

Chapter 1: Basic Genetics 2

Gamete & Meiosis

Dominance, Linkage, & Recombination

Resemblance of a father and his son



Resemblance of a father and his son



.....even they have a similar sleeping habit

Resemblance between strangers



Furthermore... resemblance between the different species!



We all came from the same parent but we look different



What does determine the similarity and difference?

There are many genetic reasons for

why watermelon and melon look similar but still different...

why you and your friend look similar but still different...

why you and your sister look similar but still different...

but the most simple, basic answer for those questions can be answered
in this classroom..

gamete, meiosis, linkage, and recombination

Gamete and Meosis

- Reproductive cells are called gametes, as opposed to the somatic cells which make up the body
- Gametes are haploid carrying a single copy of each gene, and sometic cells are usually diploid carrying two copies of each gene
- Gametes are produced by meosis in which diploid set of chromosomes are divided to give a single set of chromosome

Biological role of Meiosis

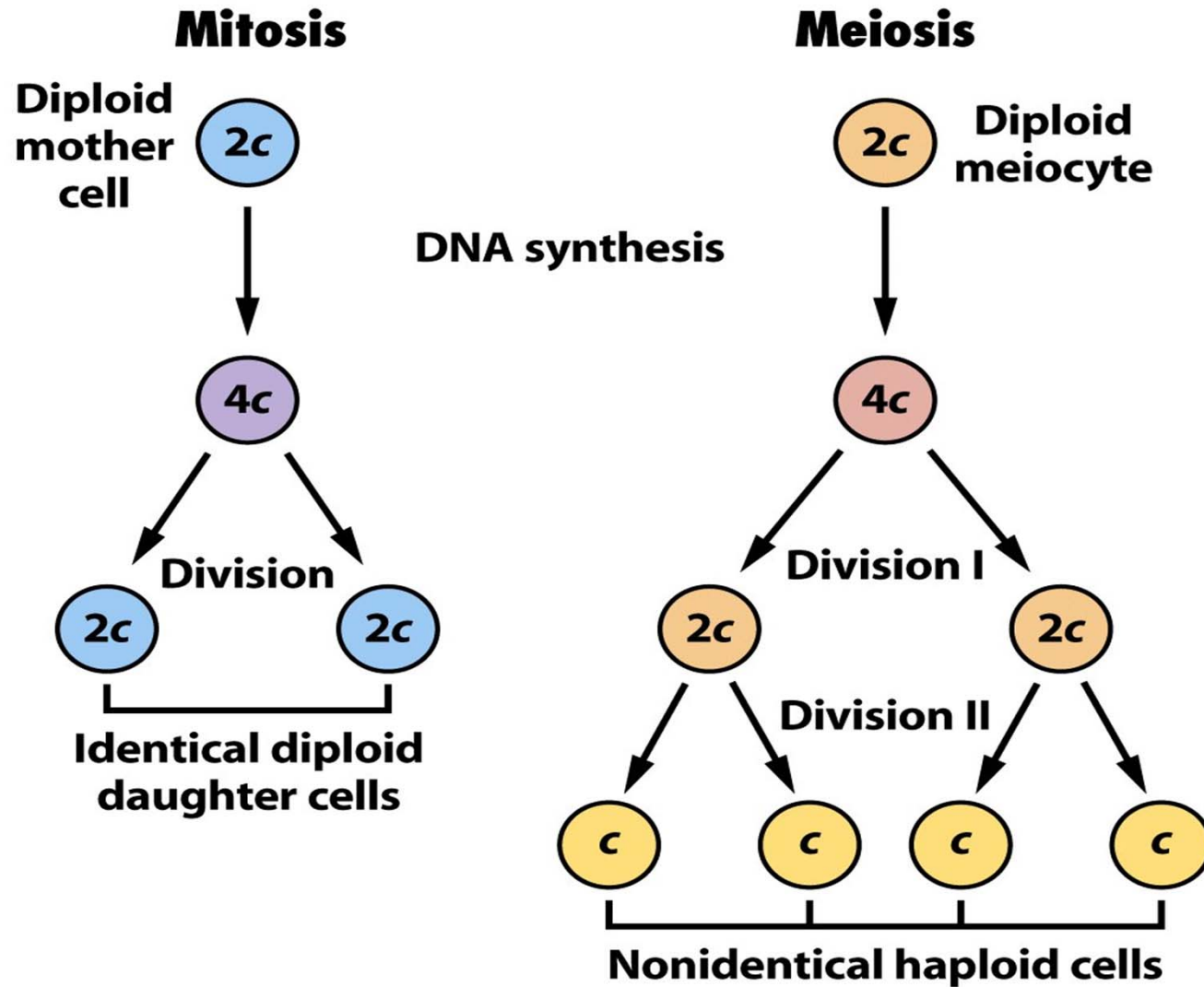
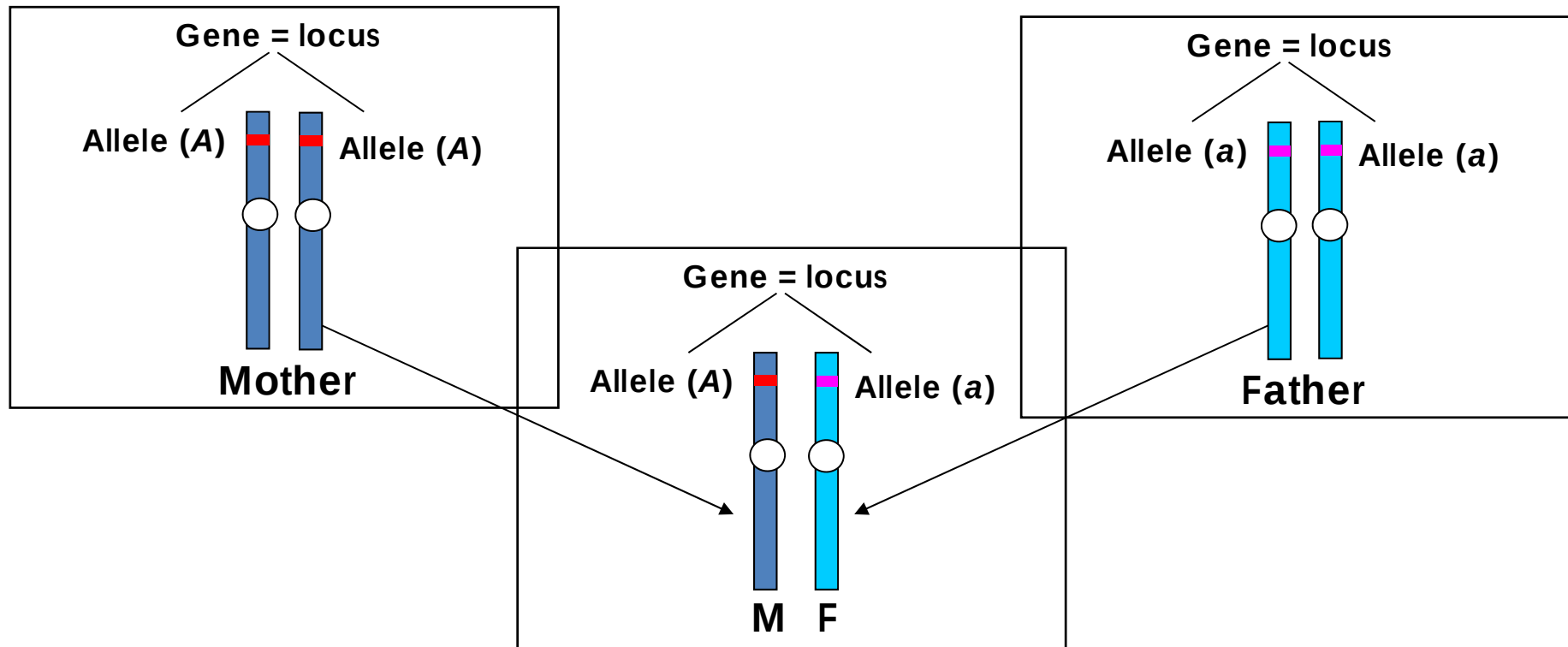


