

Attainment's

EXPLORE BIOLOGY

STUDENT BOOK

By Alex Bastian and Abby Davies

Edited by Abby Davies

Graphic Design by Josh Eacret and Erin Radermacher

Video produced by Ehren Schultz & Jeff Schultz

Written by Abby Davies & Jeff Schultz

Motion graphics by Connie Beckham, Cole Steiner, & Ehren Schultz

Captioning by Larry Callahan

An Attainment Company Publication

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Printed in the United States of America.

ISBN: 978-1-64856-167-2



P.O. Box 930160, Verona, Wisconsin 53593-0160 USA

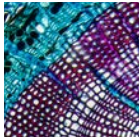
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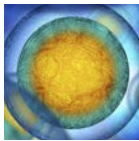
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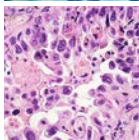


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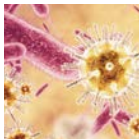


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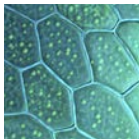


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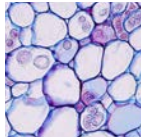
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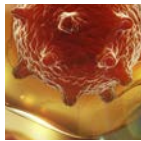
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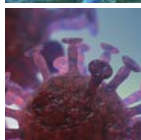


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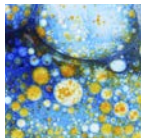


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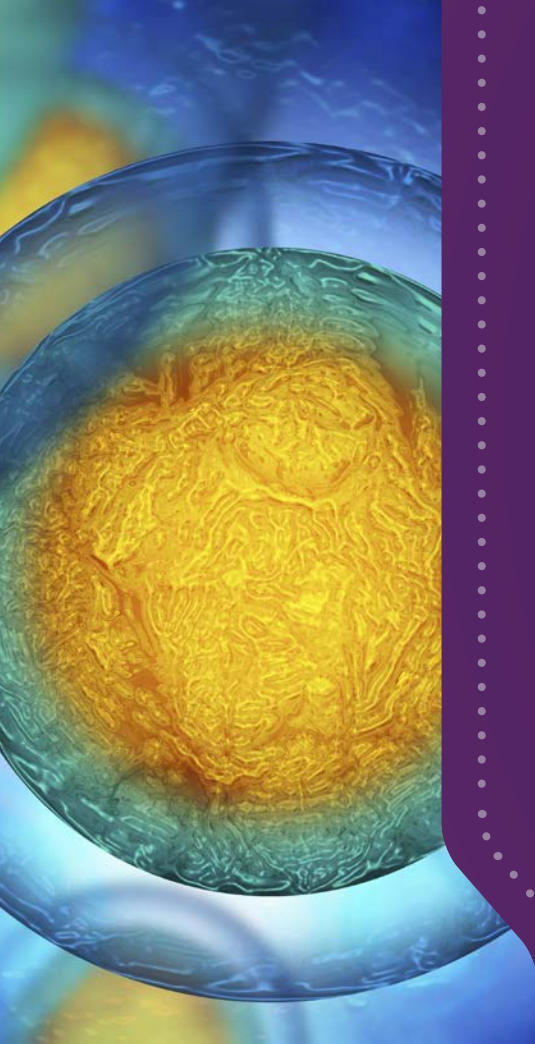
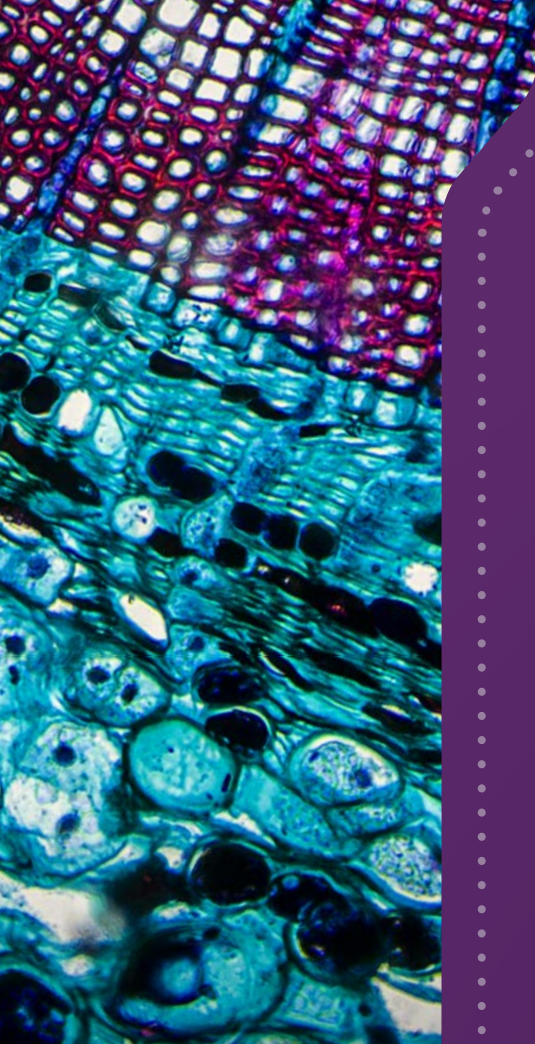


