

BAEN BOOKS TEACHERS' GUIDES

Many students love science fiction stories. Even students who don't ordinarily like to read find themselves drawn to speculative fiction. We at Baen Books believe that science fiction, fantasy, and other works of speculative fiction have many advantages for inclusion in the middle and high-school curriculum. This type of fiction can foster a love of reading among students, provide the basis for writing assignments that will motivate and intrigue them, spark lively discussions, and lead students to productive explorations of questions in history, science, sociology, religion and ethics. Baen Teachers' Guides are designed to provide instructors with resources for using Baen books as foundations for this sort of exploration.

We hope these guides will make it productive and interesting for you to include Baen titles in your curriculum. Our first guide is to a classic young adult title by Robert A. Heinlein: *The Rolling Stones*. We welcome your comments on this guide and your suggestions for future guides. Let us know how we can improve the guides for classroom use as well as any other ideas you have for using Baen books in your classroom.

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TEACHER'S GUIDE TO *THE ROLLING STONES* BY ROBERT A. HEINLEIN

Contents:

- recommended reading levels
- Heinlein biographical material and links
- background of the book and plot summary
- character sketches
- chapter guides include a more detailed plot summary and may also include some of the following:
 - prepare to read...
 - vocabulary
 - focus questions or initiating activity
 - plot summary
 - quiz/reading comprehension questions—multiple choice/short answer questions to testing reading comprehension
 - reflection and discussion questions—may be used to initiate classroom discussion, as short writing assignments, or as test questions
 - suggested activities/inquiry-based exploration—suggestions for activities and projects

Recommended reading levels: Heinlein's young adult or "juvenile" fiction appeals to readers of many ages, from early middle-school readers to adults. For use in the classroom, *Rolling Stones* is probably most appropriate for readers in grades 5-10. *Rolling Stones* has been listed on several recommended reading lists for children and young adults, including those of The Los Angeles Science Fantasy Society

("Recommended Reading for Children and Young Adults" by the staff of the Los Angeles Science Fantasy Society, revised December 2007, http://www.lasfsinc.info/index.php?option=com_content&task=view&id=95&Itemid=260#RRList) and The Golden Duck Awards for Excellence in Children's Science Fiction recommended reading list (<http://www.sff.net/rff/readlist/goldduckrl.htm>).

Biographical information on Robert Heinlein:

Robert Anson Heinlein is known as one of the "founding fathers" of modern science fiction. He was a prolific, successful, and at times controversial, contributor to the development of the genre. Born in Butler, Missouri on July 7, 1907, Heinlein graduated from the United States Naval Academy in 1929 and served in the Navy during the 1930's. Forced to retire from the Navy because of tuberculosis, he soon found another career in writing. He first published a short story in late 1939 in *Astounding Science Fiction*, one of the "pulp," magazines published on cheap (pulp) paper that catered to popular tastes for genre fiction (mystery, romance, detective, adventure, horror and science fiction stories, among others). He was a regular contributor to science fiction pulp magazines for the first several years of his career. He hit his stride as a novelist after World War II, publishing fourteen "juvenile" novels aimed at the young adult market as well as many novels for adults. Some of his most popular works are *The Puppet Masters* (1951), *Double Star* (1956), *The Door into Summer* (1957), *Stranger in a Strange Land* (1961), *The Moon is a Harsh Mistress* (1966), and *Time Enough for Love* (1973). Heinlein died in Carmel, California on May 8, 1988.¹ For more biographical details, see the following articles:

- The Robert Heinlein Society offers a biographical essay by William H. Patterson, Jr. (*The Heinlein Society*, <http://www.heinleinsociety.org/rah/biographies.html>) and further information about Heinlein's life and work (*The Heinlein Society*, <http://www.heinleinsociety.org/rah/FAQrah.html>).
- "Robert (Anson) Heinlein," *Biography.com*, <http://www.biography.com/articles/Robert-Anson-Heinlein-9333817>
- Carlos Angelo, "Heinlein," *Robert A. Heinlein: Dean of Science Fiction Writers*, <http://www.wegrokit.com/bio.htm>

Suggested class activity: Have your students read the information on Heinlein above before they begin the book. There are many parallels between Heinlein and Roger Stone, the father of the clan in *The Rolling Stones*. Ask them to make notes of similarities as they read and, when they finish, write an essay on how Heinlein put his own history, interests, and attitudes into the character of Roger.

