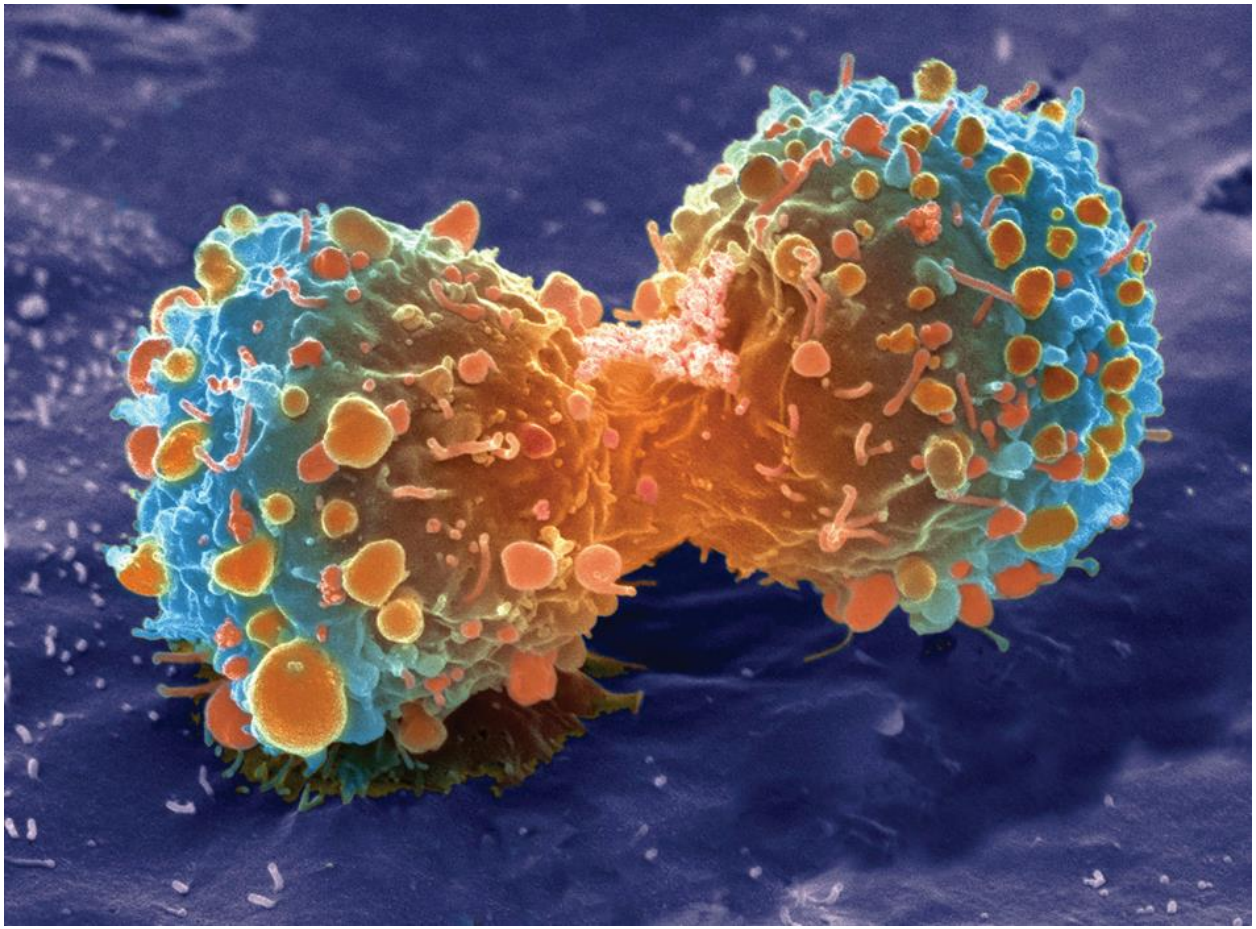
5.5 Multicellular Life

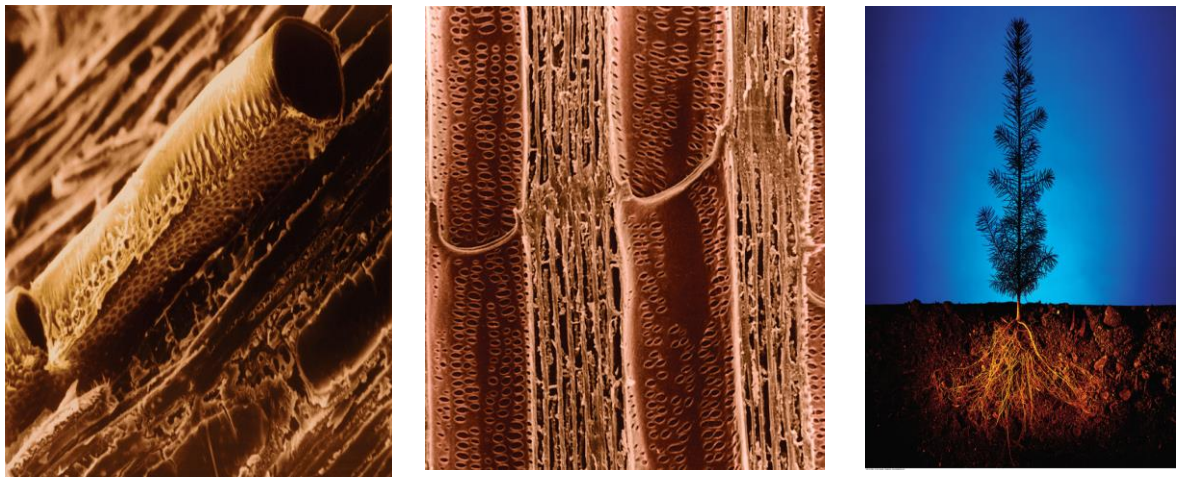
TEKS 5B, 5C, 10C

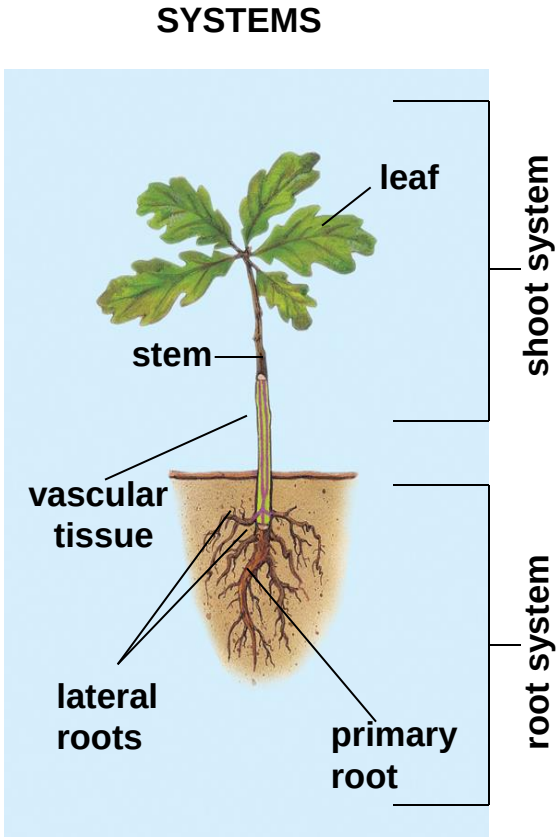
KEY CONCEPT

Cells work together to carry out complex functions.



- **Multicellular organisms depend on interactions among different cell types.**
  - ***Tissues*** are groups of ***cells*** that perform a similar function.
  - ***Organs*** are groups of tissues that perform a specific or related function.
  - ***Organ systems*** are groups of organs that carry out similar functions.