Figure 2-10 Principles of Genetics, 4/e
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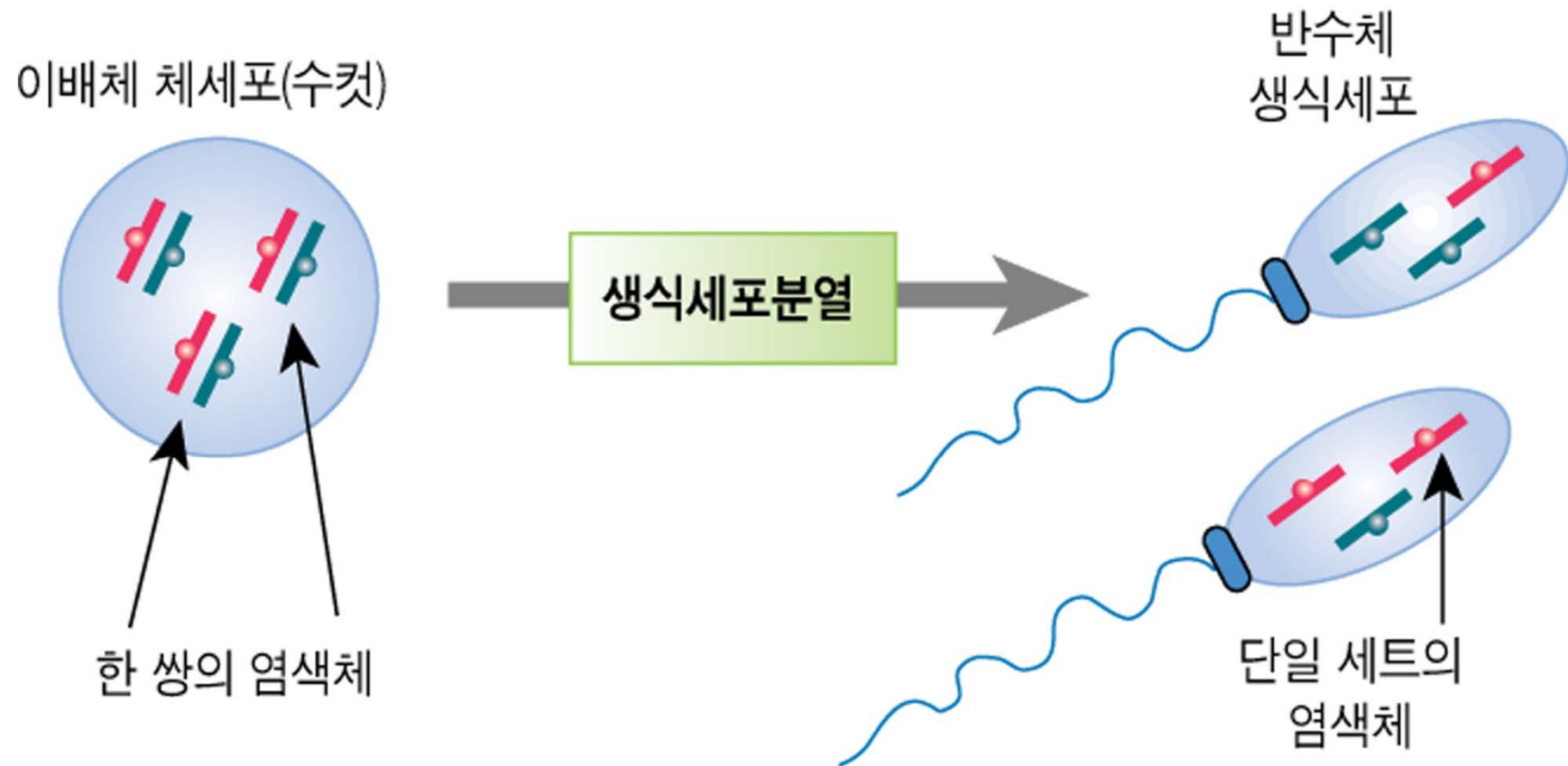
Gamete and Meiosis

- Parent passes only a single allele of each gene and which of the original pair of copies gets passed to any particular descendent is purely random
- Mendelian ratios rely on this random recombination of each single allele

