

In the **Spotlight**

Grades
3–6

by | Carol Surges

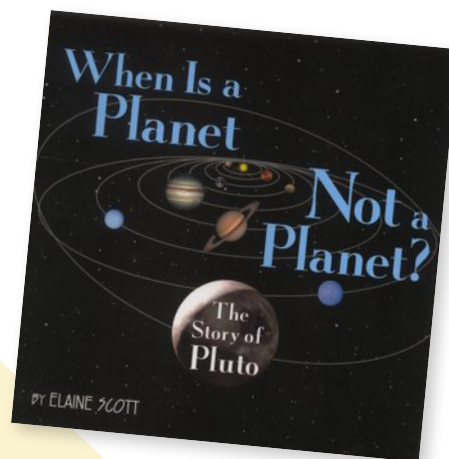
When is a Planet Not a Planet? The Story of Pluto
by Elaine Scott. Clarion Books, 2007.

When is a Planet Not a Planet? The Story of Pluto

A Scientific Conundrum

By now, most of us have accepted the new and smaller solar system. What came as a surprising, if not shocking announcement one late summer's day in 2006 was really the solution to a scientific conundrum. Pluto had puzzled astronomers since its discovery. It did not make sense in the grand scheme of the solar system. With its unusual orbit and icy composition, it was a misfit. The problem came to the forefront when a new object was located orbiting the Sun in 2003. Labeled the 2003 UB313, it was nearly three times farther from the Sun than Pluto and had a bigger diameter. Was it another planet? By the time it was formally named Eris, astronomers from around the world were in a heated debate about what the characteristics of a planet were. Was orbiting the Sun enough or was there more to it?

This was not a new argument. Scientists had never agreed on the characteristics of a planet. A committee within the International Astronomical Union was asked to form a definition. When their recommendation was announced, it appeared that the solar system might have a dozen or more planets. But when the IAU voted on August 24, 2006, they chose to use a definition that would demote Pluto and drop the the number of planets to eight. The announcement caused an uproar. Some people were angry, some were puzzled and others became sentimental. A few lobbied for Pluto's reinstatement to the solar system. Along with all of that, librarians and educators wondered how they would make adjustments to their curriculum and library collections.



About Elaine Scott

Fortunately, publishers and authors worked quickly to meet those needs. One of the first books to explain Pluto's new status was *When is a Planet Not a Planet? The Story of Pluto* by Elaine Scott. Scott had been working on a book about the Mars rovers when the discovery of Eris led to calls for a tenth planet. She quickly set the Mars work aside and began planning a book about the “new” planet. It was not long before Pluto's demotion became public and the book about Eris took on a whole new focus.

Elaine Scott was prepared for the challenge of writing about outer space. Even before beginning the book about Mars, she had written two successful books about the Hubble telescope: *Adventure in Space: the Flight to Fix the Hubble* and *Close Encounters: Exploring the Universe with the Hubble Space Telescope*. Elaine prides herself in her first-hand research and persistence. In order to write those books she had to get the approval of both Dick Covey, Commander of the mission, and NASA director Dan Goldin. Once she had their go-ahead, she gained access to the astronauts, astrophysicists, astronomers and other personnel in the Johnson Space Center. Living in Houston, Texas,

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Elaine was able to spend hours observing the astronauts at work and then plying them with questions after training sessions and even at their homes.

When the Pluto story came along, this background work and the relationships she had developed were put to good use.

Scott writes about science in a way that is accessible to the non-scientific. Using analogies and a knack for taking a difficult topic and presenting it in a story-like format, Scott has successfully explained a variety of challenging topics to young readers. As a young girl, Elaine did not excel in math or science; her strengths were in the language arts. Now, as an adult, she wishes someone had encouraged her to give science and math more attention. It's for students like her—that don't see themselves as astrophysicists—that she writes her science books.

Now that her book *Mars and the Search for Life* is finally completed and due for publication in the fall, Scott has set astronomy aside. With two more books ready for publication this year, *All About Sleep from A to Zzzzzz* and a YA novel, *Secrets of the Cirque Medrano*, it's clear that we will be hearing much more from her in the future.

The Dawn and Dusk of Pluto

Scientists had suspected a ninth planet for years. The orbits of Uranus and Neptune (discovered in 1781 and 1846 respectively) showed the effects of some unseen force. Hoping to find the mysterious Planet X, astronomers studied the skies off and on for nearly 75 years before Clyde Tombaugh discovered it on February 18, 1930. The planet was much smaller than expected and eventually scientists realized that Pluto was not the cause of the “wobbles” in the other planets orbits. Clyde, a twenty-four year old high-school-educated farm boy from Kansas, went on to earn two degrees in Astronomy and an honorary Ph.D. He discovered numerous other space objects, started an astronomy research program at New Mexico University, and made innovations in telescopic instruments. He died at the age of 90 in 1997.

