

Name: \_\_\_\_\_ Class: \_\_\_\_\_

# Things Get More Complicated When You're Older

By BirdBrain Science  
2016

*This informational text explains cells and their role in biology. It also explains how one cell can change, divide, and become a whole body with many different kinds of cells. As you read, identify the different ways that cells work in the body.*

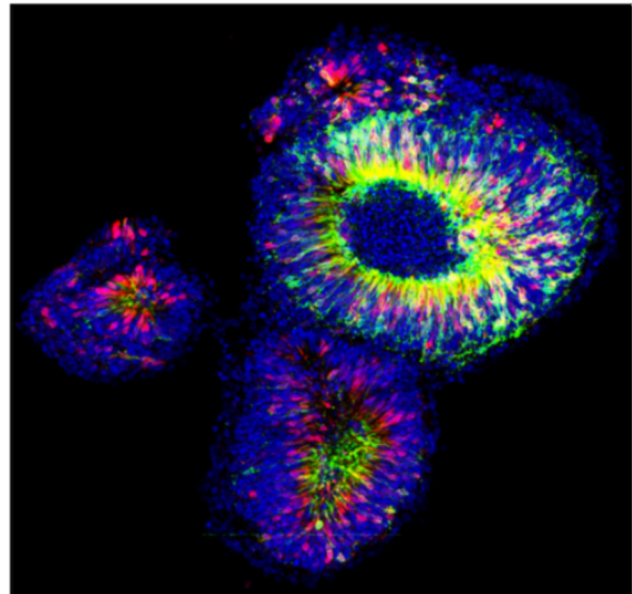
[1] The next time you walk down the street, look closely at all of the buildings. Do they all look the same? All the homes, schools, shops, and restaurants look different from the street. These buildings probably look different on the inside too. The restaurants may have a lot of tables and chairs, while the schools have desks and books.

Just as all the buildings look different on the inside or outside, all cells look different on the inside or outside. Cells are the tiny building blocks that all living things are made out of. Plant and animal cells also look different from the inside and outside. Leaf cells, heart cells, flower cells, and stomach cells all have different responsibilities, so they all have different structures inside of the cell.

Who does the different chores or jobs in your family? Maybe one night your mom makes dinner, your dad does the laundry, and you have to make your bed.

Families will divide these jobs up so that all of the work gets done quickly. They also want to make sure that all of the work is done well. What would happen if two people made dinner every night, but nobody bothered to do the laundry? You would have too much food and no clean clothes! A **division of labor** is when everyone does a different job.

There is a division of labor between cells too. In a tree, the leaves have a different job than the roots. The leaf cell's job is to soak in the sunlight and turn it into energy for the plant. The root cell's job is to soak in and store water and chemicals from the dirt. That means the tree uses a division of labor, with the leaves doing one job, and the roots doing another job. All of the jobs that need to happen for the tree to stay alive get done.



*"A cluster of nascent retinæ generated from 3D embryonic stem cell cultures" by Anai Gonzalez-Cordero is licensed under CC BY-NC 2.0.*

- [5] Almost all games and toys come with instructions. All living things have instructions or rules too. They decide what the cells look like and how they work. In living things, these rules are called genes.<sup>1</sup> Think of your genes as a huge library of directions for how to build every part of your body. Just as a library can have thousands of books, so can a cell have thousands of genes -- around 25,000 in every person! Each gene has rules for how to make something the cell needs. When you go to the library, a book can be checked out and read over and over again. Inside a cell the gene will be read every time the body needs to use those directions. That happens a lot.

Your own library of directions was made when your dad's genes and your mother's genes joined together. At that point you were the size of a single cell. However, that single cell was a very powerful cell. Inside that cell were all the directions to build a person -- you! Then that one cell divided into two, and then into four, and then in to eight ... until eventually all the cells grew into a baby.

When plants and animals get older, they grow larger and parts of them change. You see this change when you look at a baby and then an older person. Both their height and how they look are different. To **develop** means to become larger, to get older, and to change as you become larger and older. A cell will develop into a baby, and a baby will turn into an older person. What about plants! Seeds will turn into a tree or a flower.

How does the first cell become so many different kinds of cells? How does a single cell develop into a baby? There is one kind of cell that has the power to become any type of cell in the body. This cell is like clay, and the body can shape it into any kind of cell that the body needs. This is the stem cell. A **stem cell** is a cell that can change into any kind of cell. Since there are so many different cells in our body, stem cells are needed to form into each different one. The first cells that develop after your parents' genes meet are stem cells, and they develop to become all of the different cells that make up you! Children and older people have much fewer stem cells than a baby developing in its mother's body.

At this point you may be thinking that it is not possible for all cells to have the same genes, since there are so many different kinds of cells. You might ask how heart cells and brain cells can have the exact same genes when those cells are so different. It would be like trying to make different toys with the same book of directions. The cell takes care of this by turning genes on and off, just like you would turn a light switch on or off. When a certain gene is turned on, it will help make something that the cell needs. When that gene is turned off, it does not do anything. Different genes are turned on in heart cells than in brain cells, because each of those cells does a different job. Stem cells turn certain genes on or off in order to make cells that are able to do their jobs.

- [10] A stem cell can turn into any kind of cell that the organism needs. It can become a heart cell, a brain cell, or even a leaf cell. When a stem cell changes into a specific cell, we call it differentiation. **Differentiation** means to make things different or separate from each other. These different cells now have their own job that is different from other cells. Stem cells are important to living things because they have not differentiated. Once a stem cell has differentiated, the cell it becomes can no longer become any other kind of cell. Think about how you can mold clay into anything when it is soft, but you can't change it once it has dried.

Today we learned that living things are made up of many different kinds of cells, and that each cell is responsible for doing something different. Stem cells, like wet clay, can be turned into any kind of cell that the animal or plant needs. However, once the stem cell has developed into a specific kind of cell, it can no longer be changed. Heart cells cannot be turned into brain cells, and leaf cells cannot be turned into root cells. They are like clay after it dries, and it has to stay the same shape and size.

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1. A "gene" is an instruction in a living thing's DNA that controls or influences a cell's function, affecting the living thing's growth or appearance.

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