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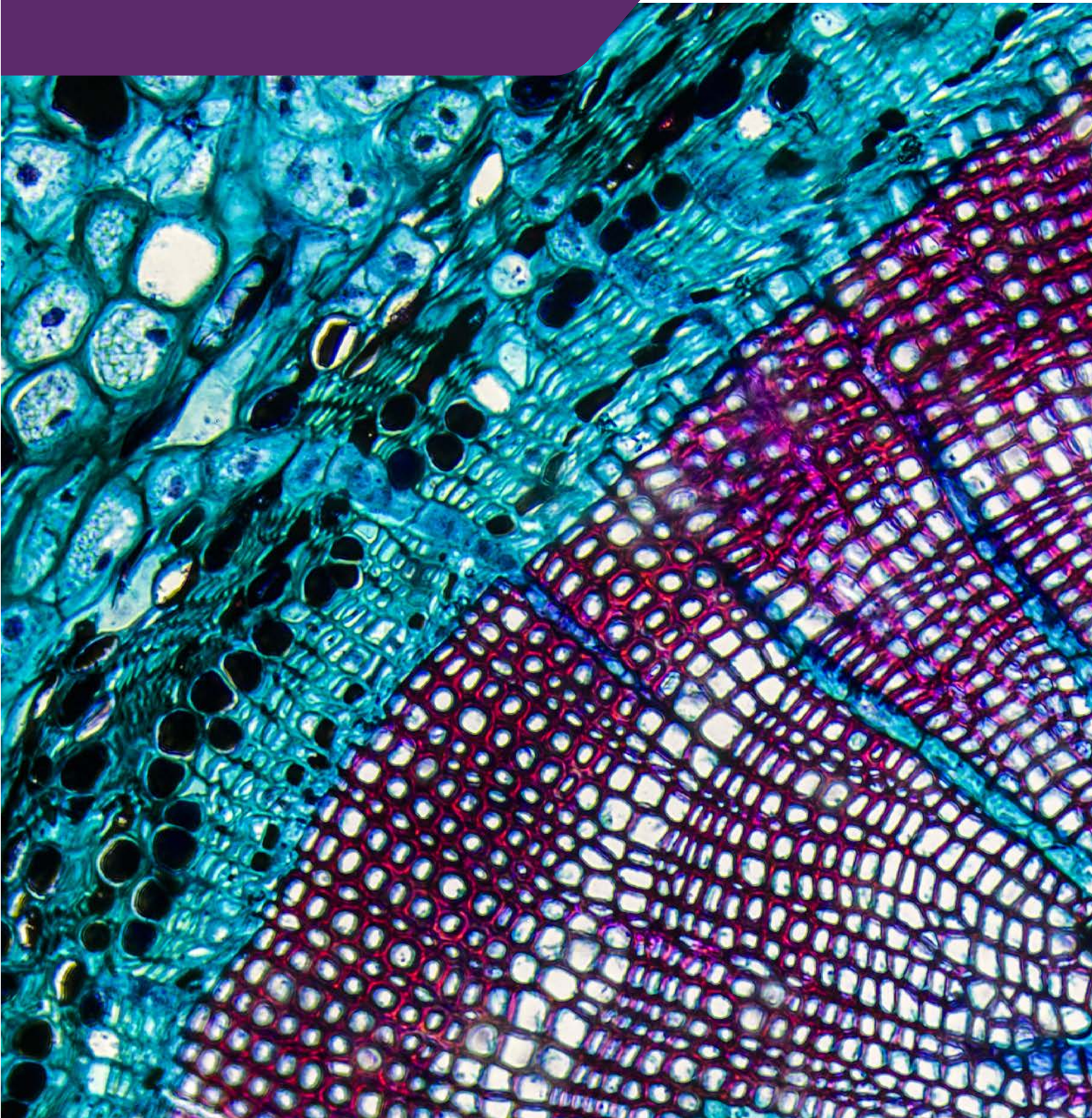


Unit 1

Intro to Biology

What is Biology?

