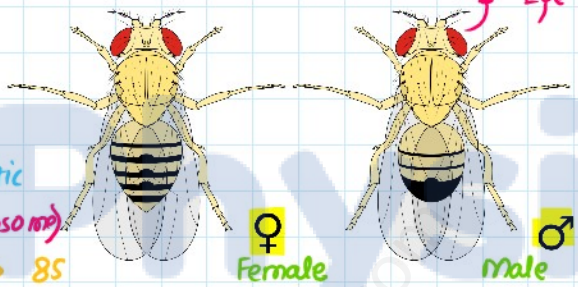
Sex Linkage in Drosophila

T. H. Morgan → 1910
Experimental Organism → Drosophila melanogaster

Advantages of Drosophila

- Easy to Capture
- Sexual Dimorphism
- Generation time (14 days / 2 weeks)
- Excellent for genetic studies (Giant chromosome)
- Contrasting traits → 8S
- Human Genome Project



Eye Colour
→ Wild Type (Bright Red Eye)
→ White Eye (Male)
Calvin Bridges

STEP-I Normal Cross

RED EYE (Female) × WHITE EYE (Male) — P_1

1237 Red Eyed → Red Eye is dominant — F_1

STEP-II Normal Cross

RED EYE (Female) × RED EYE (Male) — F_1

RED EYE (Females) : RED EYE (Male) : WHITE EYE (Male) — F_2
2459 : 1011 : 782

Observations

- Red Eye (3) : (1) White Eye ✗
  - → Ratio is not fit to Mendelian Ratio (3:1)
  - Recessive trait individuals were quite small.
  - All white eyed were male.
  - No White Eyed Female were observed.

Conclusion

- → Eye colour inheritance is associated with sex.
- → Gene for Eye colour is on X- chromosome.
- → No allele on Y- chromosome.

CROSSES OF DROSPHILA

STEP-I

Red Eye Female × **White Eye Male** — P_1

$X^{w+}X^{w+}$ → X^{w+} , X^{w+}

$X^{w}Y$

w → White Eye

w^+ → Red Eye

	X^w	Y
X^{w+}	$X^{w+}X^{w}$ (Red)	$X^{w+}Y$ (Red)
X^{w+}	$X^{w+}X^{w}$ (Red)	$X^{w+}Y$ (Red)

Population = 1237 → Red Eye — F_1

STEP-II

$F_1 \times F_1$

Red Eye Female × **Red Eye Male** — F_1

$X^{w+}X^{w}$, $X^{w+}Y$

	X^{w+}	Y
X^{w+}	$X^{w+}X^{w+}$ (Red)	$X^{w+}Y$ (Red)
X^{w}	$X^{w+}X^{w}$ (Red)	$X^{w}Y$ (White)

Red Eyed ♀ → 2459

Red Eyed ♂ → 1011

White Eyed ♂ → 782

No 3:1

- Result of F_2 cross is in Non-mendelian Ratio.

STEP-III

(Test Cross)

Red Eye Female × **White Eye Male**

$X^{w+}X^{w}$, $X^{w}Y$

	X^w	Y
X^{w+}	$X^{w+}X^{w}$ (Red)	$X^{w+}Y$ (Red)
X^{w}	$X^{w}X^{w}$ (White)	$X^{w}Y$ (White)

Red Eye → ♂, ♀

White Eye → ♂, ♀

STEP-IV → Reciprocal Cross