

ABOUT THIS GUIDE

Dear Educator,

This activity support pack is designed to be used in conjunction with a unique book on science history called the **Science Timeline Wallbook**, published in collaboration with experts at the American Museum of Natural History.

On the six-foot-long timeline, using more than a thousand pictures and captions, we've told the extraordinary story of science from prehistoric times to the present day. Dates are contained in a beam of bright white light that eventually collides with a prism containing the picture of Sir Isaac Newton. As the dates slide down to the bottom of the timeline, each colored stream represents a different branch of science and engineering, rising up from abstract math (purple) at the bottom to the infinity of space (black) at the top.

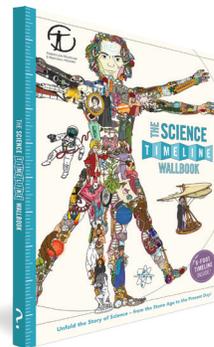
But there is so much more to this amazing book that meets the eye! It can be used in countless ways to help students connect knowledge together and develop their own critical thinking skills. This Activity Pack, which is aligned to common core standards, suggests various ways of using the Science Timeline Wallbook in class or as a curriculum-enrichment strategy.

We hope you will have as much fun using these activities and we have had making them! And if you have any ideas for more activities based on the using the Wallbook in class, then please feel free to email us at info@whatonearthbooks.com so that we can include them in future editions.

Very best wishes!

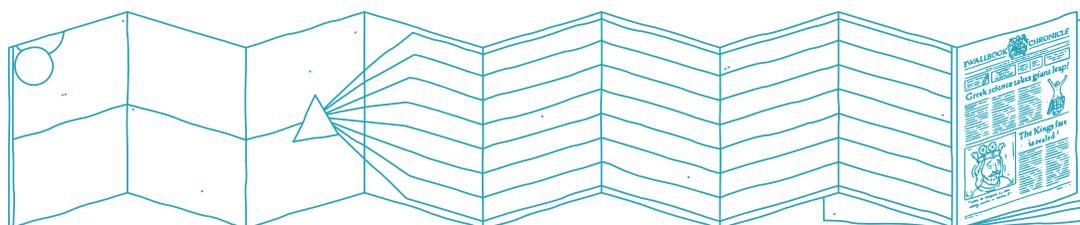


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Cover

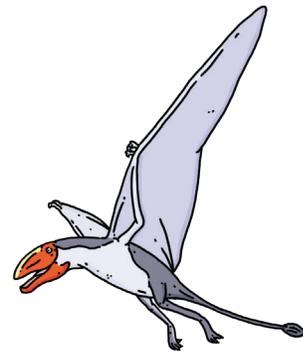
Science Timeline Wallbook



Fold out Timeline Wallbook

Chronicle

CONTENTS



| | | |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| INTRODUCTION | A Curiosity manifesto! | 4 |
| ACTIVITY 1 | Finding new words Language Arts: Vocabulary | 7 |
| ACTIVITY 2 | Diving Deeper: Expanding the Book with Research and Presentation Science History; Language Arts: Writing, Research; Speaking and Listening; Cooperative Learning; Theater Arts | 8 |
| ACTIVITY 3 | Standing on the Shoulders of Giants: Researching Nobel Prize Winners Science History; Language Arts: Writing, Research; Speaking and Listening; Cooperative Learning | 9 |
| ACTIVITY 4 | Extending a graphic narrative: Creating a graphic story based on an event in the book Language Arts: Writing, Research; Art; Cooperative Learning | 10 |
| ACTIVITY 5 | What's most important? Understanding how we decide what matters Science History; Language Arts: Writing; Speaking and Listening; Cooperative Learning | 11 |
| ACTIVITY 6 | Be the Inventor Language Arts: Writing, Critical Thinking; Speaking and Listening; Cooperative Learning | 13 |
| ACTIVITY 7 | Science is Now: Becoming aware of science in the news Science; Current Events; Language Arts: Writing, Research | 14 |
| ACTIVITY 8 | Quiz Time! Science: Natural History; Language Arts: Research, Speaking and Listening; Cooperative Learning | 15 |

