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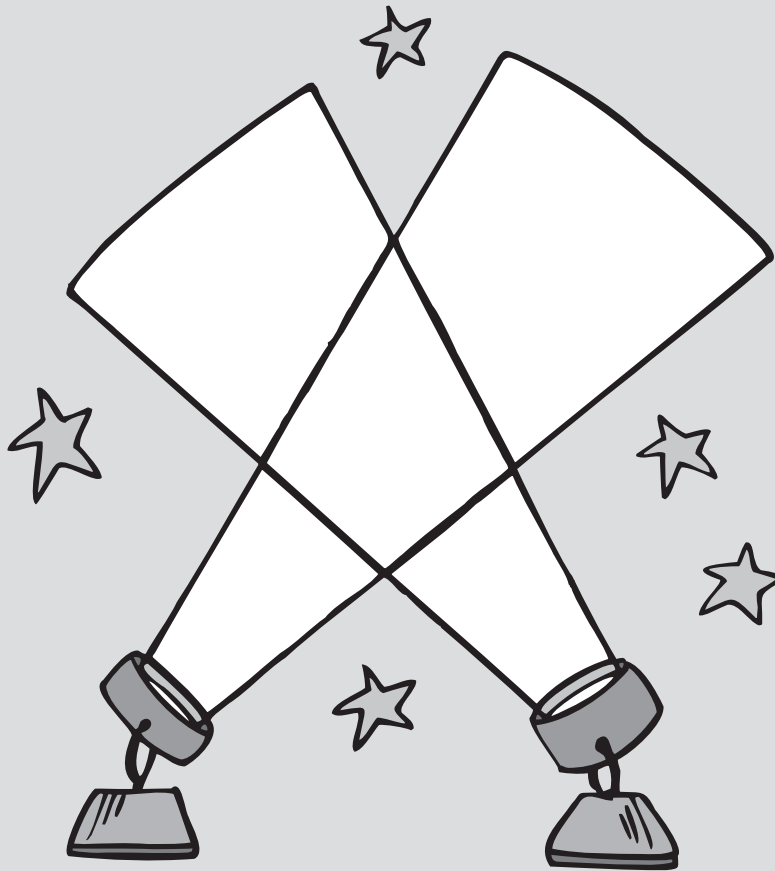
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# READERS' THEATER



# NEWTON'S APPLE

## BACKGROUND: NEWTON'S APPLE

### Natural Philosophers

An English poet wrote: “Nature and nature’s laws lay hid in night: God said, ‘Let Newton be!’ And all was light!” It was not that simple, but Isaac Newton added immeasurably to the new scientific ideas in physics, astronomy, math, and other sciences which had sprung from the works of Galileo Galilei, Nicolas Copernicus, René Descartes, and other natural philosophers, the name given to scientists in the Age of Reason. These ideas about planets, physical laws, light, and many other features of the natural world would provide the scientific basis for the many inventions and discoveries of the Enlightenment Age in the 1700s.

### Isaac Newton

Isaac Newton was born on Christmas Day in 1642 after his father’s death. His mother soon married a wealthy neighbor, but left Isaac in the care of his grandparents. He grew up feeling rejected and unloved. Isaac became a good student at the local grammar school mostly to spite a bully who picked on him. In his youth, Newton made many ingenious devices and toys. He was fascinated by the chemicals used by the druggist with whom he lived. He did make friends with the druggist’s daughter, Catherine. His mother soon decided Isaac would make a poor farmer, and he went to Cambridge University at his uncle’s suggestion.

Newton was a friendless student who paid for part of his expenses by serving wealthier students. He did demonstrate remarkable skill in mathematics. His greatest discoveries were made at home during the plague years when he worked out the universal law of gravitation and the inverse square law expressing the force of gravitation. He also codified the three laws of motion and did remarkable experiments with light. He worked out the principles of calculus that he called “fluxions.”

Newton returned to Cambridge and was made a mathematics professor at the age of 26. He always had problems making and keeping friends and often quarreled with other scientists over credit for discoveries. He wrote one of the greatest science books ever written, *Mathematical Principles of Natural Philosophy*, in the 1680s. He did further studies in astronomy, wrote a book on light, invented the reflecting telescope, and tried to convert cheap metals into gold. Newton never married. He died at the age of 84 in 1727.



**Isaac Newton**



## SCRIPT SUMMARY: NEWTON'S APPLE

The setting for this script is an English manor (large farm) during the years 1665 and 1666 when Isaac Newton has returned home to avoid the plague in London. It is a summer evening and three acquaintances—Catherine, John, and Edward—have come to visit. An apple falling from a tree grabs Isaac's attention, and he explains with great enthusiasm to the others how gravity works both on Earth and between the moon and Earth. He describes his discovery of the inverse square law. For example, if the moon were moved twice the distance from Earth, the gravitation pull would be only one-fourth as great.