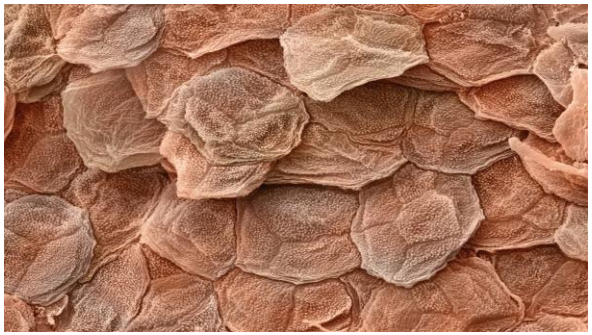




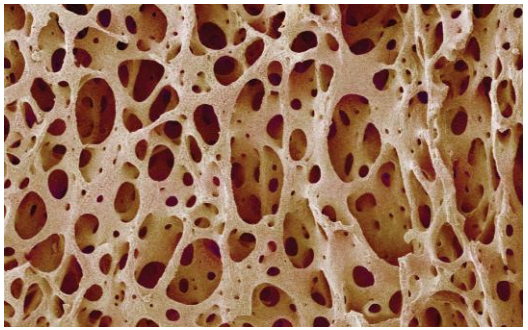
5.5 Multicellular Life

TEKS 5B, 5C, 10C

- **Specialized cells perform specific functions.**
  - Cells develop into their mature forms through the process of cell ***differentiation***.
  - Cells differ because different ***combinations of genes*** are expressed.
  - A cell's ***location*** in an **embryo** helps determine how it will differentiate.
  - A ***zygote*** is the one cell, diploid fertilized egg; once it starts dividing it is referred to as an embryo.