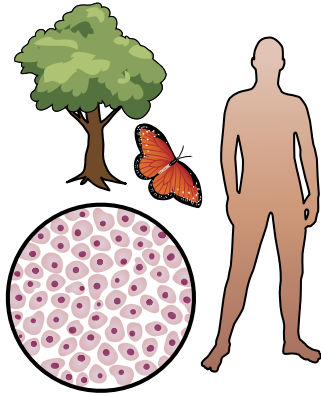
Chapter 1



Biology is the scientific study of living things.

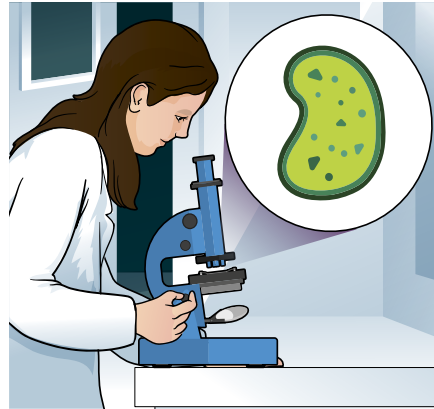


BIG IDEAS



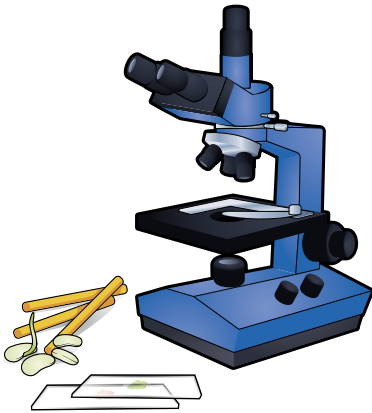
1 Biology is the study of life.

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2 Biologists learn new things through research.

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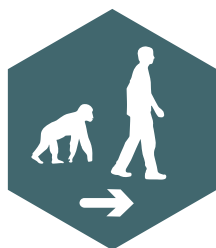
3 Tools are used to study biology.

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4 Research can be done in the laboratory or in the field.

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1800s
Evolution

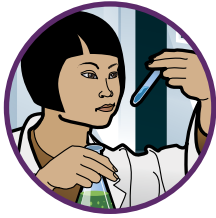


1952
Structure
of DNA

5 Biology is always changing.

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VOCABULARY



Experiment

A scientific procedure used to learn new things

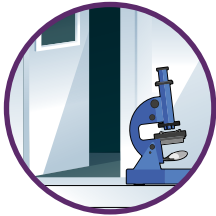
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Research

An organized process of study to learn new things

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Laboratory

A place designed for scientific experiments

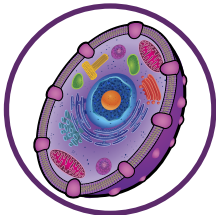
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Scientific method

The order of steps used in research

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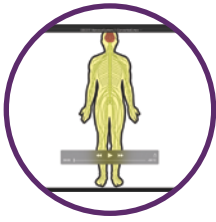


Model

A representation of a real-life concept

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VOCABULARY



Animation

A tool that uses moving pictures to represent biological processes

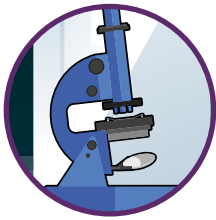
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Fieldwork

Research done in the natural environment, outside of the laboratory

.....



Microscope

A tool used to magnify small objects that often can't be seen with the human eye

.....



Data

Numbers or facts collected from an experiment

.....



Innovation

A new product or idea

.....



Biology studies living things, like plants.

Experiment

A scientific procedure used to learn new things

Biology is an important field of science. It studies how life works and what living things do. Life is complicated and hard to understand. Biologists know a lot of information about how life works. Since life is so complicated, much more can still be learned. Knowledge is gained from **experiments** biologists perform. This knowledge can have many benefits. For example, experiments can help biologists understand how life works and can help humans and environments stay healthy.

Experiments are often done in a laboratory.





Biologists use equipment like test tubes and gloves to perform experiments.

