

2 Types of Reproduction

- Asexual
 - Genetically identical offspring
- Sexual
 - Advantage =
 - increases genetic diversity
 - Genetic diversity → stability

2 Types of Cell Division

- Mitosis → new identical cells
- Meiosis → sperm and eggs ($\frac{1}{2}$ DNA)

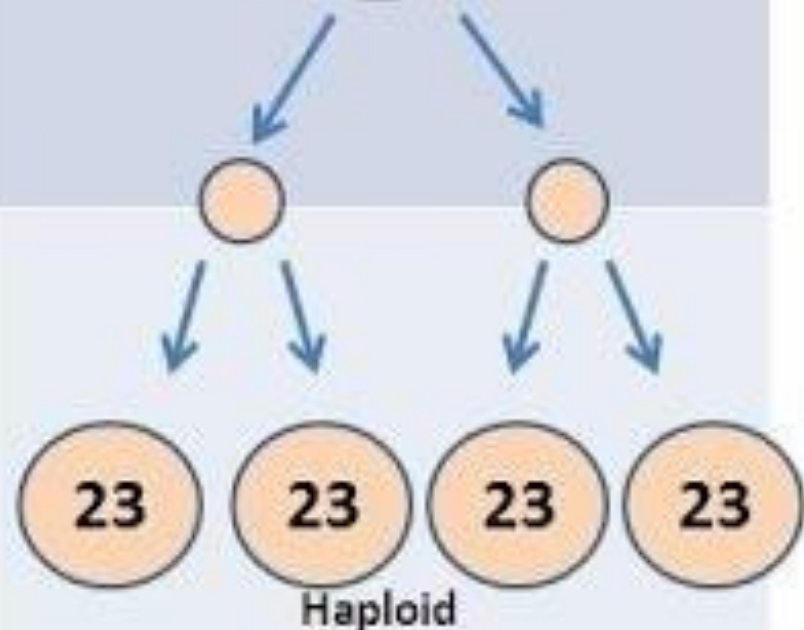
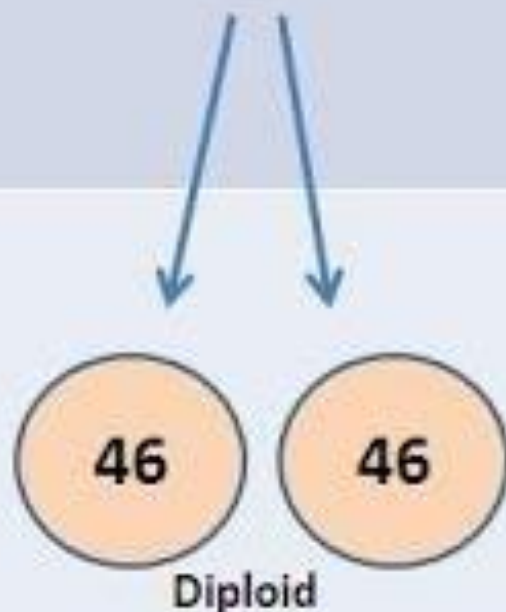
Mitosis

Meiosis

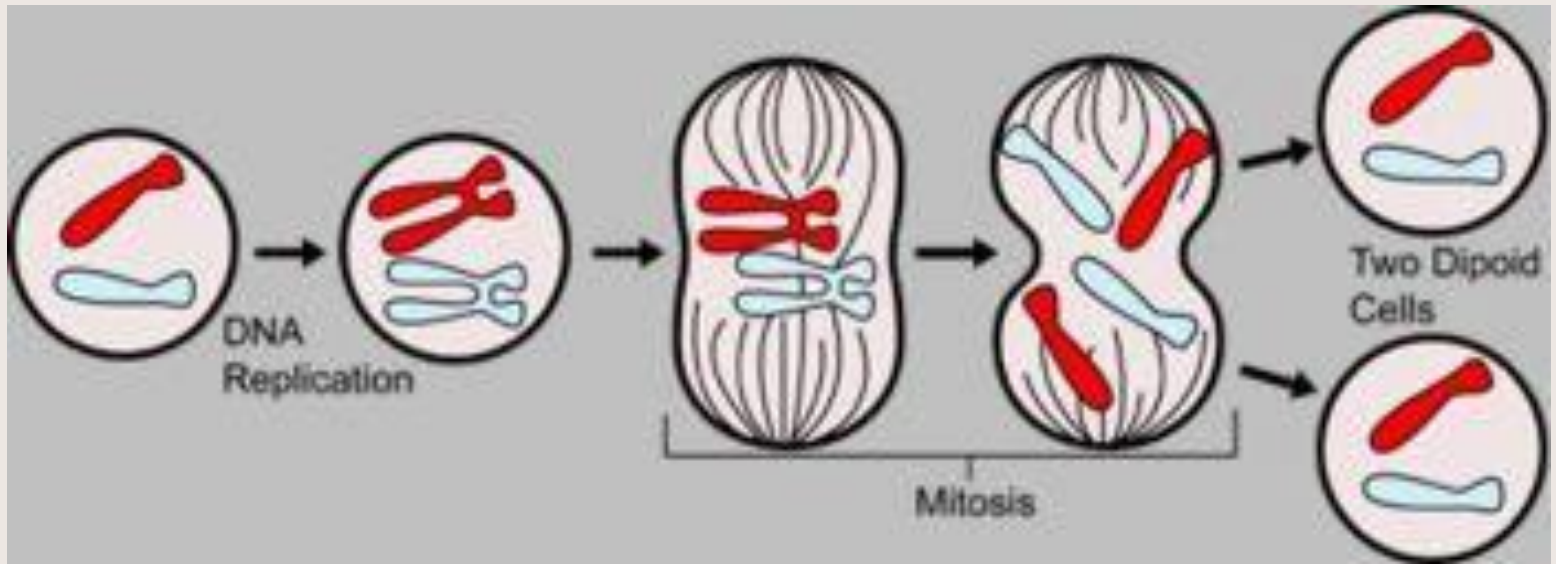
Start



End

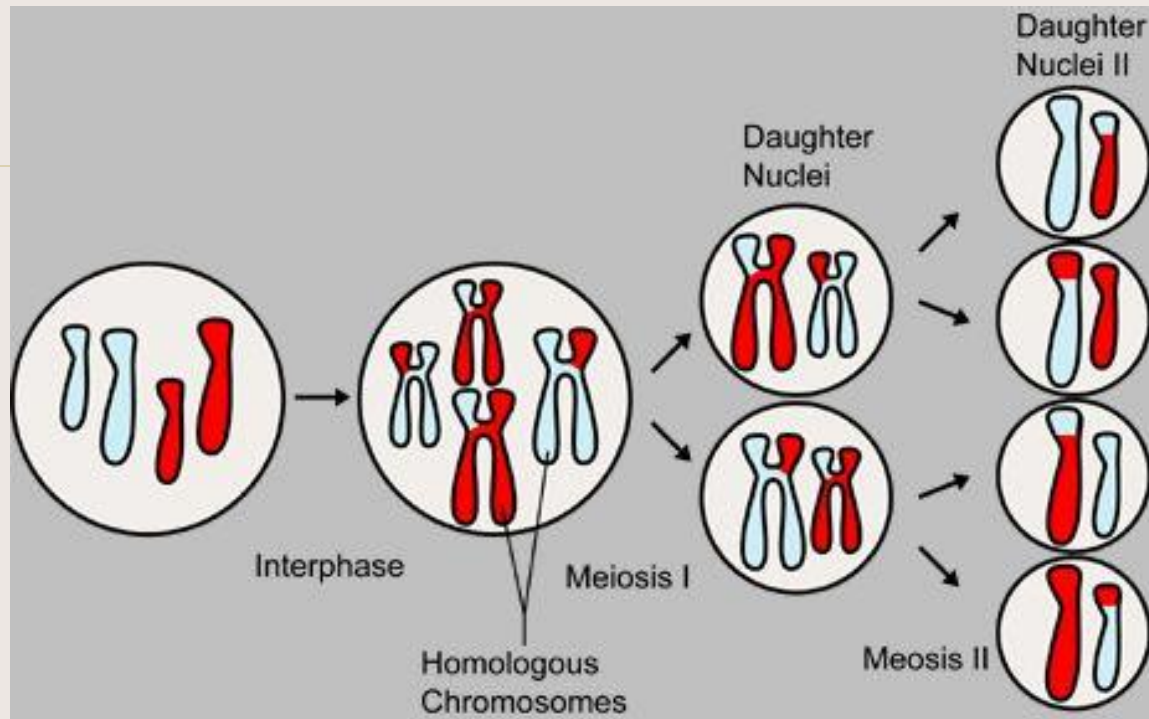


Mitosis



- DNA copies itself (replication)
- New cells have same amount of DNA as parent cell
- Cell splits once
- New cells are genetically identical to parent cell

Meiosis



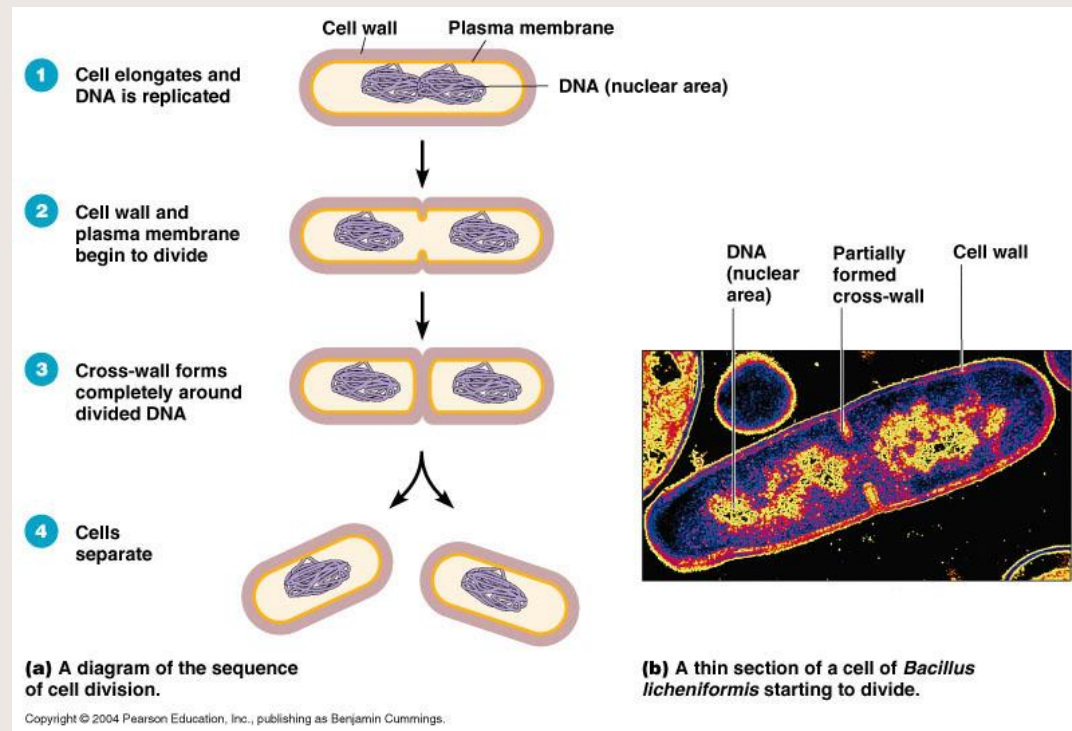
- Replication = DNA copies itself
- New cells have $\frac{1}{2}$ the amount of DNA as parent
- Cell splits 2 times
- Each new cell is genetically different (unique)