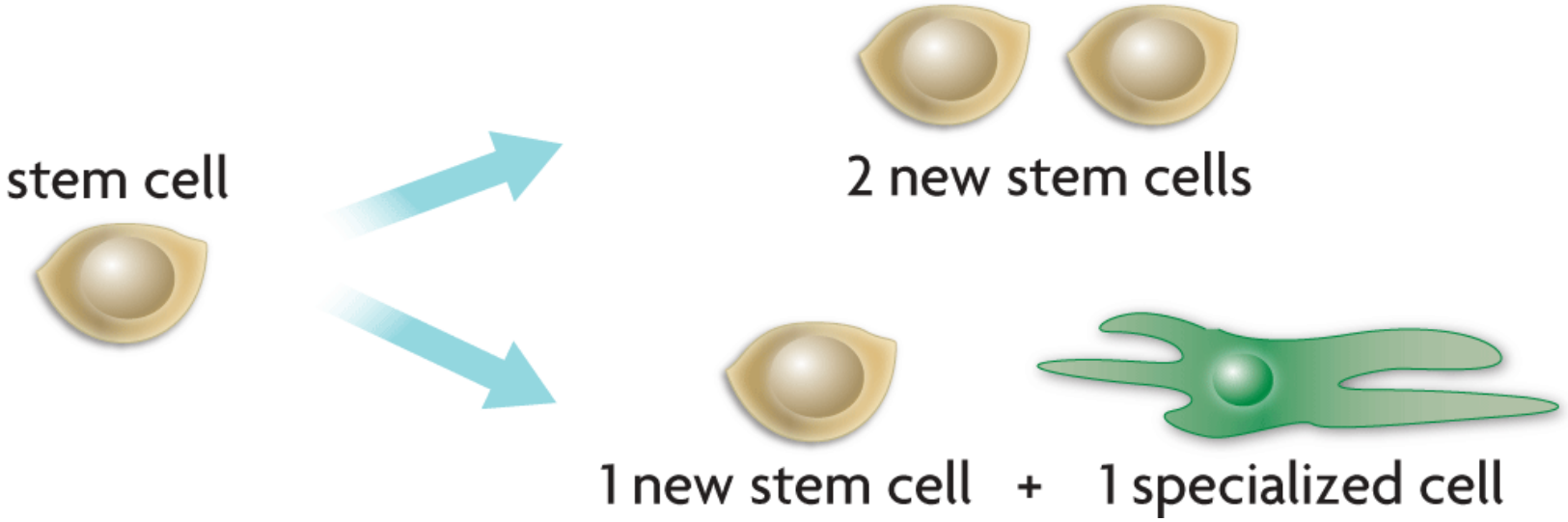
Outer: skin cells



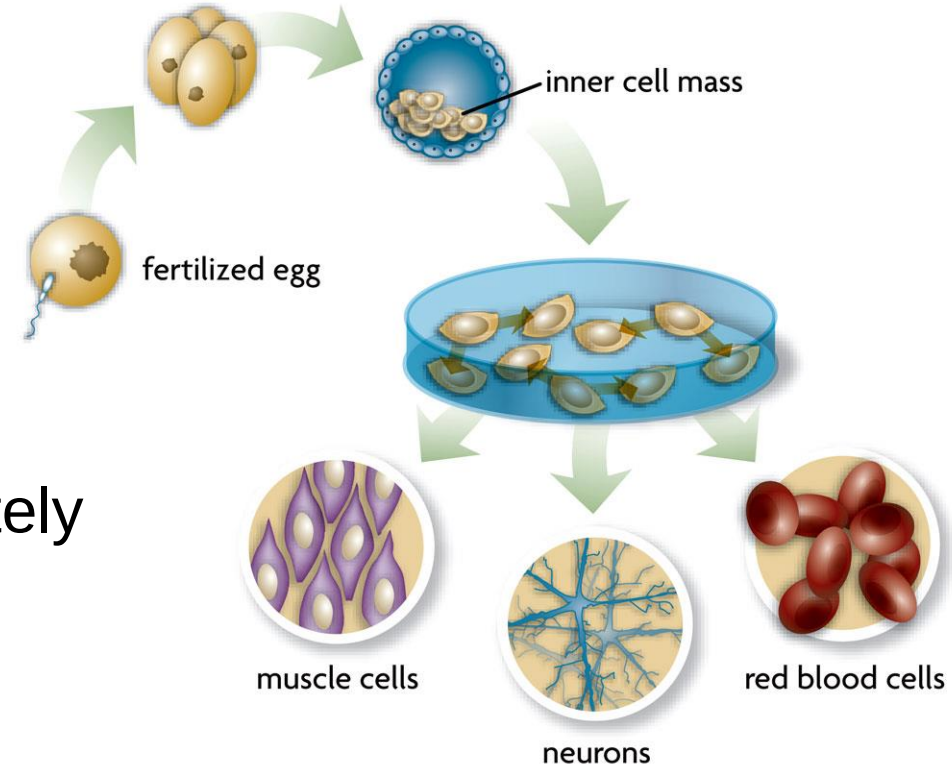
Middle: bone cells

Inner: intestines

- **Stem cells can develop into different cell types.**
  - **Stem cells have the ability to**
    - ***divide and renew themselves***
    - ***remain undifferentiated in form***
    - ***develop into a variety of specialized cell types***



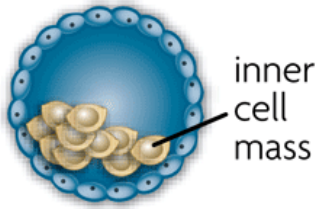
- **Stem cells come from adults and embryos.**
  - Adult stem cells can be hard to ***isolate and grow***.
  - The use of adult stem cells may prevent ***transplant rejection.***
  - The use of embryonic stem cells raises ***ethical issues***.
  - Embryonic stem cells are ***pluripotent*** and can be grown indefinitely in culture.



First, an egg is fertilized by a sperm cell in a petri dish. The egg divides, forming an inner cell mass. These cells are then removed and grown with nutrients. Scientists try to control how the cells specialize by adding or removing certain molecules.

- **The use of stem cells offers many current and potential benefits.**
  - Stem cells are used to ***treat*** leukemia and lymphoma.
  - Stem cells may ***cure*** disease or replace damaged organs.
  - Stem cells may revolutionize the ***drug development*** process.

- Stem cells are classified into three types.
  - **Totipotent**, or growing into any other cell type
  - ***Pluripotent***, or growing into any cell type but a totipotent cell
  - **Multipotent**, or growing into cells of a closely related cell family

Class	totipotent	pluripotent	multipotent
Type of cell	fertilized egg 	embryonic stem cell 	adult stem cell (example from blood) 
Can give rise to	all cells	almost any cell	closely related cells
Example	new organism	neurons, skin, muscle, kidney, cartilage, bone, liver, pancreas	red blood cells, platelets, white blood cells