

Cells - Advanced

Douglas Wilkin, Ph.D.
Niamh Gray-Wilson

Say Thanks to the Authors

Click <http://www.ck12.org/saythanks>

(No sign in required)



To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-source, collaborative, and web-based compilation model, CK-12 pioneers and promotes the creation and distribution of high-quality, adaptive online textbooks that can be mixed, modified and printed (i.e., the FlexBook® textbooks).

Copyright © 2016 CK-12 Foundation, www.ck12.org

The names “CK-12” and “CK12” and associated logos and the terms “**FlexBook®**” and “**FlexBook Platform®**” (collectively “CK-12 Marks”) are trademarks and service marks of CK-12 Foundation and are protected by federal, state, and international laws.

Any form of reproduction of this book in any format or medium, in whole or in sections must include the referral attribution link <http://www.ck12.org/saythanks> (placed in a visible location) in addition to the following terms.

Except as otherwise noted, all CK-12 Content (including CK-12 Curriculum Material) is made available to Users in accordance with the Creative Commons Attribution-Non-Commercial 3.0 Unported (CC BY-NC 3.0) License (<http://creativecommons.org/licenses/by-nc/3.0/>), as amended and updated by Creative Commons from time to time (the “CC License”), which is incorporated herein by this reference.

Complete terms can be found at <http://www.ck12.org/about/terms-of-use>.

Printed: August 23, 2016

flexbook
next generation textbooks



AUTHORS

Douglas Wilkin, Ph.D.
Niamh Gray-Wilson

CHAPTER

1

Cells - Advanced

- Describe the importance of cells to biology.



Why is a cell so complex?

Cells have lots of things to do. Some cells make the whole organism, so that one cell must do everything that organism needs to do to live. Other cells perform specific functions, so they must be designed to do that specific activity.

Introduction to Cells

The **cell** is the smallest unit of structure and function of all living organisms. A cell is also the smallest unit of life, with single-celled organisms present on this planet for over 3.5 billion years. Single-celled (**unicellular**) organisms like bacteria are obviously composed of just one cell, whereas **multicellular organisms** can be composed of trillions of cells. Multicellular organisms include protists (though single-celled protists also exist), fungi, plants and animals. Most plant and animal cells are between 1 and 100 μm and therefore can only be observed under the microscope.

The one cell of a unicellular organism must be able to perform all the functions necessary for life. These functions include metabolism, homeostasis and reproduction. Specifically, these single cells must transport materials, obtain and use energy, dispose of wastes, and continuously respond to their environment. The cells of a multicellular organism also perform these functions, but they may do so in collaboration with other cells.

Cells are essentially carbohydrates, lipids, proteins and nucleic acids in a water-based environment. It is the lipid (phospholipid) membrane that keeps the water-based environment in the cell separate from the water-based

environment outside the cell. But a cell, even the single cell of a unicellular organism, must be able to interact with its external environment. The cell must be able to bring molecules in from the outside, and expel unwanted waste products. Knowing the components of cells and how cells work is necessary to all of the biological sciences.

Learning about the similarities and differences between cell types is particularly important to the fields of cell biology and molecular biology. **Cell biology** is the field of biology that studies cells. In particular, cell biologists study a cell's physiological properties, structure, **organelles**, interactions with the extracellular environment, life cycle, division and death. **Molecular biology** concerns itself with understanding the interactions between the various systems of a cell, including the relationships between DNA, RNA and proteins.

Research in cell biology is closely linked to molecular biology, as well as genetics, biochemistry and developmental biology. The importance of the similarities and differences between cell types is a unifying theme in biology. They allow the principles learned from studying one cell type to be applied when learning about other cell types. For example, learning about how single-celled bacteria function can help us understand more about how human cells function. Understanding basic cellular processes, such as cell division or metabolism in bacteria, gives information about similar processes in our cells.

Summary

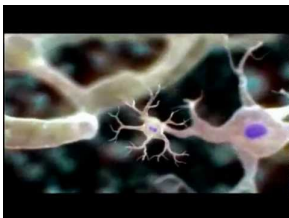
- A cell is the smallest unit of structure and function of all living organisms.
- The understanding of cells is integral to other biological fields, including molecular biology, genetics, biochemistry and developmental biology.

Review

1. What is a cell?
2. List some of the functions of a cell.
3. Describe the relationship between cell biology and molecular biology.

Explore More

Use this resource to answer the questions that follow.



MEDIA

Click image to the left or use the URL below.

URL: <https://www.ck12.org/flx/render/embeddedobject/139336>

1. Concerning cells, what does all life have in common?
2. How many cells are in the human body?
3. How big is a cell?
4. Each second, what is happening in your cells that keeps you alive?