

# Ch. 3 Reproduction

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- ⌘ Heredity: the passing of traits from parents to offspring
- ⌘ Asexual Reproduction: offspring come from a single parent through the mitosis process
- ⌘ Gene: sections of DNA that control the substances the cell makes and when it makes them

# Vocabulary

- ⌘ Sexual Reproduction: reproduction by 2 parents
- ⌘ Egg Cells: sex cell of the female parent
- ⌘ Sperm Cells: Sex cell of the male parent
- ⌘ Meiosis: the process of cell division by which sex cells are formed
- ⌘ Fertilization: the joining of male and female cells in sexual reproduction
- ⌘ Selective Breeding: the process of selecting a few organisms with desired traits to serve as parents of offspring

# Vocabulary

# Ch. 3.1 What is asexual reproduction? {



- ⌘ It is easy to tell which offspring to which parents
- ⌘ Because of heredity and sharing traits, parents and offspring resemble each other
- ⌘ An organism may grow to be bigger, smaller, lighter or darker than its parent, but the basic pattern is the same
- ⌘ Traits such as hair and eye color are examples of traits we inherit

# Heredity

- ⌘ Inherited traits do not act alone to give an organism its traits
- ⌘ Environment also affects characteristics
- ⌘ An example is being good at a sport. You may have inherited athletic ability, but it takes a lot of practice to become a good player
- ⌘ Learned traits are not passed from parent to offspring

# Heredity

- ⌘ Individual organisms do not live forever
- ⌘ Because of this the passing of traits from parents to offspring is necessary for a species to survive
- ⌘ Organisms reproduce asexually through mitosis
- ⌘ The offspring and parent share the same DNA

# Asexual Reproduction

- ⌘ Fission: a parent cell splits to form 2 offspring cells of the same size. Each offspring cell has the same traits as the parent cell. Very fast way to reproduce
- ⌘ Budding: a cell in the parent's body produces a small version of itself. Each bud has identical DNA to the parent
- ⌘ Forming Spores: a reproductive cell that has a nucleus and a little bit of cytoplasm. When conditions are right, a spore develops into a new individual with the same DNA as the parent

# Kinds of Asexual Reproduction

# Ch. 3.2 How are traits passed on? {



- ⌘ For most organisms, a cell nucleus contains its chromosomes
- ⌘ The chromosomes contain a set of instructions that control all activities of a cell
- ⌘ They tell individual cell parts what to do and the cells of a multicellular organism how to work together to form an individual organism
- ⌘ Chromosomes are made up of proteins and DNA (deoxyribonucleic acid)

# Structure of DNA

- ⌘ Scientists have been able to see chromosomes for more than 100 years, but until the 1950s no one knew the importance
- ⌘ Around that time scientists were able to show that DNA carries all the instructions for a cell and that DNA is passed from a parent cell to its offspring
- ⌘ A DNA strand looks like a twisted ladder, that contains millions of rungs

# Structure of DNA



- ⌘ These rungs are made up of just 4 kinds of materials called bases
- ⌘ The bases are known by the letters A, T, C and G
- ⌘ Each rung is made up of two bases, called base pairs
- ⌘ The DNA of a chromosome is divided into sections called genes
- ⌘ A gene is a series of base pairs or rungs
- ⌘ The number of rungs varies from gene to gene
- ⌘ Each gene controls what substances the cell makes and when it makes them
- ⌘ These substances determine an organisms traits

# Structure of DNA

- ⌘ Every species has a different number of chromosomes, with each member of a species having the same number
- ⌘ Humans have 23 pairs of chromosomes or 46 total
- ⌘ Gorillas have 48 chromosomes
- ⌘ A crayfish has 200 chromosomes
- ⌘ Dogs have 78 chromosomes

# Chromosomes

- ⌘ The DNA is made up of pairs of the same four bases
- ⌘ The order of the base pairs varies from place to place on the DNA ladder
- ⌘ The order determines exactly what instructions each gene gives to an organisms cells
- ⌘ For example: TA-CG-GC-TA gives different instructions than TA-AT-GC-TA

# Copying DNA

- ⌘ Two bases fit together to form each rung
- ⌘ They fit together only in certain ways
- ⌘ Base T can only fit with base A
- ⌘ Base G can only fit with base C
- ⌘ This pairing allows DNA to make an exact copy of itself when the cell divides through mitosis

