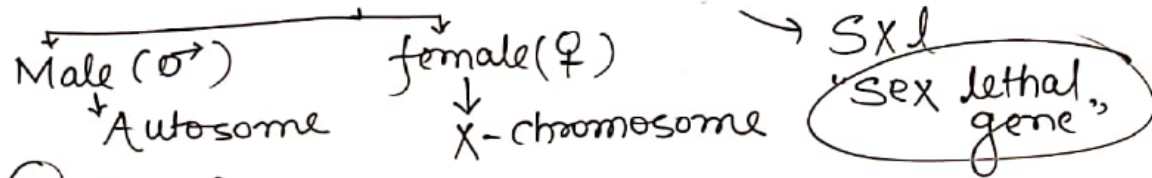


# Genic Balance Theory

Proposed by C.B. Bridges

"Sex determination in *Drosophila*"

*Drosophila*  $\Rightarrow$  Y chromosome - Heterochromatic



(n) (n-1)

(2n) (n-2)

*Drosophila*  $\Rightarrow$  Y-chromosome

$\rightarrow$  Spermatogenesis  
(formation of sperm)

$\rightarrow$  Sperm motility

Sex index Ratio

$$SIR = \frac{\text{No. of X-chrom}}{\text{No. of sets Autosome}}$$

$$SIR = \frac{X}{A}$$

# Genic Balance Theory Autosome

Sex index Ratio =  $\frac{\text{No. of X-chromosome}}{\text{No. of sets of Autosomes}}$   $\left( \frac{n \text{ cell } (n-1)}{2n \text{ cell } (n-2)} \right)$

②  $SIR = \frac{X}{A} = 0.5$  Male? ①  $SIR = \frac{X}{A} = 1$  female?

$AA + X(Y)$   
 $= \frac{1}{2} = 0.5$

$\boxed{AA + XX}$   
 $SIR = \frac{2}{2} = 1$  female

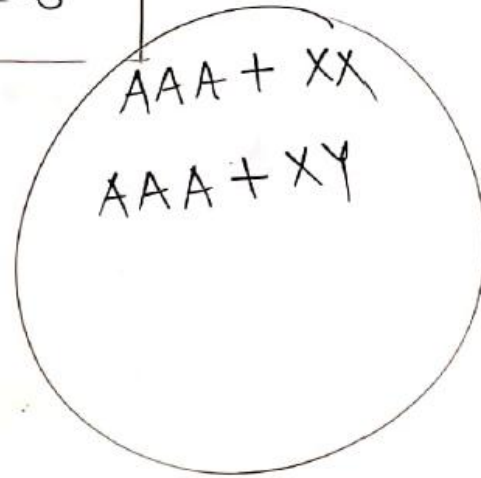
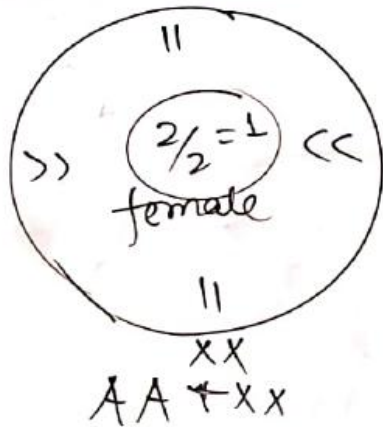
③  $\frac{X}{A} = 1.5$  (superfemale) ④  $\frac{X}{A} = \text{less than } 0.5$  (Super Male)

$\frac{3}{2} = 1.5$

$\Rightarrow AAA + XY$   
 $\frac{X}{A} = \frac{1}{3} = 0.5$

## Sex index Ratio.

1.  $AA + XX$  (female) =  $\frac{X}{A} = 1$
2.  $AA + XY$  (Male) =  $\frac{X}{A} = 0.5$
3.  $AA + XXX$  (Super female) =  $\frac{X}{A} = \frac{3}{2} = 1.5$
4.  $AAA + XY$  (Super Male) =  $\frac{X}{A} = \frac{1}{3} = 0.3$
5.  $AAA + XX$  (Intersex sterile) =  $\frac{X}{A} = \frac{2}{3} = 0.6$



