

Accidental Discoveries

Lesson Procedures

Part 1: Discuss with the students that even though scientists formulate and test their explanations of nature using observation, experimentation, theoretical and mathematical models, all scientific ideas are subject to change and improvement in how we understand them. For most major ideas in science, there is much experimental and observational confirmation. But every once in a while, there are accidental discoveries in science. Ask the students if they know of any accidental discoveries that may have taken place in science. Give them some examples of such accidental discoveries such as the discovery of quinine as an anti-malarial drug.

The story behind the chance discovery of the anti-malarial drug quinine may be more legend than fact, but is nevertheless a story worthy of note. The account that has gained the most currency credits a South American Indian with being the first to find a medical application for quinine. According to legend, the man unwittingly ingested quinine while suffering a malarial fever in a jungle high in the Andes. Needing desperately to quench his thirst, he drank his fill from a small, bitter-tasting pool of water. Nearby stood one or more varieties of cinchona, which grows from Columbia to Bolivia on humid slopes above 5,000 feet. The bark of the cinchona, which the indigenous people knew as quina-quina, was thought to be poisonous. But when this man's fever broke, he brought news of the medicinal tree back to his tribe, which began to use its bark to treat malaria.

Since the first officially noted use of quinine to fight malaria occurred in a community of Jesuit missionaries in Lima, Peru in 1630, historians have surmised that Indian tribes taught the missionaries how to extract the chemical quinine from the cinchona bark. In any case, the Jesuits' use of quinine as a malaria medication was the first documented use of a chemical compound to successfully treat an infectious disease. To this day Quinine-based anti-malarials are widely used as effective treatments against the growth and reproduction of malarial parasites in humans.

Part 2: Show students Video 3: Accidental Discoveries [Time – 3:39]. Ask the students to pay special attention to exactly how gamma-ray bursts were discovered. Be sure the students understand that sometimes these accidental discoveries cause us to change our ways of thinking of how certain phenomena occur.

Have the students share with you what they have learned about the discovery of gamma-ray bursts. Supplement any missing information using the summary below:

In the 1960s, the United States was concerned that other countries might test nuclear weapons in space, despite a treaty to ban such events. Nuclear detonations produce gamma-rays, so the U.S. military launched a series of satellites designed to detect these high-energy explosions. To their surprise, scientists soon began detecting dozens of explosions, and discovered they were not coming from the Earth. Instead, the bursts were coming from deep space. Thus, the scientists discovered gamma-ray bursts.

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Part 3: Break the class into five teams. Each team will be assigned one of the letters in “S-W-I-F-T” (Student Handout, p. 5-10) and each individual student will be responsible for maintaining their own chart found on Stories of Accidental Discoveries (Student Handout, pg. 5). Give each team a set of materials and handouts for their team. Have the students read their handouts and then ask them to write a sentence that best summarizes the story in their handout. The summary sentence must start with the letter assigned to that team. Have the team members copy their sentence onto the sheet of art paper along with an illustration of what the summary sentence is about. When everyone is finished, have each group present their story and their original summary sentence to the class. While each group is presenting, the rest of the students should copy down the summary sentence being presented onto the provided chart (Student Handout, pg. 5). When each group is done, everyone in the class should have five summary sentences, one for each accidental discovery.

Assessment Strategies

Note that scientists originally believed that nuclear energy came from unstable elements found on Earth or from man-made bombs. It was through our monitoring of nuclear activity from the Nuclear Test Ban Treaty by satellites that we saw that gamma-ray bursts were happening. The scientific community had to change their explanation based on new evidence. Ask the students how our explanations have changed about gamma-ray activity from the new evidence we have gathered. Ask them to explain how theories change with new information.

Vocabulary

Density – the amount of something per volume

Displacement – to move something out of position

Electric current – the flow of an electric charge





Gamma-rays – the most energetic form of light

Gamma-ray bursts – explosions of gamma-rays from random locations throughout the Universe

Malaria – a blood disease transmitted by mosquitoes

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Sentence and illustration of **Stories of Accidental Discoveries** (Student Handout, p. 1-6) are examples only.

Letter/team	Sentence	Illustration
S	Smallpox was the first disease to have a vaccine made to eliminate it.	
W	Water was used to determine the volume of an irregularly shaped object. Or Water was used to test if the man who made the crown for the king used all of the gold, or kept some for himself.	
I	Isaac Newton thought of the law of gravity when an apple fell from a tree.	
F	Frog legs were used to detect electricity (a spark) between two metals.	
T	Teflon was discovered by people working on keeping things cold.	