Meeting Standards With Literacy in the Science Classroom

Kappa Delta Pi 50th Convocation

October 23, 2015

Orlando, Florida

Presentation posted: http://www.ux1.eiu.edu/~adflood/

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Content Area Literacy with NGSS

- Physical Science
- Life Science
- Earth & Space Science
- Engineering, Technology, and Applications of Science

Next Generation Science Standards (NGSS)

- MS-PS 1-2 Matter and its interactions
- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

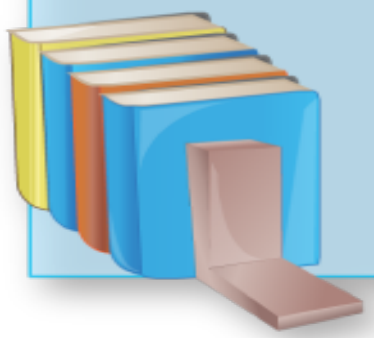
Common Core State Standards

- CC.6.R.L.1
- Cite textual evidence to support analysis of what the text say explicitly as well as inferences drawn from the text

Linking the Standards using Literature

- These standards can be linked together into one lesson using literature and a reading strategies
- Use ISP- graphic organizer
- Information Source Page
- Allows students to reach literature standard by citing textual information and interpret the information learned in the science standard

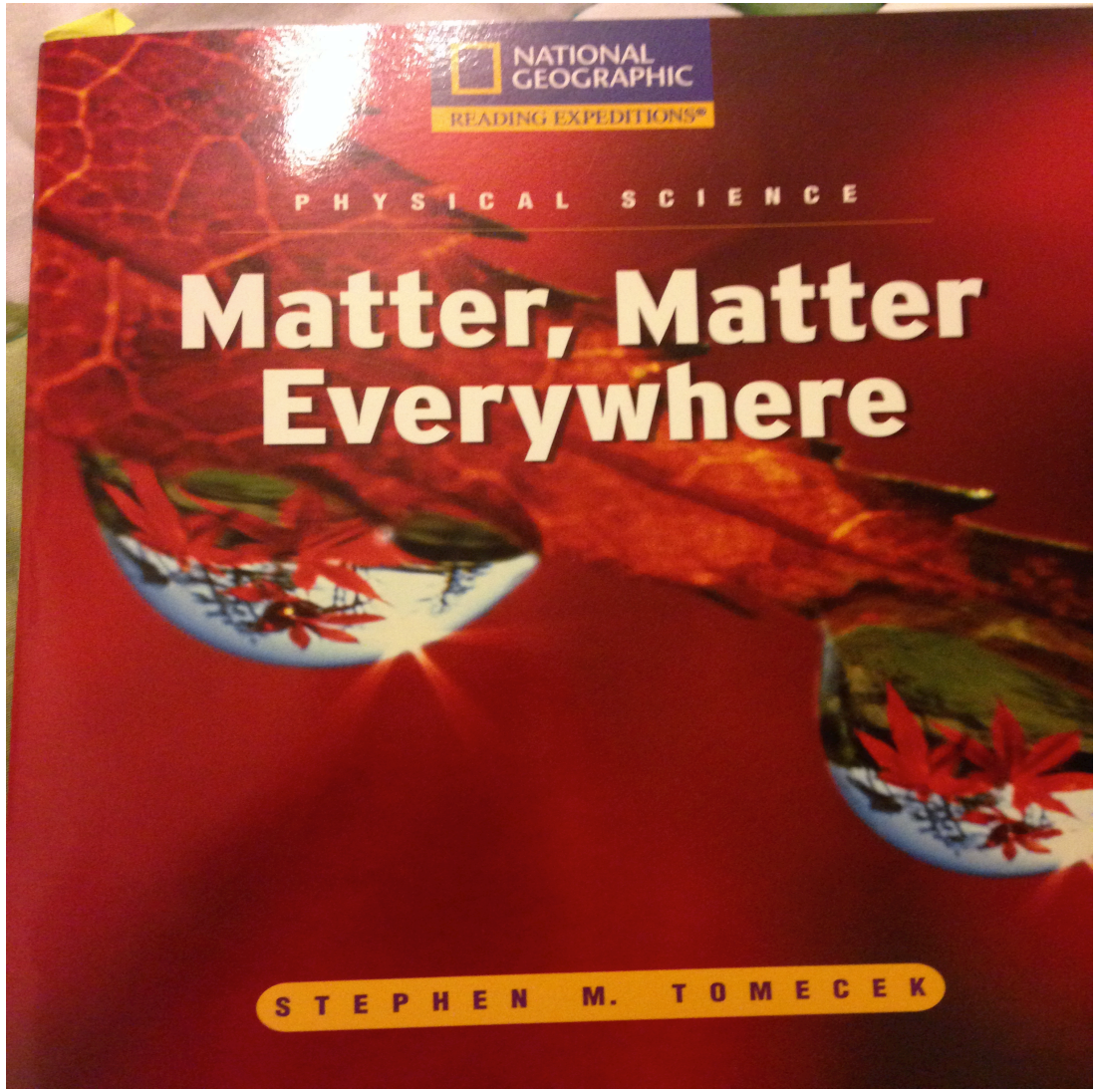
Information	Sources	Page



After using the chart

- Linking information learned from the literature and chart to create a hands on activity to better understand the information

Example Books and Activities



Hands-on Science

Changing Matter

Long before people had electric or gas freezers, they were enjoying the taste of ice cream, even in the hot summer. They made this delicious dessert by changing milk and syrup into a treat. Try the activity to see how you can change matter and make a frozen treat.

Materials

- ✔ Large empty container with lid
- ✔ Small plastic container with lid
- ✔ Ice cubes
- ✔ Measuring cup
- ✔ Milk (125 milliliters or 4 ounces)
- ✔ Flavored syrup (1 spoonful)
- ✔ Salt
- ✔ Spoon
- ✔ Winter gloves

Explore

1 Fill the small container with the milk and syrup. Stir. Write down the properties of this mixture.

2 Seal the small container tightly and place it in the larger container.

3 Fill the rest of the large container with ice and add about 1 cup of salt.

4 Seal the large container and begin shaking. The container will get very cold, so make sure you wear your gloves.

5 After 10 minutes, stop shaking, open the large container, and take out the small container. Open the small container. If the contents are not frozen, put it back into the large container and add some more ice and salt. Seal it back up and shake the container for 5 more minutes.

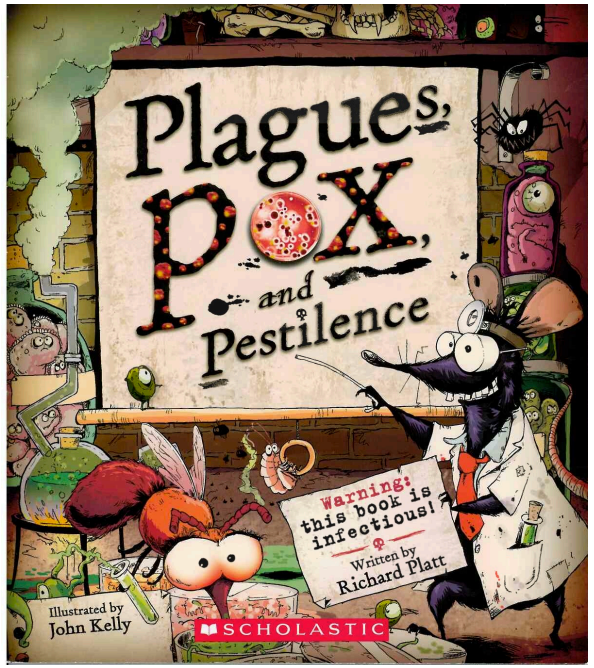
6 Once the mixture in the smaller container is frozen, write down the properties of the mixture.
Note: Do not eat the frozen treat unless your teacher says it is okay.

