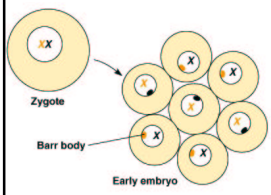
MENDEL & PROBABILITY



P(cell is black)

GREGOR MENDEL

1822-1884
Augustinian monk; Brno, Czech Republic
published results in 1865
Experiments in Plant Hybridization
results were 'rediscovered' 1900
their authenticity is debated
their importance is undeniable
they exemplify computational biology

MENDEL'S THEORY

was formulated from proper scientific technique; Mendel

chose appropriate research material

carefully designed experiments

collected data

analysed data to test hypotheses

MENDEL'S EXPERIMENTS 1

the garden pea *Pisum sativum* is

- **variable**
- **self-pollinating**
- **inexpensive, available, spatially and temporally efficient to grow, fecund**

MENDEL'S EXPERIMENTS 2

involved

- **pure lines (2 years) – control**
- **properties (phenotypes)**
  - **round OR wrinkled ripe seed**
  - **inflated OR pinched ripe pods**
  - **green OR yellow unripe pods**
  - **axial OR terminal flowers**
  - **long or short stems**
  - **purple OR white petals**
  - **yellow OR green seed interiors**

MENDEL'S EXPERIMENTS 3

P Yellow x green

F1 Yellow

F2 6022 Yellow, 2001 green

F3 1 / 3 Yellow, 2 / 3 Yellow & green

Yellow 3:1

MENDEL'S OBSERVATIONS 1

P Yellow x green *YY* x *yy*

F1 Yellow *Yy*

F2 6022 Yellow, 2001 green *YY*/*Yy*, *yy*

F3 Yellow, Yellow & green *YY*, *Yy* & *yy*

model tested with YY x yy

MENDEL'S LAWS 1

Equal Segregation

gene pair members segregate from each other into gametes, so that half carry one and half carry other member

GENE NOMENCLATURE

the normal phenotype is called the 'wild type'
genes are symbolised on the basis of the first mutant that is observed
recessive, lowercase; Dominant, uppercase
the wild type symbol is superscripted with +

(*e.g.*, Cy^+Cy^+ normal straight wing genotype
w^+ normal red eye allele)

MENDEL'S EXPERIMENTS 4

P ***RRyy*** **x** ***rrYY***

F1 ***RrYy***

F2
315 Round Yellow
101 wrinkled Yellow
108 Round green
32 wrinkled green

MENDEL'S OBSERVATIONS 2

P ***RRyy*** **x** ***rrYY***

F1 ***RrYy***

F2	**315**	**Round Yellow**	**9**
	101	**wrinkled Yellow**	**3**
	108	**Round green**	**3**
	32	**wrinkled green**	**1**

Round:wrinkled = 3:1 = Yellow:green

MENDEL'S LAWS 2

Independent Assortment

during gamete formation, gene pairs segregate independently

MENDEL'S & PROBABILITY LAWS RULES

Equal Segregation and P(i) = n_i / n

P(*Y*) = 1 / 2 = P(*y*)

Independent Assortment & P(i and j) = P(i) P(j)

P(*rryy*) = 1 / 16 = P(*r*) P(r) P(*y) P(y*)