

OUTLINE 15

E. Violation of independent assortment

- 1. Bateson and Punnet**

- 2. Linkage**

- 3. Crossing over**

- 4. Chromosome mapping**

- 5. Effects of linkage and crossing over on genotypic
and phenotypic ratios**

William Bateson and R.C. Punnett

P = purple dominant to **p** = white

L = long dominant to **l** = round

P PPLL X ppll

F1 all purple / long

F2 Phenotype	Number	Number expected
Purple / long	284	215
Purple / round	21	71
White / long	21	71
White / round	55	24

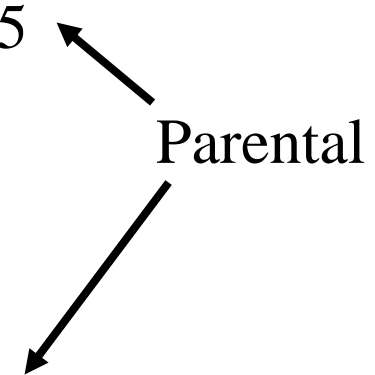


Diagram illustrating the relationship between the observed numbers and the expected numbers for the parental phenotypes. Arrows point from the word "Parental" to the expected numbers 215 (for Purple / long) and 24 (for White / round).

Tendency toward non-independent segregation - Partial gametic coupling

Test cross F1 to double recessive:

Parents PpLl X ppll

Gametes PL pl

Pl

pL

pl

Expect 1:1:1:1 ratio of phenotypes

Bateson and Punnett observed 7:1:1:7

Test cross to determine if genes are linked in coupling or repulsion

$PL//pl \times pl//pl$

$Pl//pL \times pl//pl$

Gametes $1/2 PL$ all pl

$1/2 Pl$ all pl

$1/2 pl$

$1/2 pL$

F1 $1/2 PL//pl$ (purple, long)

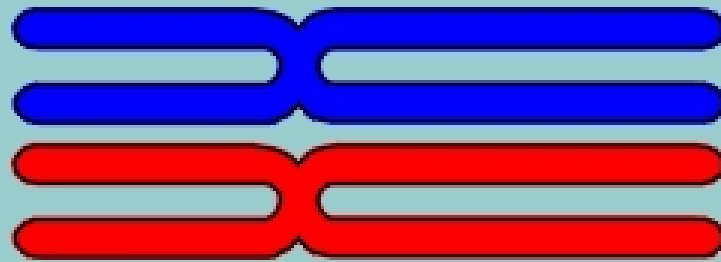
$1/2$ (purple, round)

$1/2 pl//pl$ (white, round)

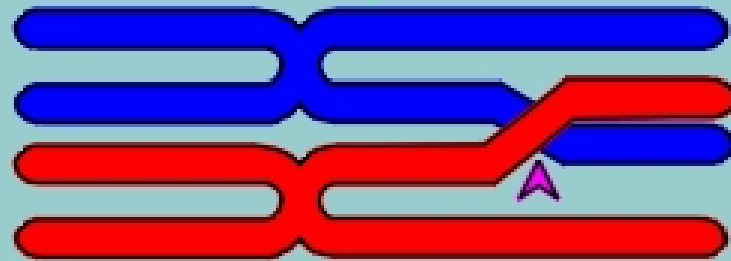
$1/2$ (white, long)