INTRODUCTION

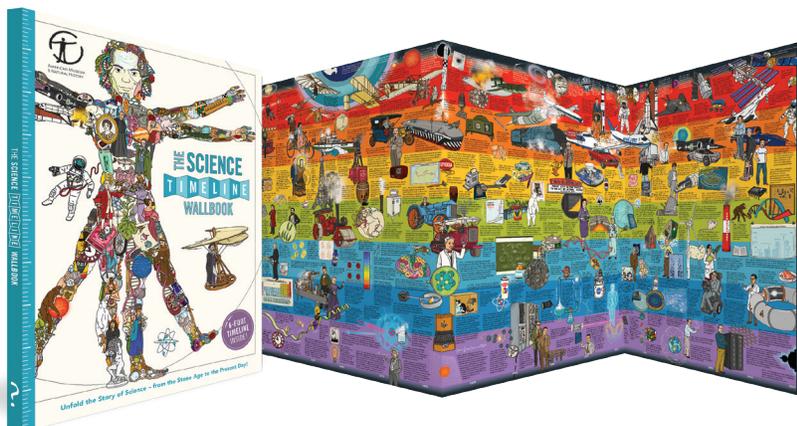
A Curiosity Manifesto!

Because earning a living no longer means doing the same job for life but rather adapting to a changing world, young people must be equipped with two critical pieces of equipment when they launch into the world. The first is a treasure trove of general knowledge; the second, a lifelong love of learning.

A free-wheeling study of history—one that encourages students' natural curiosity and teaches them to make unexpected connections—can help create and empower young adults with grit, flexibility, and a hunger for knowledge that will stand them in good stead throughout their lives. The Science Timeline Wallbook and the others in the Timeline Wallbook series from What On Earth Publishing are designed to help you encourage your students along this path.

With this fresh and exciting format, you can present the **extraordinary story of science from prehistoric times to the present day** to your students. They will be eager to follow scientific advancements building on each other across time from the Stone Age to the present. When you display the six-foot-long Timeline, the array of achievements is revealed in its continuity, allowing students to follow progress in different branches of science and engineering.

For example, in medicine: it was in 400 BC when Hippocrates of Cos claimed that diseases are caused naturally and are not simply the whims of gods; it was 1150 when Hildegard of Bingen described the healing powers of plants and herbal remedies; William Harvey's discovery about how blood circulates came in 1628; and centuries later Christian Barnard performed the first heart transplant in 1967. That very first step, the recognition that human beings can understand how their bodies work when they are well or ill, allowed people to seek cures—a process that continues today.



Science Timeline Wallbook - Cover and timeline

Or in physics, although there were discoveries even before Isaac Newton (1643-1727), it was his discovery that light is made up of all the colors of the rainbow, his understanding of gravity, and his presentation of the three laws of motion that served as the foundation of the modern field of physics. The Timeline shows clearly how scientists after him stand on his shoulders.

In addition to the Timeline, the articles in **The Wallbook Chronicle** enable your class to learn about discoveries, inventions, and the “latest” theories as if they were living at the time and reading the daily newspaper. Of course, with the wisdom of hindsight and all that they learned from the Science Timeline, students are sure to have informed opinions about what they are reading. Further, in these articles they will meet important scientists in all fields who step out of the pages of dry science and history texts and into the here and now.

This guide offers activities that extend the learning, connect to curriculum and support common core state standards. Curriculum ties are noted at the start of each activity; common core standards at the end of each activity. Immerse your students in the fascinating and on-going story of science, and enjoy the journey together.

THE WALLBOOK CHRONICLE

AN AMAZING ADVENTURE THROUGH THE HISTORY OF SCIENCE & ENGINEERING

INVENTIVE INNOVATIONS!
A list of 100 inventions from the past 100 years.

CAXTON'S BOOKS
A list of 100 books from the past 100 years.

WATER CLOX CO.
A list of 100 inventions from the past 100 years.

TRADE IN YOUR WALLS FOR A COPY OF LEONARDO'S LIME ABACUS!

Greek scientist takes giant leap!

BY OUR EUROPE EDITOR, Spinoza@spinoza.com

An **EXCITING ENGINEER** from Sicily was spotted pondering changing metal down a public street toward the King's palace after hearing out of his bath shouting, "Eureka! Eureka!" ("I have found it! I have found it!")

Look, say the scientists, known as Archimedes, explained that his behavior had resulted from finding the solution to an intractable problem posed to him by royal officials.