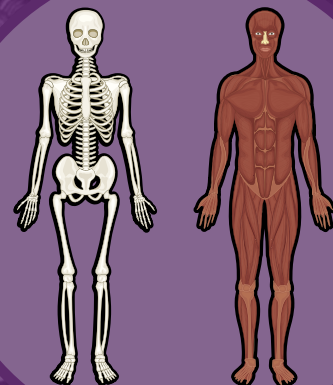
Biologists and other scientists are always trying to learn new things through **research**. Scientists share the results of their research with other scientists. By sharing knowledge throughout the scientific community, science can move forward. When knowledge is shared, many scientists can help each other by doing similar research.

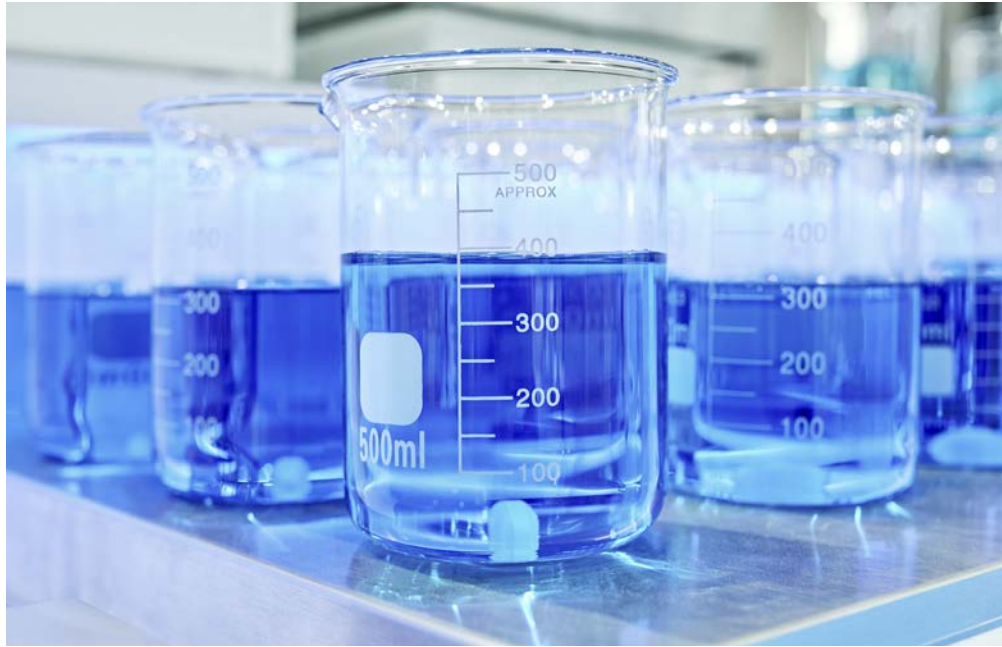
Research

An organized process of study to learn new things

DID YOU KNOW?

Biologists started learning a lot about the human body during the Renaissance in Europe in the 1400s. They studied human and animal anatomy while artists learned to paint the human body more accurately.





Beakers are often found in a laboratory.

Laboratory

A place designed for scientific experiments

Scientific method

The order of steps used in research

Biologists and other scientists often do their research in a **laboratory**. They use the **scientific method** to perform their research. The scientific method is the order in which tasks are performed during experiments. It is important to follow this order to make sure the results of the research can be trusted. Once scientists come up with a question, they must follow the scientific method before they can reach a conclusion.



The scientific method has six basic steps.

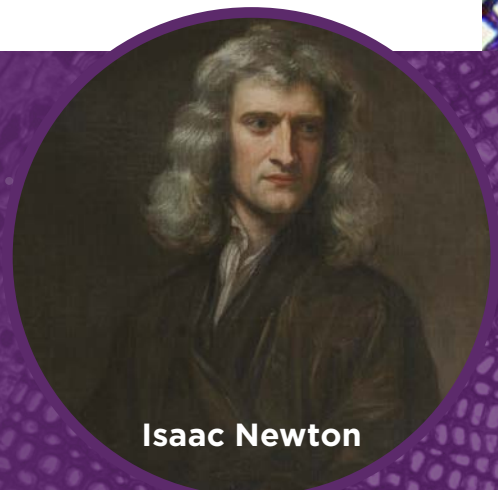


The first step of the scientific method is making an observation.