Asexual Reproduction

- 1 parent
- Mitosis only
- Offspring = genetically identical to the parent

Examples of Asexual Reproduction

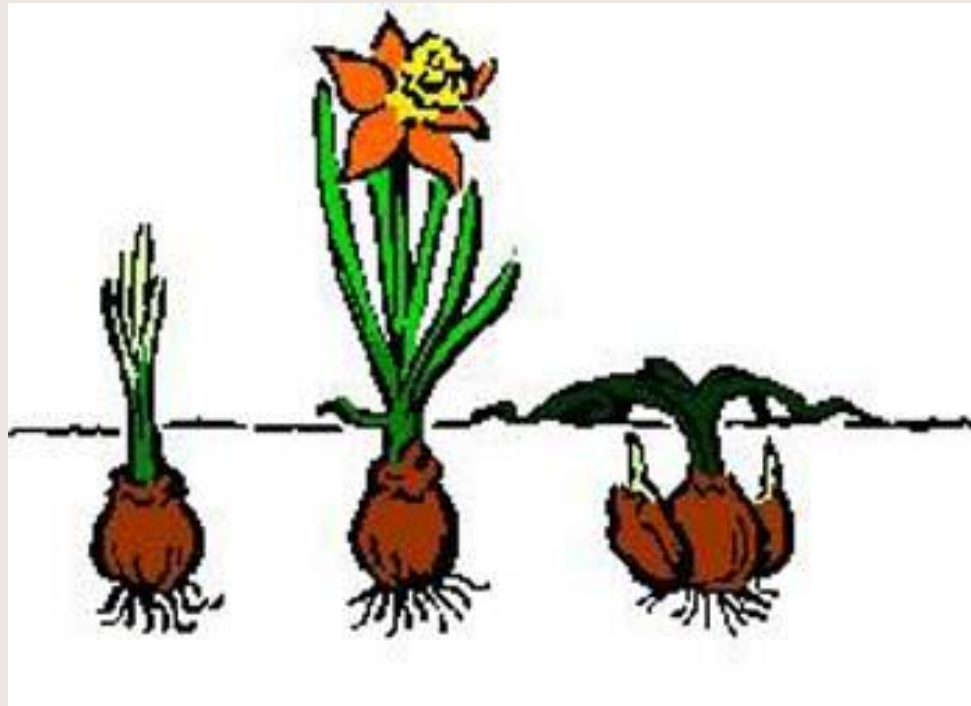
- Ex 1: single celled organisms (Bacteria and protists)
- DNA replicates = DNA copies itself
- Cell splits



- Ex 2: Asexual in plants = vegetative propagation
- strawberry plants → runners



- Daffodils and garlic → bulbs → new plants

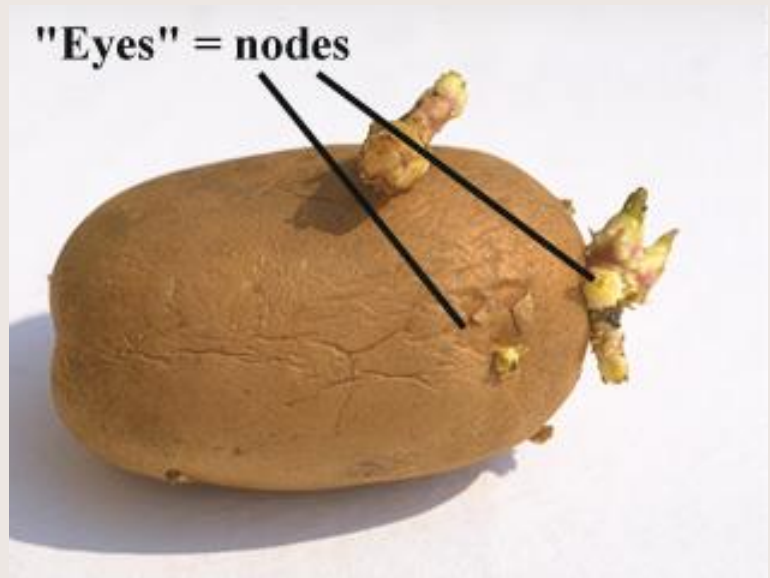


http://www.grannysgardenschool.com/bulb_different_stages.jpg

- Each eye on a potato → new plant



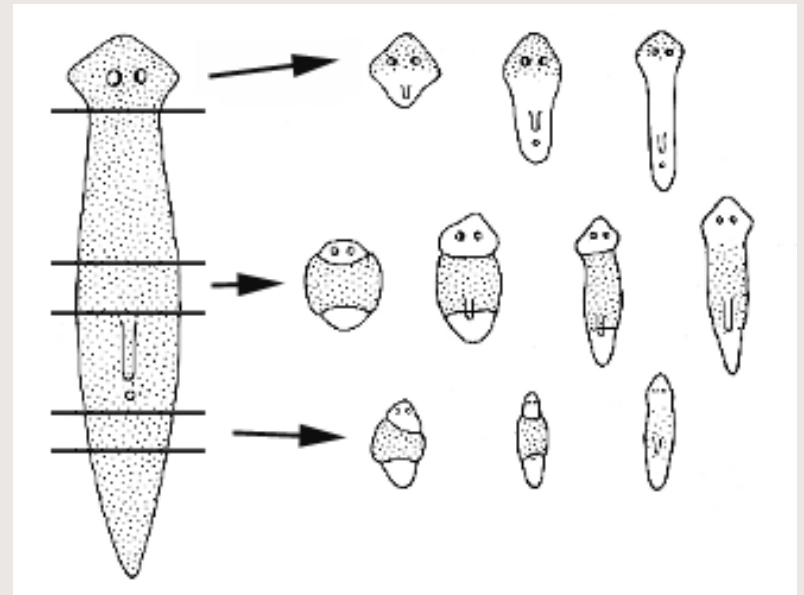
http://us.ent4.yimg.com/movies.yahoo.com/images/hv/photo/movie_pix/walt_disney/toy_story_2/_group_photos/mrs__potato_head10.jpg



<http://www.csdl.tamu.edu/FLORA/tfplab/veg13.jpg>

Ex 3: Some animals can regenerate

- Ex: Planaria (flatworm) (cut it in half parts can re-grow → new worms)



- Starfish can regenerate



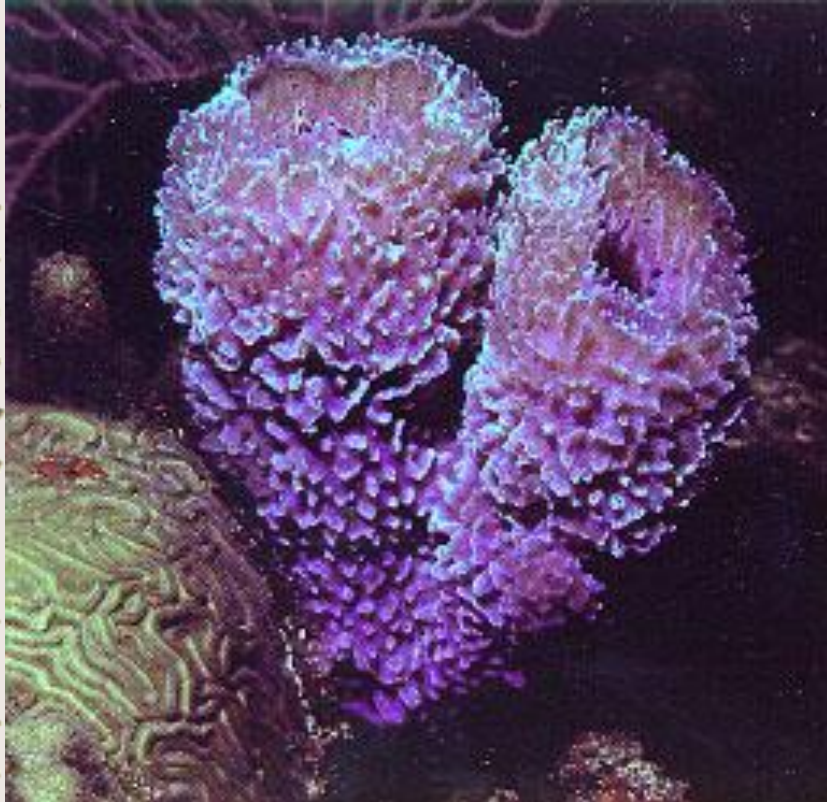
http://www.imagequest3d.com/ImageFolio3_files/gallery/aquatic/echinodermata/asteroidea/tn_RGS00723.jpg

Ex#4: Some animals and fungi reproduce by budding

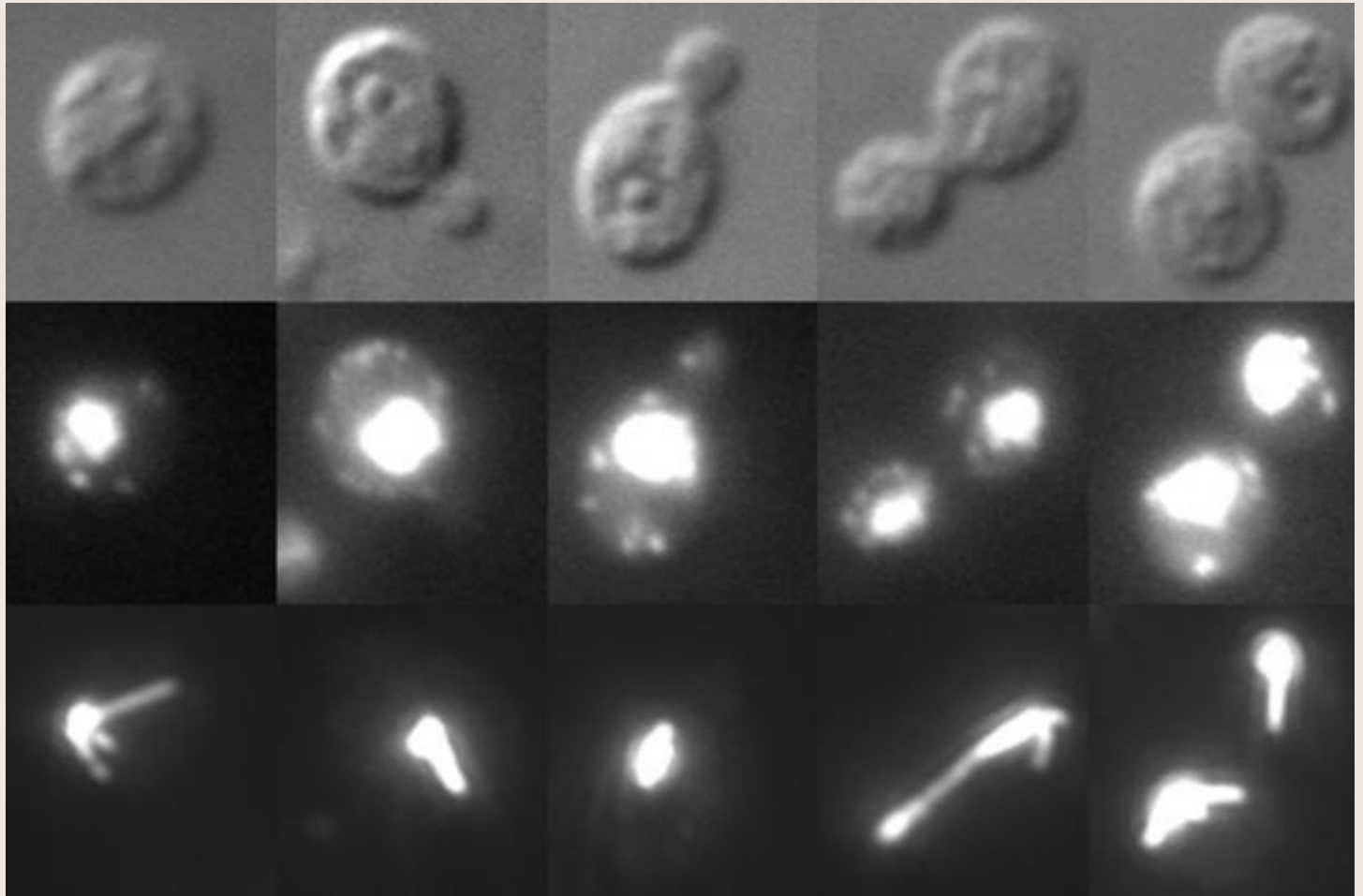


- Budding = new organism grows off the side of the parent
- ex: Hydra

and Sponge (animal)



Yeast is a fungus that reproduces by budding

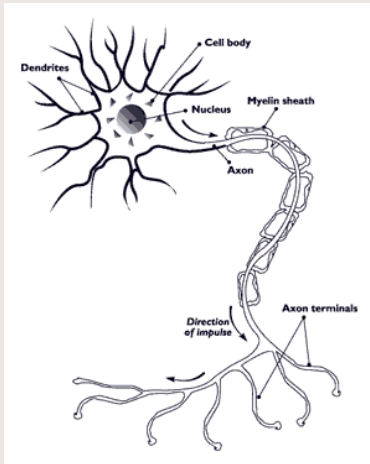


Body cells reproduce

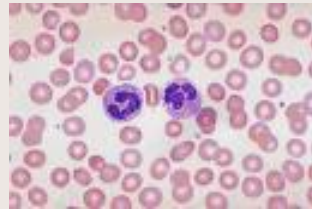
Mitosis → Growth

- How do multi-celled organisms grow
- Describe the DNA of cells in a multi-celled organism