With independent assortment: $PpLl \times ppll$ expect 1:1:1:1

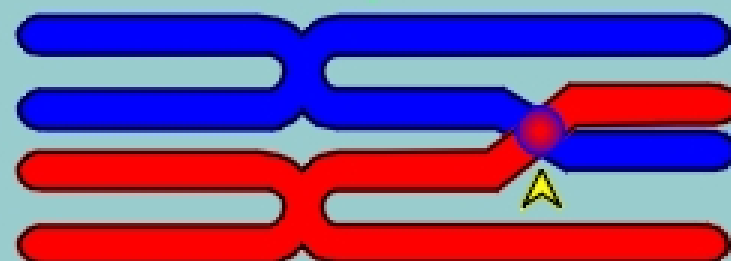
CROSSING OVER



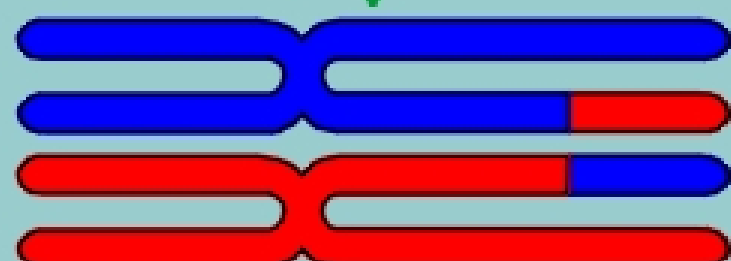
Pairing of
Homologous
Chromosomes



Chiasma
Formation



Chromosome
Breakage &
Rejoining

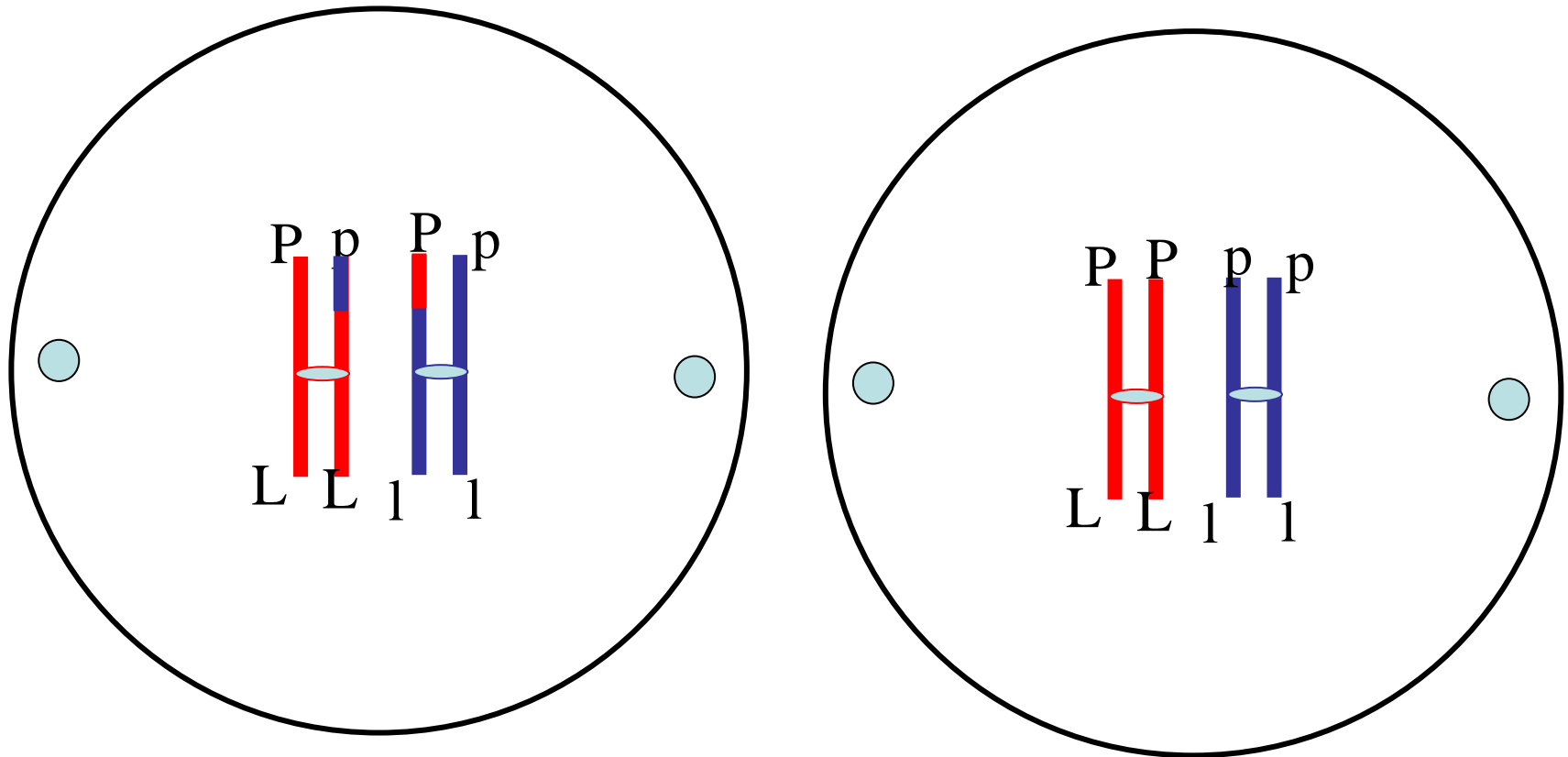


Recombinant
Chromosomes



P: **PL//PL** X **pl//pl**

F1: (**PL//pl**)



● = centrosome

Effects of crossing over on number of possible gamete types

With x-over

No x-over