King Hieron of Syracuse, Sicily, had given some gold to a goldsmith and asked him to make a wreath from it.

"The when it was finished, His Majesty suspected the goldsmith had pocketed some of the gold and replaced it with a cheaper metal," said Archimedes. "So he challenged me to find a way of proving whether the wreath was or was not made of pure gold."

Archimedes explained that he could only guarantee that the goldsmith had not cheated the King if he could determine beyond doubt from the original gold and the new wreath were the same weight and volume. They over the same weight, but were somewhat different, could not measure the volume of such an irregular shape as a metal wreath.

Archimedes says the answer came to him like a lightning bolt from the sky yesterday evening just as he was stepping into his bathtub.

"When I noticed how the water level rose as I sank deeper into the bath, I realized that if I measured the rise in the water when I placed the gold in the bath and compared it with the rise in water level when I placed the wreath in the bath, they should be the same."

However, initial findings indicated that the water levels were not the same, showing the wreath had been made with fake materials. King Hieron has since had the goldsmith arrested.

Archimedes, a celebrated inventor of pulleys and war pumps, for being rewarded for speaking in public, is being hailed as a hero.



Humans and apes have common descent

BY OUR NATURE EDITOR, Mrs. Nightingale

A NEW BOOK claiming to reveal the inner workings of life on Earth has been published by Charles Darwin, a naturalist living in Kent, England.

The book makes the astounding claim that all forms of life share a common ancestor—including humans.

who share primitive ancestors with modern man.

Mr. Darwin's book, *On the Origin of Species by Means of Natural Selection*, proposes that life evolves over many generations through a process in which those living things best adapted to environmental conditions thrive, while those less well adapted suffer, eventually becoming extinct. "From so simple a beginning," he writes, "colossal forms have been and are being evolved."

The book is causing upset among religious leaders, who refuse to accept that humans and apes share a common ancestor. They also argue that since—according to the Bible—the world is only 5,000 years old, there is not enough time for Mr. Darwin's "evolution" to have occurred.

Chinese monks accidentally invent explosive powder

BY OUR CHINA STAFF, ca. AD 100

An **EXTRAORDINARY** discovery is rumored to have been made by Taoist monks looking for a potion that would keep fire lit forever.

The holy men are said to have been mixing heavy charcoal, sulfur, saltpeter, and saltpeter, only to have the recipe for immortality explode with such force that their hands and faces were burned and the house destroyed. The witnesses of this incident is unknown, but it is thought to have been lost.

It seems profoundly ironic that it is here, the original heart of China, that these peace-loving monks performed their alchemical experiments.

They soon realized the huge and untold instructions from the emperor, who is said to be desperate to secure the homeland of immortality.

Details of the monks' recipe have now reached officials in the military, who have plans to make weapons using the explosive powder.

Experts believe the new formula could transform the world's most powerful that the highly destructive power of these compounds could now make warfare obsolete, as who would dare to confront an enemy equipped with such deadly fire?

However, others argue that if the secret of how to make the powder spreads, it could potentially lead to dangerous consequences.



School of nursing opens thanks to a Nightingale

War hero's statistics prove that good hygiene is key to good health

BY OUR NURSING EDITOR, London, England, 1914

NURSING PIONEER Florence Nightingale can be rightly credited as the first nursing school for professional nurses, based at St. Thomas' Hospital, London.

Miss Nightingale, also known as the Lady of the Lamp, is famous for running a war hospital that used teams of nurses providing rounds of injured soldiers day and night. However, Miss Nightingale is now campaigning to improve human welfare and has developed a reputation as a formidable statistician.

The daughter of a wealthy upper-class English family, Miss Nightingale says she had an instinctive calling to use her wealth, education and medicine to help others. In 1854 she volunteered to work in a war hospital during the Crimean War. There she led a team of 53 volunteer nurses and nursed in appalling conditions, but reduced that improved hygiene, food, and living conditions were key to saving soldiers' lives.

Miss Nightingale's meticulous records of cases of death have now been carefully analyzed using statistical data, known as Censorship. They reveal a graphic detail of the awful truth that ten times as many responded from malnutrition, poor sanitation and insufficient that enemy action.

