

Heredity

Character

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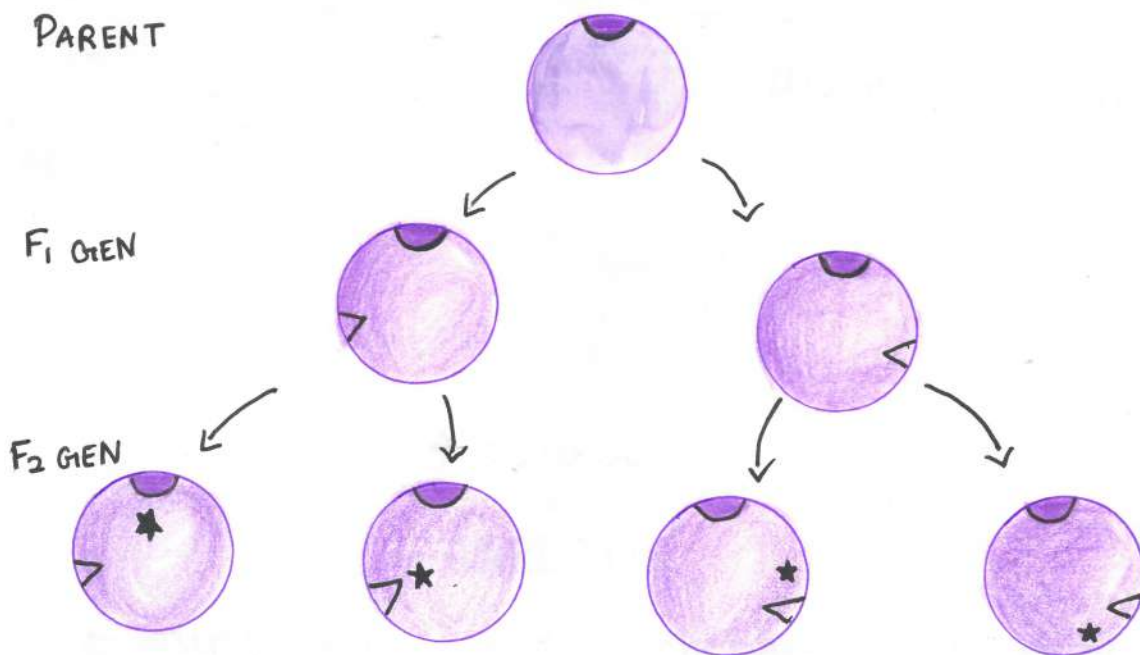
Recognisable features of humans or any other organisms.

Heredity

Transfer of characters from parent to offspring.
heredity information - present in SEX CELLS / GAMETE.

Inheritance

Process by which characters / traits pass from 1 generation to another.



Variation in F₂ = Parent + F₁ Gen

Variation

- ▷ difference in character or trait among individuals of same species.
- ▷ changes accumulated in body design.

(Due to environment mutation mixing characters)

