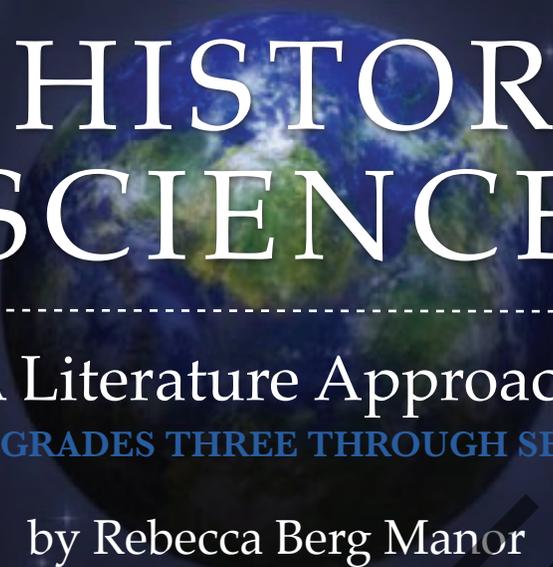


THE HISTORY OF SCIENCE



A Literature Approach
FOR GRADES THREE THROUGH SEVEN

by Rebecca Berg Manor

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INTRODUCTION

How to Use this Guide:

Children are full of questions about the world around us. These can be answered in interesting and meaningful ways and this science course is designed to do just that! It is my desire that by reading about the lives of great scientists and inventors and then doing experiments to learn about their discoveries and inventions, your students will grow in their curiosity and seek to continue investigating this amazing world we inhabit. This course is designed to be an introduction to scientific study for students in elementary and middle school. It will introduce people who we will study in detail as well as scientific principles, laws, and theories that will be later examined in more depth and detail.

This course is supposed to be fun! Biographies of people like Archimedes, Galileo, Newton, Marie Curie, the Wright Brothers, and many more will relate the stories of some of science's most interesting figures. Experiments, websites, and guided observations will allow your students to see science at work. The guide is set up so that if you complete three lessons each week, the course will be finished in one school year. This should be fine for middle school aged students. Slow it down for younger students or speed up the pace for older ones. Feel free to adjust your pace as necessary. This is a guide—not a strict book of rules and checkboxes.

Throughout the study you will be building a science portfolio. This can be a notebook or binder divided into the following three sections: The History of Scientific Discovery, Experiments and Lab Reports, Glossary of Scientific Terms. Most of the assigned portfolio activities will be recorded in the History of Scientific Discovery section. Any terms you are asked to define will be recorded in the Glossary. Many of the terms will be defined and explained in the reading assignments, so pay close attention when reading and feel free to copy the explanations in your glossary. The glossaries in *The Way Science Works* and *The Picture History of Great Inventors* will be very helpful for any vocabulary assignments.

Experiments!

Throughout this study you will be instructed to conduct lots of experiments. They will use things generally found around your house, but some may require a trip to the hardware store. Check **Resources**, page iv, for suggestions on where to procure some of these items. Before you do any experiment it is very important that you read through all the instructions first. This is very helpful for experiments that require you to complete a few steps and then wait a period of time (sometimes minutes, sometimes days). Next, make a list of all the materials you will need and gather those materials into one place. When you're ready to begin, make sure you've taken any steps necessary to protect yourself. Then begin! Carefully follow the instructions, making notes as you progress using the **Scientific Method Lab Report**, page 45. These notes will be helpful for recording your experiments in your lab notebook. Think of yourself as an investigator where the details you record are clues to solving the mystery.

Mapping the World

In addition to learning about the lives of scientists and their discoveries, you will practice the science of geography! Using the internet, an atlas, and the books you read, you will make maps, mark the birthplaces of famous scientists, follow their lives as they move from place to place. It's a hands-on application of the principles of geography. Feel free to illustrate and embellish your maps however you'd like! Mapmakers have always taken a little creative license—something that has caused some people to get very lost! No danger in that with your maps!