# Copying DNA

- ⌘ When the cell undergoes mitosis, the DNA “unzips” and the base pairs come apart
- ⌘ Free-floating bases within the nucleus pair with separated bases on the DNA strand
- ⌘ The process continues until 2 complete double strands of DNA are formed
- ⌘ The 2 strands are identical to the original
- ⌘ An organism that reproduces asexually gives exact copies of its genes to each new cell
- ⌘ When a base is added or deleted it causes a mutation
- ⌘ A mutation can change the instructions a gene sends

# Copying DNA



# Ch. 3.3 What is Sexual Reproduction? {

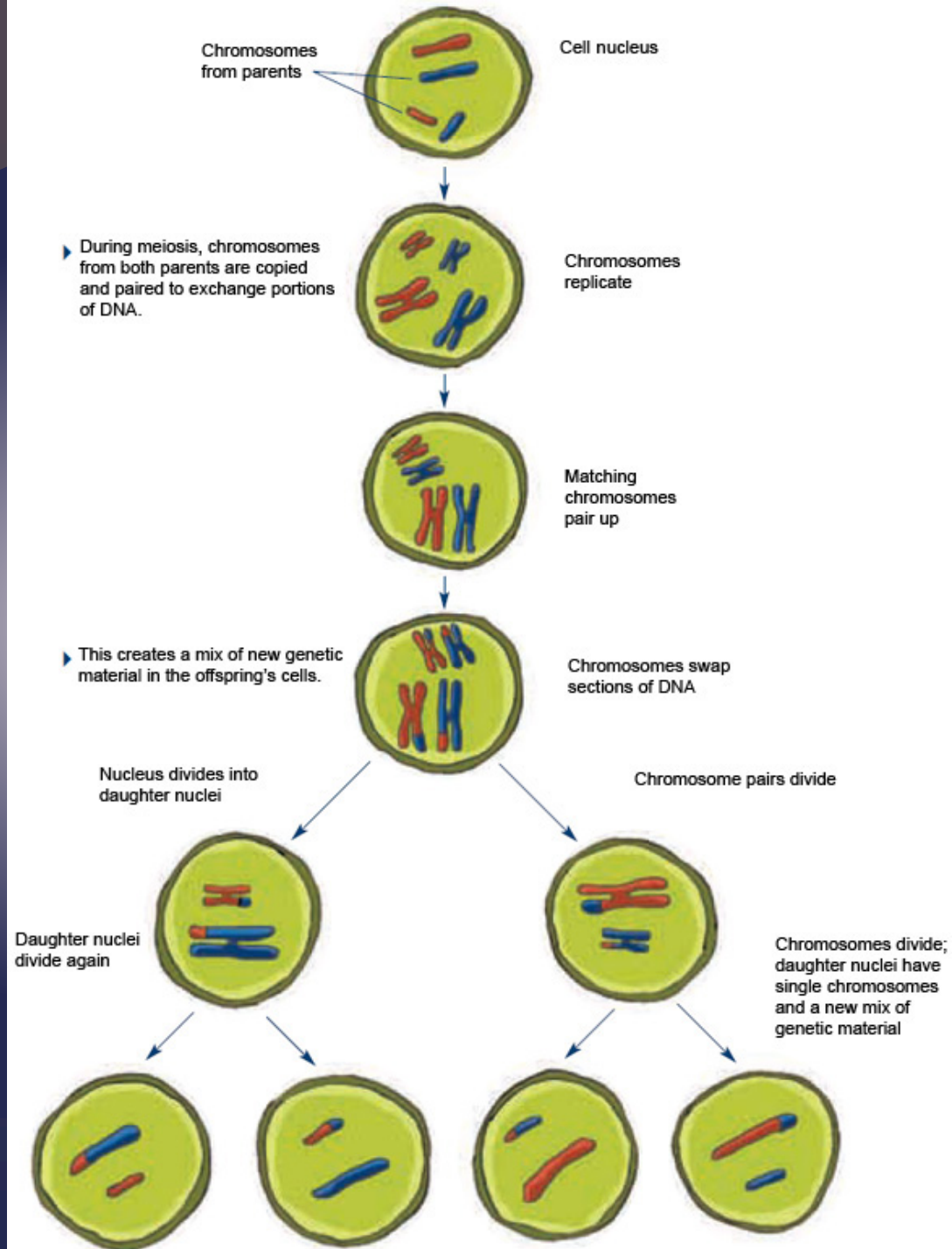
- ⌘ Sexual reproduction is reproduction by 2 parents
- ⌘ Living things that reproduce sexually have special sex cells, male: sperm, female: egg
- ⌘ Each sex cell has half the number of chromosomes as other cells in the body
- ⌘ Sex cells form by a process called meiosis
- ⌘ In meiosis one cell divides into 4 new cells
- ⌘ Each cell has half the number of chromosomes as the parent cell