▷ Evolution

- ▷ accumulation of variation

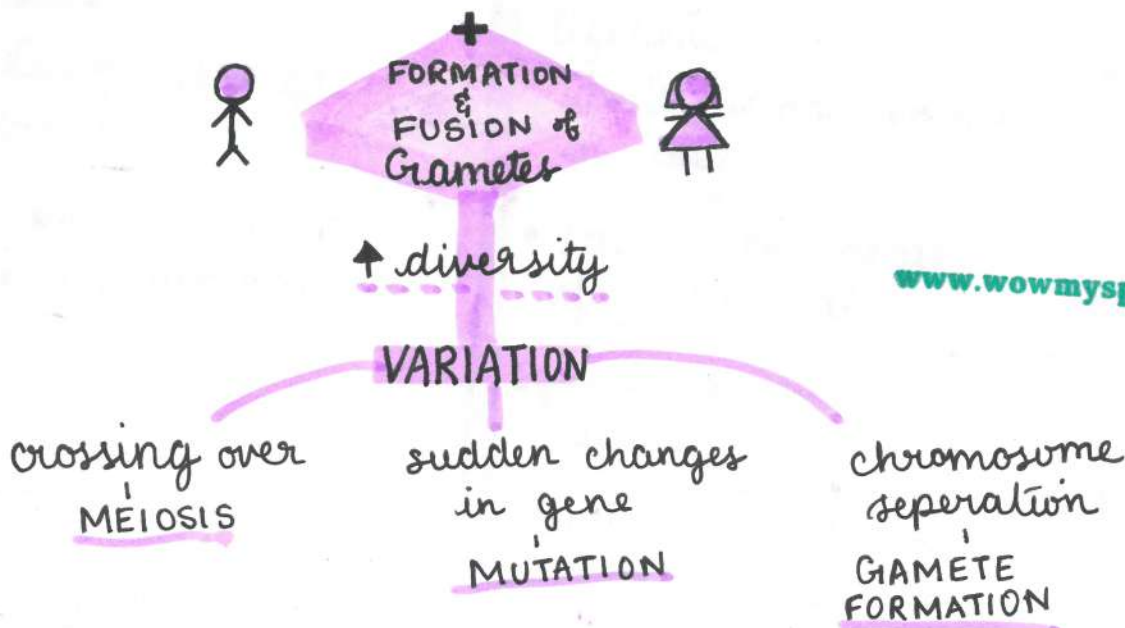
▷ IMPORTANCE

1. ↑ chances of survival
 2. adapt to changing environment
 3. basis of heredity
 4. raw material for development & evolution of species
- nature of variation advantages if favourable - survive & pass the variation to progeny

Accumulation

- ▷ ... inheritance - from 1 generation to another
- SIMILARITIES - basic body design
- VARIATIONS - subtle changes

▷ Sexual



Inherited Traits



Attached earlobe



Free earlobe



What is ~~is~~ inherited ?
What is Transmitted ?

- ▶ physical features
- ▶ • psychological changes
- biochemical reactions
- rate of metabolism

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INHERITED	ACQUIRED
• received by organism from parents at birth.	• develop in organism during their own lifetime.
• brings change in GENES	• don't bring change in Gene
• TRANSMITTED to next generation	• LOST with death of individual
Eg. fused & free earlobes	Eg good physique, scars

structural, functional & behavioural changes.

Terms

1. Chromosome:

A thread like structure in nucleus of cell. (nu)
Appears during cell division and carries gene.

2. Gamete:

Reproductive cells with only one set of dissimilar chromosomes [HAPLOID] ^{2?} pair

3. Gene: "FACTOR"

- ▷ functional unit of heredity
 - ▷ unit of inheritance forming a part of chromosome.
 - ▷ determines a particular character
 - ▷ section of DNA in chromosome.
-

4. Allele:

- ▷ version of gene
 - ▷ alternate forms of gene / pairs of matching gene.
-

5. Hybrid:

- ▷ An individual having 2 different alleles for same trait.
-

6. Genotype Genetics

- ▷ Branch of science dealing with heredity and evolution
-

7. Dominant Allele :

▷ decides appearance of organism even in the presence of an alternative gene.

▷ CAPITAL LETTERS ▷ same phenotype in heterozygous / homozygous

Eg: Tall - "TT"
- "Tt"

8. Recessive Allele :

▷ decides appearance of organism only in presence of another identical gene.

▷ can't express itself in presence of dominant gene.

Eg: Dwarf - "tt"

▷ Small letters

9. Clone :

▷ Organisms which are exact copies of each other

10. Homozygous :

▷ both alleles are identical

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Eg: - "TT"
- "tt"

11. Heterozygous :

▷ 2 alleles are dissimilar

▷ 1 dominant , 1 recessive

▷ Eg: "Tt"



12. Progeny :

▷ A descendent or offspring as a daughter organism.