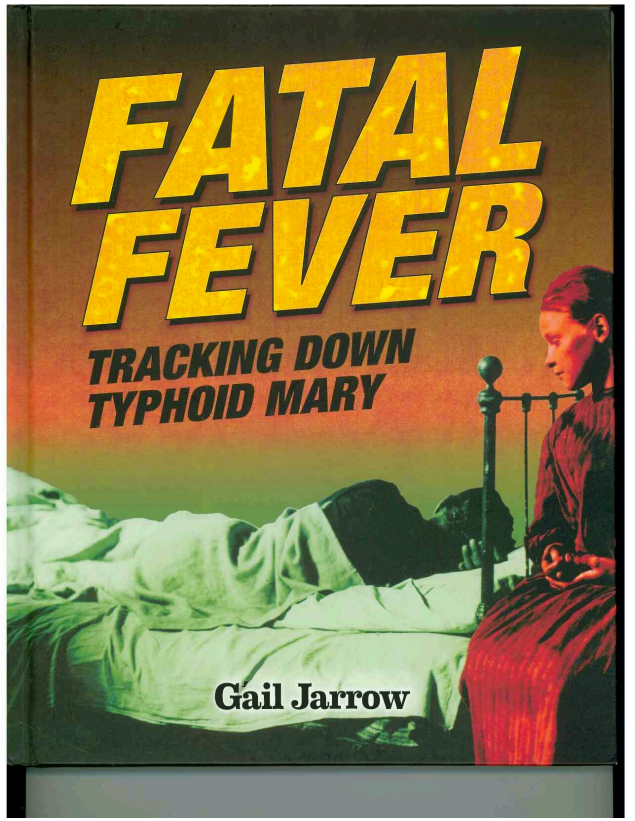
Think

In what state of matter were the milk and syrup at the beginning of the experiment? In what state of matter were they at the end? Did a physical change or chemical change take place? How do you know?

Life Science

- Gail Jarrow books – Fatal Fever, Red Madness, Bubonic Panic (can pre-order)
- Plaques, Pox, and Pestilence





Standards Addressed:

NGSS

- MS-LS2 Ecosystems: Interactions, Energy, and Dynamics
  - MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems
  - MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services

CCSS

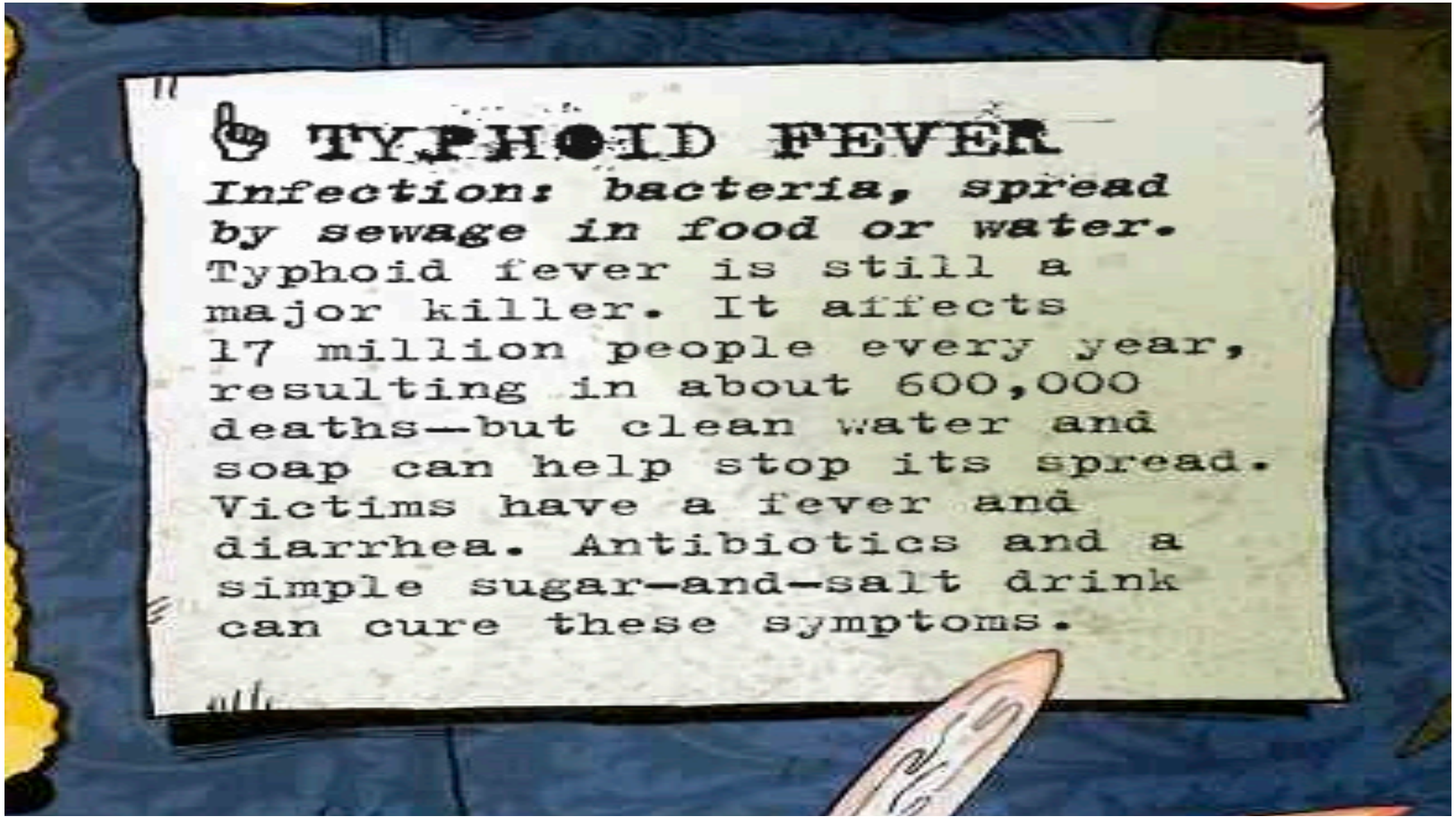
- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts
- WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research

Strategy:

- Inquiry Chart
- Focus on comprehension; can be used for pre-reading, during reading, and post-reading
- Hoffman, J.V. (1992). Critical reading/thinking across the curriculum: Using I-charts to support learning. *Language Arts, 69*, 121-127.
- Wood, K.D. & Taylor, D.B. (2006). Literacy Strategies Across the Subject Areas 2nd edition, New York, NY: Pearson Education

Typhoid Fever

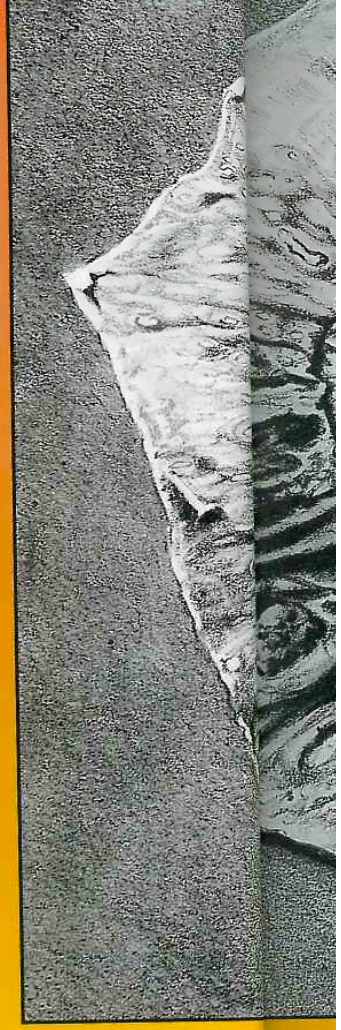
	How is it spread?	Do we need to worry about it today?	How can we prevent this infection?	How is it treated?	Other Interesting Facts	New Questions
What We Know						
Fatal Fever: Tracking Down Typhoid Mary						
Plaques, Pox, and Pestilence						
Source 3						
Summaries						


TYPHOID FEVER
Infection: bacteria, spread by sewage in food or water.
Typhoid fever is still a major killer. It affects 17 million people every year, resulting in about 600,000 deaths—but clean water and soap can help stop its spread. Victims have a fever and diarrhea. Antibiotics and a simple sugar-and-salt drink can cure these symptoms.

organic material. This idea seemed reasonable since sicknesses were often linked to smelly sewer gases, swampy ground, stagnant water, and decomposing animals and plants.