Newton describes the laws of motion that he has been studying and how they affect things as simple as a moving apple or a ball hit by a stick. His discussion of light and his experiments with prisms interest and amuse his visitors. His visitors remind Isaac of some of his boyhood inventions, including a mouse-driven mill and burning kites flying in the night.

Edward is clearly the most interested in the science Isaac is trying to explain. John thinks he's somewhat odd, and Catherine wishes Isaac would pay more attention to her and a possible future as a simple farmer. The narrator concludes with some basic facts about Newton's career.

### Assignment

Read the readers' theater script "Newton's Apple." Prepare for the performances and share your interpretations of the scripts with the class.

### Extensions: Writing and Literature

- Write a script based on one of the events listed below or another one related to Isaac Newton, Galileo, Descartes, or other scientists of the time. Use the background section, biographies, textbooks, and Internet sources for help.

Newton's arguments with Robert Hooke or Gottfried von Leibniz over his discoveries

Newton's relationship with his young niece, Catherine Barton

Newton's work as warden of the mint

Queen Anne makes Newton a British knight.

A scene from Newton's childhood dealing with his mother, his small inventions, his school days, or his fight with the bully

- Read *Isaac Newton* by Kathleen Krull. Use one episode or a chapter as the basis for a readers' theater script about a facet of Isaac Newton's life. After practicing your script, share your performance with the rest of the class.



## SCRIPT: NEWTON'S APPLE

This script is set in a small English manor, a farm where Isaac Newton is doing some of the most extraordinary science investigations ever done in one place by one person. There are five speakers.

**Narrator:** Twenty-two-year-old Isaac Newton has been sent home from Cambridge University in London, England, in the summer of 1665 because the bubonic plague has hit the city. As many people as possible, including all college students, have been sent away to reduce the number of potential deaths. Newton is sitting under an apple tree in the evening with a girl and two village acquaintances. An apple falls from the tree. He picks up the apple and looks at it and then at the moon.

**Isaac:** An apple falls. It doesn't go back up. It always falls straight down toward Earth—toward the center of Earth. It doesn't fly off into space. It falls straight down.

**John:** Did you think it should fall up—not down? Is that what you learned in your fancy college, Newton? You could have stayed right here at your mother's manor and figured that out.

**Catherine:** Isaac, I don't know what you see in that college, anyway. I missed you here.

**Isaac:** You see, Catherine, the apple is attracted to Earth. The rocks are attracted to Earth. Even the softest dirt and the lightest flower seed are attracted to Earth. If they weren't attracted, they would just float off into space. Even the moon is attracted to Earth. All of the heavenly bodies are attracted to Earth. Everything is attracted to Earth.



## SCRIPT: NEWTON'S APPLE *(cont.)*

**Edward:** Yes, and the heavier we are, the more attracted we are. See, I'm a lot more attracted than you skinny people.

**Isaac:** You're right, Edward. The greater the weight and the shorter the distance between the two objects, the greater the attraction.

**Catherine:** Isaac, haven't you forgotten something else that is attractive?

**Isaac:** No, Catherine, everything is attracted to Earth, and Earth is attracted to everything else. Earth is attracted to the moon. Earth is attracted to the stars. Earth is attracted to the sun. Earth is attracted to everything else. The closer the distance between the heavenly bodies and Earth, the greater the attraction.

**Catherine:** I'm very attracted to you, Isaac.

**Isaac:** Of course, Catherine. It's gravity, you see. It works everywhere in the heavens, on Earth, and throughout the cosmos.

**John:** I'm not sure this college boy is nearly as smart as he's supposed to be.

**Edward:** Can you measure this gravity, like water or string?

**Isaac:** Yes, I have spent weeks working out the equations. My workbooks are filled with the numbers. I have determined that an inverse square law governs this attraction. The farther one object is from another, the less the attraction. If the moon moved twice as far from Earth, the attraction would only be one-fourth as great. If it moved three times as far away, the force of gravity would only be one-ninth as strong.



# READER'S RESPONSE: NEWTON'S APPLE

## Directions

- These discussion activities and questions may be used in small groups or with the entire class. They may also be used by the actors as a part of their preparation for the reading.
- Refer to the script “Newton’s Apple” when responding to all questions. You may also find useful facts in the background section, biographies, textbooks, and Internet sources.
- Make notes on the lines provided below each question before your group discussion.

## General Discussion

1. Which of Isaac’s visitors liked Isaac the most and respected what he did? Explain your choice.

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2. With which of Isaac’s toys or inventions would you have liked to work? Why?

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3. Why do you think Newton made so many discoveries?

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## Making It Personal

Would you like to be a person like Isaac Newton? What would be the good things and the unpleasant things about his life and character? Explain your answer.

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What do you think was Isaac Newton’s greatest discovery or invention? Explain your choice.

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Who do you think was the greatest genius in the history of the world: Isaac Newton, Leonardo da Vinci, or someone else? Explain your choice.

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