The Crimean War (1853 to 1856) saw British, French, and Ottoman Turkish allies fighting Russia for control of the Crimean Peninsula and

surrounding lands on the shores of the Black Sea. For the first time, newspapers reported on the horrendous conditions soldiers were living in and they detailed Nightingale's groundbreaking research into the unnecessary loss of life.

Government officials responded to Miss Nightingale's findings by sending a professional hospital, designed by leading engineers Lombard Kingsland Brand, to the frontlines to help improve conditions for soldiers. Among new volunteers was Mary Seacole. Hereto proud of both her Jamaican and Scottish ancestry, Miss Seacole nursed soldiers on the front line and was a strong supporter of Miss Nightingale's efforts to save lives.

Miss Nightingale's new training school means that nurses will now be recruited from all levels of society where previously the profession was reserved for women in the lower and poorer of circumstances. They will be properly trained in the benefits of good hygiene, one of the greatest medical discoveries of all time.

A **SHERRAN CHEMIST** last night succeeded in improving new ways to make the chemical elements, by placing them in a table that makes sense of their properties.

Dmitri Mendeleev was awarded to make a table of arranging human elements called writing a new notebook titled *Principles of Chemistry*. He is said to have made the discovery while gazing Soloviova with a pack of cards.

He realized that by ordering all the elements by increasing atomic weight, a pattern emerged in which every seventh element lined up with the first, every eighth with the second, and so on. This pattern allowed him to predict the properties of elements that had not yet been discovered.

By looking at the places where the gaps were, Mr. Mendeleev believed it may be possible to predict the properties and weights of the missing elements. Mr. Mendeleev says his greatest inspiration has been gained from his work. "I cannot tell you they are only for science," he explains. "What I have is a matter of engineering. Science is the product of the human spirit, as Mr. Mendeleev has called it, and it is the most wonderful of the elements."