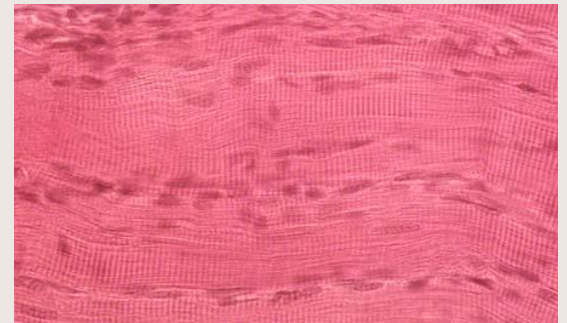
Human cells can look and function differently



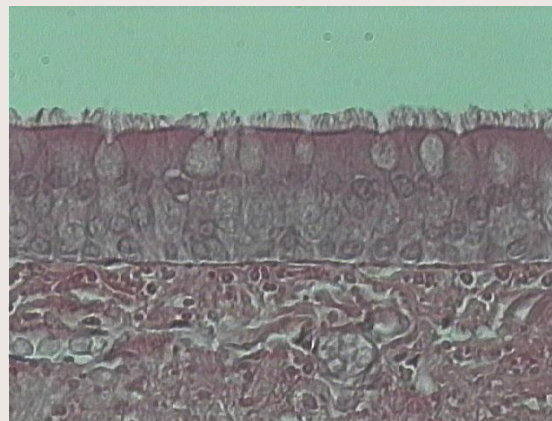
Nerve cell



Blood cells



Muscle cells



Tracheal cells

http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/Bio%20101/Bio%20101%20Lectures/cells/trachea_X_400_large.jpg

Human cells can look and function differently even if they have the same DNA

- Body cells = same DNA different shapes and function
- How?
- Environment controls which traits the cells use

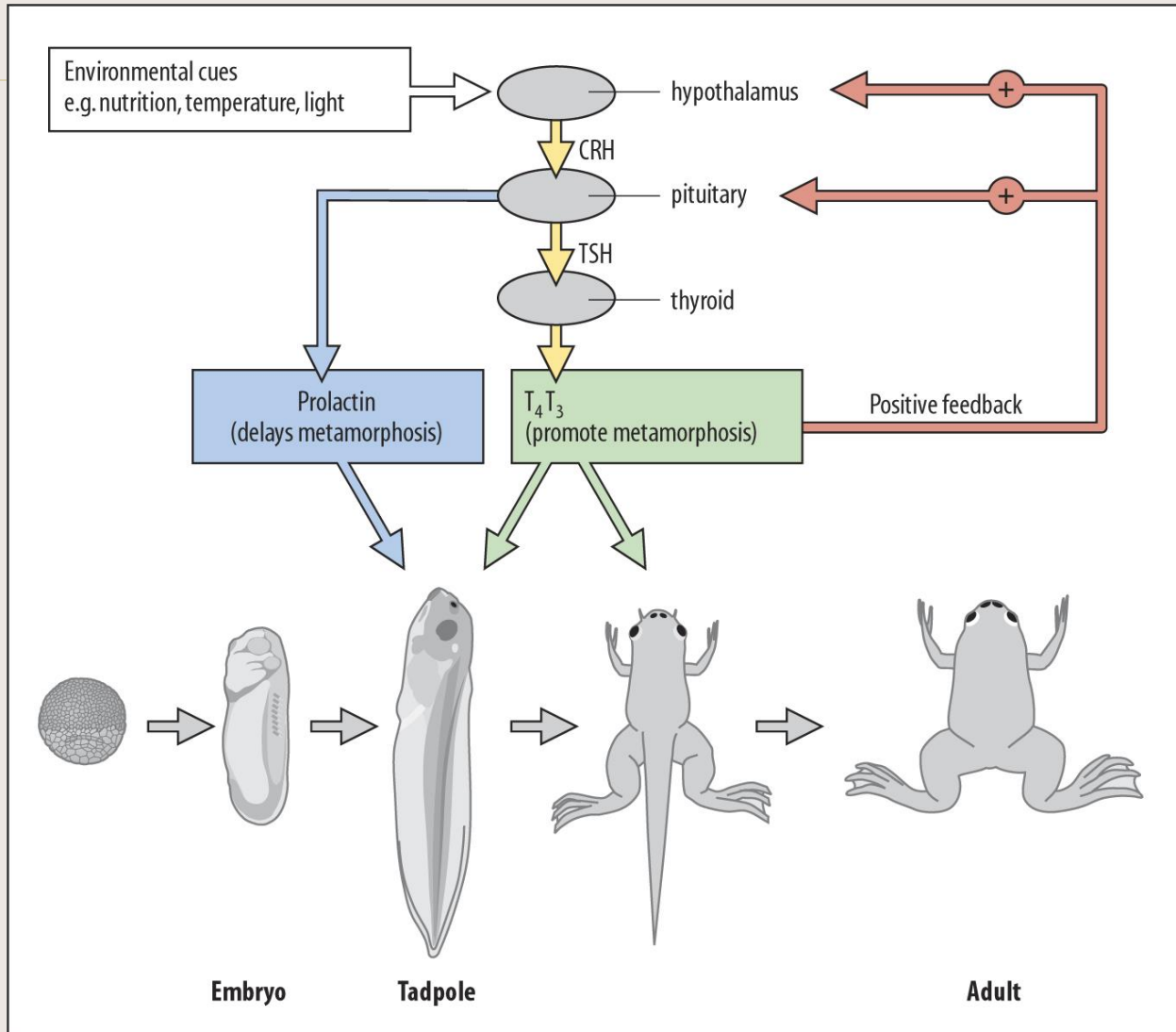
Define Metamorphosis



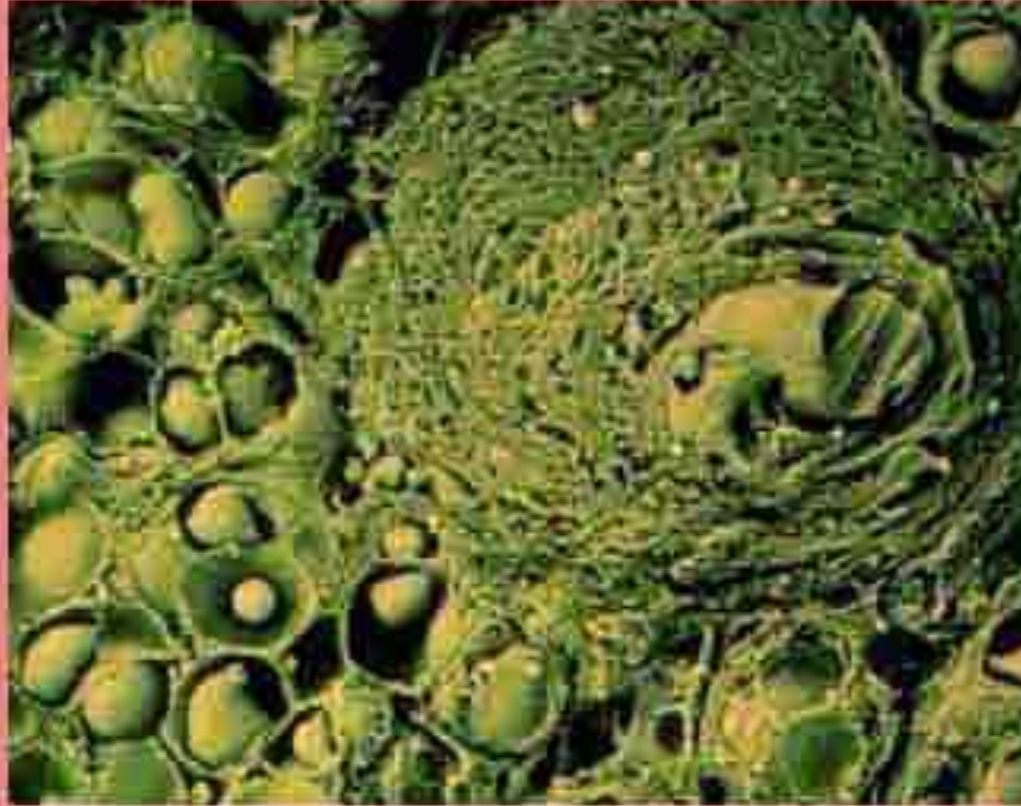
- Change from one form to another

What causes metamorphosis?

