... We are all familiar with the tale of Newton’s apple. While sitting in his orchard one day in 1665, Isaac Newton’s curiosity was sparked by a falling apple, leading him to “discover” the law of gravity. As doubtful as the story sounds, writings by Newton and his contemporaries verify the incident. Though science often seems an orderly and methodical process, history is dotted with surprising discoveries such as these. Were they merely luck? Or the results of a gifted mind? Actually, a bit of both. Sometimes scientific discoveries come from the most unexpected places, when talented people are watching out for them. Here are two examples of similarly serendipitous finds.

The Smallpox Cure

In the late 1700s, Edward Jenner, a young English doctor-in-training, was told by a local milkmaid that she was safe from smallpox because she had already had cowpox. Like its deadly cousin, cowpox also produced painful blisters, yet doctors had not made a connection between the two diseases. After extensive research, Jenner discovered that what she said was true—milkmaids exposed to a common strain of cowpox almost never contracted smallpox.

Jenner’s supervising physicians took little interest in his findings. Then, in 1796, he injected a young boy named James Phipps with tissue taken from a cowpox blister on a milkmaid’s hand. He then exposed the boy to the deadly smallpox virus. So pervasive and devastating was this disease at the time that the boy’s family was willing to take this unimaginable risk. But their gamble paid off. Young James remained completely healthy, and the vaccination process was born.

Jenner’s idea opened the door not only to the eradication of smallpox but to the subsequent perfection of the immunization procedure by Louis Pasteur. The modern

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1. Isaac Newton: mathematician and scientist (1642–1727) who developed the theory of gravity.
2. smallpox: a highly infectious, often fatal disease characterized by high fevers and blisters that leave pockmarks on the skin.
3. Louis Pasteur: French chemist (1822–1895) who founded modern microbiology and developed several life-saving vaccines.
term “vaccine,” from the Latin word for “cow,” honors Jenner and his life-saving inspiration.

**Penicillin**

Arguably the most important medical discovery of the 20th century came about purely by accident. Throughout the 1920s, Scottish scientist Alexander Fleming was searching for a cure for infectious disease, the major cause of death throughout much of human history. As part of his research, Fleming was cultivating several species of bacteria in separate petri dishes.

One day, Fleming noticed that a mold had contaminated the petri dish containing the bacteria *Staphylococcus*, a common microbe responsible for a variety of ailments ranging from the earaches to deadly post-operative infections. But before tossing away the moldy dish, Fleming realized that the intruder had actually killed off much of the bacteria culture.

The tiny, wind-born mold spore must have landed in the *Staphylococcus* colony during a brief moment Fleming had uncovered the dish. Fleming isolated the mold and identified it as a member of the genus *Penicillium*. He called the antibiotic substance it secreted penicillin.

Fleming’s further investigation found that penicillin killed off several, but not all, strains of the disease-causing microbes he was growing in his lab. Had the penicillium contaminated a different dish, Fleming might never have discovered its medicinal benefits. Additionally, Fleming found penicillin was non-toxic to humans and animals. Realizing the strategic advantage in possessing the world’s first antibiotic, the U.S. and Britain joined forces to mass-produce the drug, and treated thousands of Allied troops wounded in the D-Day invasion of Europe. It has saved countless lives ever since. In 1945, Fleming shared the Nobel Prize in Medicine for his work on the “Wonder Drug” penicillin.

**Serendipity or Smarts?**

Each of these examples of serendipity helped advance the scope of human knowledge by great leaps and bounds. But these accidents and twists of fate are not quite as random as they seem. Each discovery occurred in the presence of a well-trained intellect. As Louis Pasteur once said, “In the fields of observation, chance favors only the prepared mind.”

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**MONITOR**

Reread the subheading of this section. Based on this, what question about smallpox should you be able to answer? If you can’t answer this question for yourself, reread lines 9–25.

**infectious** (in-fē’kshəs) adj. capable of being transmitted by infection

**contaminate** (kon-täm’a-nät’) v. to make impure or unclean through contact
Comprehension

1. **Recall** How does the C-Leg described in “Robo-Legs” work?

2. **Summarize** According to “Robo-Legs,” what is different about the way young amputees feel about their prosthetic limbs?

3. **Clarify** James Phipps is mentioned in “Eureka: Scientific Twists of Fate.” Why was his family willing to risk his exposure to the smallpox virus?

Critical Analysis

4. **Examine the Message** Reread the first paragraph of “Robo-Legs” as well as lines 23–28 and 35–39. Based on the information stated and the descriptive words and phrases used, what do you think is the message the author wants to share about science and technology?

5. **Interpret Quotation** “Eureka: Scientific Twists of Fate” contains this quote from Louis Pasteur: “In the fields of observation, chance favors only the prepared mind.” What does he mean? Use examples from the article to support your answer.

6. **Evaluate Monitoring Techniques** Look back at the chart you created as you read. Which strategy best helped you understand the articles? Explain.

7. **Analyze Authors’ Purposes** Reflect back on your reading of both articles. What’s the author’s main purpose in “Robo-Legs”? What is the main purpose of “Eureka: Scientific Twists of Fate”? Give examples from each selection to support your answers.

8. **Compare Texts** Use a Venn diagram like the one shown to record similarities and differences between the articles. Consider the subject matter, purpose, and tone of each article. Why do you think these two articles were presented together in a single lesson?

Extension and Challenge

9. **Readers’ Circle** Both “Robo-Legs” and “Eureka: Scientific Twists of Fate” describe medical advancements that have helped people lead better lives. What problems would you like science to solve? Discuss your answer with a small group.

10. **SCIENCE CONNECTION** Robotics has become an exciting and popular field of scientific study. Other than prosthetics, what is another way robotics is being used today? Research to find an answer. Then present your findings to the class.

For more on robotics, visit the Research Center at ClassZone.com.