BYRACUSE CA. 432 BC

CHINA CA. AD 100

KENT 1124

LONDON 1814

ST. PETERSBURG 1712

The Science Wallbook Chronicle

COMMON CORE STATE STANDARDS CODE

grade 6



Reading for information



Writing



Speaking and Listening

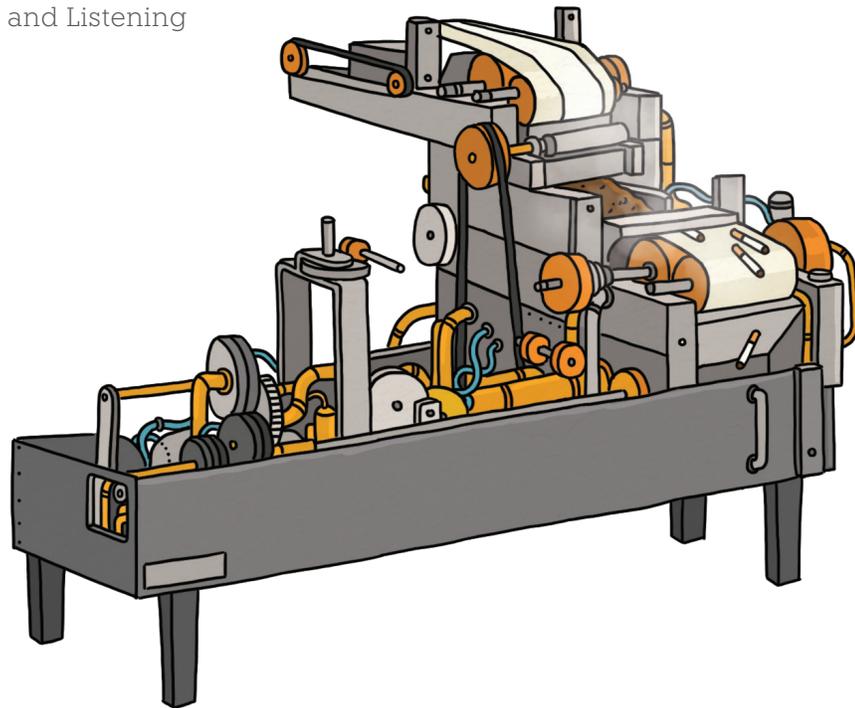
grade 8



Reading for information



Writing History
Social Studies,
Science, and Technical
Subjects



ACTIVITY 1

Finding new words

Language arts - Vocabulary

RI

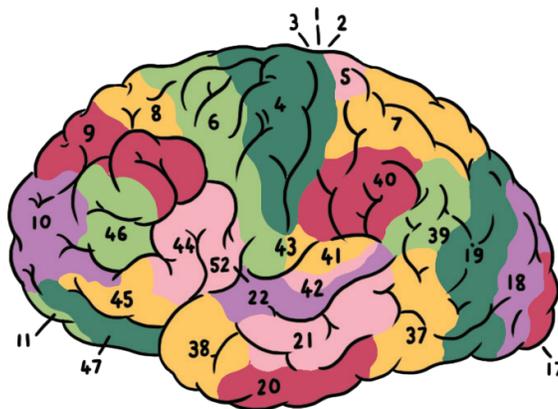
RH

The Science Timeline Wallbook contains many words and phrases that your students will be encountering for the first time. As they scan through the Timeline and read articles, they should take note of unfamiliar words or phrases, putting each at the top of a 4x6 index card, followed by the sentence in which that word appears. On the back of the card, they should write what they think the word means based on how it is used in the sentence.

They can begin the speculation with the words: "I think the word means..." Next, they should look up the word in a dictionary and write the definition down. As a fun additional step and to cement the meaning of the words in their minds, they can write their own sentences using the words and quiz one another on their meanings. Cards should be alphabetized and kept in a Timeline Wallbook Vocabulary Box.

RI- 6.4

RH- 6-8.4



ACTIVITY 2

Diving Deeper: Expanding the book with research and presentation

Science History

Language Arts - Writing, Research; Speaking and Listening; Cooperative Learning; Theater Arts

RI

W

SL

Divide your class into teams of 5. Assign each team 5 articles from The Science Wallbook Chronicle. Each member of the team will be responsible for researching one of the subjects of their articles and the scientist involved. In a team meeting each student will have the opportunity share what they have learned and to answer questions from their fellow members.

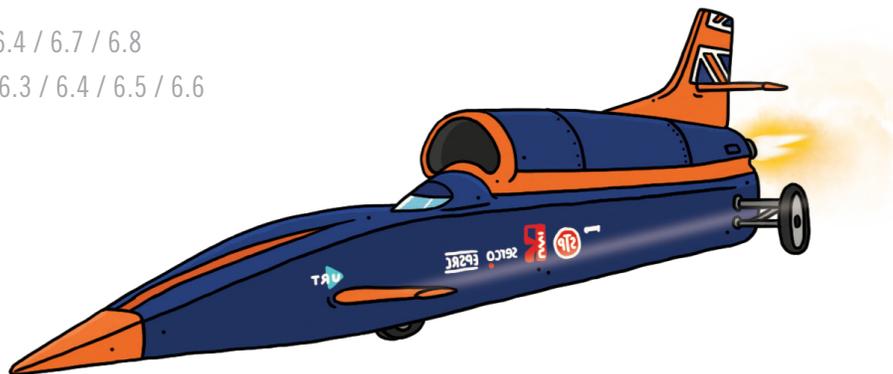
From their discussions they will select three scientists to participate in a newsworthy roundtable discussion to be videotaped for a showing to the entire class. Three students will be acting as the scientists they researched, one will be the moderator to facilitate the discussion, and the fifth will be the videographer.

Based on their group work, the team will work together to create a script for the actors to follow. The script should include but not be limited to opening statements from each scientist and a Q and A where they are able respond to each other's questions.

RI- 6.1 / 6.2

W- 6.2 / 6.3 / 6.4 / 6.7 / 6.8

SL- 6.1 / 6.2 / 6.3 / 6.4 / 6.5 / 6.6



ACTIVITY 3

Standing on the shoulders of giants: Researching Nobel Prize winners

Science History

Language Arts - Writing, Research; Speaking and Listening; Cooperative Learning



Each student should look up the list of Nobel Prize winners in the categories of Physics, Chemistry, or Medicine. (The official category of the medicine prize is “Physiology or Medicine”).



Each student should select one of the Nobel Laureates who is not included in the Timeline and research the scientist, his/her area of expertise, and who else’s work led to their discovery or achievement. Then the student should create a Timeline entry for that scientist, including an illustration, a caption, and a label indicating where on the Timeline the person would be added.