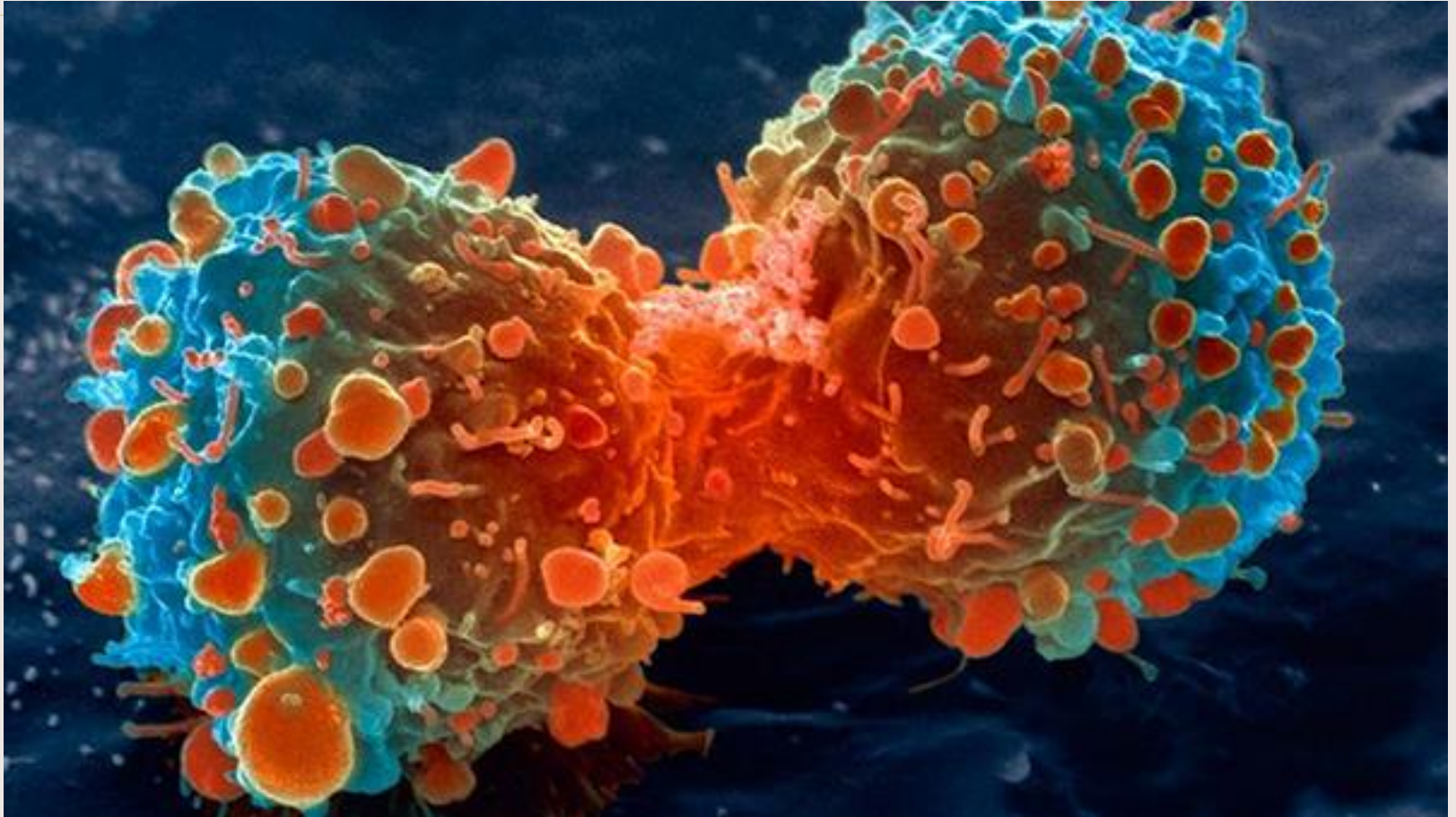
- Hormones



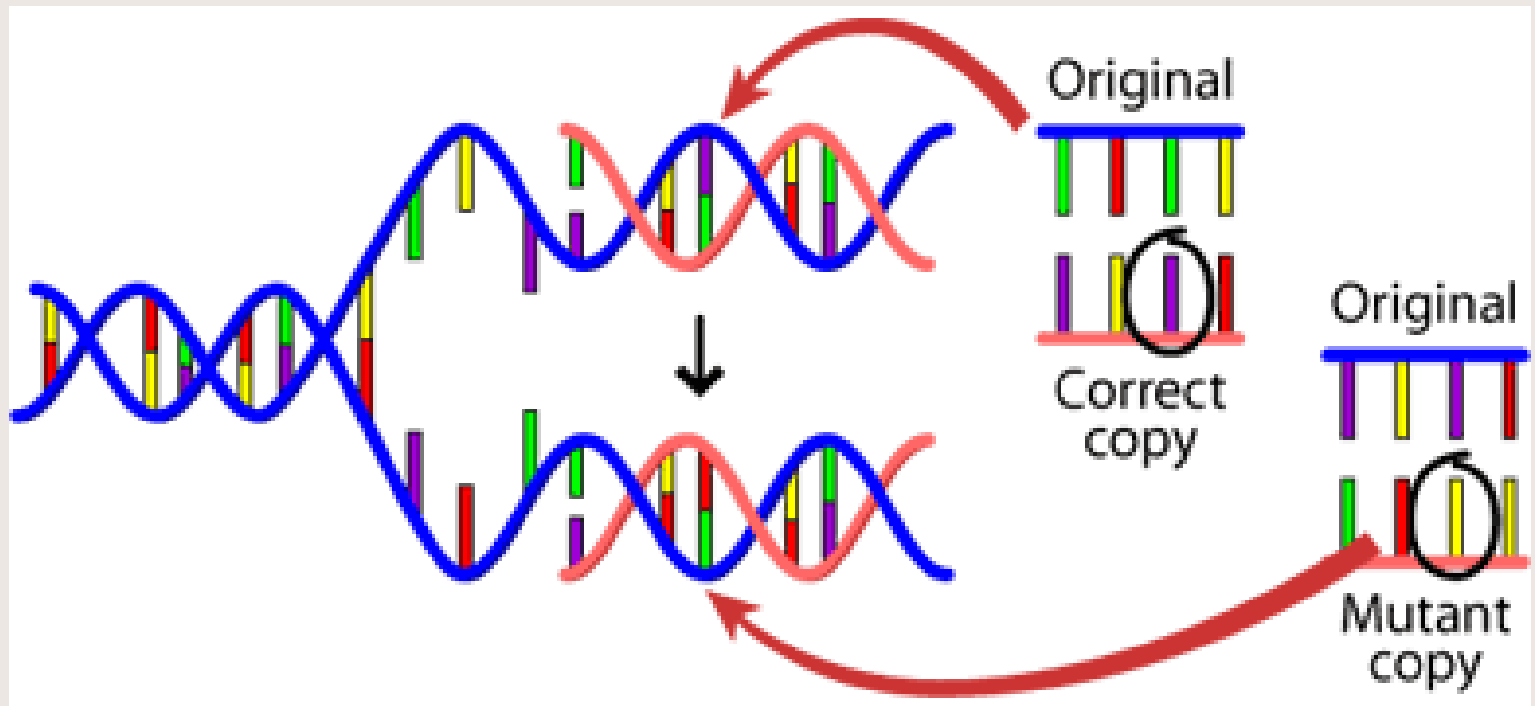
Define cancer



Uncontrolled cell division



Caused by a mutation



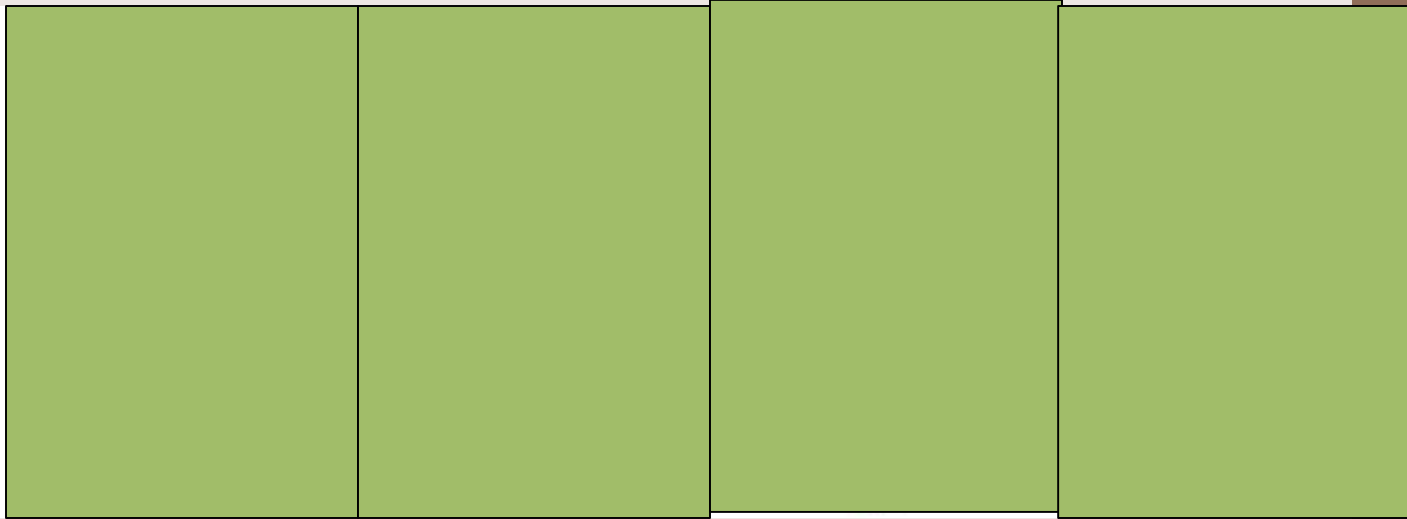
Define mutation

- Any change in DNA

Normal



BEAST

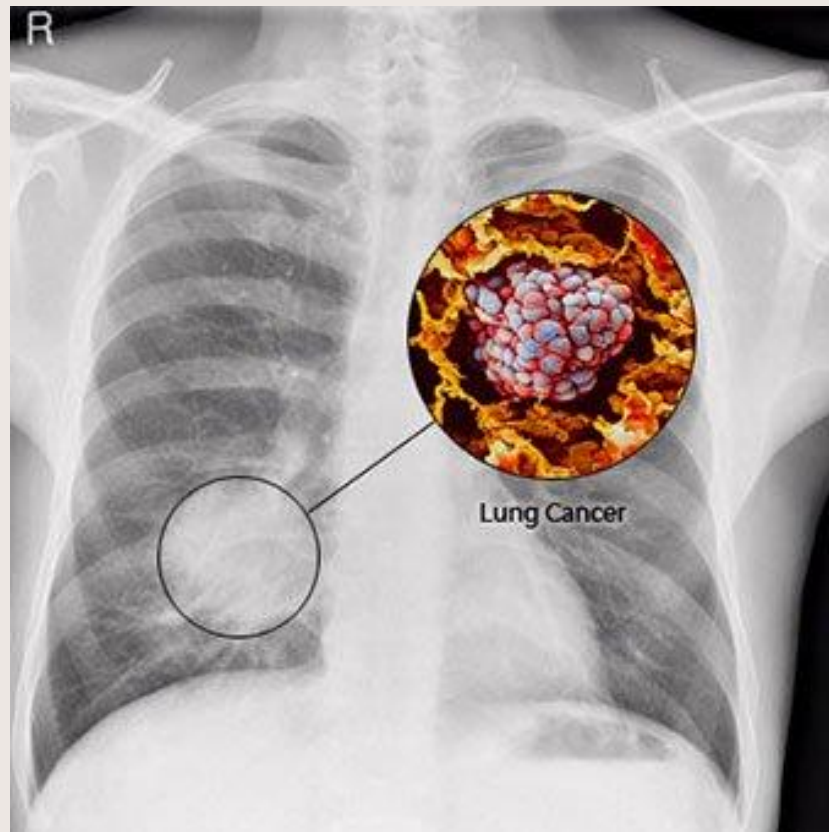


Why do mutations happen?

- Random errors
- Radiation
- Toxic chemicals (ex: cigarettes)

What happens when cancerous cells grow?

- Mass of cells = tumor



2 types of tumors

- Benign tumors stay in place
- Malignant tumors spread

What is a clone?



- **Farmers often clone plants**

- **Pros**

- **Cons**



Dolly The Sheep

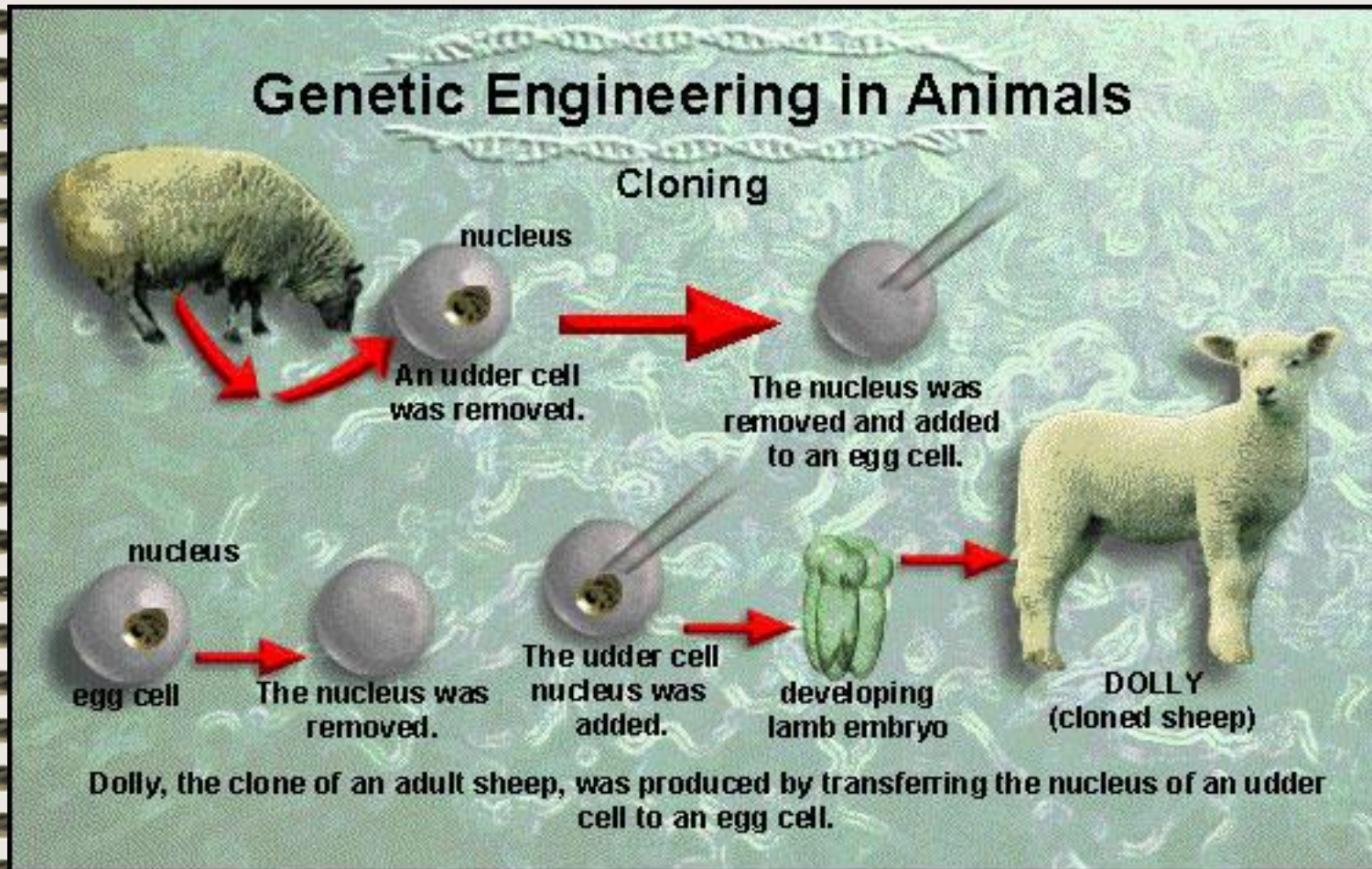


Dolly was the first mammal cloned from an adult cell.

