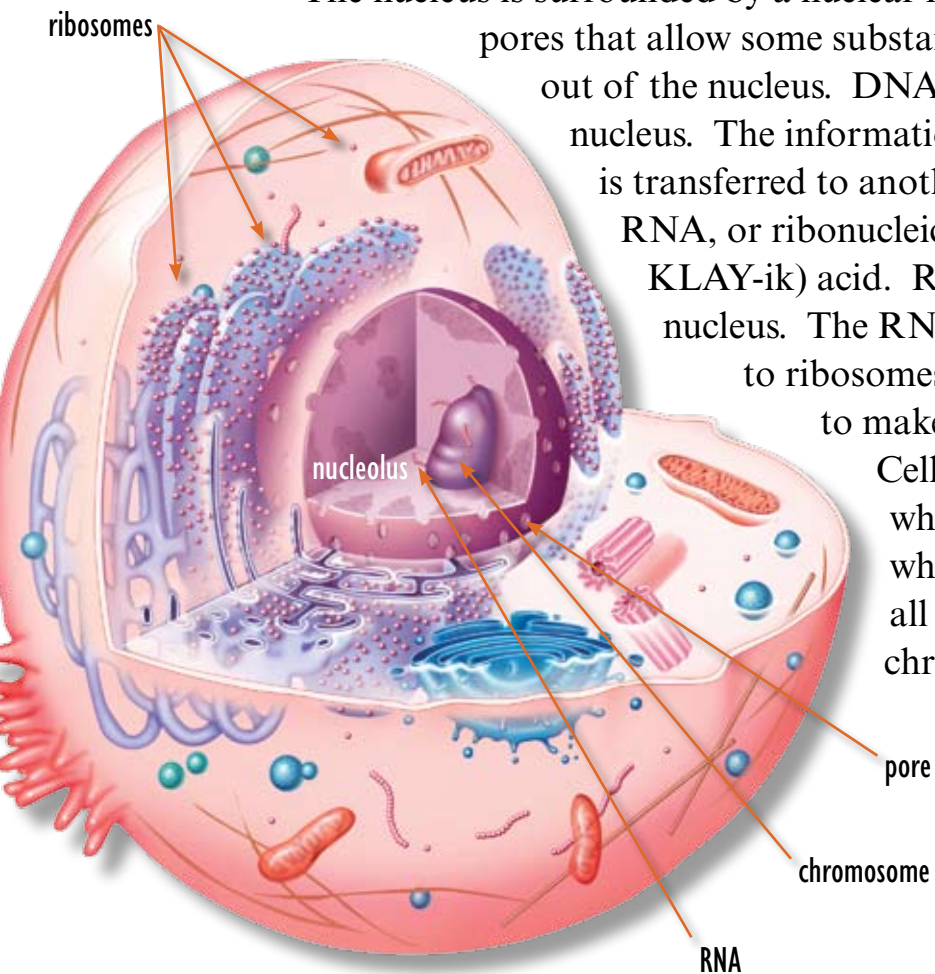


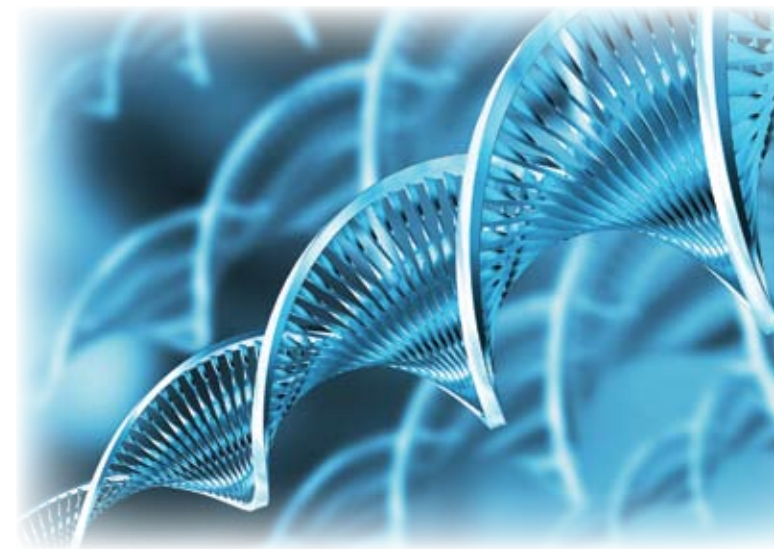
Controlling the Cell

The **nucleus** of a cell is often called the control center of a cell. The nucleus directs what happens in a cell. It controls the cell's growth and **reproduction**. How can the nucleus direct these activities? The nucleus contains the **chromosomes** of a cell. Chromosomes are long, threadlike structures. They are made of **DNA**. Chromosomes and DNA are what make each species unique. They make each individual unique, too.

The nucleus is surrounded by a nuclear membrane. It has pores that allow some substances to pass in and out of the nucleus. DNA never leaves the nucleus. The information carried by DNA is transferred to another molecule called RNA, or ribonucleic (ry-bow-noo-KLAY-ik) acid. RNA can exit the nucleus. The RNA gives instructions to ribosomes (RI-bow-zohms) to make different proteins. Cells' proteins affect what they are like and what they can do. It all starts with the chromosomes in DNA.