First, biologists make an observation. They then choose a question to answer. They use a hypothesis, or a logical guess for the answer, to guide the experiment. The experiment comes next. It is the most important step of research. The results of the experiment can help answer the question. Often, many experiments need to be done to answer the question.

DID YOU KNOW?

The process of the scientific method was perfected by different scientists. It was first introduced by Copernicus (Poland, 15th century), formalized by Francis Bacon (England, 17th century), and made famous by Isaac Newton (England, 17th century).



Isaac Newton



Technology is crucial for the advancement of research.

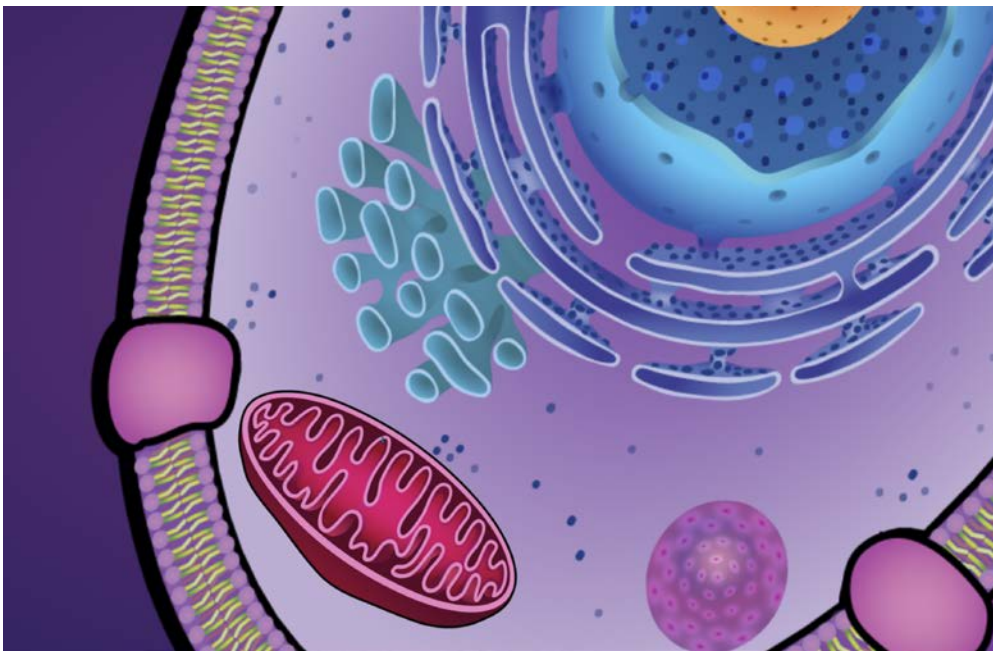
As technology continues to improve, researchers are using better equipment to perform experiments. Special computer programs are used to organize and analyze large amounts of data. Experiments that weren't possible before can now be carried out due to new equipment. Scientists can use **models** to explain and even predict real-world systems and outcomes. Examples include a model of a living thing, like a plant or animal, or a model of an environment. Scientists can use technology to create their own models.

Technology allows scientists to create models of small molecules.



Model

A representation of a real-life concept



Animations can show things like the insides of a cell.

Biologists also use **animations** in research and to explain their findings. Animations can show representations of things people can't see with their eyes, like the insides of plant and animal cells. They help people learn more about the world around them. Animations are often 3D and interactive.

Animation

A tool that uses moving pictures to represent biological processes

DID YOU KNOW?

Biomedical technology is a field that connects engineering, technology, and biology to create important devices that can help save lives. Some biomedical inventions include artificial organs and robot surgeons.





Biologists wear safety equipment, like gloves and masks, when performing research to protect themselves and the samples.

Many biologists and other scientists do their research in a laboratory. Scientists often use special pieces of equipment to do their research. Laboratories must be very clean to help research and experiments run smoothly. Some research is done in the field.

