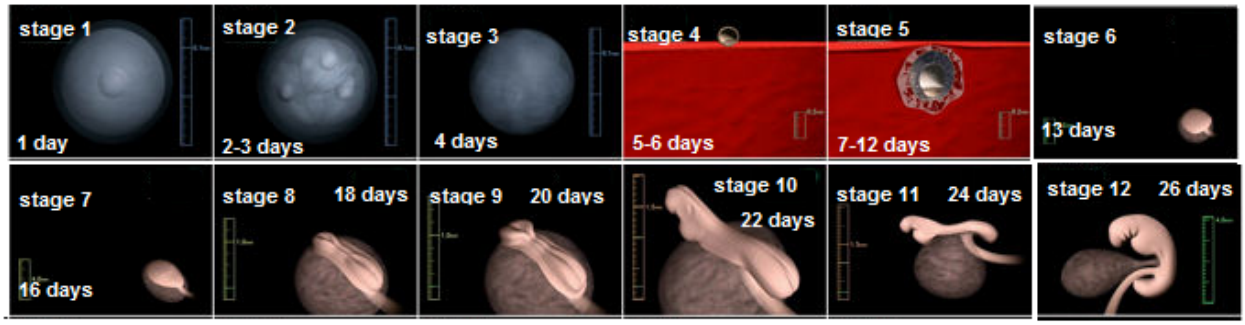
"FROM ONE TO MANY"—THE EMBRYO

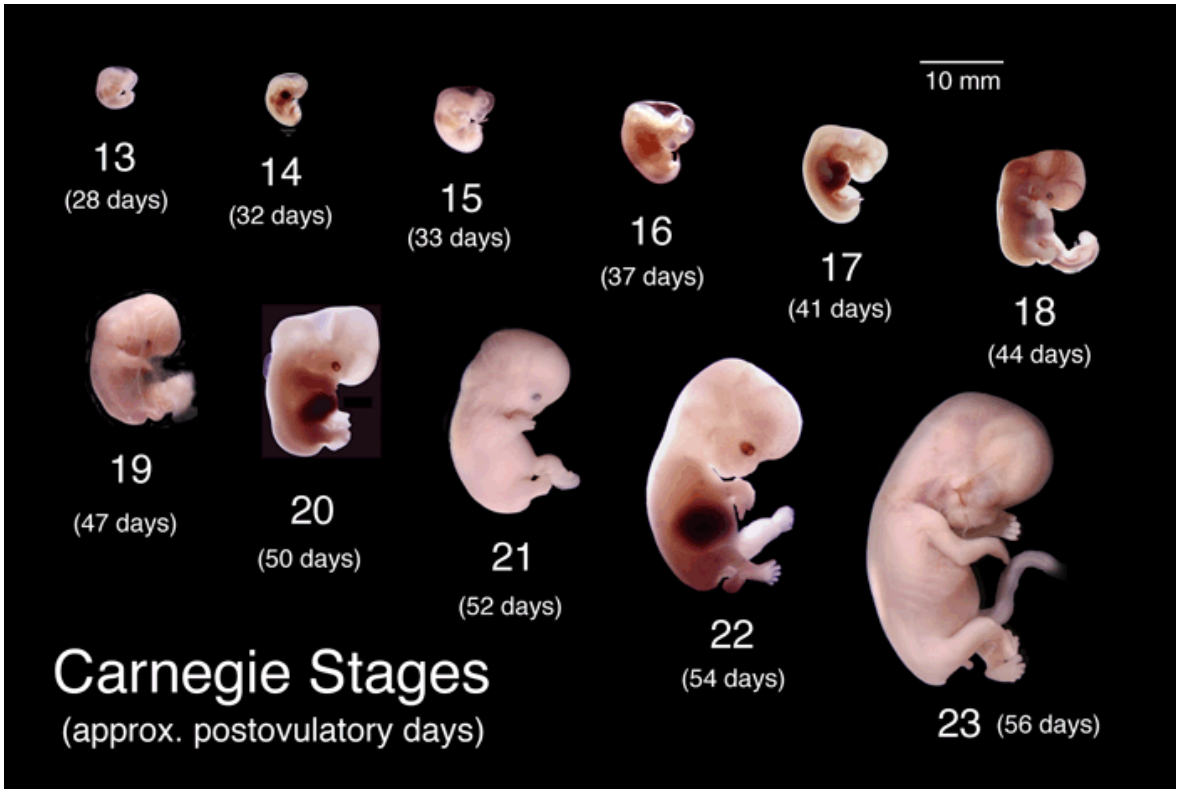
When sperm and egg unites, **fertilization** occurs. The organism is now one fused cell with a complete set of DNA. The single cell then begins to divide to create more cells. This tiny developing organism is called an **embryo**.