Locus, Gene, Allele, & Genotype



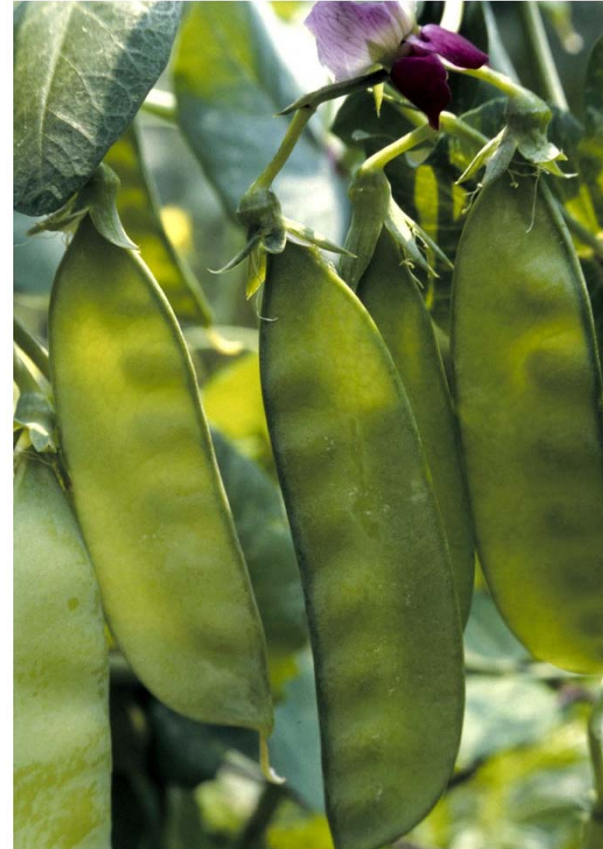
Mendel's law of 'Segregation' and 'Independent assortment'