INTRODUCTION

A Word on Faith and Science

“The heavens declare the glory of God, and the sky above proclaims his handiwork.” Psalm 19:1

Louis Pasteur once said, “A little science estranges man from God, but much science leads him back to Him.” Throughout this course, it is my hope that what you learn provides a window for a richer and more full understanding of our Creator. I have always found science to expand my wonder at the genius of God, his infinite creativity, his sense of humor, his capacity to continually show our wisdom to be foolishness. For centuries many have told us that science and faith are incompatible or that science is only of value when it provides proof of the existence of God. I find both these statements troubling and, frankly, lacking in imagination. This is the result of looking to faith and science for answers and beliefs they were not meant to provide. Faith, by its very nature, eschews positive proofs. Science, when pursued properly, cannot be turned into the handmaiden of faith. Yet, that does not mean that faith and science are incompatible. I firmly believe that when pursued using proper methodologies, science can expand our faith, deepen our appreciation for God. As Albert Einstein observed (echoing Pasteur) “The more I study science the more I believe in God.”

In writing this course, I endeavored to provide factual biographical accounts of the scientists, especially in regards to their faith. I have also included origin theory presented from three perspectives in order to help parents, teachers, and students discuss ideas of where we came from and why we’re here. Outside of that, I believe the science speaks for itself and is a powerful illustration of the amazing world we inhabit. I believe that it is not my place as the author of a history curriculum to provide faith-based observations. Each family has a responsibility for the spiritual education of their children and with that in mind, I have written this study to allow parents to educate their children according to their own convictions and consciences.

RESOURCES

Experiment Supplies

Most of the things required for the experiments in this study are general household items. A few things require a bit more effort but the resulting experiments will prove worthwhile. Below are resources for procuring some of these items.

Agar Bacteria Growing Kits: These kits are reasonably priced and have everything you need to collect samples of bacteria and mold from around your home and then culture those samples. It's a very fun experiment and well-worth the cost of the kits. Kits are available widely online and at the following two stores:

Science Store Bob: sciencebobstore.com/bacteria-growing-kit-science-fair-size/

Steve Spangler Science: stevespanglerscience.com/bacteria-growing-kit.html

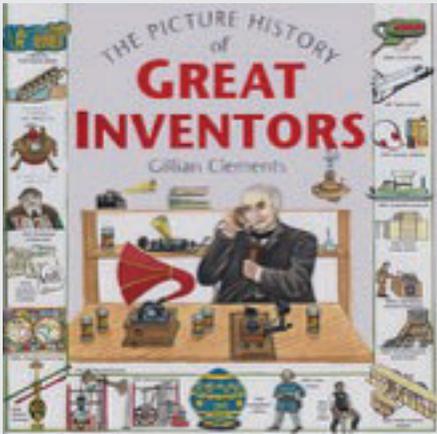
Acid Indicator Paper: Widely available at drugstores, Walmart, Target, pool supply stores or online at Amazon.

Lenses for Galilean telescope: Inexpensive lenses are available at Surplus Shed and they will help you with ordering: surplushed.com/lens.cfm

Microscope and Slide Preparations for Microscopes: A microscope is absolutely not required for this course. If you choose to purchase one for use in your school or homeschool, you will be able to use it in this course. Preparing slides of specimen can be a lot of fun, especially if you have good supplies, so check at your local school supply store. Slide preparation kits are available inexpensively at Amazon and Home Science Tools: hometrainingtools.com/microscope-slide-making-kit

Petri Dishes: Available online at science supply stores and Amazon. Also try medical supply stores and craft stores.

RESOURCE TEXTS

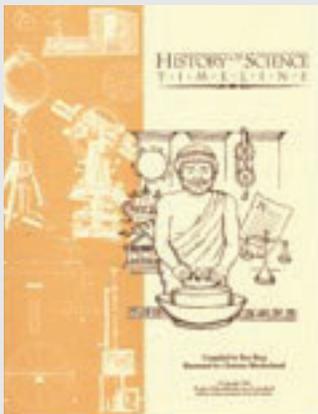
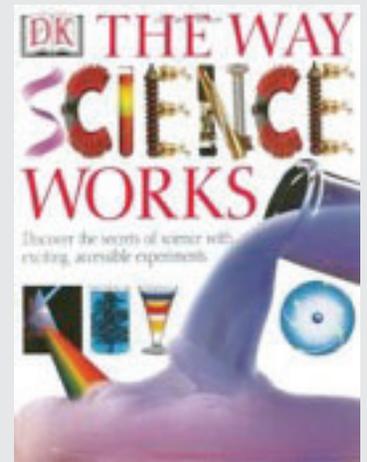


The Picture History of Great Inventors by Gillian Clements

Follow the lives and work of over 50 major innovators as you set off on a journey from the earliest inventions in recorded history to the most recent developments in science and technology. A colorful, decade-by-decade catalog of the world's greatest inventors. Illustrated with 800+ drawings, and bursting with facts, *Great Inventors* celebrates ingenuity of people throughout the ages. Fascinating read for those curious about the notable, and not so notable, technical achievements that have shaped our lives.