Conduct a mock Nobel Award ceremony where each student delivers a three-minute acceptance speech on behalf of their scientist. The speech should include thanks to the other scientists whose work made their work possible.

RI- 6.1 / 6.2 / 6.3 / 6.6

W- 6.3 / 6.4 / 6.7 / 6.8 / 6.9

SL- 6.1 / 6.2 / 6.4 / 6.6



ACTIVITY 4

Extending a Graphic Narrative: Creating a graphic story based on an event in the book

Language Arts - Writing, Research; Art; Cooperative Learning

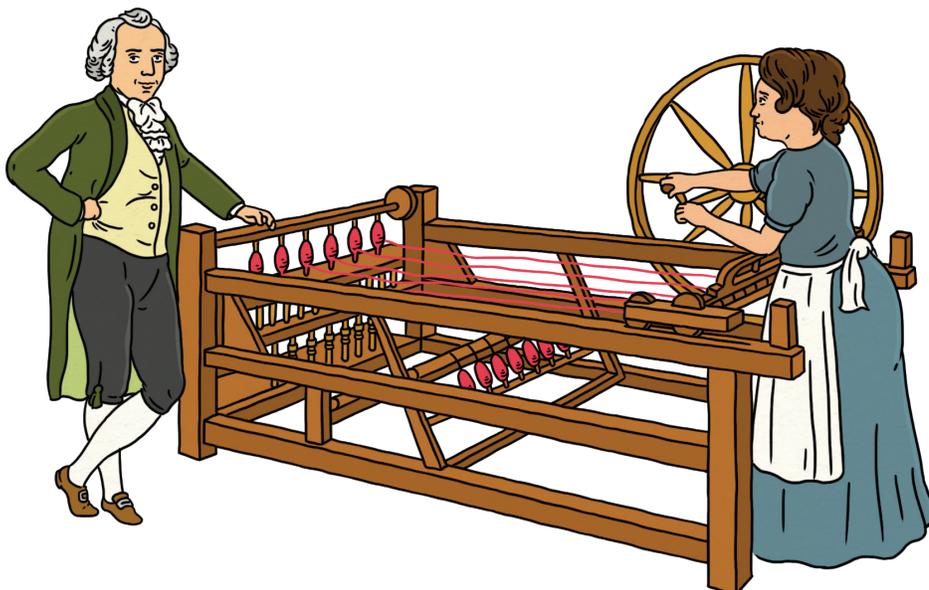


Learning from the Timeline is as much visual as it is textual. Young people find it easier to learn by focusing on visual representations, which is why many teachers use graphic novels in their classrooms as teaching tools. Any one of the illustrations in the Timeline can be looked at as the start of a graphic novel waiting for your students to complete.

Each student should select an image and text that interests him/her and find out more about it. From that research, he/she should create a two-page spread made up of twelve graphic (comic) panels that completes the story. Each panel can include dialog bubbles, thinking/imagining bubbles, narration, and sound effects.

Work should be shared with their classmates. If you have the ability, scan their stories and print and distribute the collection to the entire class.

W- 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8



ACTIVITY 5

What's Most Important? Understanding how we decide what matters

Science History

Language Arts - Writing, Research; Speaking and Listening; Cooperative Learning

RI

W

SL

The Timeline is divided into two eras: before Isaac Newton and after Isaac Newton. His discoveries of the laws of motion, gravity, and the nature of white light heralded the Age of Enlightenment. Have your students study the advances in science and engineering made from his time until the present. For simplicity they will view the time spans of scientific achievement page by page covering:

- 1730 to 1810
- 1810 to 1870
- 1870 to 1920
- 1920 to 1970
- 1970 to present

Divide your class into five study groups. Each group will be responsible for one page of the Timeline. They should note that the Timeline has seven streams of science and engineering highlighted by the colors of the spectrum from Newton's prism. They are:

- **Sky and Space** – Red
- **Building & Invention** – Yellow
- **Medicine & Biology** – Blue
- **Mathematics & Measurement** – Violet
- **Transportation & Communication** – Orange
- **Earth & Land** – Green
- **Physics & Chemistry** – Indigo

Each group will survey the Timeline horizontally and vertically. Their task is to decide within their period of time, which was the most important advancement in each branch of science and engineering. For example, the group that is studying the period of 1810 to 1870 will have to decide whether Rene Laennec's invention of the stethoscope in 1810 was more important than William Morton's use of ether in 1846 as an anesthetic during surgery. Have them think about and discuss what "most important" means to them. Does it mean most famous? Creating the biggest change? Most surprising? Most beneficial? Something else? They should use these ideas to justify each of their choices. Working with the whole class, create a master chart like the one below, showing their selections.