Then during the 1840s, British physician William Budd (1811–1880) began a study of typhoid fever after he almost died of it. He discovered a connection between the outbreak of new cases and water contaminated with the feces of typhoid patients. In 1856, Budd advised fellow physicians that the disease's spread could be prevented by boiling drinking water and by chemically disinfecting typhoid patients' excrement and soiled linens.

No one realized then that microorganisms caused diseases. This idea, called the germ theory, took hold in the medical community during the 1880s and 1890s, thanks to research by Louis Pasteur (1822–1895), Robert Koch (1843–1910), and others. In 1880, Karl Eberth (1835–1926), a German microbiologist, identified a bacterium found in typhoid patients as the microbe behind the disease. Today it is known as *Salmonella* Typhi. The bacterium is related to other types of *Salmonella* that cause food poisoning symptoms such as diarrhea and vomiting. But their effects are milder than *Salmonella* Typhi's and usually not fatal.



A typhoid fever victim can give off a trillion of the bacteria in each gram of his or her feces (about the weight of a paper clip). A small fraction of that is enough to produce infection in someone who swallows them.

The bacteria travel to this person's stomach, where


DENGUE
Infection: a virus, spread by mosquito bites.
There is no way to prevent or cure this disease, which threatens two-fifths of the world's people. Sufferers have pain in their joints, which gives the disease its nickname, "break-bone fever." They are treated with painkillers and sweet drinks.
POLIO
Infection: a virus, spread by sewage in food or water.
Polio infects young children, withering their muscles. Ancient Egyptian paintings (3,400 years old) show signs of the disease, but epidemics began only in the 20th century. In 1952, 3,500 Americans died of it. Vaccination now protects children from polio.
SLEEPING SICKNESS
Infection: a protist, spread by tsetse fly bites.
Explorers spread this disease throughout 19th-century Africa. A 20-year epidemic in Uganda began in 1901, killing 250,000 people in total. Untreated, it kills as the protists invade the brain. Drug treatment is hard, but fly control is helping stop the disease.
HIV
Infection: a virus (right), spread by sexual contact or through infected blood (for example, from using contaminated needles).
HIV, short for human immunodeficiency virus, stops the patient's body from fighting off other deadly infections. Though drug treatments can control HIV, it still kills about two million people every year, mostly in Africa. However, in countries where the right kind of medical care is available, people can live for many years with HIV.

Today, death from typhoid is rare. The Centers for Disease Control and Prevention (CDC) estimates that about 5,700 people are infected each year. Laboratory tests confirm 300 to 400 cases. Nearly two-thirds occur in just six states with large populations: California, New York, New Jersey, Illinois, Texas, and Massachusetts.

About 80 percent of these people caught the bacteria during a trip outside the country. Most had been to India, Bangladesh, or Pakistan, where the vast majority of the world's cases occur. Parts of sub-Saharan Africa, Latin America, and south and east Asia also have high typhoid rates, particularly in urban slums.

Typhoid spreads easily where human waste contaminates drinking water and food. As many as 2.5 billion people worldwide live without basic sanitation, with a billion of them routinely defecating on open ground. Nearly 800 million have no access to clean water. In these areas, people tend to wash their hands less often and without the soap that helps remove bacteria.

International public health experts estimate that each year about 22 million people become sick with typhoid and between 200,000 and 800,000 die. But it's not a precise count. Many victims live in developing countries that don't monitor typhoid cases. In places without laboratory testing facilities, typhoid is often misdiagnosed (and miscounted) because its early symptoms resemble other diseases such as malaria.

VACCINE PROTECTION

Travelers to high-risk countries can protect themselves by being vaccinated. Most U.S. cases occur in travelers who had not received a vaccine before visiting these parts of the world.

Today the dock at North Brother Island has rotted and the buildings are covered with thick vegetation.

became the temporary home for a group of returning soldiers and their families.

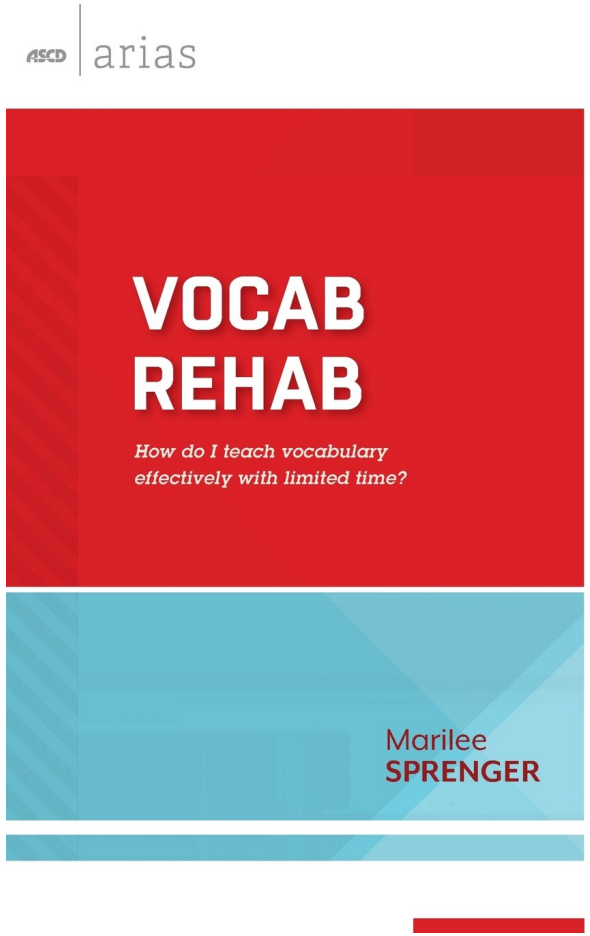
In 1951, New York State acquired the hospital, turning Riverside into a treatment and rehabilitation center for teen drug addicts. By 1963, officials decided that the center had a poor success rate in curing addicts and cost too much to maintain. That July, the Island was abandoned.

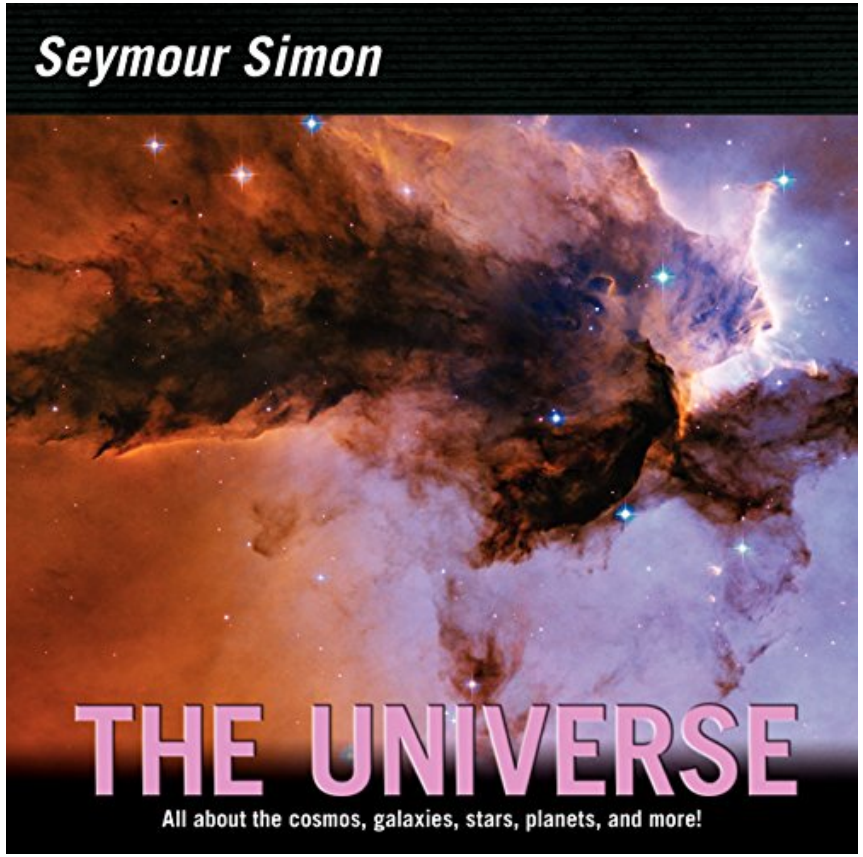
The ferry shut down, buildings crumbled, and trees and vines took over. Flocks of birds made it their home, and the city designated the Island a bird sanctuary. Today it is closed to the public.