The Way Science Works by Robin Kerrod and Dr. Sharon Ann Holgate

Eye-opening experiments and exceptional photography bring science to life. Discover science in action, from the principles that explain the natural world around us to the theories behind today's fast-moving technology. Test key theories in more than 60 hands-on projects using items from around the house! Next-generation visuals and cutting-edge content help illuminate major scientific developments in this book that is packed full of facts about famous scientists, new technology, and much more!



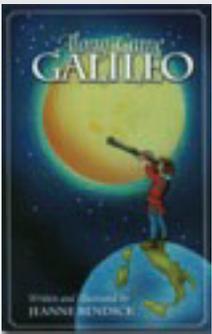
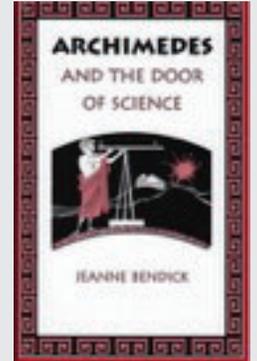
The History of Science Timeline by Christen Blechschmid

This time line goes back to the ancient world of Pythagoras, Aristotle and Archimedes, to the medieval world of Copernicus and Galileo, up to the modern world of Edison and Einstein. With a total of 21 illustrations, many of the world's most notable scientists will be brought to life for your student. All the figures are dated with a brief explanation concerning the discoveries of each individual. Your student will more fully appreciate the progress of science through the centuries.

LITERATURE

Archimedes and the Door to Science by Jeanne Bendick

A wonderful biography of one of the most important scientists of Ancient Greece and an explanation of his contributions to physics, astronomy, and mathematics. Archimedes was a most remarkable ancient Greek. His belief that truth is important for its own sake, not for its practical applications, is of enormous importance. This book shows how exciting Archimedes found ideas.

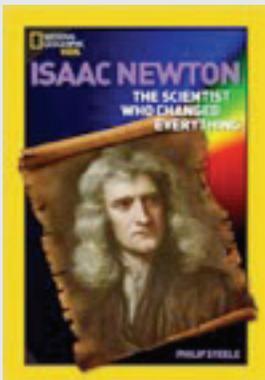
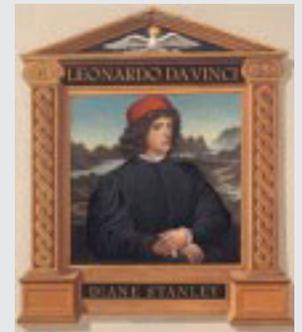


Along Came Galileo by Jeanne Bendick

Often referred to as the "Archimedes of his time," Galileo was forever asking questions. These questions led to some of the most important answers of the scientific world—and to his contributions to astronomy, physics, and mathematics. Galileo also advanced the astronomical telescope and invented the compound microscope. He measured the rotation of the sun, invented the thermometer, a geometrical compass and the pendulum clock.

Leonardo da Vinci by Diane Stanley

Drawing from a range of sources, including her subject's extensive notebooks, Stanley's conversational narrative describes Leonardo da Vinci's astoundingly far-reaching and varied achievements. Young readers will come to appreciate both da Vinci's universally renowned accomplishments as a painter and the breadth of his scientific experimentation and research. A virtuosic work.



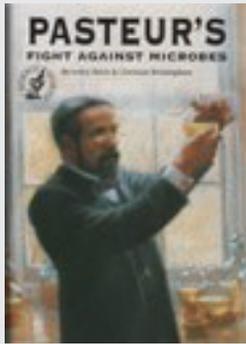
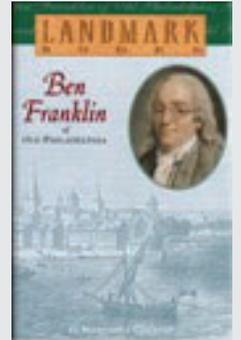
Isaac Newton, The Scientist Who Changed Everything by Philip Steele

Born in England in 1643, Isaac Newton grew up in the age when Renaissance thinkers were challenging accepted ideas throughout Europe. Fascinated by all earthly science, Newton developed laws of motion and universal gravitation which also furthered our understanding of the movement of celestial bodies. This vibrant biography profiles the famed physicist as an acclaimed mathematician, astronomer, alchemist, philosopher, and inventor as well.