To learn more about Clyde Tombaugh, his life, and the discovery of “Planet X,” start with these links:

- **ICStars**, www.icstars.com/HTML/icstars/graph-ics/clyde.htm

- **Starchild**, starchild.gsfc.nasa.gov/docs/StarChild/whos_who_level1/tombaugh.html

This site includes an interview with Clyde Tombaugh as he reminisces about his youth, his discovery of Pluto, and the rest of his career:

- **Academy of Achievement**, www.achievement.org/autodoc/page/tom0int-1
- **The Planetary Society**, www.planetary.org/explore/topics/pluto/plutodiscovery0.html. Explains in detail the history and discovery of Pluto.
- **New Mexico University's Clyde W. Tombaugh Papers**, archives.nmsu.edu/exhibits/tombaugh_website/index.htm

Where would Pluto Be without Technology?

Advances in technology go hand in hand with advances in science. Nowhere is this more true than in the science of Astronomy. Most people believed the earth was the center of the universe until Galileo Galilei pointed his telescope up toward the skies. As telescopes improved and scientists could see farther into the universe, more discoveries were made.

When Pluto was discovered in 1930, Clyde Tombaugh was using a thirteen-inch telescope, a hand operated camera, and a piece of equipment called a blink comparator. He personally analyzed thousands of photos before he found Planet X or Pluto, as it was named. (See this Arizona State site for photos and more information on the equipment Tombaugh used in 1930: ircamera.as.arizona.edu/NatSci102/lectures/pluto.htm.)

Today, thanks to advances in technology, telescopes and cameras are operated by robots, and computers are used to screen the photos before astronomers make a final analysis. (Read a talk by Michael Brown, an astronomer mentioned in *When is a Planet Not a Planet*, as he explains Clyde Tombaugh's discovery process and contrasts it with how astronomers work today at PHYSORG.com www.physorg.com/news91889915.html.)

When the Hubble Space Telescope (hubblesite.org) was launched in 1990, its primary mirror was 94 inches in diameter; allowing never-before-possible images and discoveries to pour back to Earth. Hubble's replacement, the James Webb Space Telescope, will have a mirror twenty feet wide and begin its orbit in 2013. (See this PlanetQuest page

for more information: planetquest.jpl.nasa.gov/missions/jwstMission.cfm.)

In January 2006, eight months before Pluto was given its new classification, NASA launched the New Horizons spacecraft on the first-ever mission to Pluto. The spacecraft isn't scheduled to reach Pluto until 2015. At the end of the nine-year, three-billion-mile journey it will spend about five months photographing and carrying out experiments on Pluto and its largest moon, Charon. Eventually the spacecraft will move on to explore other objects in the Kuiper Belt at the edge of our solar system. As a tribute to Clyde Tombaugh, some of his remains are being carried on the New Horizons spacecraft.

For more information on the New Horizons mission, use these links:

- **The New York Times**, www.nytimes.com/2006/01/20/science/space/20pluto.html
- **Clyde Tombaugh**, www.clydetombaugh.com/page/page/2892808.htm

For background information on the types of telescopes and their operation go to Amazing Space from the Space Telescope Science Institute at amazing-space.stsci.edu/resources/explorations/groundup.

For a lesson about telescopes and their parts, appropriate for grades three through five, go to the Challenger Center for Space Science Education and click on the "Telescope Tech" link: www.challenger.org/teachers/lessons/astronomy.cfm.

For a look at the earth-bound telescopes being used for most of today's discoveries, go to CalTech Astronomy at www.astro.caltech.edu/palomarnew/sot.html, and click on the "Telescopes" link in the right column.

Students can gain an understanding of the advances in astronomy while learning about the advances in telescopes. Using the preceding sites, Scott's book, the books in the bibliography, and biographies of the scientists listed below, readers can develop a timeline of the technological advances:

- Claudius Ptolemaeus
- Aristotle
- Nicolaus Copernicus
- Hans Lippershey
- Galileo Galilei

For more information about Elaine Scott use these links:

- **Elaine Scott**, www.elainescott.com
- **Balkin Buddies**, www.balkinbuddies.com/scott/index.html
- **Biography.jrank.org**, biography.jrank.org/pages/1892/Scott-Elaine-1940.html
- **Cynthia Leitich Smith**, www.cynthia-leitichsmith.com/lit_resources/authors/texasauth-ill2.htm

- Isaac Newton
- William Herschel
- George Ellery Hale
- Percival Lowell
- Clyde Tombaugh
- Edwin Powell Hubble

For information on Michael E. Brown a modern-day astronomer go to this CalTech web page: www.gps.caltech.edu/~mbrown/bio.html.

Mnemonics: Devices for Remembering

When is a Planet Not a Planet? opens with a mnemonic device used for learning the order of the nine planets. Most of us grew up learning one of the numerous mnemonics that made the names and sequence of the planets easy to remember. After August 24, 2006, those memory devices no longer worked and new ones were needed. Readers may be interested in developing a mnemonic for the new solar system.

Share a few mnemonic devices with students and they may be surprised to find they already know some of their own. You'll find ideas in the Web sites listed below and in Rod L. Evan's book *Every Good Boy Deserves Fudge* (A Perigee Book, 2007). Challenge students to devise their own memory aides. The planets can be a starting point, but once students get the idea, they'll want to apply the technique to other parts of their curriculum.