Gregor Johann Mendel (1822-1884) and garden pea



Gregor Mendel

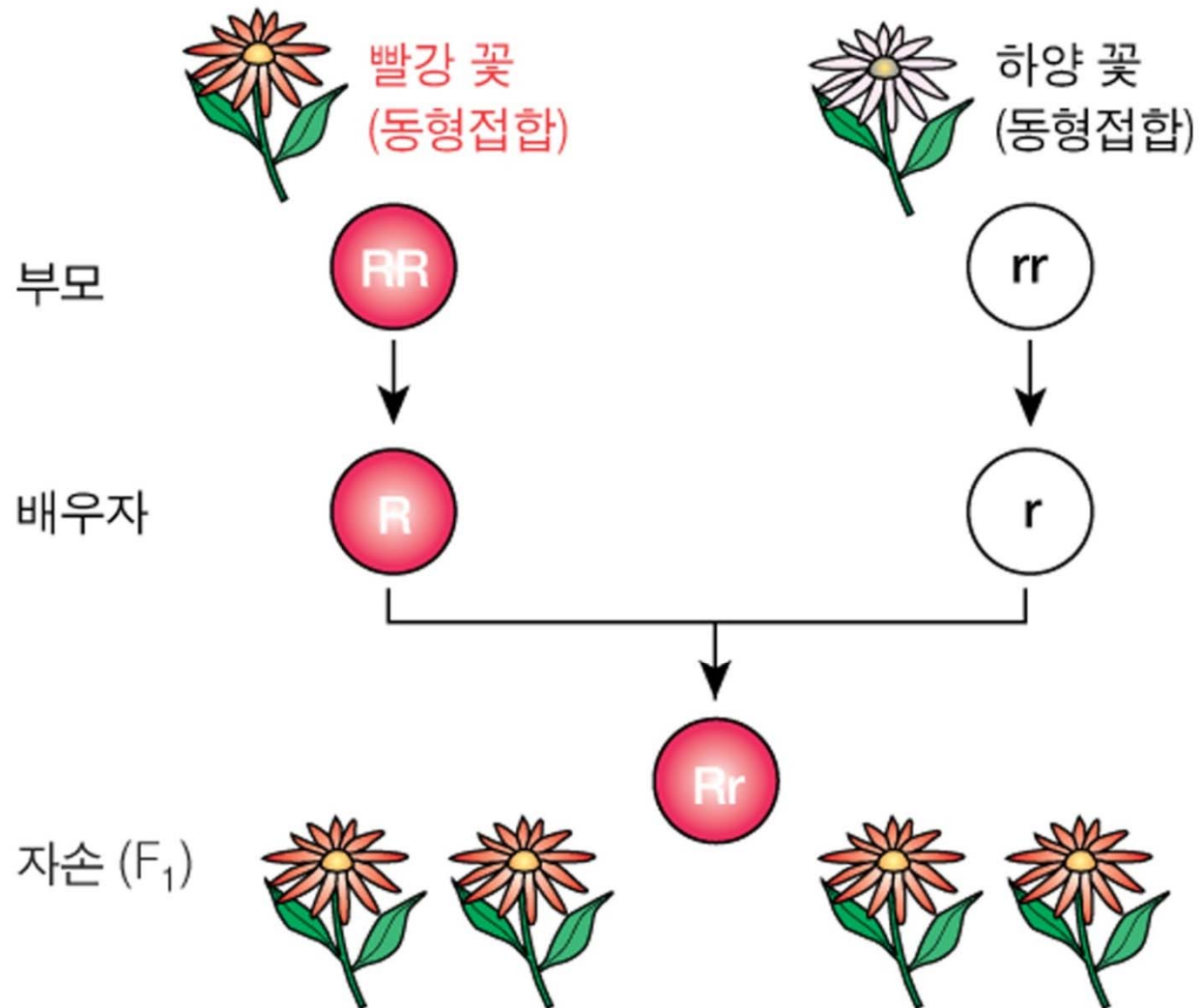


Chapter 3 Opener Principles of Genetics, 4/e

We are looking at the same numbers that Mendel used to look... but
Do you have the insight that Mendel used to have?

Table 14.1 The Results of Mendel's F ₁ Crosses for Seven Characters in Pea Plants [true breeding: itself = itself]					
Character	Dominant Trait	×	Recessive Trait	F ₂ Generation Dominant:Recessive	Ratio