TYPHOID IN THE TWENTY-FIRST CENTURY

In the United States, the public health battle against typhoid fever was a success. Water filtration, chlorination, and improved sewage disposal greatly reduced the number of victims. In 1900, about 31 of every 100,000 Americans died of typhoid fever. By 1940, the rate had dropped to only 1 out of 100,000.

Earth and Space Science





Common Core State Standards

- CCSS.ELA-LITERACY.RST.6-8.4Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.

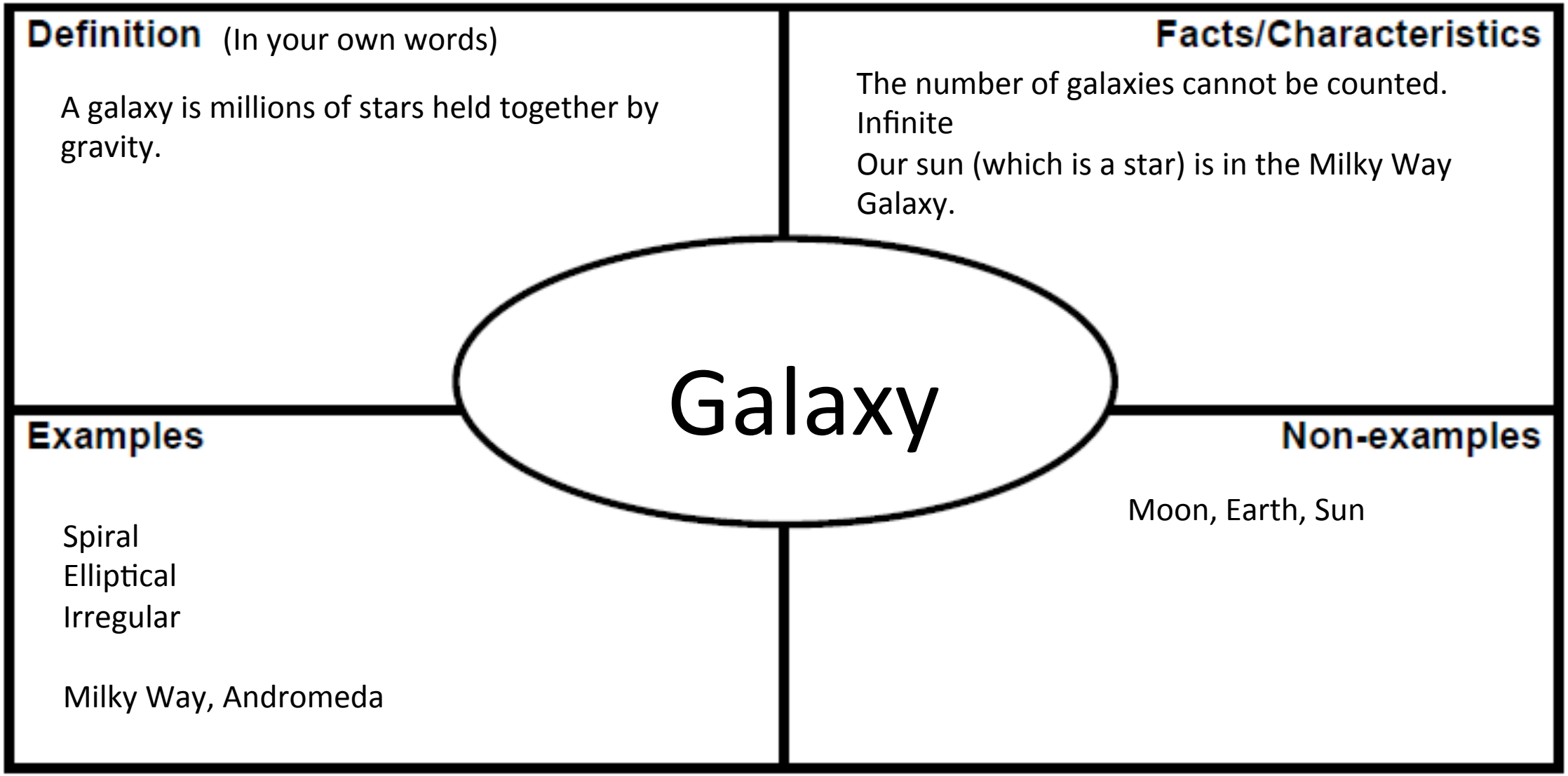
- CCSS.ELA-LITERACY.L.6.4Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.

- CCSS.ELA-LITERACY.L.6.6Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Next Generation Science Standards

- (MS-ESS1-1) ♣ Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.
- (MS-ESS1-2) ESS1.B: Earth and the Solar System ♣ The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),
- (MSESS1-3) ♣ This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.
- (MS-ESS1-1) ♣ The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

Frayer Model (1969)



Vocabulary Word Ladders (traced back to Lewis Carroll in 1877)

Adaptation is the Vocabulary Paint Chip (Timothy Rasinski, 2008) (Marilee Sprenger, 2014)

Rasinski, T. (2008). *Daily Word Ladders*. New York, NY: Scholastic.

Sprenger, M. (2014). *Vocab Rehab: How Do I Teach Vocabulary Effectively with Limited Time* Alexandria, VA: ASCD.

DEFINITIONS OF ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE

- **Engineering** is a systematic and often iterative approach to designing objects, processes, and systems to meet human needs and wants.
- **Technology** is any modification of the natural world made to fulfill human needs or desires.
- **An application of science** is any use of scientific knowledge for a specific purpose, whether to do more science; to design a product, process, or medical treatment; to develop a new technology; or to predict the impacts of human actions.

CORE AND COMPONENT IDEAS IN ENGINEERING,TECHNOLOGY, AND APPLICATIONS OF SCIENCE

Core Idea ETS1: Engineering Design

ETS1.A: Defining and Delimiting an Engineering Problem

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution

Core Idea ETS2: Links Among Engineering, Technology, Science, and Society

ETS2.A: Interdependence of Science, Engineering, and Technology

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Common Core State Standards

- CCSS.ELA-Literacy.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- CCSS.ELA-Literacy.RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- CCSS.ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- CCSS.ELA-Literacy. RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
- CCSS.ELA-Literacy. RST.6-8.9 Compare and contrast the information gained from experiments simulations, video, or multimedia sources with that gained from reading a text on the same topic.