13. Test Cross :

▷ Distinguish pure & impure dominant

genotype  phenotype

Genotype	Phenotype
<ul style="list-style-type: none"> heredity information of organism in form of <u>gene</u> in DNA. 	<ul style="list-style-type: none"> characters of an organism (GENOTYPE) which are visible 
<ul style="list-style-type: none"> same genotype produces same phenotype 	<ul style="list-style-type: none"> same phenotype may NOT belong to same genotype
<ul style="list-style-type: none"> Present inside body as GENETIC MATERIAL. 	<ul style="list-style-type: none"> Expression of gene as EXTERAL APPEARANCE
<ul style="list-style-type: none"> inherited trait 	<ul style="list-style-type: none"> acquired trait
<ul style="list-style-type: none"> scientifically determined 	<ul style="list-style-type: none"> determined by 
<ul style="list-style-type: none"> affected by - Genes 	<ul style="list-style-type: none"> affected by <ul style="list-style-type: none"> - genotype - environment
<ul style="list-style-type: none"> Eg: Blood group, Eye Colour, Height 	<ul style="list-style-type: none"> Eg: physique, weight, beak of birds
<h3>Height</h3>	
<ul style="list-style-type: none"> hybrid tall = Tt pure tall = TT pure dwarf = tt 	<ul style="list-style-type: none"> tallness dwarfness

gene



MENDAL:

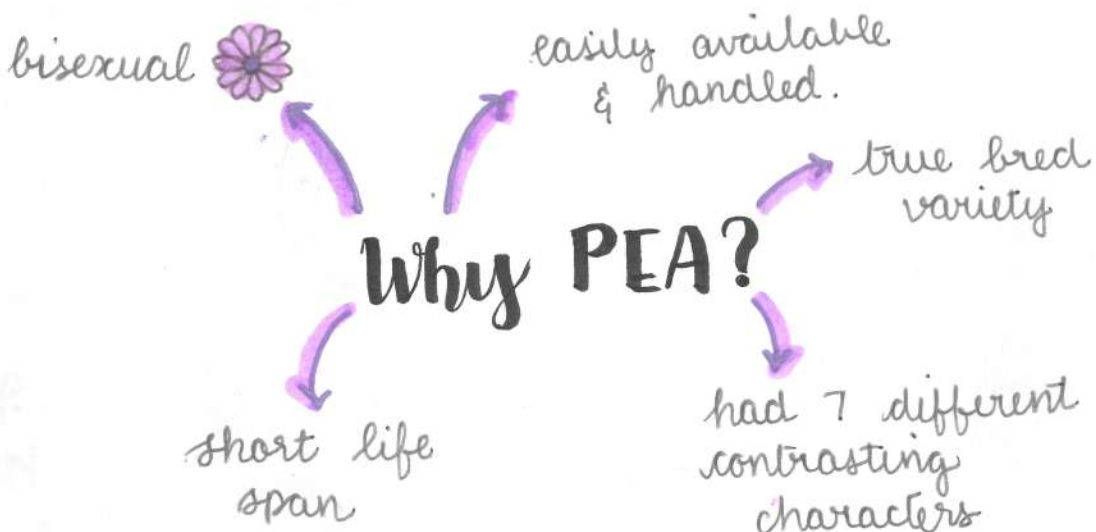
Gregor Johann Mendal:















- ▶ 'FATHER OF GENETICS'
- ▶ Austrian Genecist
- ▶ had knowledge of Science + Math
- ▶ 1st = keep count of individuals exhibiting a particular trait in each generation in PEA exp.

