY RrYY
RRYy rrYY RRYy
RrYy RrYy RrYy RrYy
rrYy RRyy rrYy
Rryy Rryy
rryy
Filial Generation Phenotype
Round Yellow
Round Green
Wrinkled Yellow
Wrinkled Green
Phenotype Ratio
9/16
3/16
3/16
1/16