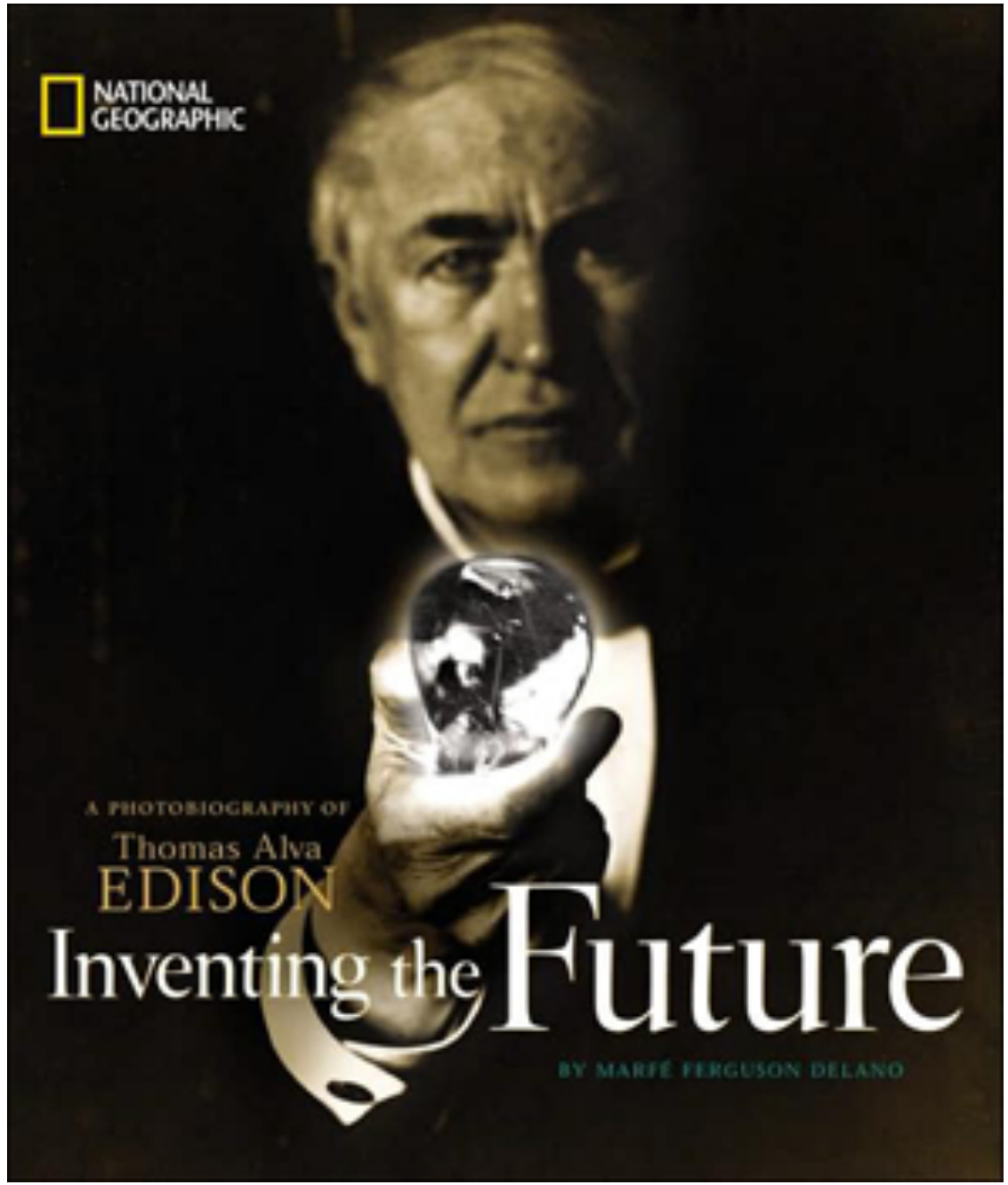
“Close reading is careful and purposeful rereading of complex text.”

(Fisher & Frey, 2014, p. 223)

References

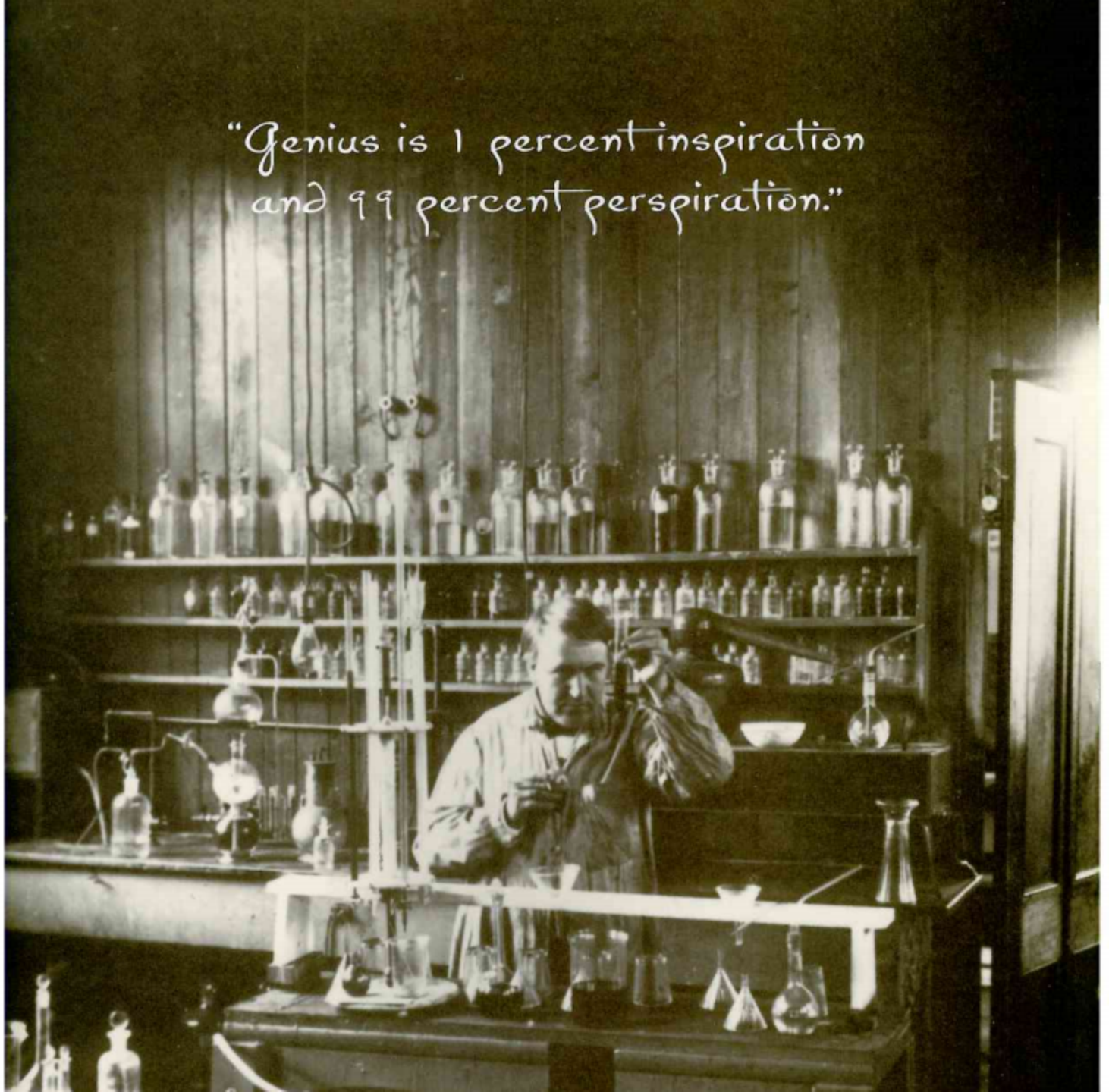
Fisher, D. & Frey, N. (2014). Closely reading informational texts in the primary grades. *Reading Teacher, 68*(3), pp. 222-227.

Fisher, D. & Frey, N. (2015). Improve reading with complex texts. *Kappan, 96*(5), pp. 56-61.


NATIONAL GEOGRAPHIC
A PHOTOBIOGRAPHY OF
Thomas Alva
EDISON
Inventing the Future
BY MARFÉ FERGUSON DELANO

Close Reading – Text-Based Discussions
(Fisher & Frey, 2014)

- Students engage in extended discussion, which is driven by text-dependent questions and dialogic teaching.
- Students deepen their understanding through analysis of the literal, structural, and inferential dimensions of the text.


"Genius is 1 percent inspiration
and 99 percent perspiration."

Close Reading – Annotation
(Fisher & Frey, 2014)

- The teacher guides annotation practices using displayed text and fosters collaboratively developed annotations.
- Students familiar with annotation practices are marking text independently and adding to their annotations throughout class discussions.

Annotations
(Fisher & Frey, 2015, p. 60)

- ✓Underlining the central, main, or key ideas…this requires that students learn to note important information.
- ✓Circle confusing or unclear words and phrases…this requires the students learn to monitor their understanding.
- ✓Write marginal notes in your own words…this requires the students learn to summarize and synthesize information.