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Contribution

- ▶ rules of inheritance of traits are related to fact that:
 - both  &  contribute = genetic material
 - for each trait - 2 version (Maternal & Paternal) in child.
- ▶ Pisum Sativum
 - ▶ inferences + interpretations of Garden Pea Exp.
 - foundation of modern genetics
 - mechanism of inheritance of traits from 1 gen. to another

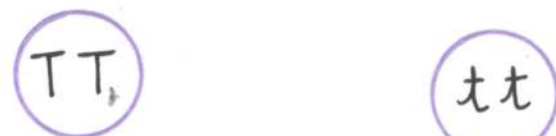


	Dominant	Recessive
FLOWER COLOUR		
PLANT HEIGHT		
SEED COLOUR		
SEED SHAPE		
POD COLOUR		
POD SHAPE		
FLOWER POSITION	 T _u	 A _x

Monohybrid Cross

- ▶ Crossing between 2 pure breeding plants having single contrasting characters.
- ▶ Stem Height :

PARENT



GAMETE



F₁ GEN



F₂ GEN



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	T	t
T	TT	Tt
t	Tt	tt

Genotypic Ratio :

$$1 : 2 : 1$$

$$TT : Tt : tt$$

Phenotypic Ratio :

$$1 : 3$$

$$\text{dwarf} : \text{tall}$$

Law of Dominance

- ▶ When Mendel crossed a pure ♀ tall plant with a pure ♂ dwarf plant, he got only tall plants in F_1 generation.
- ▶ When F_1 plants were self-pollinated, Mendel got both Tall and Dwarf plants in F_2 generation in the ratio 3:1 (phenotypic) 1:2:1 (genotypic).
- ▶ The trait of dwarfness was present in F_1 generation but was not expressed.
- ▶ The character which gets expressed in presence of its contrasting gene is called DOMINANT TRAIT.
[Monohybrid flowchart + Geno + Pheno]

Law of Segregation

- ▶ In monohybrid cross when F_1 hybrid plants undergo self-pollination, each parent produces 2 types of gametes. One gamete carries a dominant allele and another carries a recessive allele.
 - ▶ This law explains that a pair of alleles segregate from each other during MEIOSIS $\frac{1}{2}$ cell division (gamete formation) so that only 1 allele will be present in each gamete.
- [Monohybrid flowchart + Geno + Pheno]

Dihybrid Cross

▶ Crossing between 2 pure breeding plants having 2 contrasting characters

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▶ Seed Shape & Colour:

	D	R
Seed Shape	Round RR	Wrinkled rr
Seed Colour	Yellow YY	Green yy

PARENT

RRYY

rryy

GAMETE

RY

ry

F₁ GEN

RrYy

Round Yellow

F₂ GEN

RrYy

Self Pollinate

RrYy

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

Phenotypic Ratio:

9 : 3 : 3 : 1
 round yellow round green wrinkled yellow wrinkled green

Law of Independent Assortment

When cross was made between round with yellow seeds & wrinkled with green seeds,

→ F₁ progeny plants are all round yellow seeds. This indicated round and yellow seeds are the dominant traits.

When F₁ plants were self pollinated the

→ F₂ progeny consists of some round yellow seeds and green wrinkled seeds are produced. They are parental traits.

Along with this some new combinations such as round green seeds & yellow wrinkled seeds produced in ratio 9:3:3:1.

Alleles with different characters separate independently from each other during GAMETE FORMATION.

[Flowchart - Dihybrid Cross + phenotype]

Expression of Traits

- Cellular DNA - source of info. for making protein
- Section of DNA that provides info. for particular protein
↳ gene of that protein
- Hormones - TRIGGER growth.
 - amt. hormone \propto efficiency of process
 - Height
↳ gene-alteration = \downarrow efficient - short