LITERATURE

Ben Franklin of Old Philadelphia by Margaret Cousins

Ben Franklin was one of the busiest men in the American colonies. Through his own hard work, he established a printing business in Philadelphia. He was also a postmaster, an inventor, a writer, and a diplomat. His inventions have improved the lives of millions of people and his exploration of electricity made huge advances in the field!

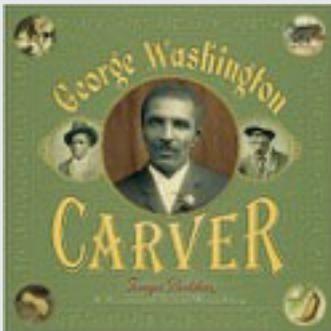
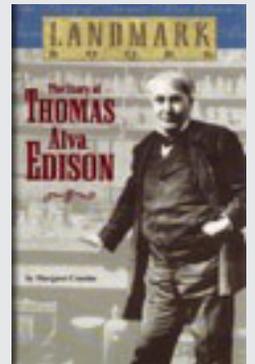


Pasteur's Fight Against Microbes by Beverly Birch

In 1856, when Louis Pasteur first began studying microbes in rotten sugar beet juice, he put into motion a chain of events that saved France's wine industry, and revolutionized medicine and biology. This is the true story of a man who helped save millions of lives. Because of his work, the diseases that had killed people for centuries were finally defeated. His imagination, patience, and clear thinking have transformed our world forever.

The Story of Thomas Alva Edison by Margaret Cousins

Genius is “one percent inspiration and ninety-nine percent perspiration.” So said Mr. Edison. America's greatest inventor's contribution to modern technology are all colorfully explained. Thomas Edison set up a laboratory in his basement when he was just ten years old. When he got older, he worked as a telegraph operator and found ways to make the telegraph work faster and more efficiently. He went on to invent revolutionary inventions that forever changed the way people live.



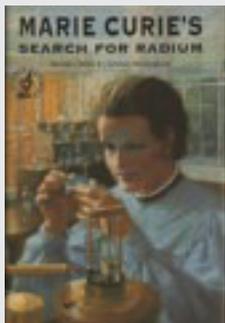
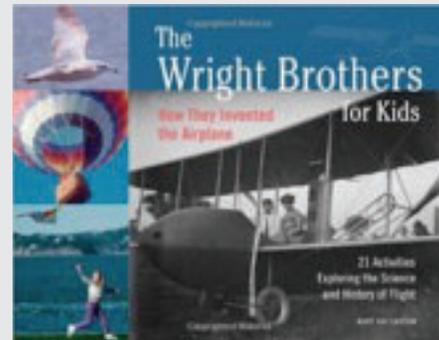
George Washington Carver by Tonya Bolden

Born a slave, George Washington Carver grew up to become one of the most famous scientists in the world! He discovered how to improve crop conditions in the South by planting peanuts and sweet potatoes. He then invented hundreds of new ways to use these crops. His work was so important that Mr. Carver was honored by the President of the United States. He was loved and admired not only by other scientists, but by all who knew him.

LITERATURE

The Wright Brothers for Kids: How They Invented the Airplane by
Mary Kay Carson

This activity book tells the amazing true story of how two bicycle-making brothers from Ohio, with no more than high-school educations, accomplished a feat that forever changed the world. At a time when most people still hadn't ridden in an automobile, Wilbur and Orville Wright built the first powered, heavier-than-air flying machine. Woven throughout the heartwarming story of the two brothers are activities that highlight their ingenuity and problem-solving abilities as they overcame many obstacles to achieve controlled flight.

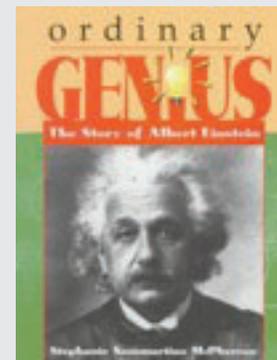


Marie Curie's Search for Radium by Beverly Birch and Christian Birmingham

Marie Curie's scientific research and discovery of radium in 1902 helped open the door to our modern nuclear age. This handsomely illustrated, documentary-style volume is filled with facts but conveys the drama of a good story. An exciting tale of scientific exploration for young readers. Learn about how this young woman from Poland changed our understanding of energy and led the way for other women to enter the field of science!