Post-it-note…

Text-Dependent Questions
(Fisher & Frey, 2014)

- **What does the text say?**
  - **General understanding**
  - **Key Details**
- How does the text work?
  - Vocabulary
  - Text Structure
  - Author's craft
- What does the text mean?
  - Inferences
  - Opinions and arguments
  - Inter-textual connections

Edison's work produced more than a thousand patents, but not all of it really succeeded. He encountered many disappointments. He lost most of his fortune in the 1890s in mining ventures. He lost most of his factory in 1914 in a disastrous fire. Late he wrote on a singed picture of himself, the fire "never touched me!" and rebuilt the works. Edison was not daunted by failure. Failed experiments were not failures to him if they produced new information and eliminated blind alleys. Trying and failing became a system for thinking. His own experimental lab was the first of its kind and the harbinger of the modern research laboratory.

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He was granted 1,093 U.S. patents.

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Menlo Park was a state-of-the-art laboratory!

Informational Text

- A question mark to note a question that the reader has about something in the text.

?

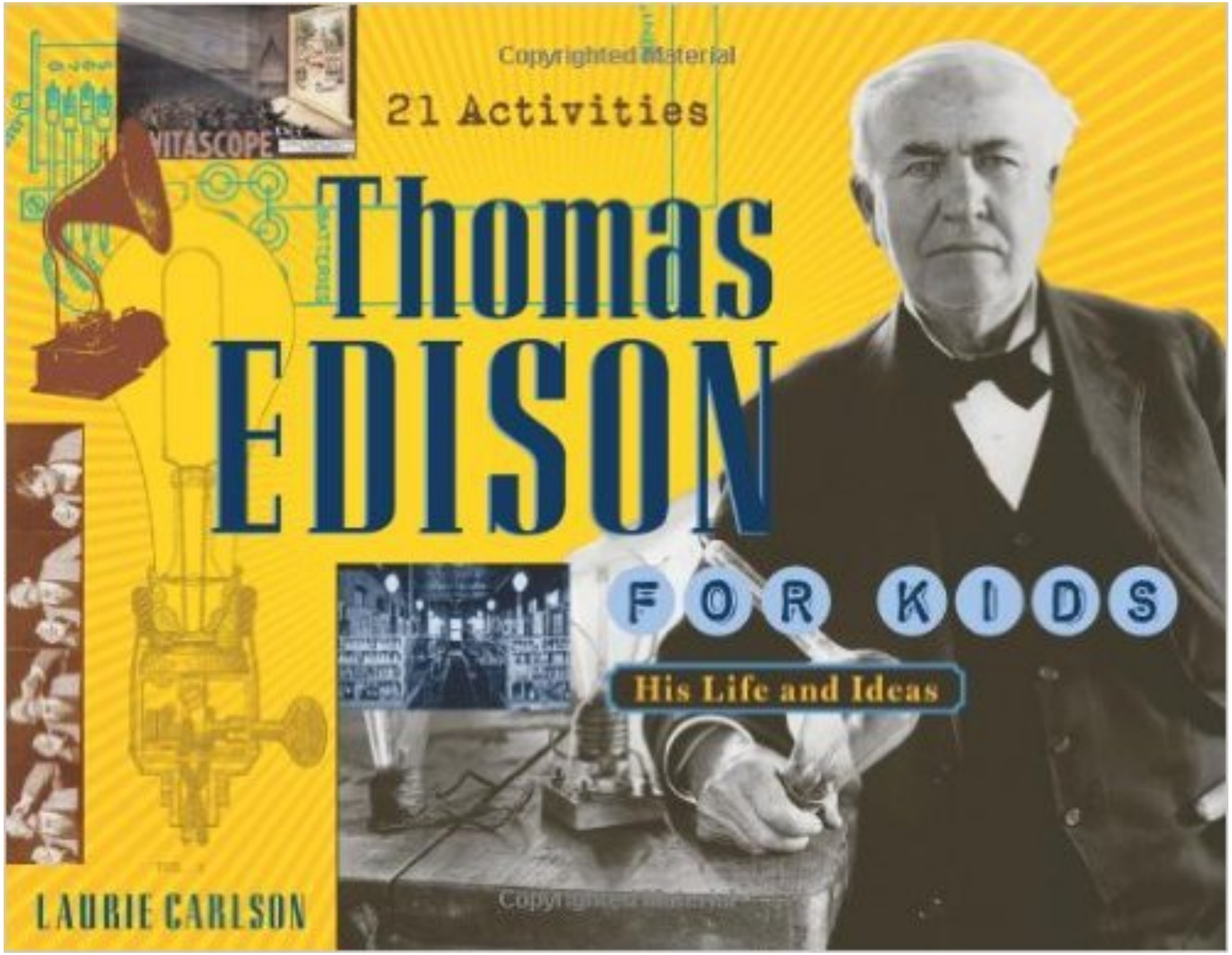
- An exclamation mark to note a point in the text when the reader links information to his/her prior knowledge. "Wow! I've made a connection!"

!

- A light bulb to note an important idea or concept.

Close Reading – Responding to Texts
(Fisher & Frey, 2014)

- Students draw and write collaboratively and independently, with adult support and guidance.
- They investigate, research, and debate compelling questions.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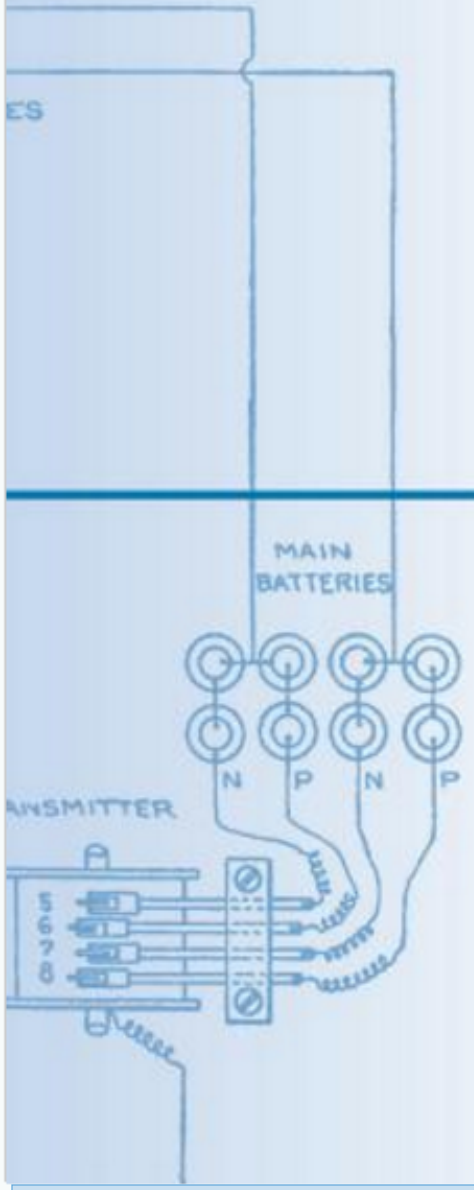

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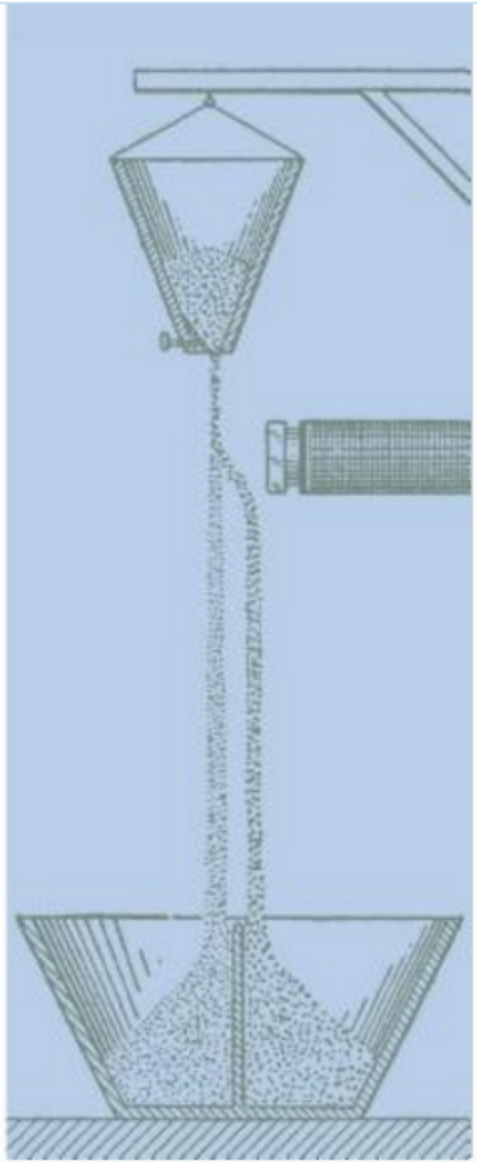


Presenting Your Activity

- **Title** – Make it an accurate description of the project. You can use the title in the book or come up with one of your own.
- **Introduction and Purpose** – This section introduces the topic of the project, notes any information already available, explains why you are interested in the project, and states the purpose of the project.