Flower color	Purple 	×	White 	705:224	3.15:1
Flower position	Axial 	×	Terminal 	651:207	3.14:1
Seed color	Yellow 	×	Green 	6022:2001	3.01:1
Seed shape	Round 	×	Wrinkled 	5474:1850	2.96:1
Pod shape	Inflated 	×	Constricted 	882:299	2.95:1
Pod color	Green 	×	Yellow 	428:152	2.82:1
Stem length	Tall 	×	Dwarf 	787:277	2.84:1

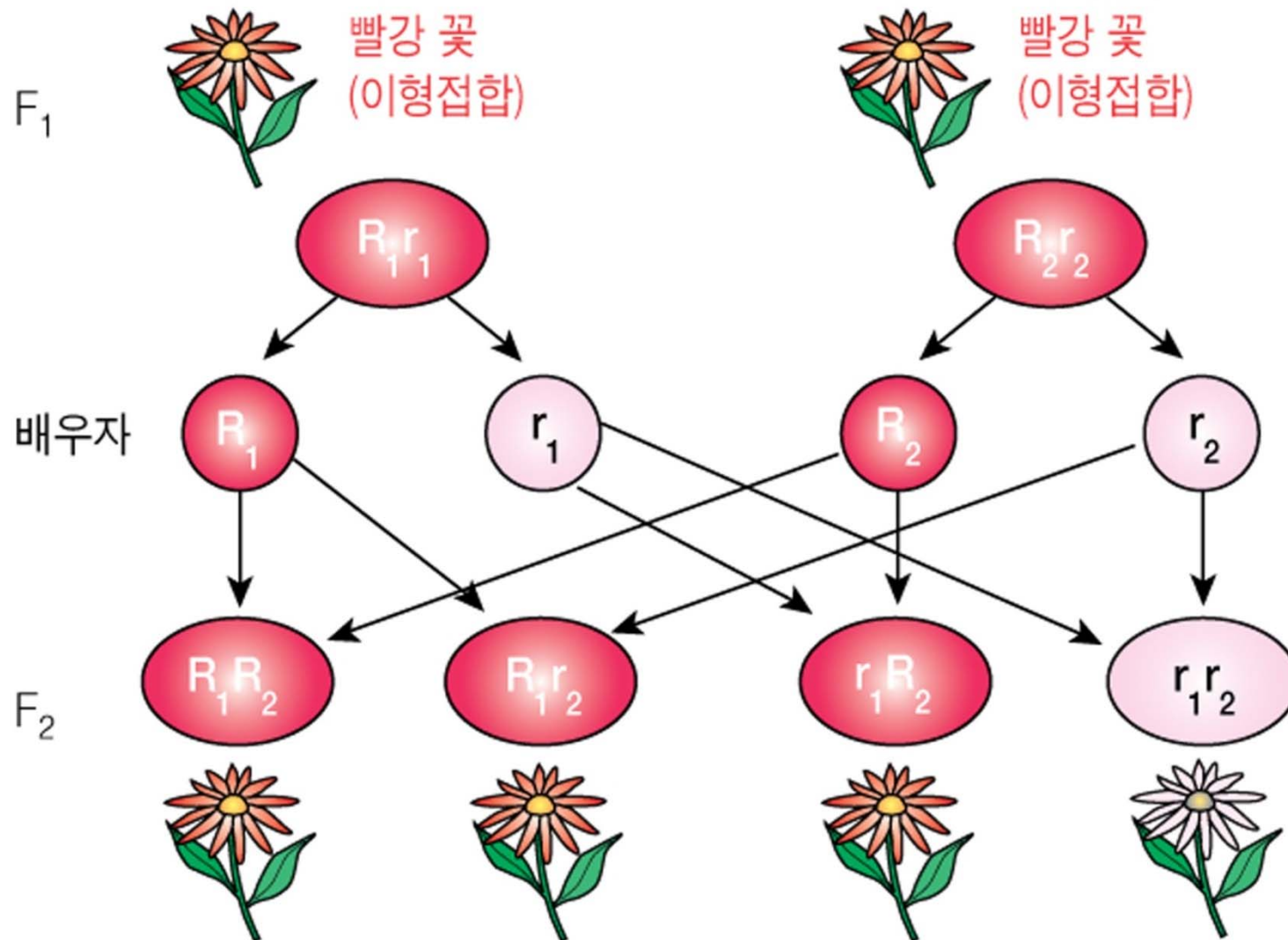
Which Mendel's law do you find from this diagram?