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These sites give an introduction to the different types of memory devices:

- **Bucks County Community College**, www.bucks.edu/~specpop/mnemonics.htm
- **Fun with Words**, www.fun-with-words.com/mnem_example.html

These sites have numerous examples of mnemonics by category (Although many of the planet mnemonics are for the original nine planets, students will get ideas for their own version.):

- **Mnemonics Guide**, www.eudesign.com/mnems
- **Amanda's Mnemonics Page**, www.netnaut.com/mnemonics.html

Bibliography

Books by Elaine Scott

- *Adoption*. Franklin Watts, 1980.
- *Adventure in Space: The Flight to Fix the Hubble*. Photographs by Margaret Miller. Hyperion, 1995.
- *All About Sleep from A to Zzzzzz*. Viking, 2008.
- *The Banking Book*. illustrated by Kathie Abrams. Warne, 1981.
- *Close Encounters: Exploring the Universe with the Hubble Space Telescope*. Hyperion, 1998.
- *Could You Be Kidnapped?* Franklin Watts, 1988.
- *Doodlebugging for Oil: The Treasure Hunt for Oil*. Warne, 1982.
- *Friends!* Photographs by Margaret Miller. Atheneum, 2000.
- *From Microchips to Movie Stars: The Making of Super Mario Brothers*. Hyperion, 1995.
- *Funny Papers: Behind the Scenes of the Comics*. Photographs by Margaret Miller. Morrow Junior Books, 1993.
- *Look Alive: Behind the Scenes of an Animated Film*. Photographs by Richard Hewett. Morrow Junior Books, 1992.
- *Mars and the Search for Life*. Clarion Books, 2008.
- *Movie Magic: Behind the Scenes with Special Effects*. (Photo Essay) Morrow Junior Books, 1995.
- *Oil! Getting It, Finding It, Selling It*. Warne, 1984.
- *Poles Apart: Why Penguins and Polar Bears Will Never Be Neighbors*. Viking, 2004.
- *Ramona: Behind the Scenes of a Television Show*. Photographs by Margaret Miller. Morrow, 1987.
- *Safe in the Spotlight: The Dawn Animal Agency and the Sanctuary for Animals*. Photographs by Margaret Miller. Morrow Junior Books, 1991.
- *Secrets of the Cirque Medrano*. Charlesbridge, 2008.
- *Stocks and Bonds, Profits and Loss*. Franklin Watts,

1985.

- *Twins! Photographs* by Margaret Miller. Atheneum, 1998.
- *When is a Planet Not a Planet? The Story of Pluto*. Clarion Books, 2007.

Other Print Resources: Grades K–3

- *Clyde Tombaugh and the Search for Planet X* by Margaret K. Wetterer, illustrations by Laurie A. Caple. Carolrhoda Books, 1996.
- *Faraway Worlds: Planets Beyond Our Solar System* by Paul Halpern, illustrated by Lynette R. Cook. Charlesbridge, 2004.
- *Galileo's Treasure Box* by Catherine Brighton. Walker & Co., 1987.
- *The Incredible Story of Telescopes* by Greg Roza. Powerkids Press, 2004.
- *Nicolaus Copernicus: The Earth is a Planet* by Dennis Brindell Frandin, illustrated by Cynthia Von Buhler. Mondo, 2003.
- *Starry Messenger* by Peter Sis. Farrar, Straus and Giroux, 1996.

Other Print Resources: Grades 3–6

- *Astronomers at Work* by Julie Haydon. Smart Apple Media, 2004.
- *The Planet Hunters: The Search for Other Worlds* by Dennis Brindell Frandin. Margaret K. McElderry Books, 1997. (Although this book is dated, the historical information is valuable.)
- *Every Good Boy Deserves Fudge: The Book of Mnemonic Devices* by Rod L. Evans, Ph.D. A Perigree Book, 2007.
- *Galileo: His Life and Ideas For Kids* by Richard Panichyk. Chicago Review Press, 2005.
- *Galileo Galilei* by Mike Goldsmith. Raintree Steck-Vaughn Publishers, 2001.
- *Isaac Newton* by Paul Mason. Raintree Steck-Vaughn Publishers, 2001.
- *Kepler and the Laws of Planetary Motion* by Heather Hasan. The Rosen Publishing Group, 2005.
- *The Telescope* by Tamra Orr. Franklin Watts, 2004.

Note: there are numerous biographies available on many of the early astronomers that have not been listed.



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What is a planet, anyway? The word planet stretches back to antiquity, deriving from the Greek word "planetes," which means wandering star. The five classical planets — Mercury, Venus, Mars, Jupiter and Saturn — are visible to the naked eye and can be seen shifting in strange pathways across the sky compared with the more distant background stars. Pluto was found and classified as a planet in 1930, when astronomer Clyde Tombaugh of the Lowell Observatory compared photographic plates of the sky on separate nights and noticed a tiny dot that drifted back and forth against the backdrop of stars. Right away, the solar system's newest candidate was considered an oddball.