Source: ScienceNetLinks
http://sciencenetlinks.com/student-teacher-sheets/presenting-your-activity/

Presenting Your Activity (cont.)

- **The Hypothesis or Question** - State your hypothesis or question clearly. For example, in the “Make Music with a Needle” project on page 54 of Thomas Edison for Kids, your question might be, “How can a needle make music?”
- **Materials and Methods** - List the materials you used in your project and describe the procedure that you used to perform the project. If you have a photo or diagram of your project, this is a good place to include it.

Source: ScienceNetLinks
http://sciencenetlinks.com/student-teacher-sheets/presenting-your-activity/

Presenting Your Activity (cont.)

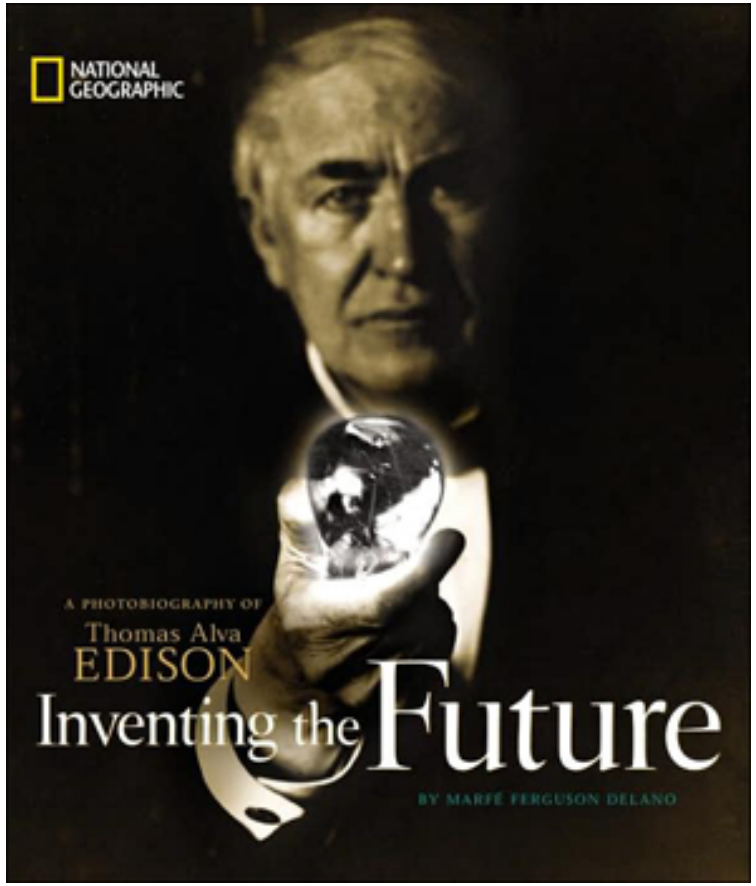
- **Data and Results** - Data and Results are not the same thing. Some reports will require that they be in separate sections, so make sure you understand the difference between the concepts.
  - "Data" refers to the actual numbers, other information, or measurements you obtained in your project. Data can be presented in tables or charts.
  - The "Results" section is where the data is manipulated or the hypothesis is tested. Sometimes this analysis will yield tables, graphs, or charts, too.

Source: ScienceNetLinks
http://sciencenetlinks.com/student-teacher-sheets/presenting-your-activity/

Presenting Your Activity (cont.)

- **Conclusion** - The Conclusion focuses on the Hypothesis or Question as it compares to the Data and Results.
  - What was the answer to the question?
  - Was the hypothesis supported? (Keep in mind a hypothesis cannot be proved, only disproved.)
  - What did you find out from the experiment?
  - How does your activity relate to Edison's work?

Source: ScienceNetLinks
http://sciencenetlinks.com/student-teacher-sheets/presenting-your-activity/