↑ human chromosomes



Human Chromosomes

Humans have 23 pairs of chromosomes.



Unique DNA

Each person has different DNA. It can be used to help solve crimes. Police can figure out people's DNA by using their blood. But, they can also use their fingernails or hair. They can then match the DNA with a data bank to help them solve the crime.

← DNA curls into a shape called a double helix.

Changing Leaves

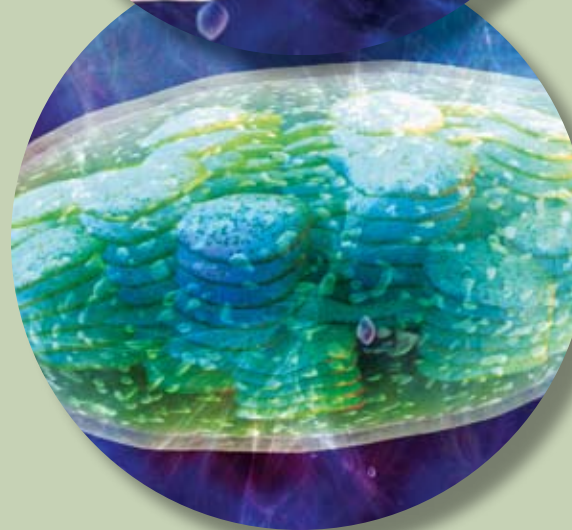
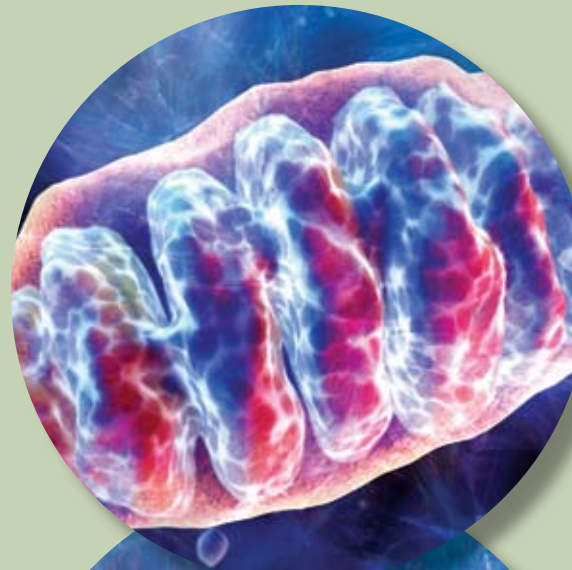
Did you ever wonder why leaves change color in the fall? It is because the chlorophyll goes out of the cells in the leaves.

Energy in Cells

Where do we get the energy we need to move, eat, and sleep? It comes from cells. **Mitochondria** (my-tuh-KON-dree-uh) are organelles that change food into energy cells can use. This is called **cellular respiration**. Cellular respiration needs oxygen. Mitochondria break apart molecules of food and release the energy. Then the cell uses the energy to build new proteins, move molecules around the cell, and make more cells.

Both plant and animal cells have mitochondria. Plant cells have chloroplasts, too. These are organelles that use energy from light. Chloroplasts contain a **pigment**. It is called **chlorophyll** (KLOR-uh-fil). Chlorophyll absorbs energy from the sun or other sources of light. The chloroplast uses that energy to make food from water and carbon dioxide. This process of making food is called **photosynthesis** (foh-tuh-SIN-tuh-sis). The green pigment is also what makes plants green.

↓ mitochondrion

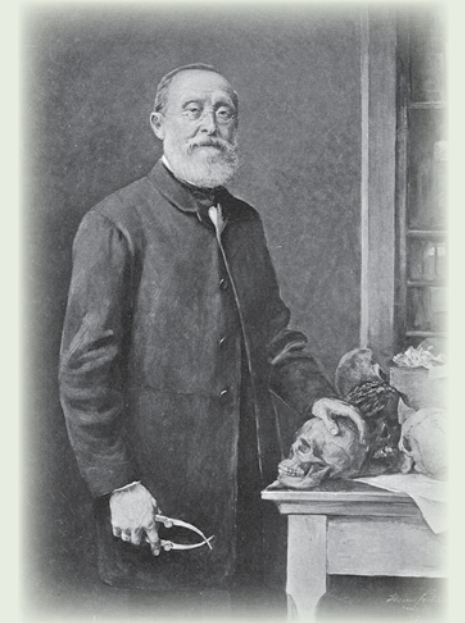


↑ chloroplast

Skulls and Disabilities

Virchow studied the skulls of disabled persons. He wanted to determine what caused their disabilities.

Rudolf Virchow (1821–1902)



Rudolph Virchow was a German doctor. He held many other titles, too. He is known for his contribution to cell theory. He found that every cell originates from another cell. He is considered the founder of **cellular pathology**. He believed that disease is caused by cells, not organs or tissues.

Virchow was also elected to the Berlin City Council. He actively worked toward improving sewage disposal and school hygiene. He designed two hospitals. He even established a way to do autopsies.