Here is a time lapsed video showing days 1-5. http://www.youtube.com/watch?v=RcjJ8LUvdkc

Here is a time lapsed video showing days 24- 56 http://www.youtube.com/watch?v=bf0vy8xd1LA

These are pictures of the human embryo developing over time. Stages 1-12 are bigger on this page than they actually are in real life. Stages 13-23 are very close to actual size.





During this time of development, the life form is called an embryo. An **embryo** is an organism in its early stages where cells are just beginning to **differentiate**. In the first several days of life there are no heart cells, no brain cells, no liver cells, no bone cells, no muscle cells, etc. These undifferentiated cells are called **stem cells**. As more and more cells reproduce, however, some of them start to take on special jobs. This is called **differentiation**. A cell that is becoming a heart cell would start to beat. A cell that is becoming a brain cell would change its shape and begin to send signals. A cell that is becoming a bone cell would begin to secrete minerals and create bone. More and more cells form every single day. By the time the human is fully developed, over 200 ***different kinds*** of cells have differentiated, and there are a total of about 37 trillion cells. This production of new types of cells occurs because different sections of DNA get "turned on" and "turned off." For example, the genes that tell a cell how to make stomach acid would only be turned on in the stomach cells. Heart cells would have this gene "turned off." If this turning off process didn't happen, all the cells would be exactly like the original cell they came from – the egg.

"FROM ONE TO MANY"

NAME_____ HR __ / 18

THE EMBRYO

1. How many cells are in stage 1? _____

2. Why is the sphere of cells smaller looking in the stage 4 picture?
   _____

3. At stage 5 the embryo imbeds itself into the wall of the uterus which is rich with blood. Why would this be important to the group of cells? _____

4. Why doesn't the embryo look human at stage 8? _____

5. At stage 10, 22 days after fertilization, cells have differentiated into heart cells and begin to beat. If there are 14 heart cells right next to each other all beating in unison, what is this zone of cells called?
   _____

6. What system has just begun to form? (heart cells beating) _____
7. Which stage has more cells, stage 12 or 13? How do you know? _____
   _____

8. Look at stage 17. Put an x on the cells that will differentiate into brain cells.

9. Look at stage 18. Put a 0 on the cells that will differentiate into a functioning arm.

10. Look at stage 20. Put a triangle on the cells that are differentiating into eye cells.

11. Look at stage 23 and the tiny visible ribs that have formed. What system is now forming?
    _____

12. Think about the entirety of your life. How big were you when you were at your smallest?
    _____

MATCHING: (5 PTS)

	embryo	A	The method cells use to reproduce themselves
	fertilization	B	Undifferentiated cells that can turn into ANY type of cell. Found in the early stages of the embryo
	differentiation	C	A tiny developing organism with cells just beginning to differentiate
	stem cells	D	Process whereby cells take on specific jobs and become specialized
	division	E	The moment where sperm meets egg and the very first cell has a complete set of DNA

13. What is the mechanism that cells use to differentiate? (How do they know that they should behave like a heart cell and not a stomach cell?)
    _____