RI- 6.1 / 6.2 / 6.3 / 6.6 / 6.7

W- 6.1 / 6.4 / 6.7 / 6.8 / 6.9

SL -6.1 / 6.2

Most Important Scientific and Technological Advancements 1810 to 1870

| BRANCH OF SCIENCE AND ENGINEERING | ADVANCEMENT | WHY WE CHOSE IT |
|------------------------------------------|--------------------|------------------------|
| SKY & SPACE | | |
| TRANSPORTATION & COMMUNICATION | | |
| BUILDING & INVENTION | | |
| EARTH & LAND | | |
| MEDICINE & BIOLOGY | | |
| PHYSICS & CHEMISTRY | | |
| MATHEMATICS & MEASUREMENT | | |

ACTIVITY 6

Be the inventor!

Language Arts - Writing, Critical Thinking; Speaking and Listening; Cooperative Learning

RI

W

SL

The events that your students are reading about in The Science Timeline Wallbook can be divided into two branches, pure science and applied science. Pure scientists, also called basic or fundamental scientists, conduct research to understand the natural world. They are not primarily concerned with whether there is a practical use for their finding. Applied science, on the other hand, uses scientific theories (often those developed by basic scientists) to develop innovations in technology with specific goals in mind. Developments such as driverless cars and new medicines to fight disease are examples of applied science.

When your students look through the Timeline, they should be able to identify Albert Einstein's Special Theory of Relativity as pure science and the development of the first hydrogen-oxygen fuel cell by engineer Francis Bacon as applied science. This activity asks your students to be engineers and inventors, or applied scientists, and come up with innovations to solve practical problems. Divide your class into development teams.

The teams will first identify the problem they want to solve. They should write a statement of necessity for their invention that describes its need, who will use it, its size, how it works, and the benefits to be derived.

They should create a set of at least three drawings or illustrations of the invention from different perspectives, and they should construct a scale model of the invention.

When your students are ready, hold a fair for them to display and talk about their work. Invite other classes to view their work and videotape their presentations.

RI- 6.1 / 6.2 / 6.7

W- 6.2 / 6.3 / 6.4 / 6.5 / 6.6 / 6.7 / 6.8

SL- 6.1 / 6.4 / 6.5 / 6.6

ACTIVITY 7

Science is now: Becoming Aware of Science in the news

Science / Current Events

Language Arts - Writing, Research

RI

After reading through The Science Timeline Wallbook, your students should be aware that the length and breath of scientific inquiry is ever expanding; scientists continue to do research improving or disproving theories and developing new technologies based on old ones.

W

In light of this, have your students research what is new in science today. Two examples are the continuing effort of physicists to prove the Unified Field Theory first proposed by Albert Einstein and the continuing development of smaller and more powerful computer chips.

Have them access newspapers, magazines, the Internet, and science-oriented programming on television and report on one single development that is happening now in the scientific world. Excellent sources are:

- *The Tuesday Science section of the New York Times*
- *Scientific American*
- *www.PBS.org/Nova*
- *The Discovery Channel*
- *NASA's website*

RI- 6.1 / 6.2 / 6.3 / 6.7

W- 6.2 / 6.4 / 6.7 / 6.8 / 6.9

ACTIVITY 8

Quiz time!

Language Arts - Research; Speaking and Listening; Cooperative Learning
Science - Natural History

RI

At the end of The Science Timeline Wallbook there are fifty “brain-teasing” science questions. All of the answers can be found in the foldout Timeline. For fairness to all of your students and to ensure that all of the questions are answered, have a lottery to see which student is responsible for answering particular questions.

W

SL

Write numbers from one to fifty on slips of paper. Each student will draw out two numbers. He/she will have to search through the Timeline for the answers to his/her questions. Students may wish to learn more about their assigned questions.

RH

WHST

Their answers should be presented to the entire class along with what they learned from further research. Presenters should be prepared to answer questions from their peers about the event or person that was the subject of their query.