Dominance, Linkage, & Recombination

- When a functional allele completely masks a defective allele
= complete dominance
- When a functional allele only partly masks a defective allele
= partial dominance
- When two functional alleles both contribute to the observed properties
= co-dominance

Again, which Mendel's law do you find from this diagram?



Again, which Mendel's law do you find from this diagram?

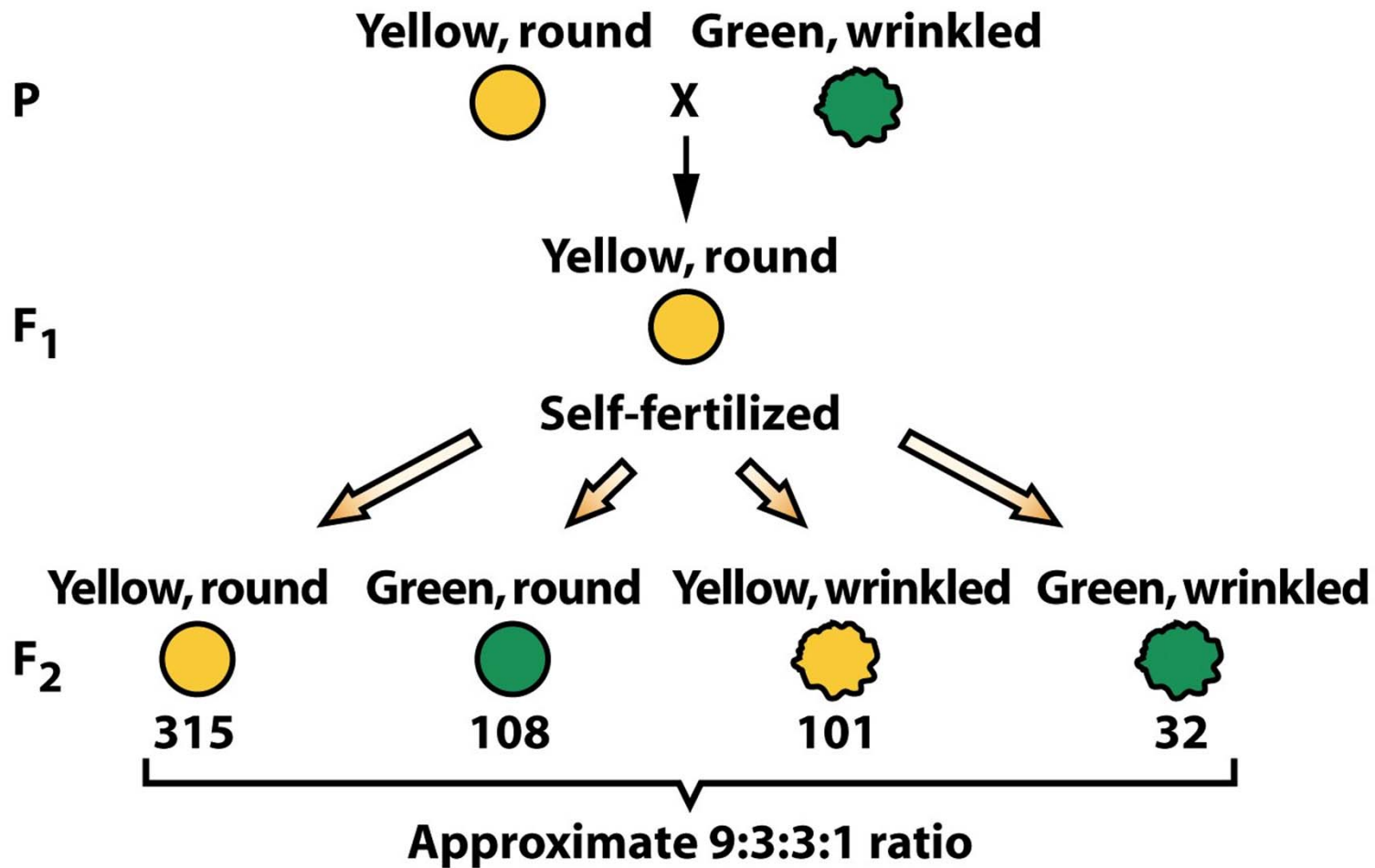


Figure 3-3 Principles of Genetics, 4/e
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Which dominant effect can explain the phenomenon below?



RR = 빨강 꽃



Rr = 분홍 꽃



rr = 하양 꽃



RR = 빨강 꽃



Rr = 빨강 꽃



BB = 파랑 꽃



Br = 파랑 꽃



rr = 하양 꽃



BR = 보라 꽃

Is that all for making the biological differences?

Different genes on different chromosomes randomly segregate...,

Then, what happens for the different genes on the same chromosome?

Dominance, Linkage, & Recombination

- Two genes are linked when they are on the same DNA molecule (on the same chromosome) = linkage
- When two different strands of DNA are broken and are then joined to one another = crossing over
- Suffering of different alleles between chromosomes = recombination
- The farther apart two genes are on the chromosome, the more likely a crossover will form between them and the higher will be their frequency of recombination

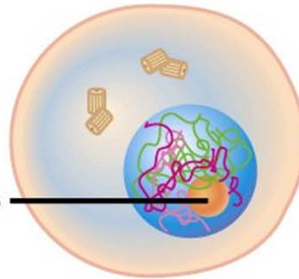
Crossing-over occurs at meiosis
and separates and recombines the genes on the same chromosome
(= linked genes)

Prophase I

Leptonema

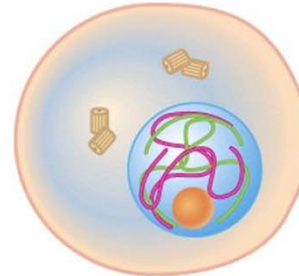
Replicated
chromosomes
become visible.

Nucleolus



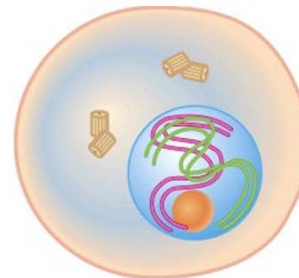
Zygonema

Homologous
chromosomes pair.



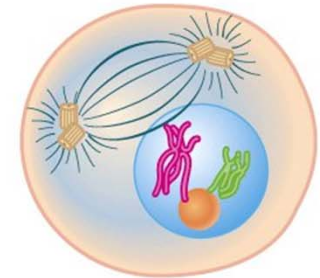
Pachynema

Homologous
chromosomes fully paired.
Crossing over occurs.



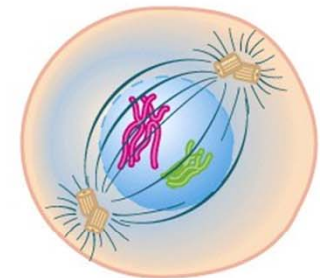
Diplonema

Homologous chromosomes
begin to repel each other.
Chromatids become fully
visible. Chiasmata become
visible.