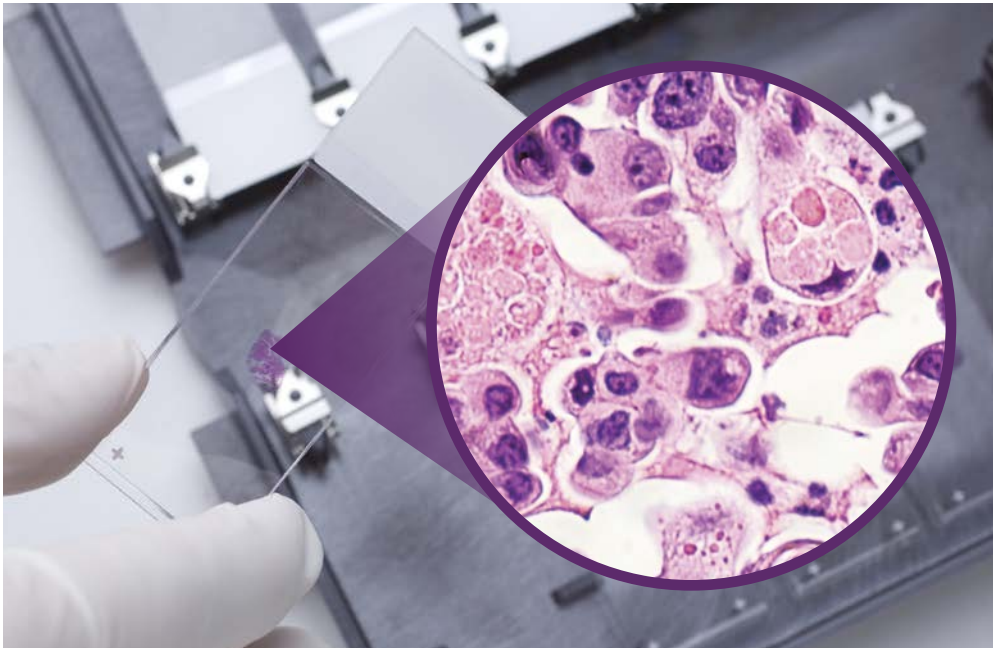
Fieldwork is often used to study organisms in their natural environment, like fish in the ocean or trees in a forest. The results from fieldwork are frequently used to keep organisms and environments healthy.

Biologists collect samples while doing fieldwork.



Fieldwork

Research done in the natural environment, outside of the laboratory



Biologists use microscopes to see very small things.

Biologists often use **microscopes** to learn more about the world around them. Microscopes use lenses to magnify objects. There are different types of microscopes. Some are used to look at fieldwork samples, like small living things. Microscopes have improved over time. They are still often used today in research.

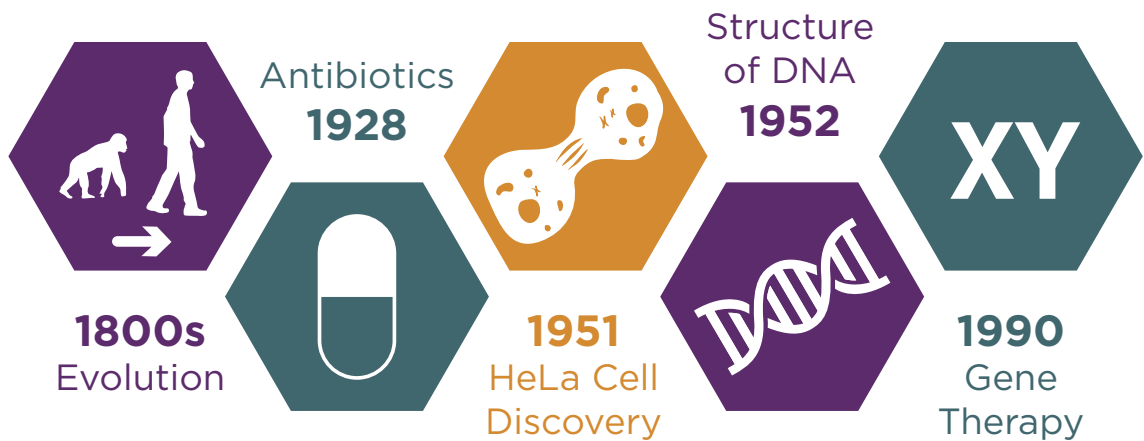
Microscope

A tool used to magnify small objects that often can't be seen with the human eye

DID YOU KNOW?

A lot of equipment is needed in a biology laboratory, like safety equipment, microscopes, test tubes, and machines.





.....
A lot of biological discoveries have happened throughout history.

Like all scientific fields, biology is constantly changing as new experiments are performed and more **data** is collected. After conducting an experiment, biologists analyze the data to make a conclusion. The conclusion says what was learned in the experiment and if the hypothesis, or logical guess, was correct or not. The data and results are then shared with other scientists. The experiment is often carried out many times.