She was born in 1996 and died in 2003.

She was 6 when she died, about half the usual age for a sheep

Describe the technique used to make cloned animals



Cloning animals

- Techniques used to make identical offspring
- Take nucleus out of an egg
- Insert DNA from a body cell of organism to be cloned
- Mitosis only → new organism = genetically identical to the nucleus inserted

Can Cloning bring back extinct species

Case study: the Gastric Breeding Frog



Darwin's frog

A silver metal spiral binding is visible along the left edge of the page, consisting of a series of loops that hold the paper together.

Reproduction notes: Part 3

Problems with cloned crops

- 1) No genetic variation = no adaptation



No adaptations + change in environment →



- Ex: virus infects a plant in a field
 - no variation → all die

Virus →

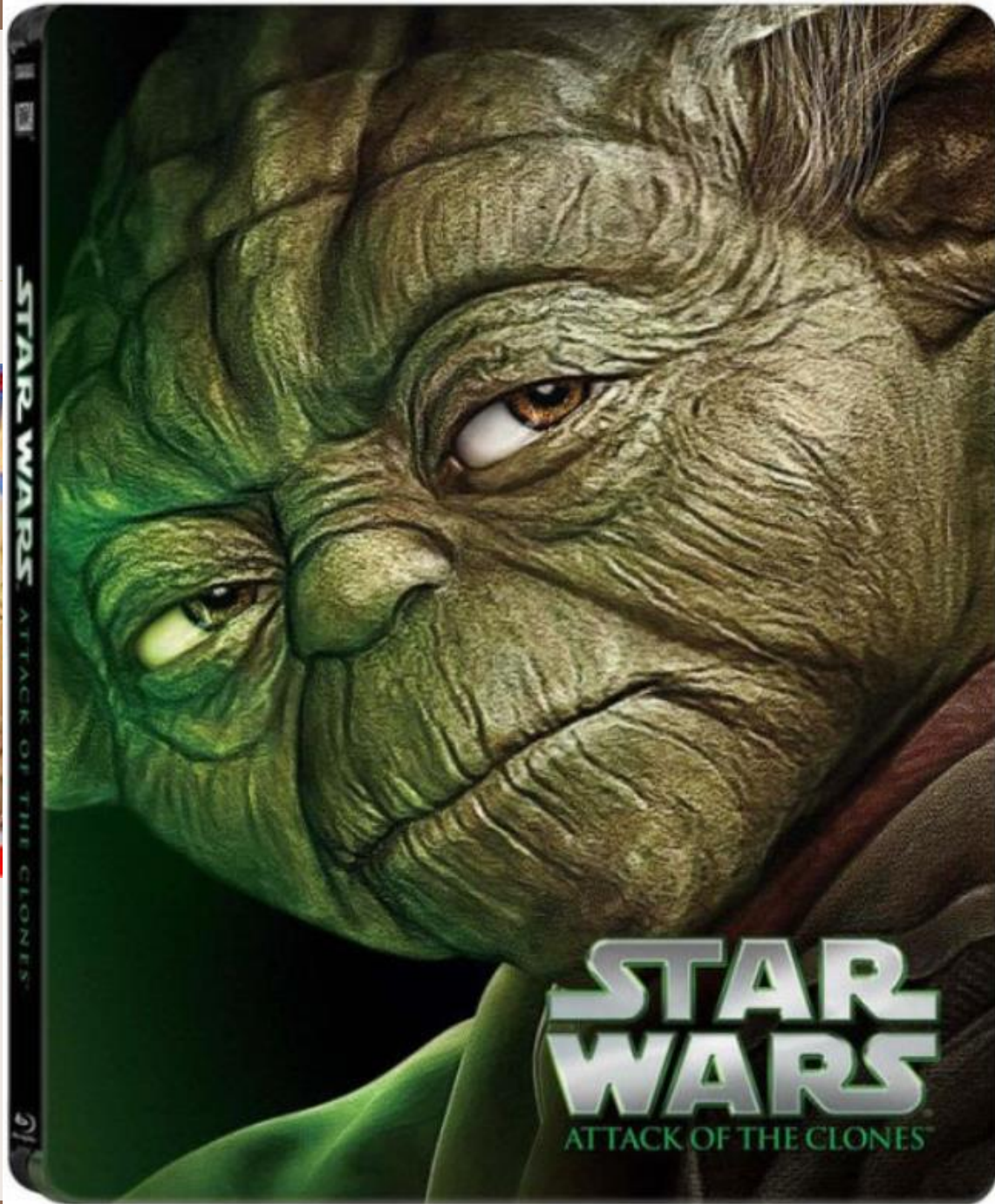


Recently cloned animals



Questions about clones

- Do they live as long?
- Are they as healthy?
- Is it ethical to produce them?



- 2) Planting the same plants in same soil
- removes the same nutrients each year →
- nutrient poor soil

Diversity > Stability



How can you increase diversity?

- Sexual Reproduction → diversity

What are the Chances????

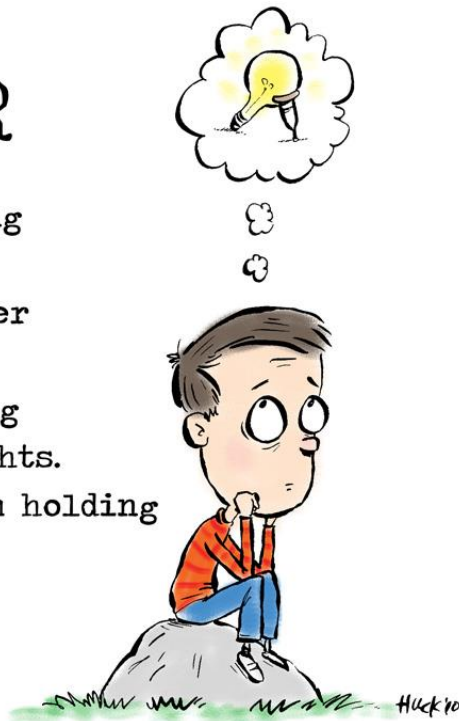
A Short Lesson in
Probability
And Possibilities!!!

Question 1

- In order for you to be sitting here in this classroom what had to occur?

THINKER

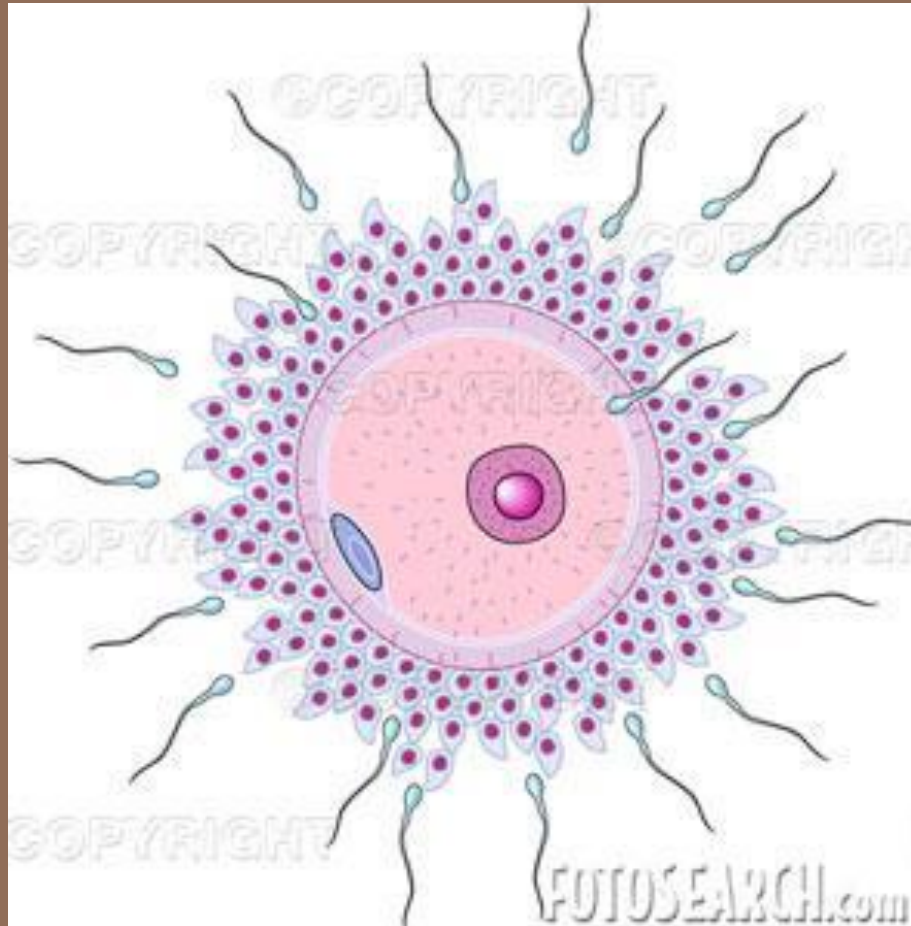
I think I've been thinking
a little too much.
The thought on my thinker
is in need of a crutch.
I think I'll stop thinking
and just hold my thoughts.
But the thoughts that I'm holding
think I might not.



• Fertilization!!!

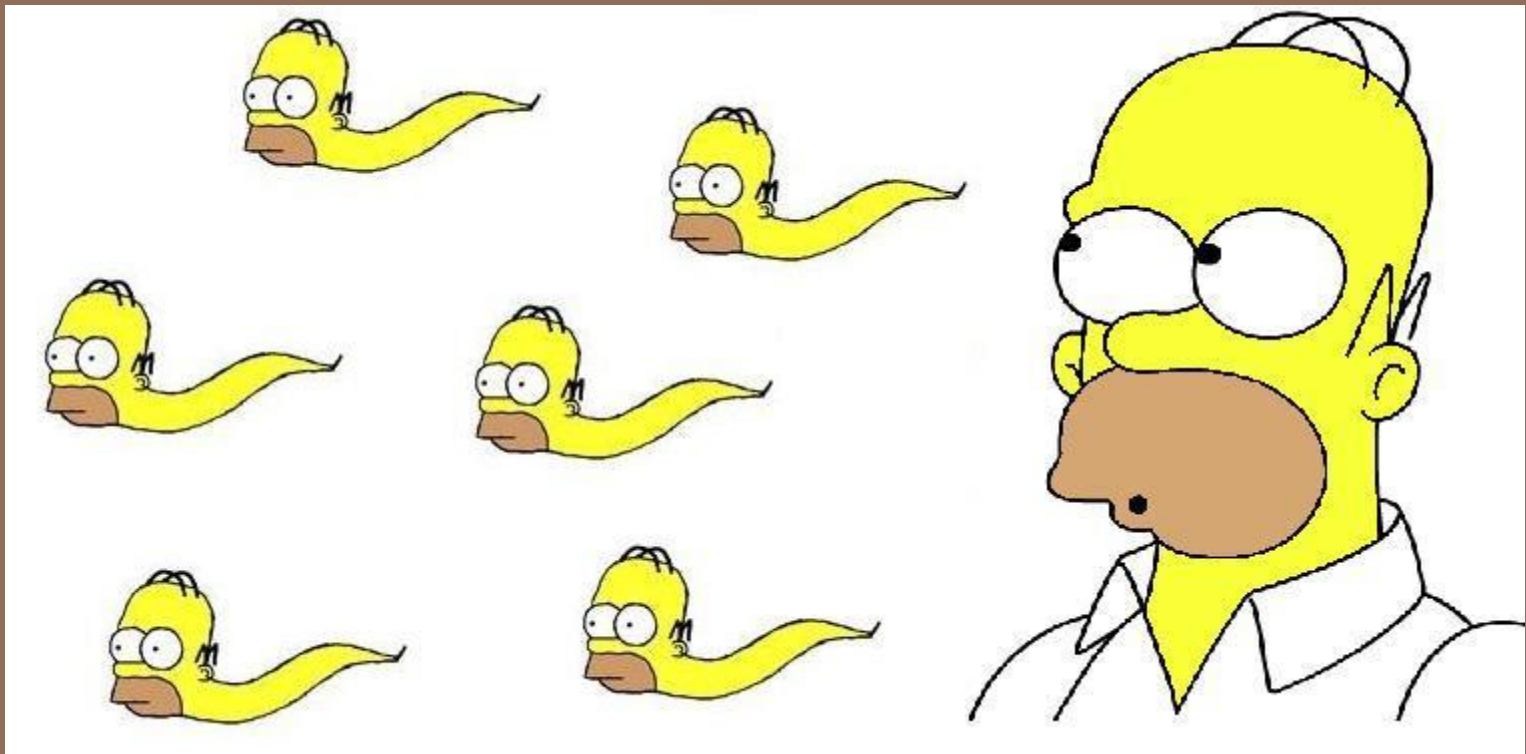
ONE sperm (from your dad)

had to fuse with ONE egg (from your mom)!!!