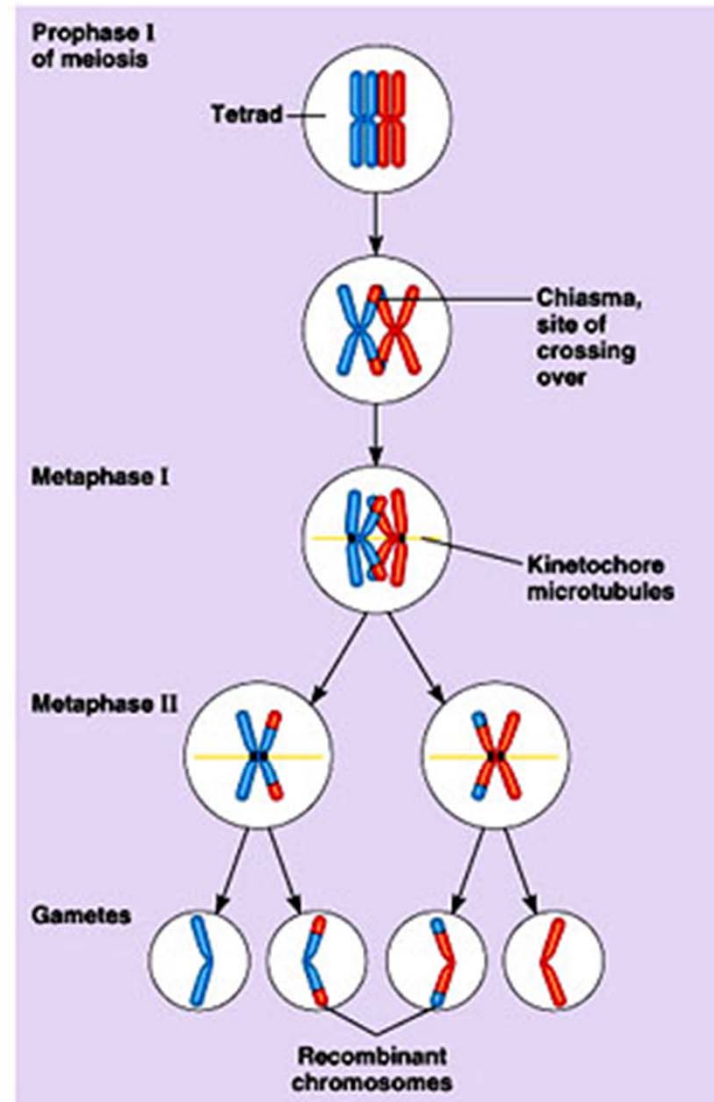
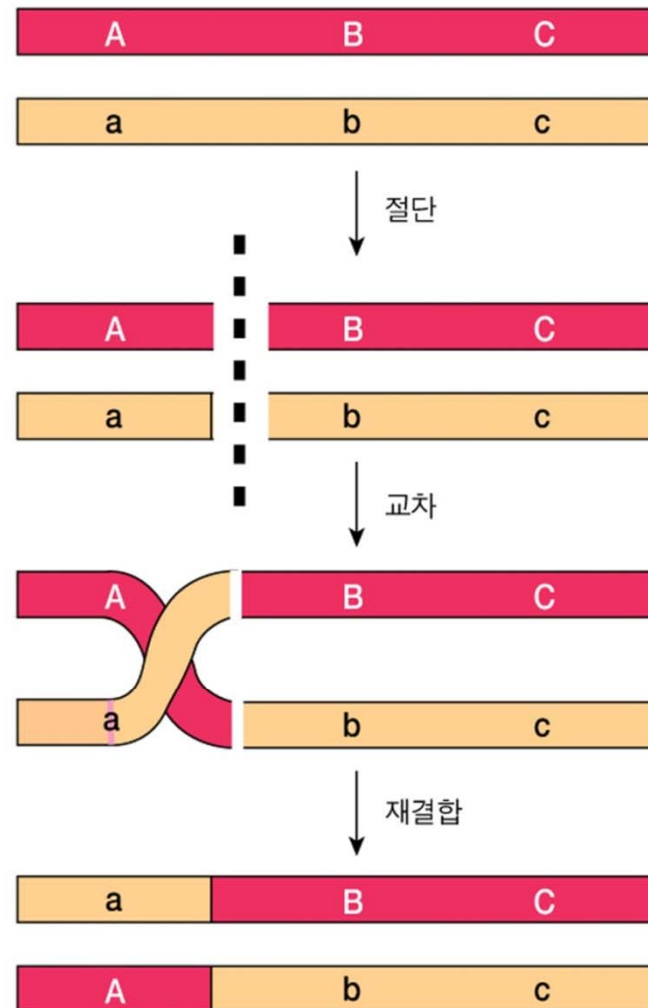


Diakinesis

Chromosomes continue to
shorten and thicken.
Nucleolus and nuclear
membrane disappear.
Microtubules attach to
kinetochores.



Crossing-over occurs at meiosis and separates and recombines the genes on the same chromosome



What does determine the similarity and difference?



Segregation, assortment and crossing-over

Hold on! There's one more.... **Mutation !**



Million years later?

