How Do Plants Survive Through Time?

Asexual reproduction leads to new individuals mainly via fragmentation (formation of adventitious roots, buds, plantlets) or agamospermy (formation of seeds containing mitotically produced embryos)

- All progeny are identical genetically to the parent and to one another
- All are as adapted as the parent is, but none is more adapted
- Rapid colonization of a new site is possible
- All may be adversely affected by even minor changes in the habitat
- Even isolated individuals can reproduce

Sexual reproduction leads to new individuals via production of sex cells that fuse to form a zygote, which develops into an embryo, which develops into a new plant

- Progeny are genetically diverse
- Some are less adapted than the parents, but others are more adapted
- Cannot colonize a new site as rapidly, but can colonize different sites with characteristics not suitable for the parents
- Changes in the habitat may adversely affect some progeny, but others may be adapted to the new conditions
- Isolated individuals cannot reproduce

Genetic variation gives a species flexibility in a changing world

- Characteristics of organisms (e.g., flower color) are controlled by genes
- Alternative forms of a gene (e.g., a gene for white flower color vs. a gene for purple flower color) are called alleles
- The types of alleles that an individual has (e.g., two alleles for purple flower color, two alleles for white flower color, or one allele for purple and one for white) defines its genotype
- The expression of alleles in an individual (e.g., purple-flowered or white-flowered) defines its phenotype
- A population is a group of individuals of the same species occupying a particular area
- The gene pool of a population is all of the alleles in all of the sex cells in all of the individuals of that population
- Genetic variation in a population results from mutation (changes in a genes) and recombination (new combinations of alleles resulting from sexual reproduction)

Assume a population of diploid sexually reproducing organisms, all homozygous dominant for genes A and B (all with genotype AABB)

Assume mutations in both the A and B genes such that:

Mutation #1: AABB → AaBB
Mutation #2: AABB → AABb

These genotypes are new due to mutation alone

Next Generation

AaBB Produces Gametes AB and aB
AABb Produces Gametes AB and Ab

	AB	aB
AB	AABB	AaBB
Ab	AABb	AaBb*

*New genotype due to sexual recombination

One More Generation With:

AaBb x AaBb

Offspring: AABB, AaBB, AABb, AaBb, AAbb*, Aabb*, aaBB*, aaBb*, aabb*

*New genotypes due to sexual recombination – these may also represent new phenotypes

Evolution is the change in a species' genetic makeup over time due to mutation, genetic drift, gene flow, and natural selection

Mutation is a heritable change in the genetic material (DNA)

Genetic drift is a random fluctuation in allele frequencies over time due to chance occurrences alone

Gene flow is a change in allele frequencies as individuals leave or enter a population

Natural selection is a change in allele frequencies due to differential reproduction of variant members of a population

This lecture outline was prepared partly from *Biology*, by Campbell and Reece, 2002 (6th edition), and from *Botany – An Introduction to Plant Biology*, by Mauseth, 1998 (2nd edition), and may contain phrases or entire sentences taken verbatim from those sources.