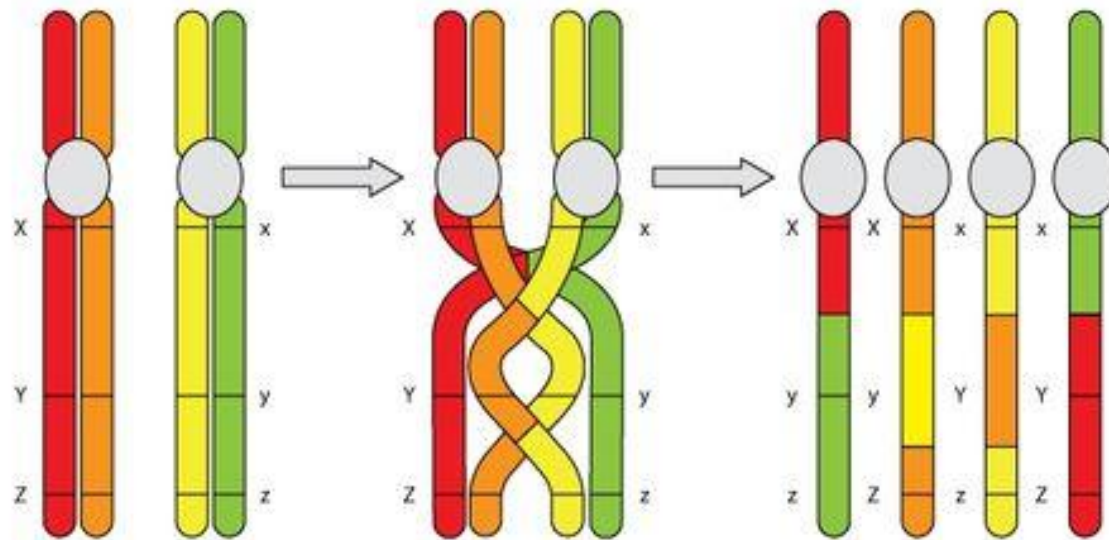


Consider the following:

- During his lifetime, the average male produces and dispenses ~ 300 trillion sperm

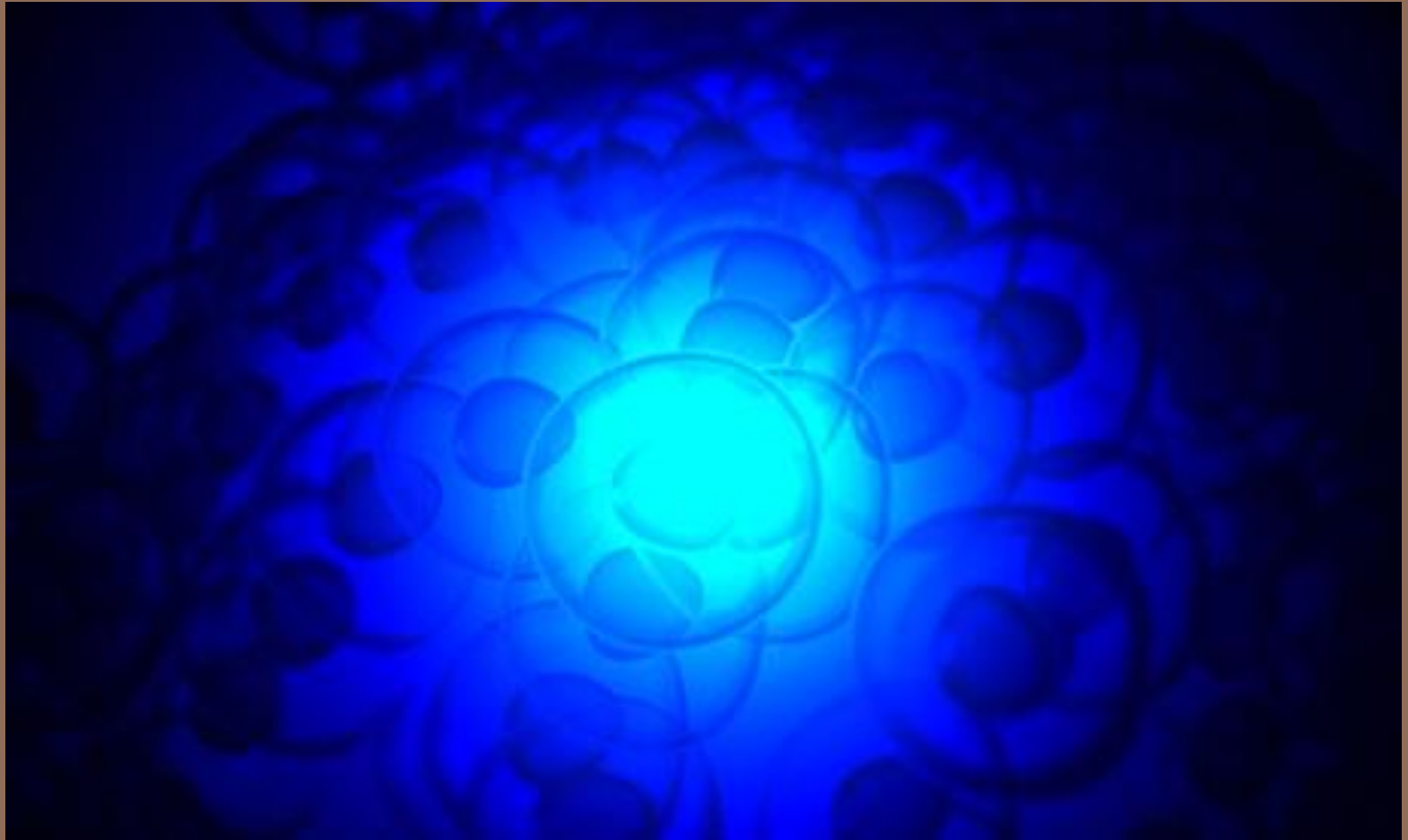


Each sperm is a unique combination of traits

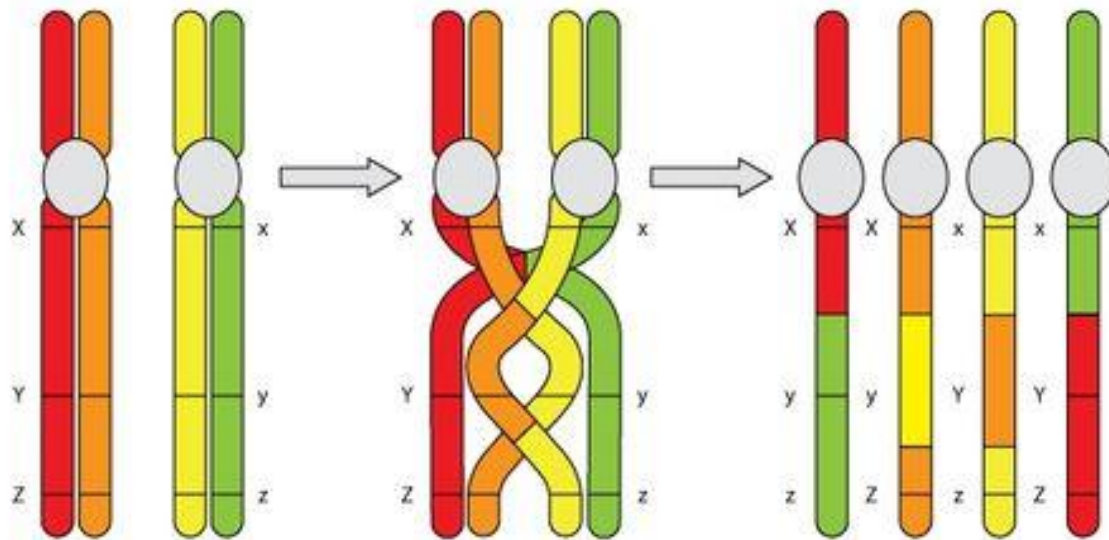


Consider the following:

- Women are born with ~ 300,000 egg cells



Each egg is a unique combination of traits

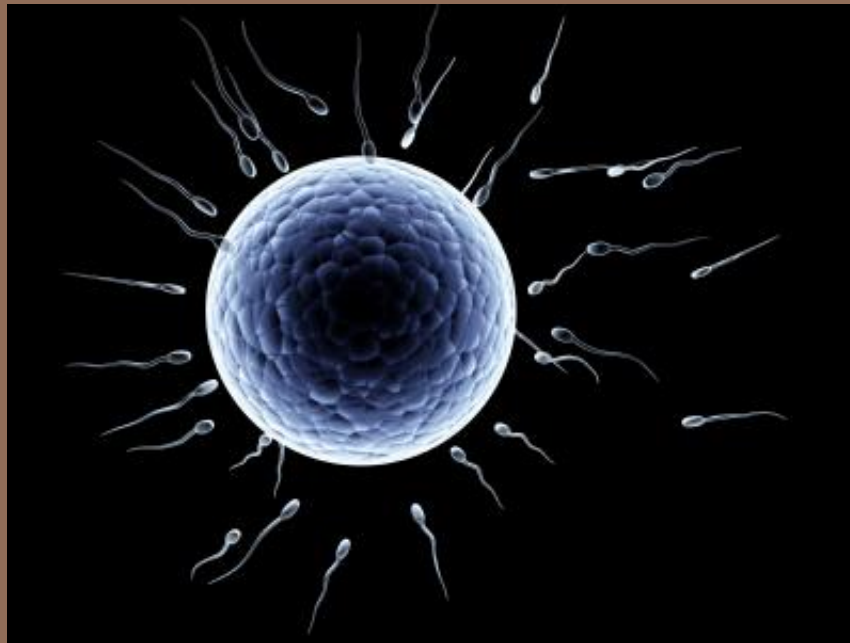


Do the math

- Chance of getting the one sperm that made you
 - $1/300,000,000,000,000$
- Chance of receiving the one egg that made you
 - $1/300,000$

What are the chances?

- What is the probability that the one sperm and the one egg that made you ever met?
- $1/300,000,000,000,000 \times 1/300,000$



And that chance is.....(drum roll
please!)

- $1/900,000,000,000,000,000$
- OR 1 in 900 quadrillion
chances

WOW!!!!

- That means you are one in a Quadrillion!!!

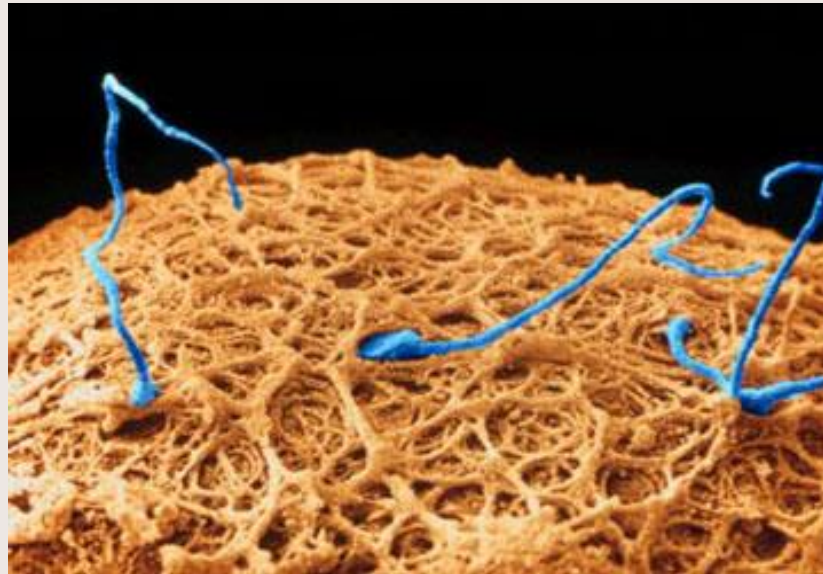
Look to your left then to your right

- That person next to you is 1 in a quadrillion too
- Your relationship with that person is a once in a lifetime opportunity
- Don't waste that opportunity!!!!!!