Data

Numbers or facts collected from an experiment

Scientists can collect data out in the field.





Some biological innovations are used to keep us healthy.

Sometimes the new data collected will go against old data and more research will need to be done. More research and new **innovations** can help improve scientific knowledge. Scientists can collaborate to come up with new conclusions. They can also review others' research and give their educated opinion. The study of biology is never complete—it is always improving.

Innovation

A new product or idea

DID YOU KNOW?

The Nobel Prize is the most prestigious award given to scientists. It is given to someone who makes an important innovation or discovery that helps all people. The first Nobel Prizes were awarded in 1901.



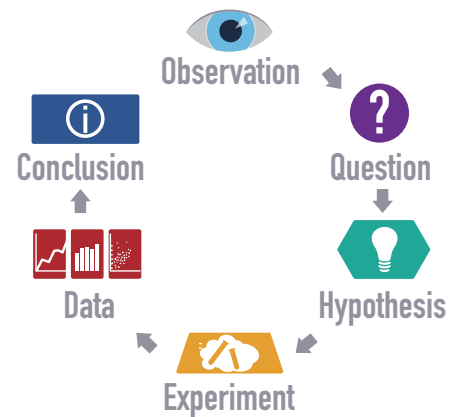


Let's do an Experiment!

Now that we know about experiments, let's try one for ourselves. Take two cups and fill them up with liquid tap water. What do you think will happen if you add ice to one of the cups of water? Will it be colder or warmer than the other cup? Let's use the scientific method. First, make a hypothesis. Then, carry out the experiment. Add ice to one of the cups. Now, use a thermometer to get the necessary data. Take the temperature of each cup. Which cup of water is colder? Was your hypothesis correct?



For this experiment, you need two cups, water, and ice.



It is important to follow the scientific method when carrying out an experiment.

Make a Conclusion

Now that you have performed the experiment, you can make a conclusion. Record your data on the Discovery Worksheet provided by your instructor. Use the data collected to decide which cup is colder. We know that science is most accurate when data is shared and compared. Let's share our results with our classmates. Did everyone get the same results? Take note of all your classmates' data on the Discovery Worksheet. If people have different results, we can do the experiment again to improve accuracy.



CHAPTER 1 QUIZ

Choose the correct answer.

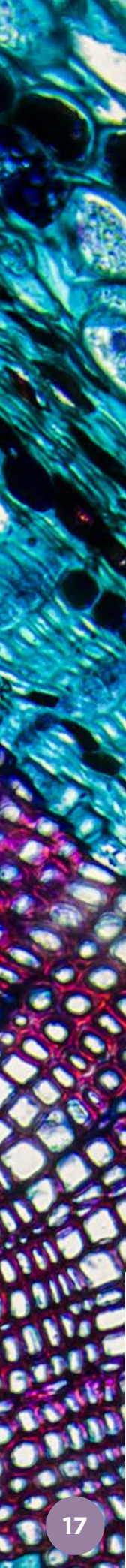
- 1 What does biology study?**
 - A** How life works and what living things do
 - B** Chemistry and mathematics
 - C** Space science

- 2 Why is it important for scientists to share their results?**
 - A** So environments stay healthy
 - B** So other scientists can do similar research and learn more
 - C** Because science is hard to understand

- 3 What do biologists have to follow to perform their research?**
 - A** A guess
 - B** A process of their choosing
 - C** The scientific method

- 4 What is the first step of the scientific method?**
 - A** Making an observation
 - B** The experiment
 - C** The result

- 5 How has biology benefited from technology?**
 - A** New equipment has made more experiments possible
 - B** Everything can be performed on a computer
 - C** Technology has not improved biology





CHAPTER 1 QUIZ

Choose the correct answer.

- 6 What can animations show?**
- A** Computer programs
 - B** Representations of things people can't see with their eyes
 - C** Laboratory equipment
- 7 Where is fieldwork performed?**
- A** In the laboratory
 - B** On a computer
 - C** In the natural environment
- 8 How do microscopes work?**
- A** They use lenses to magnify small objects
 - B** They make large objects smaller
 - C** They keep organisms and environments healthy
- 9 What do scientists have to do to make a conclusion?**
- A** Make a hypothesis
 - B** Analyze the data they collected
 - C** Come up with a question
- 10 What happens if new data goes against old data?**
- A** More research needs to be done
 - B** The newest data is always accepted
 - C** The oldest data is always accepted