Teacher's Guide for ODYSSEY:

July/August 2011: Rage or Reason?

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Teachers: This Teacher's Guide is designed to be readily reproducible for student use. Please find an Answer Key at the end of the guide.

"Lab Wars," pages 6–9

1. What is the biggest scientific feud that started in 1859 and continues today?

2. Where does most of the money for scientific research in the United States come from?

3. Why do many scientific feuds benefit science, in the end?

4. What do you think is a good way to win an argument?

"The Alien Discovery that Wasn't," pages 10–13

1. All life on Earth requires what six elements?

2. How does the aluminum foil description help you visualize the arsenic/phosphorus comparison?

3. If a good argument benefits from strong supporting details, why is Wolfe-Simon's team's case shaky?

4. Have you ever lost an argument? What could you have done to strengthen your case?

"In the Garden: A Famous Futile Feud," pages 14–16

- How is the text in this article structured (cause-and-effect, like a play, steps in a process, descriptive), and how does the structure help you understand the information?

"A Quarrel: Who Invented Calculus?" pages 17–19

1. Using the information from the article, complete the timeline below:

1666—Newton writes a paper on calculus.

1669—

1673—

1676—

1677—Leibniz independently invents calculus.

1684—

1687–1699—

1710—Newton's side accuses Leibniz of plagiarism. Later, Leibniz's fans accuse Newton of plagiarism.

2. What words would you use to describe the relationship between Newton and Leibniz?

3. Given the information in the article, who do you think invented calculus?

"Germ Warfare: Showdown in a Paris Theater," pages 20–23

Mark the following statements true (T) or false (F). If false, provide the necessary correction.

1. ___ Louis Pasteur believed that spontaneous generation was impossible.

2. ___ He believed that the spread of germs prevented disease.

3. ___ Félix Pouchet agreed with Pasteur.

4. ___ Scientists follow the scientific method when they can take a hypothesis and create an experiment that clearly supports the idea.

5. ___ Pasteur created a flask that would let air into it but would not allow microbes to enter.

6. ___ His successful experiment ultimately helped him create a process that keeps harmful mercury out of milk, or pasteurization.

How does the timeline on page 23 help you understand this article?

"Battle of the Currents: AC or DC?" pages 28–31

1. Make a T-chart with the headings "Thomas Edison" and "Nikola Tesla" and list each inventor's accomplishments.

2. What words would you use to describe Edison? Tesla?

3. A fight between two people often has negative consequences. Why was Edison's and Tesla's rivalry positive?

"Rosalind Franklin: The Woman Who *Should Have* Won the Nobel Prize," pages 34–36

- Have you ever lost or missed out on something that was rightly yours? How did that make you feel, or how do you think something like that would make you feel? Write a description of your experience or create your own story. Be sure to include details about your feelings.

"Einstein vs. Millikan: Right *and* Wrong Win the Prize," pages 38–39

Fill in the blanks.

1. When light strikes metal, _____ absorb so much energy from the light that they separate from their atom and burst out of the metal.

2. This stream of electrons creates an _____.

3. Einstein reasoned that light traveled through space as individual particles or _____.

4. Einstein said that photons required a certain color of _____ to knock them loose.

5. Contrary to what Millikan thought, Millikan concluded that Einstein's _____ was correct.

What words would you use to describe the relationship between Einstein and Millikan?

How has the combined work of Einstein and Millikan transformed life as we know it today?

"Cosmic Warriors," pages 40–43

- Is it important to stick to your beliefs? Why do you think the scientists in this issue stuck to their beliefs, right or wrong? Where would we be today if people didn't push their limits, trying to confirm beliefs and make discoveries, and disagree with one another?

ANSWER KEY:

"Lab Wars"

1. the debate over evolution
2. the federal government
3. Possible responses: Scientists think hard to make their best case. Experiments are refined. More data is collected to bolster the result.
4. Possible response: A good way to win an argument would be to present your case with lots of evidence and clear reasoning to support your side.

"The Alien Discovery that Wasn't"

1. carbon, nitrogen, oxygen, hydrogen, phosphorus, and sulfur
2. Possible response: I know how weak aluminum foil is, so I can picture how easily the chain would fall apart. It helps me see, or understand, how unstable arsenic bonds are compared to phosphorus bonds.
3. Possible response: The paper doesn't clarify which batches of bacteria correspond with which sets of results.
4. Responses will vary but may include doing research to back claims.

"In the Garden: A Famous Futile Feud"

Possible response: This article is structured like a play, with lines for each of the characters. Sometimes there are even stage directions, for example, "Pope Urban (now absolutely furious) . . ." The structure helps me see who is talking and what he is saying. It helps me understand the discussion because I can clearly see each side as the men go back and forth.

"A Quarrel: Who Invented Calculus?"

1.

1666—Newton writes a paper on calculus.
1669—Newton becomes a mathematics professor at Cambridge.
1673—Leibniz visits London and learns about Newton.
1676—Leibniz and Newton exchange letters.
1677—Leibniz independently invents calculus.
1684—Leibniz outlines his calculus in a journal.
1687–1699—Newton publishes materials claiming he had invented calculus.
1710—Newton's side accuses Leibniz of plagiarism. Later, Leibniz's fans accuse Newton of plagiarism.

2. Possible words to describe the relationship between Newton and Leibniz: unfriendly, guarded, argumentative, grudge-holding

3. Responses may vary but should include evidence from the article for support.

"Germ Warfare: Showdown in a Paris Theater"

1. (T)
2. (F) He believed that the spread of germs caused disease.
3. (F) Félix Pouchet disagreed with Pasteur.
4. (T)
5. (T)
6. (F) His successful experiment ultimately helped him create a process that keeps harmful microbes out of milk, or pasteurization.

The timeline helps me understand the important achievements in Louis Pasteur's life.

"Battle of the Currents: AC or DC?"

1.

Thomas Edison	Nikola Tesla
motion pictures	neon lights
phonograph	radio
mimeograph machine	robotics
the stock ticker	guided missiles

2. Possible responses:
   Edison: driven, inquisitive, self-taught, street smart
   Tesla: talented, motivated, scholarly, bookish

3. Possible response: The rivalry between Edison and Tesla had positive consequences because the two men turned their differences into a battle of wits. They made new inventions in an effort to outdo the other. As a result, society benefited from great new inventions that would do work and enhance lives.

"Rosalind Franklin: The Woman Who *Should Have* Won the Nobel Prize"

Responses will vary but should include details about the experience and a description of feelings.

"Einstein vs. Millikan: Right *and* Wrong Win the Prize"

1. electrons
2. electric current
3. photons
4. light
5. theory

Possible responses: disagreeing, respectful

Responses will vary but should include how the work of Einstein and Millikan has advanced the ways in which we communicate, and collect and share information.

"Cosmic Warriors"

Responses will vary but should include ideas about having the confidence, know-how, and will to believe in yourself and find support for your beliefs, as well as speculation on where we would be today without the feuds of our scientific forefathers.