Respect Genetics

Sexual reproduction

- DNA from a sperm and DNA from an egg join together to make one new cell



What is this called

- Fertilization





Flowers → Sexual Reproduction
in Plants

A silver metal spiral binding is visible on the left side of the page, consisting of a series of loops that hold the paper in place.

Draw and label the parts of a
flower

What happens during sexual reproduction in plants

- **Pollination (pollen fuses with an egg)**

POLLEN



Eggs form in an ovary

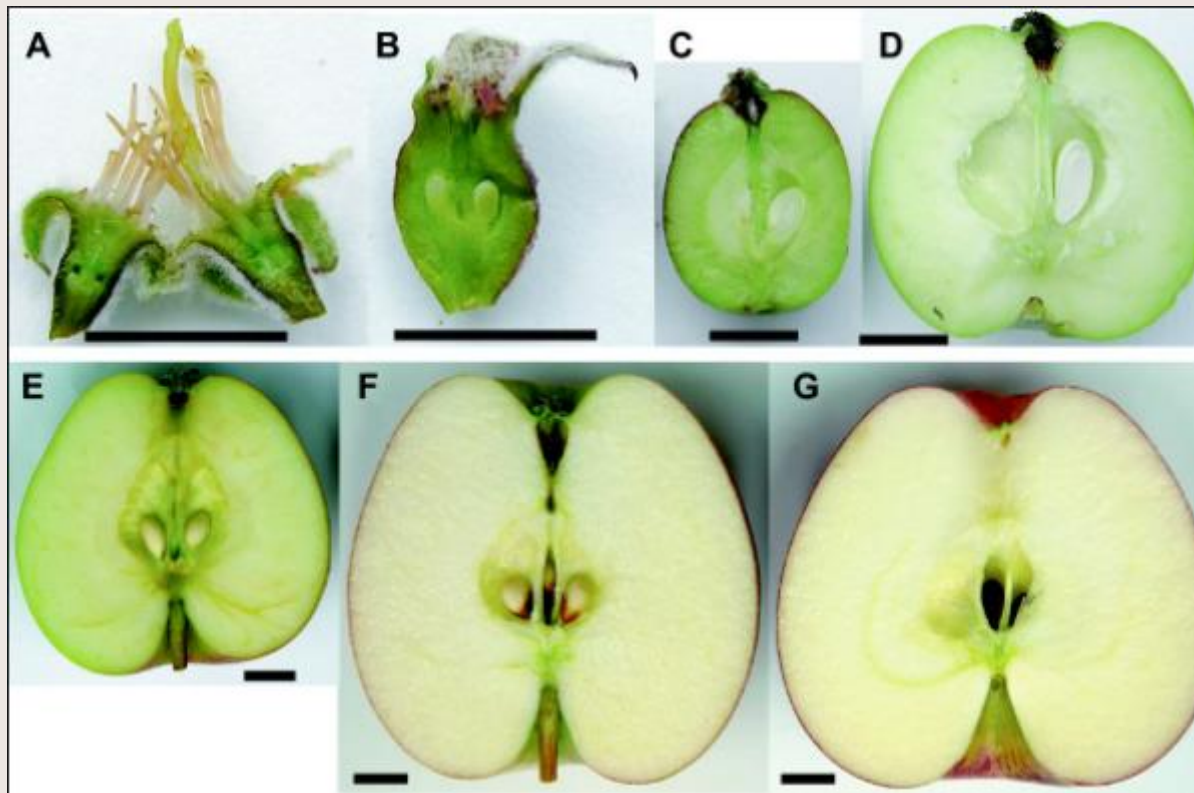


Fertilized eggs in plants =



Ripened ovary (with seeds)

Fruit



A silver metal spiral binding is visible on the left side of the page, looping through a series of holes in the paper.

What is the advantage of sexual
reproduction

Sexual reproduction gives variation



OBSERVED VARIATION WITHIN ONE POPULATION

Group activity

- List similarities and differences between
- Mitosis and meiosis
- Sexual and asexual reproduction
- Label parts of the flower

value:
0.52 points

Label the parts of a typical flower.

Filament

Receptacle

Ovule

Stigma

Carpel

Anther

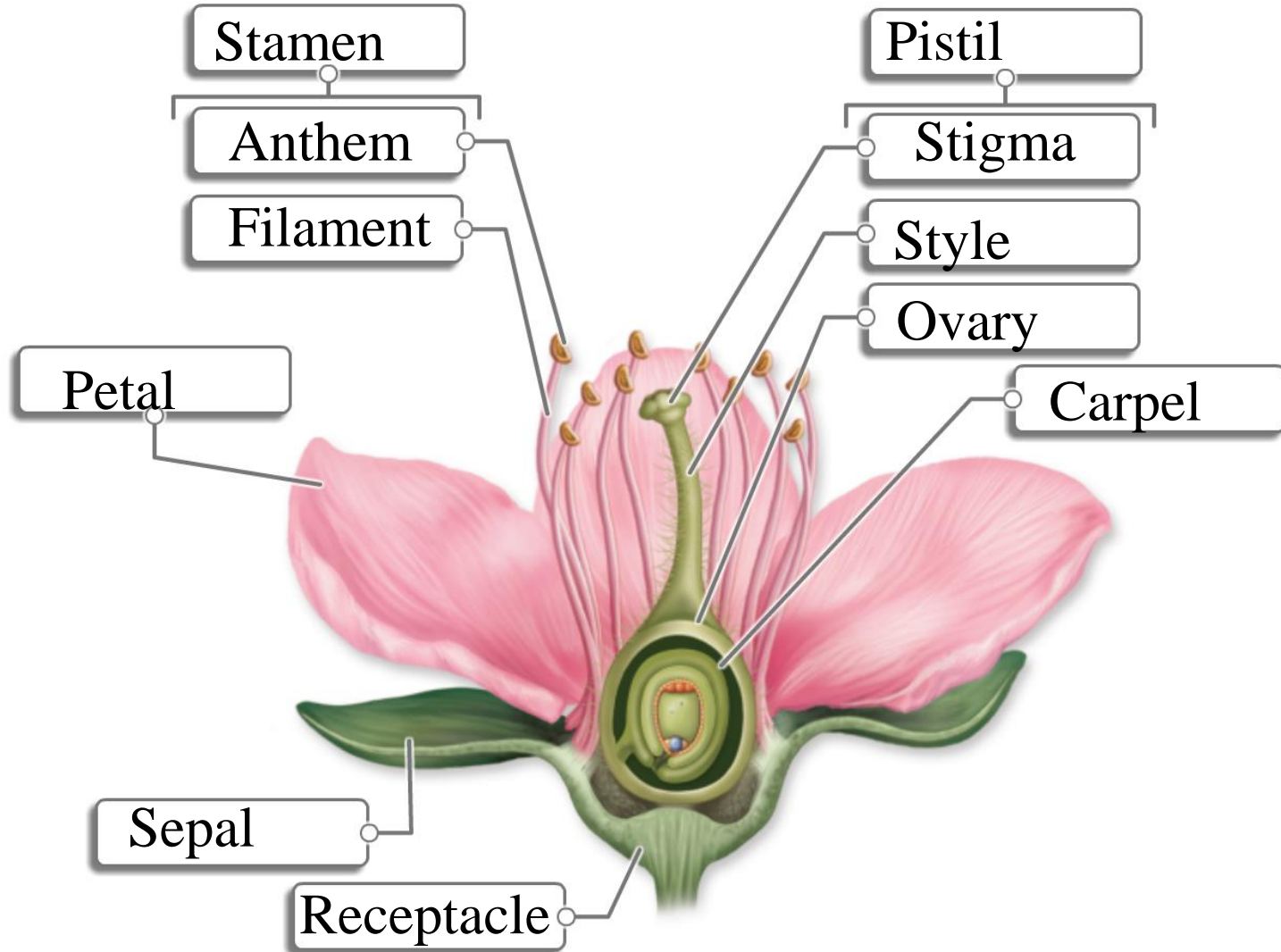
Style

Stamen

Ovary

Sepal

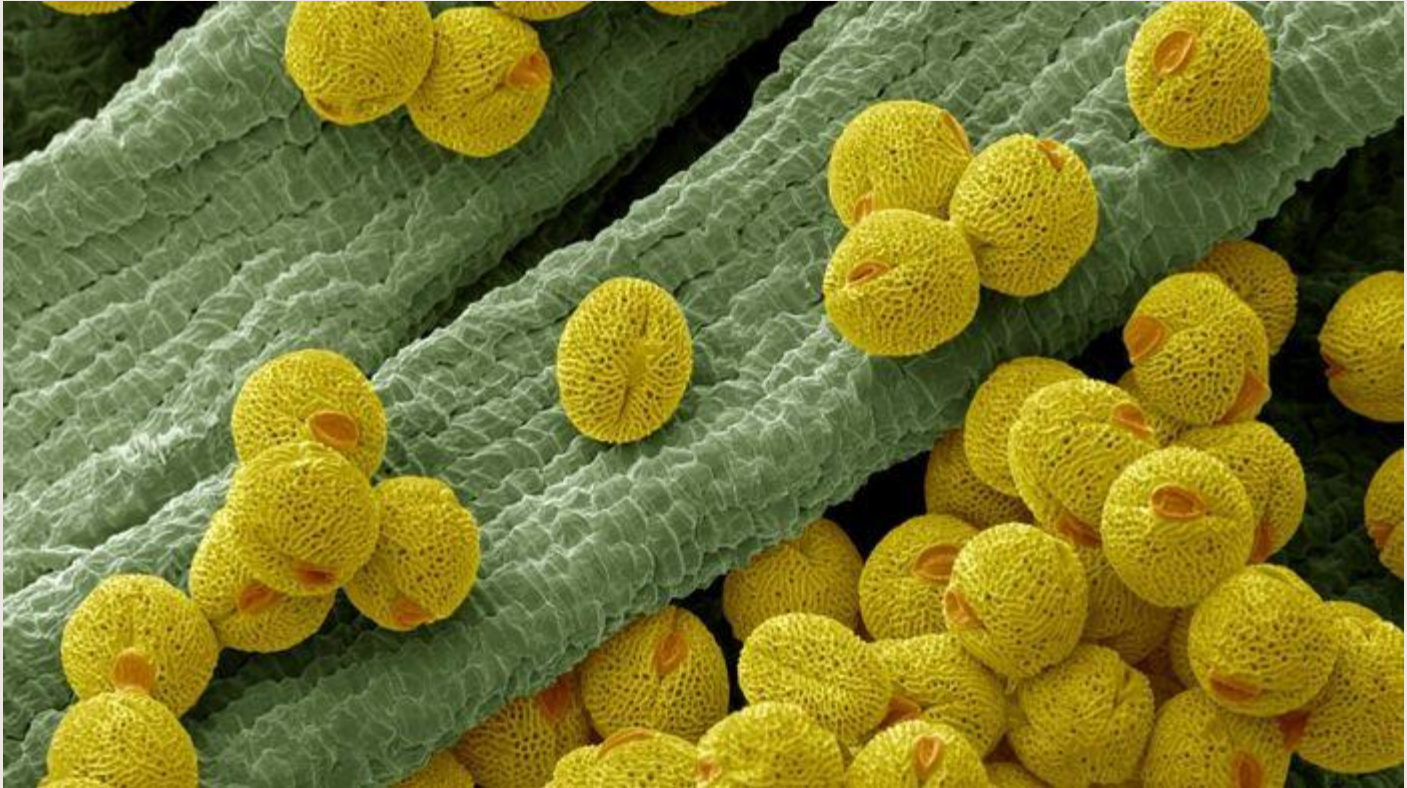
Petal



Sexual Reproduction in Plants

1. Meiosis → Pollen and Eggs
2. Pollination = pollen carried to stigma
3. Fertilization → Seeds inside fruit (ripened ovary)
4. Germination = seed sprouts

Pollen adaptations



Thick walls prevent drying out

Pollen is lightweight and sticky



Pollination = transfer of pollen to stigma

- Self pollination = same plant
- Cross pollination = different plants →
- Increased diversity

- Wind, insects, birds = pollinators

Bees pollinate flowers = Mutualism

- Mutualism = symbiotic relationship
– (both benefit)





Case study: Bee Bummer

Germination

- When do seeds germinate
- Favorable environment



How do they grow

- Cells divide
 - Mitosis
- Cell specialize
 - Hormones → stems, roots, leaves...