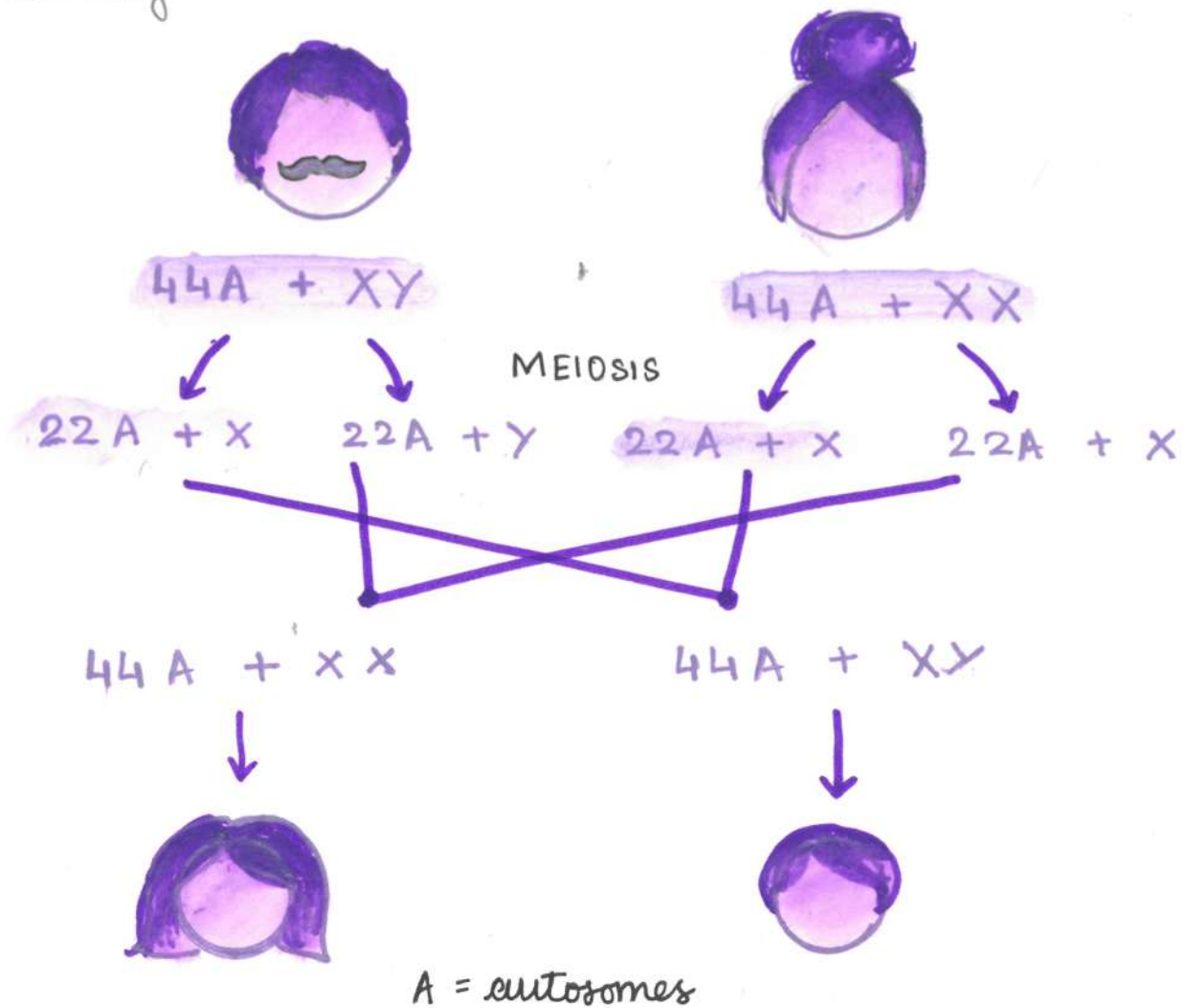
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Each germ cell must have only 1 gene set.

2 germ cells combine - restore normal no. of chromosome in progeny
Stability

Sex Determination

Process by which sex of a new born is determined genetically ✓



Others = Environmental Factors

lizard - ↑ temp ♂

turtle - ↑ temp ♂

snails - changes sex

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∴ NOT GENETICALLY DETERMINED