¹ Sources for details of Heinlein's life are William H. Patterson, Jr., "Biographies of Robert and Virginia Heinlein: Robert A. Heinlein," <http://www.heinleinsociety.org/rah/biographies.html> (accessed July 20, 2010) and "Robert (Anson) Heinlein," *Biography.com*, <http://www.biography.com/articles/Robert-Anson-Heinlein-9333817> (accessed Jul 20, 2010).

For further information on Heinlein and his work:

- The most current and extensive website dedicated to Heinlein is that of The Robert Heinlein Society (<http://www.heinleinsociety.org/>). In addition to the biographical information linked above, the Society website includes news, essays, forums and many other interesting areas to explore.
- Another useful website is *RAH: The Robert A. Heinlein homepage* by James Gifford (<http://www.nitrosyncretic.com/rah/>). Although this web site is not currently being updated, it contains useful FAQs, essays and links on Heinlein's life and work.
- Another website that is not currently being updated, but which provides some interesting essays and biographical information is *Robert A. Heinlein, Dean of Science Fiction Writers* (<http://www.wegrokit.com/>).

Background: Scribner's first published *The Rolling Stones* in 1952. As William H. Patterson, Jr. points out in his introduction to the Baen edition, Heinlein's book taps into a particular strain in the American psyche which expressed itself after World War II in the desire of families to pick up, pack up and set out to explore America together. Although Heinlein projected this restlessness and spirit of adventure out into the solar system, its roots are deeply embedded in America's pioneer past. Steve A. Hughes, in his afterword to the Baen edition, "The Endless Frontier," provides a rich analysis of the story's roots in the mythos and sociology of the American Frontier.

Plot Summary: The lively Stone family—grandmother Hazel, father Roger, mother Edith, teenage twins Castor and Pollux, older sister Meade and younger brother Lowell ("Buster")—live in Luna City, an established human colony on the Moon. The twins, budding entrepreneurs, want to buy a used spaceship and become space traders. Their father refuses to let them pursue this scheme. Instead, the whole family sets out for Mars. The twins try another business and run up against Martian bureaucracy. Jailed for fraud, they are successfully defended by their Grandmother Hazel, one of the founders of Luna Colony. The family acquires a Martian life form called a "flat cat," which multiplies so rapidly that its progeny almost take over the ship and eat up all their supplies. Still thinking like businessmen, Castor and Pollux manage to make a profit off what could have been a disaster. Driven by the desire for more freedom and "elbow room," the family continues their adventures in the Asteroid belt before heading off to see Saturn's rings.

Characters:

- **Roger Stone** is the father of the Stone family as well as Heinlein's "stand-in" in the story. As a trained engineer and a working writer, Roger's skills and opinions reflect Heinlein's in many ways. Roger started writing on a bet that he could write better stuff than what was being channeled up from Earth. As the story opens he is

- writing a series called *The Scourge of the Spaceways*. He was Mayor of Luna City at one time.
- **Edith Stone** is Roger’s wife and mother of the children. She is also a medical doctor and the eye of calm in the maelstrom that is the Stone household. She is probably modeled, at least in part, on Heinlein’s wife Virginia.
 - **Castor and Pollux Stone** are fifteen-year-old twins. Like their mythological namesakes, they are inseparable. They are smart (and sometimes smart-alecks) who are brimming with energy, enthusiasm for life, and the desire to make a buck.
 - **Meade Stone** is the oldest Stone sibling, just turning 18 as the book opens.
 - **Lowell Stone**, a/k/a “Buster” is, at four years old, the youngest of the Stone siblings. He is a prodigy who can use a slide rule and beat his Grandmother at chess repeatedly. He is also telepathic, which may explain his chess victories.
 - **Hazel Stone**, Roger’s mother and grandmother to the kids is ninety-five years old and going strong. Hazel was one of the founders of the Lunar Colony. As she tells it, she was an engineer for the Atomic Energy Commission, but ran into bias against women, hit the glass ceiling and became a blackjack dealer instead. She successfully takes over Roger’s job of writing serials for an interplanetary broadcast adventure series.
 - **Captain Vandenberg** is captain of the spaceship *War God*. The Stones encounter the captain when illness breaks out on board his ship, and Edith goes on board to figure out a cure for the epidemic.
 - **“Dealer Dan” Ekizian** owns the used shipyard on Luna City where the Stones buy their ship.
 - **Tony Angelo** runs a shop on Mars where the twins go to peddle their bicycles.
 - **Joe Pappalopoulos** is the proprietor of the Old Southern Dining Room on Mars. He buys bicycles from the twins to start a bike touring business.
 - **Fuzzy Britches** is a “flat cat,” a mammalian life form indigenous to Mars. The boys buy him (her? it?) from Tony Angelo and give him to Buster. Flat cats are “pie-shaped masses of sleek fur,” friendly little creatures that have three eyes, no bones to speak of, an ingratiating purr, a soothing effect on humans and other hidden talents.
 - **Shorty Devine** is a miner the family encounters in the Asteroid belt. Dr. Stone sets his partner’s broken leg.
 - **Mayor Fries** is mayor of Asteroids. He wants to recruit Roger to serve on the Citizen’s Committee and talks Dr. Stone into serving as their doctor.
 - **Judge Warburton** presides over the trial of Castor and Pollux for fraud. Luckily, Hazel knew his grandfather.