NATIONAL GEOGRAPHIC
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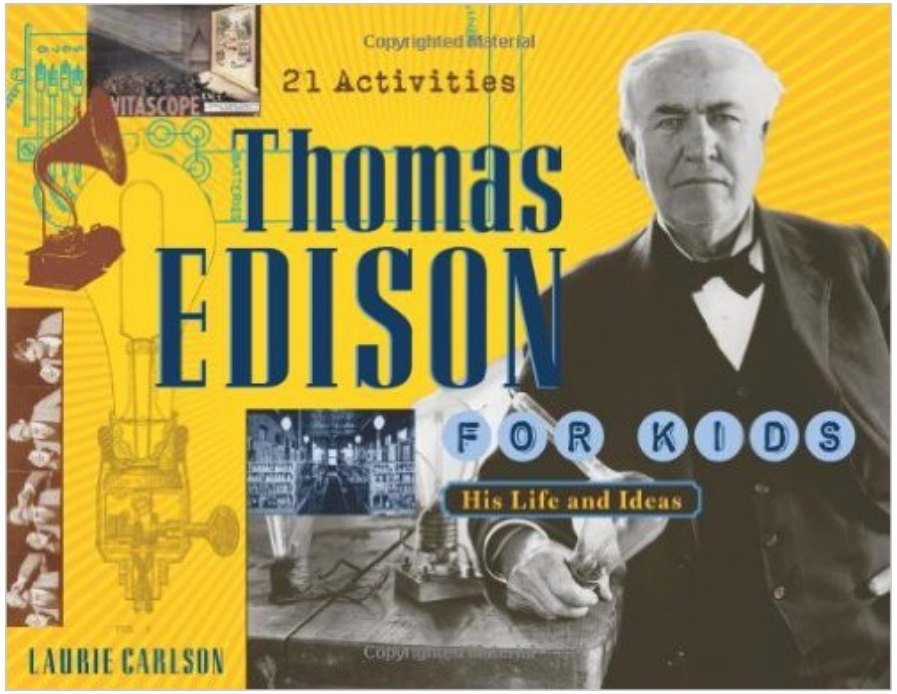
Inventing the Future
BY MARFÉ FERGUSON DELANO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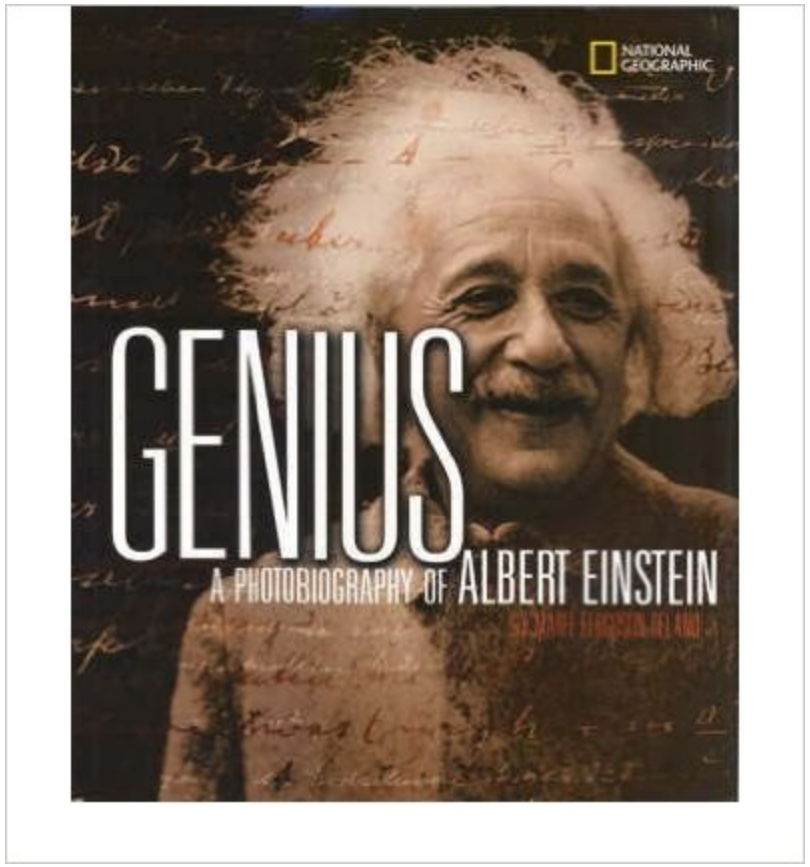
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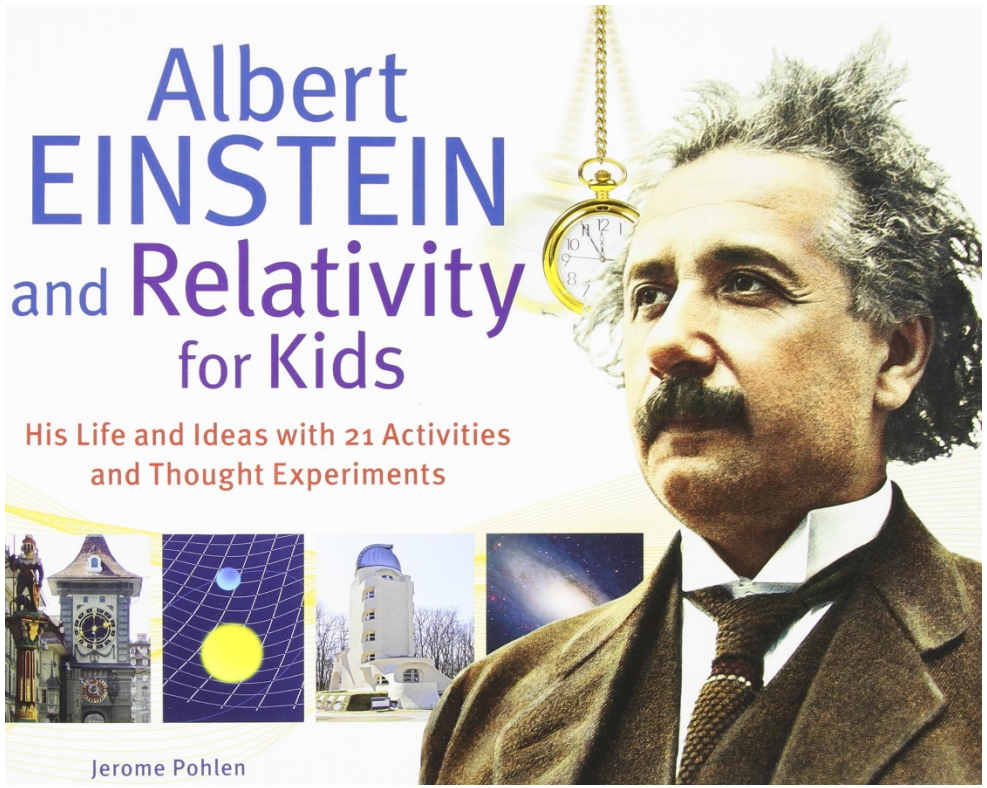
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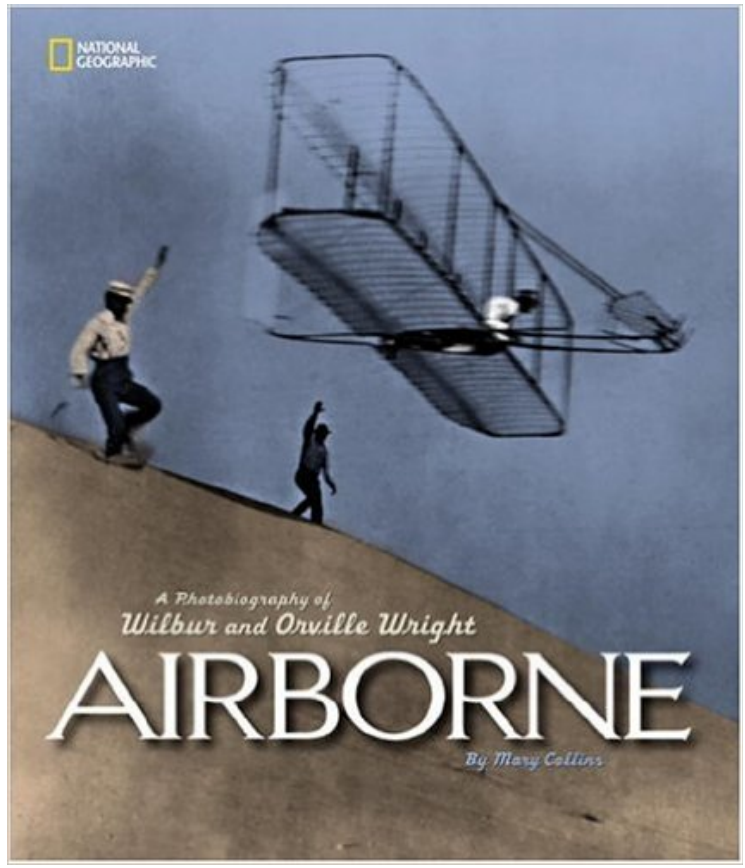
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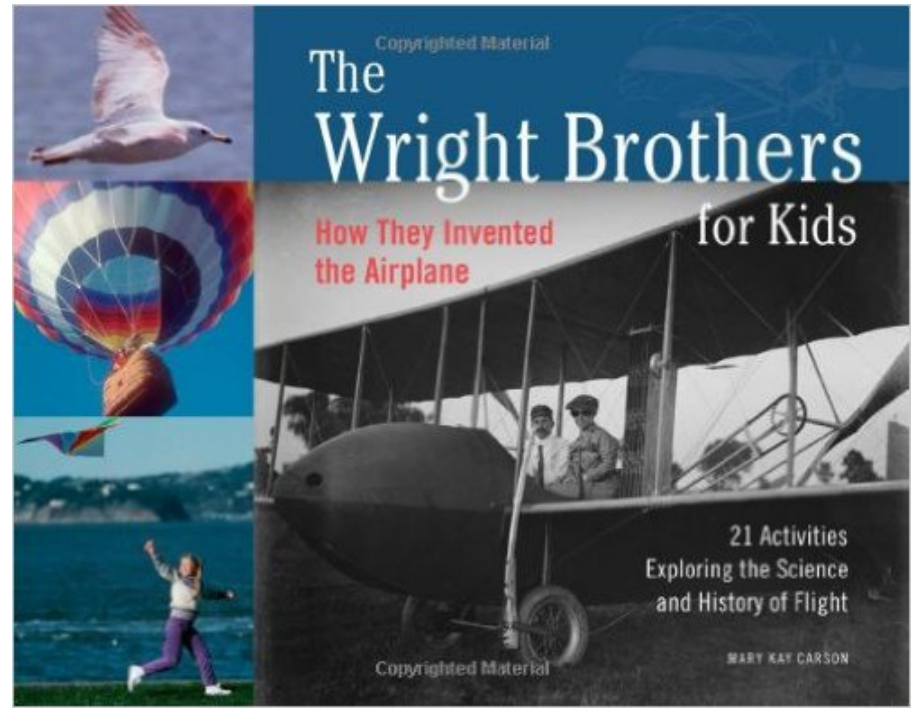
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