# Sex determination in honey bee.

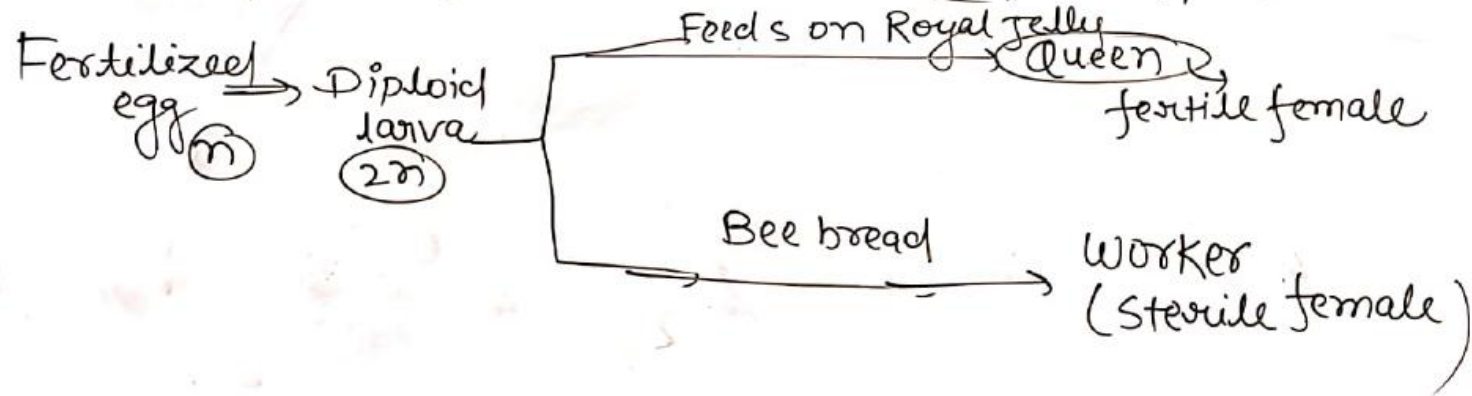
(Haploid and diploid) Mechanism

① Diploid =  $2n$  two sets  $\Rightarrow$  Female  $\text{\textcircled{\textit{f}}}$

Insects - Hymenoptera  
(Ants, Honey bee wasps)

② Haploid  $\Rightarrow$  (one set)  $\Rightarrow$  Male  $\text{\textcircled{\textit{m}}}$

Male individual "drone"  $\Rightarrow$  parthenogenesis



# Cytological basis of sex determination

Lyon's hypothesis  $\Rightarrow$  Barr body  $\rightarrow$  Basic dye

Flemming  $\rightarrow$  Acetocarmine

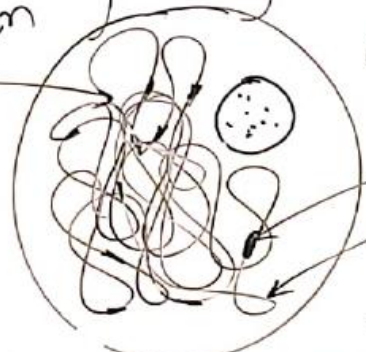
Heterochromatin  
(Dark stain)

No. of Barr body =  $\frac{\text{No. of X chromosome} - 1}{1}$

Euchromatin  
(light stain)

Acidic  $\rightarrow$  DNA

Chromatin



Interphase Nucleus

female  $\Rightarrow$  2 chromosome **XX**

One chromosome

One

$\downarrow$

$\downarrow$

Facultative  $\rightarrow$  Heterochromatin  
X (Dense)

Euchromatin  
X

**Barr body**

## Cytological basis of sex determination

Normal female =  $AA + XX \Rightarrow$  one barr body

Male =  $AA + XY \Rightarrow$  Barr body absent

Turner's syndrome  $\Rightarrow$  Sterile female -  $AA + XO \Rightarrow$  No. Barr.

Klinefelter syndrome = (Sterile Male)  $AA + XXY$   
 $\Rightarrow$  one barr body