A spiral-bound notebook with a brown cover and a white page. The spiral binding is on the left side. The text "Plant pea shoots" is written in the center of the page.

Plant pea shoots

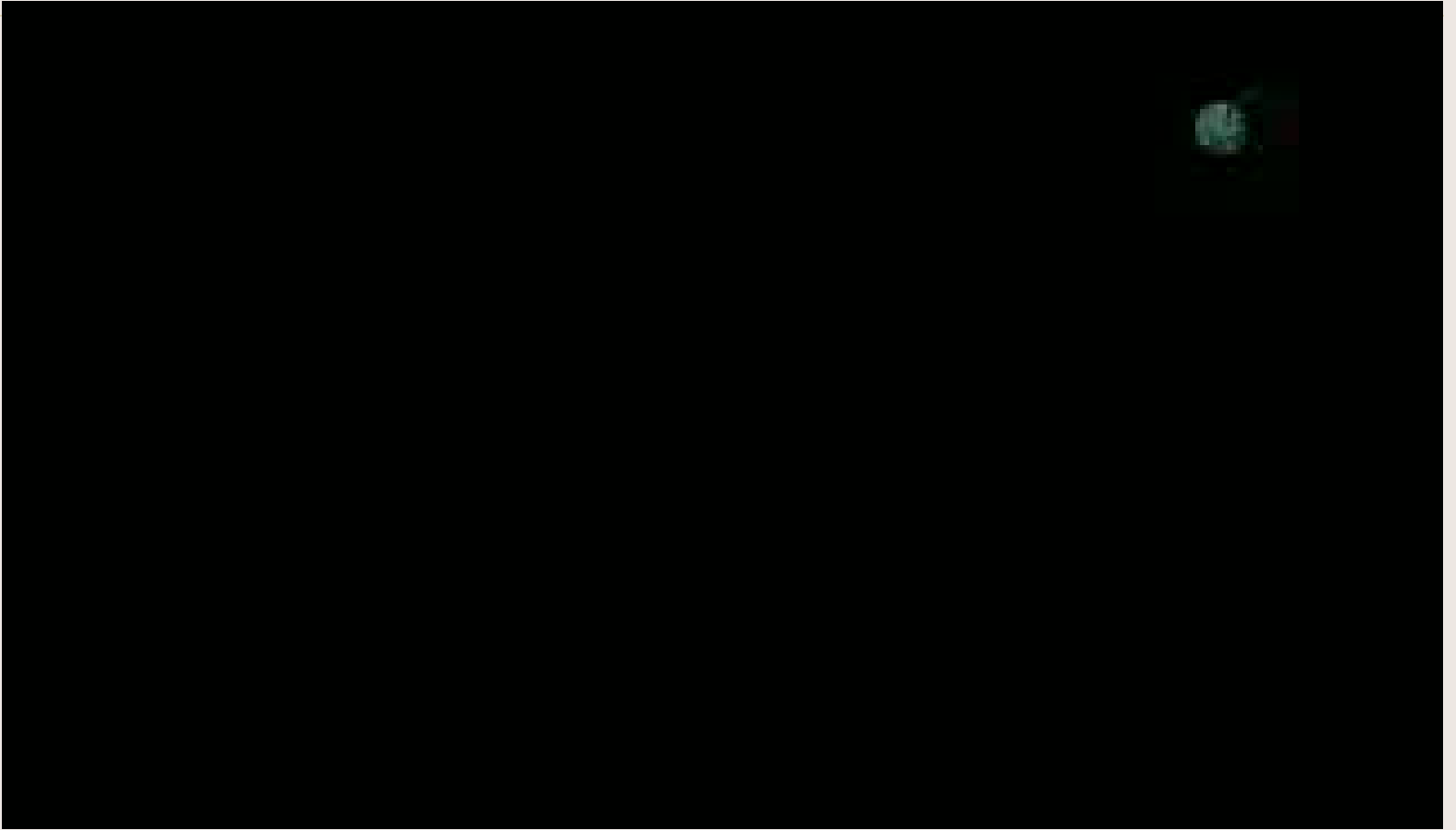
Selective Breeding in plants =

- Humans control which plants pollinate
- Pros:
- Select good traits
- Cons:
- → less diversity

Advantage of sexual reproduction and cross pollinating

- Increased diversity → stability

Sexual Reproduction in Animals



- http://www.youtube.com/watch?v=nz4Vm_oPDiw&feature=fvsr

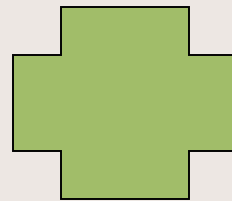
Sexual reproduction →

- **Increased variation →**
- **More Adaptation →**
- **Increases the rate of evolution →**
- **Diversity of life**

Formation of gametes

- Meiosis → Gametes
- Gametes = cells with half the DNA
- Ex: eggs and sperm

Fertilization and Development



- Fertilization = fusion of gametes → zygote
- Zygote divides by mitosis
- Hormones control development

2 types of Fertilization

(both require moist environment)

1) External fertilization

- Ex: Fish, amphibians, insects
- Have to produce lots of eggs → survive

External Fertilization

(Cane Toad video 4:50)



- Most frogs and toads hold female in a pose called amplexus.
- Sperm are deposited as the eggs are laid.

2) Internal Fertilization

- Required for life on land
- Most vertebrates
- Ex: (birds, reptiles, mammals)

Internal fertilization



Mammals



Platypus



Kangaroo



Bat



Rhino



Dormouse



Leopard

Characteristics of mammals

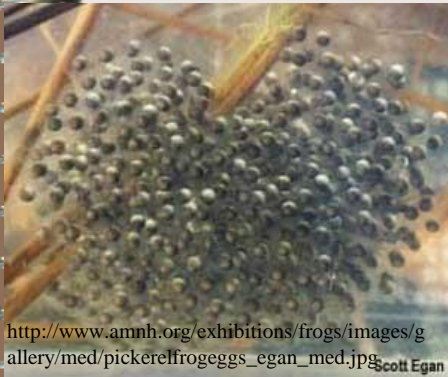
- Internal fertilization
- Warm-blooded
- 4 chambered heart
- Hair or fur
- Mammary glands
- (most give birth to live young)

Whales are mammals not fish
(internal fertilization, live
young)

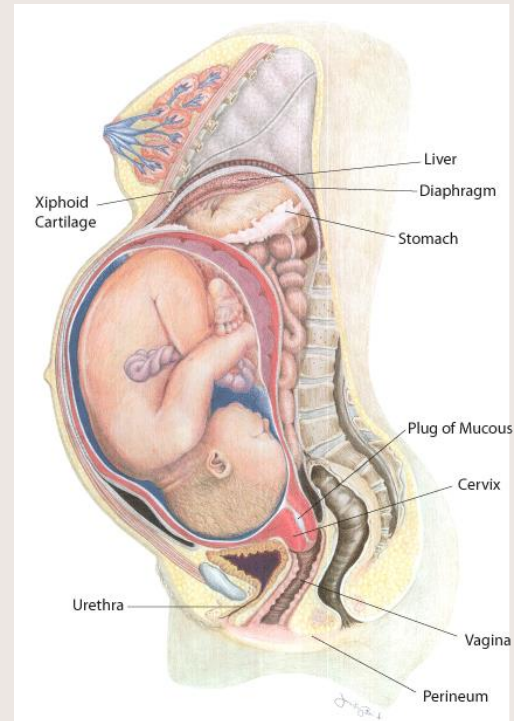


2 Types of Development

- External



- Internal



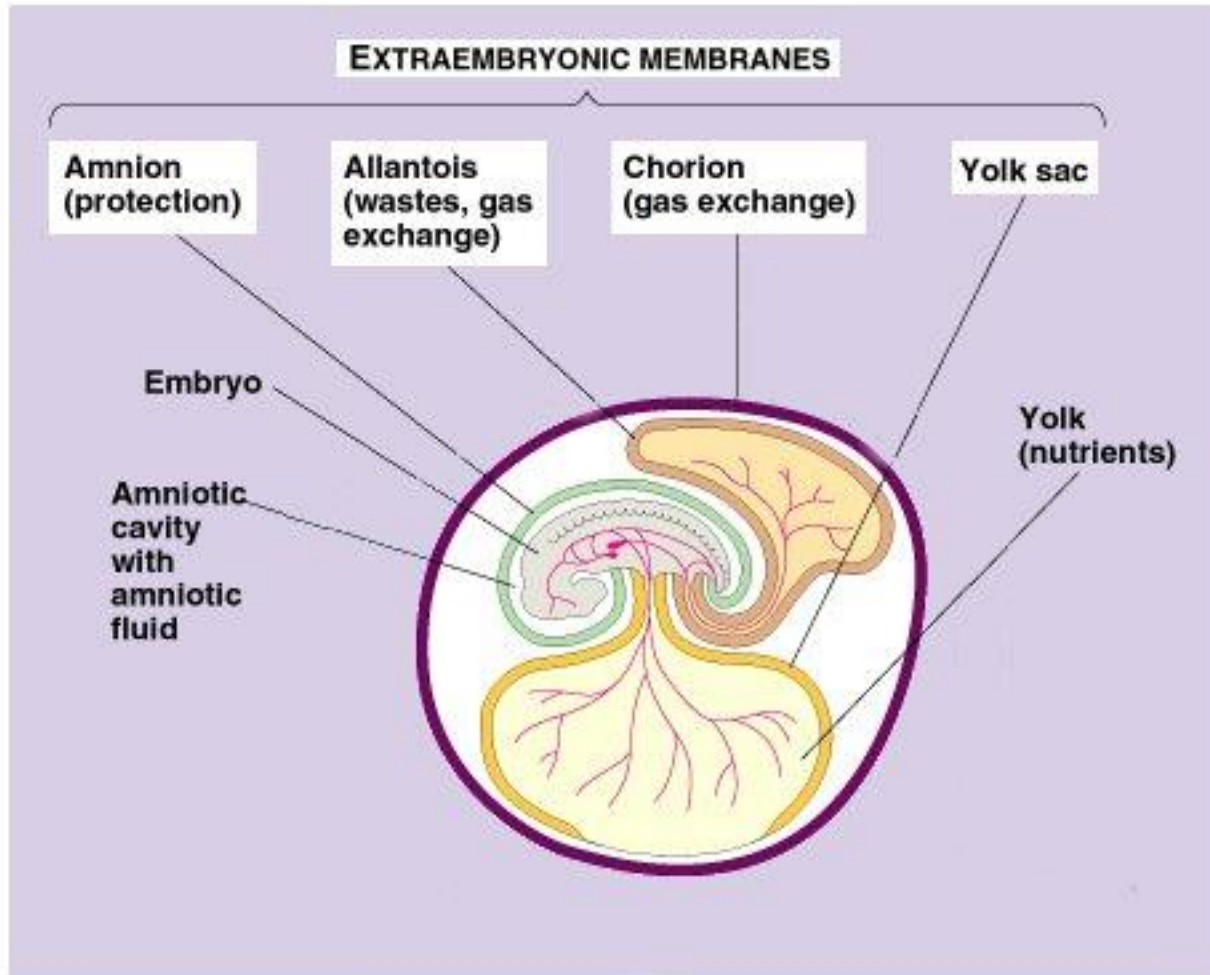
External development

In water

- Fish,
- amphibians,
- insects
 - Food in egg

- On land
- Birds,
- reptiles,
- a few mammals
(duckbilled platypus,
spiny anteater)
 - Food in egg yolk
 - Amniotic fluid →
moist environment and
protection

Amniotic Eggs → life on land



Egg laying mammals of Australia



Internal development

- Most mammals
- 2 types of mammals
- Marsupials (kangaroo and opossum)
 - No placenta
 - Food = egg yolk
 - Embryo born premature in a pouch → food from milk (mammary glands)

Marsupials



Placental Mammals

- Embryo develops in uterus
- Placenta = organ → nutrients and waste removal
- Amniotic fluid → moist environment and protection

Placental Mammals give birth to live young