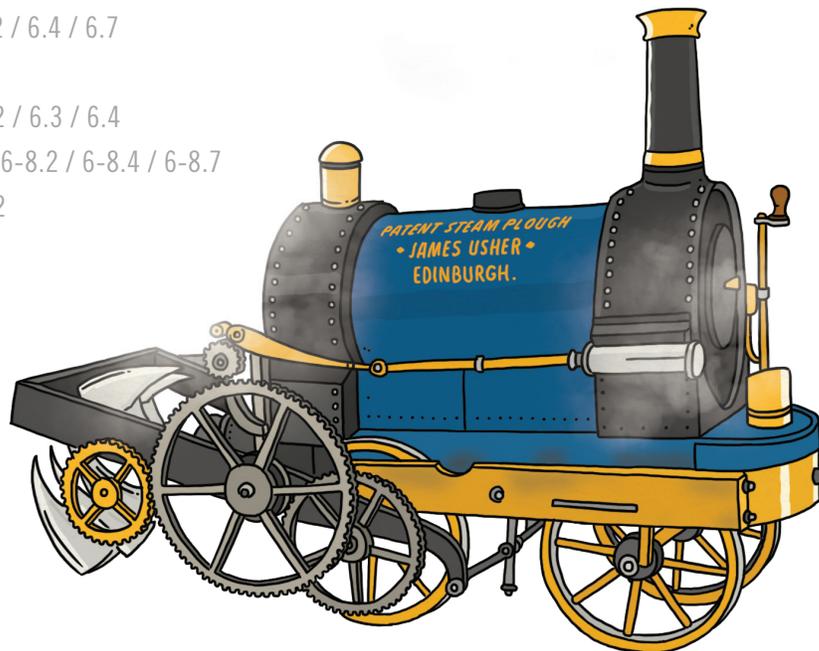
RI- 6.1 / 6.2 / 6.4 / 6.7

W- 6.2 / 6.4

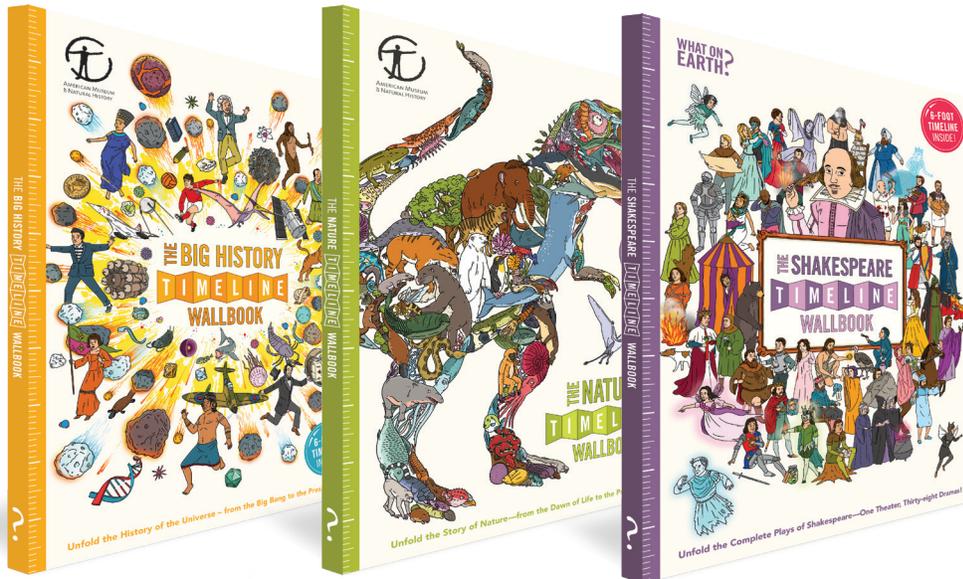
SL- 6.1 / 6.2 / 6.3 / 6.4

RH- 6-8.1 / 6-8.2 / 6-8.4 / 6-8.7

WHST- 6-8.2



OTHER WHAT ON EARTH? TIMELINE WALLBOOKS



Big History

Nature

Shakespeare

All our timeline books are available at great prices from www.whatonearthbooks.com.

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We also produce giant highly-durable laminated editions specifically for use in school classrooms - these are called **Posterbooks** - please see our website for more details.

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