Ordinary Genius, The Story of Albert Einstein by Stephanie S. McPherson

Following Einstein's life from his boyhood in Germany and Italy to his time teaching in Switzerland, Austria, and Germany and finally ending up in the United States, this biography provides insight into the man who would change science forever. His famous theories changed the way scientists understood gravity, light, and energy. Quiet, absentminded, and kindhearted, Einstein's genius went beyond science and his influence is felt far and wide.



The Story of Alexander Graham Bell by Your Story Hour

Radio dramatization of the life of Alexander Graham Bell. Learn all about his childhood, struggles in school and his mother's unwavering belief in her son's abilities. The inventor of the telephone changed the way we communicate and this CD provides a wonderful biography of this remarkable inventor.



ANCIENT SCIENTISTS

Lesson 1

Date:

1. Begin *The Picture History of Great Inventors*, read pages 9-12.
2. In the science portfolio you have set up (see page ii of this guide for instructions) write out Proverbs 1:2-7. In the History of Scientific Discovery section create a cover page entitled “The Ancient Greeks”. This page may be decorated with sketches or pictures of Greek inventions as the study progresses.
3. Read and discuss Chapters 1-2 of *Archimedes and the Door of Science*. Teacher: you may find the Introduction to *Archimedes and the Door of Science* helpful.
 - a. Discuss the process of scientific discovery as described on pages 4-5. Trace the development of one ancient discovery from its first uses to its uses now. One such example would be the wheel: first used on carts, now used to transport spaceships. Add chart to your science portfolio.
4. Read pages 6-7 of *The Way Science Works*.



Lesson 2

Date:

1. Draw a map of the known world as shown on page 11 of *Archimedes and the Door of Science*. Use an atlas to trace the area and cut this map out and paste into science portfolio in the Ancient Greeks section.
2. Make a replica of the first “books” as shown on page 21 of *Archimedes and the Door of Science*. On this “book” copy the Greek Alphabet as shown on page 19 of *Archimedes and the Door of Science*.
3. Define *intuitive* and record in glossary of portfolio. How did the Greeks exemplify this trait? See page 13 of *Archimedes and the Door of Science* for guidance.
4. Write out Luke 11:9-10 in the science portfolio.
5. One important mathematician who live nearly three hundred years before Archimedes was called Pythagoras. Do some research on him and define the Pythagorean Theorem, a mathematical principle he discovered. The following link will be helpful: historyforkids.org/learn/greeks/science/math/pythagoras.htm
6. Color and paste picture of Pythagoras on the *History of Science Timeline*.

Lesson 3

Date:

1. In preparation for your reading, define and record the following terms in the glossary of science portfolio:

matter	atom	molecule
density	elasticity	
2. The ancient Greeks believed that everything in the universe was made up of four elements: Earth, Water, Fire, and Air. We now know that there are many elements and some ancient Greeks were centuries ahead of their time in believing that tiny little bits of matter existed. To learn more about matter and the different states in which it can exist read pages 10-13 of *The Way Science Works*.

3. Perform the experiment on page 13 of *The Way Science Works*. Record findings in science portfolio. You may use the **Scientific Method Lab Report** on page 45 of this guide. You will need the following items:

plastic soft-drink bottle
modeling clay
solid objects for testing

plastic straw
measuring cup

Lesson 4

Date:

1. Read Chapter 3 of *Archimedes and the Door of Science*.

a. Mark Alexandria on the map in your portfolio and chart Archimedes' journey to Sicily.

b. Page 29 mentions the Seven Wonders of the Ancient World. Do some research on these and record your findings in science portfolio.

2. Read more about the Archimedean Screw online or in an encyclopedia. The following is a helpful website:
sciencebuddies.org/science-fair-projects/project_ideas/ApMech_p039.shtml#background

3. In preparation for your reading, define and record the following terms in science portfolio: conductor, polymer, alloy, crystallization.

4. Continue reading about matter on pages 14-17 of *The Way Science Works*. Perform experiments on these pages, skipping the crystallization experiment on page 17 (unless you have access to copper sulphate). You will need the following items:

beaker of water test tube tongs
heat source chocolate
butter candle wax
two weights ice cubes
a bottle a copper wire
thermometer that goes up to 212°F

Lesson 5

Date:

1. Read Chapter 4 of *Archimedes and the Door of Science*. In this chapter you will learn all about levers and pulleys.

2. Using what you learned in your reading, define the following terms and record in glossary. You may also find the glossary of *The Way Science Works* helpful.

body fulcrum thread
axis machine work
force lever pulley
mechanical advantage



Archimedes explaining his screw