# Reproduction by 2 Parents



- ⌘ The male and female sex cell join in a process called fertilization
- ⌘ During fertilization the sperm and egg cell unite to form a new cell
- ⌘ This new cell is called a zygote, and is the first cell of a new organism
- ⌘ Since each sex cell has half the number of chromosomes, the new cell receives a complete set
- ⌘ The zygote then divides by mitosis to form the many cells that make up the adult body of the organism

# Reproduction by 2 Parents



- ⌘ A flower is an adaptation that allows a plant to reproduce sexually
- ⌘ In flowering plants, fertilization takes place in the flower
- ⌘ The male sex cell is pollen, which is made in the stamen
- ⌘ The female sex cell is at the bottom part of the flower which is the pistil
- ⌘ The process in which the pollen gets from the stamen to the bottom of the pistil is called pollination

# Fertilization in Flowering Plants

- ⌘ In animals fertilization can take place inside or outside the body of the female
- ⌘ Many animals that live in or near water use external fertilization
- ⌘ During external fertilization, animals release sperm and eggs into the water
- ⌘ The sperm swim to the eggs and fertilization takes place
- ⌘ Each time a zygote forms and a new individual starts to develop

# Fertilization in Animals



- ⌘ Only a few of the fertilized eggs in external fertilization will survive
- ⌘ This can be due to environmental conditions such as severe weather, pollution or predators
- ⌘ External fertilization is difficult in land animals because the sperm and eggs would dry out too quickly
- ⌘ Most animals on land use internal fertilization
- ⌘ Fertilized eggs also need moisture
- ⌘ In some animals the zygote develops inside the female's body which is moist
- ⌘ In animals like birds and turtles, the zygote develops in eggs with shells that keep it from drying out and protected from predators

# Fertilization in Animals

- ⌘ While in asexual reproduction, offspring is identical to the parent cells, offspring of sexual reproduction share characteristics from both parents
- ⌘ Each individual has its own set of traits
- ⌘ They may resemble their parents but have its own unique set of DNA
- ⌘ Meiosis is the reason
- ⌘ Because each sex cell has only half the DNA, when they combine the offspring will receive traits from both parents

# Individuals Differ

## ⌘ Asexual Reproduction

- ⌘ Simpler, occurs quickly, produces many offspring in a short amount of time
- ⌘ One lone organism can reproduce, even if the closest individual is hundreds of miles away
- ⌘ Takes less energy, no need to produce sex cells
- ⌘ Same DNA as parent
- ⌘ Negative: traits all come from one parent so it is more difficult to adapt to changes in environment

# Comparing Sexual and Asexual Reproduction



## ⌘ Sexual Reproduction

- ⌘ Slow process
- ⌘ Requires more energy
- ⌘ Must have 2 parents
- ⌘ Produces offspring with unique DNA
- ⌘ Offspring has better chance to survive in a changing environment

# Comparing Sexual and Asexual Reproduction

# Ch. 3.4 How do genes determine traits?

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- ⌘ Since offspring in sexual reproduction get genes from both parents, it is hard to determine what traits they will have
- ⌘ When the genes mix, one version will show up, the other won't
- ⌘ A version of a gene that masks the effect of another version is called a dominant trait
- ⌘ The trait that is hidden is called a recessive trait
- ⌘ The only way to get a recessive trait is for both versions of the gene to be the recessive version

# Dominant and Recessive Traits

- ⌘ The dominant traits are represented by a capital letter
- ⌘ The recessive traits are represented by a lower case letter
- ⌘ When an organism receives one dominant and one recessive version of a trait they are called a hybrid

# Dominant and Recessive Traits

- ⌘ Plants and animals can be selectively bred
- ⌘ This means people choose the best traits and breed for those traits. They then take the most desired traits out of the new group and keep going until the plant or animal is exactly how they want it
- ⌘ This is called selective breeding

# Choosing Traits

|   |    |    |
|---|----|----|
|   | L  | L  |
| l | Ll | Ll |
| l | Ll | Ll |

A new species of aliens have been discovered on Mars. If one parent has 2 dominant genes for a large head (L) and the other has 2 recessive genes for for a small head (l), what is the percentage the offspring has a large head?

|   |    |    |
|---|----|----|
|   | A  | a  |
| A | AA | Aa |
| a | Aa | aa |

If a farmer is trying to breed his cows. He has one bull with one dominant gene for aggression (A) and one recessive gene for calmness (a). His cow also has one dominant gene for aggression (A) and one recessive gene for calmness (a). What is the percentage that the offspring will be calm