CHAPTER SUMMARIES

Chapter I—The Unheavenly Twins

- prepare to read:
 - vocabulary

- superannuated
 - pogo stick
 - ballistic
 - astrogation
 - thorium
 - asteroid
 - Jovian
 - Dantesque
 - trajectory
 - scourge
 - gyros

- focus question/initiating activity: What is the significance of the names of the twins? Have your students explore two layers of meaning: the mythological (see “Castor and Pollux,” *Myths Encyclopedia: Myths and Legends of the World* at <http://www.mythencyclopedia.com/Ca-Cr/Castor-and-Pollux.html>) and the astronomical (Tami Plotner, “Astronomy for Kids: Gemini—Twins Everywhere! *Astronomy for Kids*, <http://www.universetoday.com/2010/03/14/gemini-twins-everywhere/>)

- chapter summary: In this chapter, we are introduced to the Stone family, who live in an apartment in Luna City on the Moon. The lively family consists of parents Edith and Roger, grandmother Hazel, older sister Meade, twins Castor and Pollux, and younger brother Lowell (a/k/a “Buster”). As the story opens, the fifteen-year-old twins are visiting used space ship lots, dickering for a deep-space ship. Budding entrepreneurs, they plan to become traders and get rich by taking goods out to the Asteroids and bringing back high-grade rocket fuel. Their father flatly opposes the plan. He doesn’t want them to waste their savings, and he wants them to go to college on Earth. Hazel suggests that he go in with the twins on a ship. Roger, an engineer-turned-author, tries to get out of the conversation by pointing out that he has to write an episode of his “space cast” serial *Scourge of the Spaceways*. Hazel bets she can take over writing the *Scourge* episodes.

- quiz/reading comprehension questions:
 1. The twins want to buy a space ship
 - (a) for sightseeing
 - (b) to run away from home
 - (c) for interplanetary trade
 - (d) to get to school on Earth

 2. When the reader first meets four-year-old Lowell, he is
 - (a) taking a nap
 - (b) beating his grandmother at chess

- (c) at nursery school
 - (d) watching space-vision
3. Roger Stone makes his living as
- (a) a writer
 - (b) a doctor
 - (c) an engineer
 - (d) a shuttle pilot
4. When the twins first tell him of their plan to buy a spaceship, their father
- (a) is proud and enthusiastic
 - (b) says he'll lend them the money
 - (c) vetoes the plan

Answers: 1-c, 2-b, 3-a, 4-c

- suggestion for reflection and discussion: Heinlein's female characters are unusually strong for the time in which he wrote (1951). What do you notice about Heinlein's depiction of the female characters in this first chapter?

Chapter II—The Second-Hand Market

- prepare to read:
 - focus questions or initiating activity
 - Have you students research the Marquis of Queensbury. What does he have to do with the dispute between Hazel and Roger?
- chapter summary: Relieving Roger of the burden of writing the *Scourge of the Spaceways* episodes, and getting rid of his excuses for the family to go adventuring, Hazel has an episode ready by morning. She announces her plan to kill off all his characters to set him free from the “golden treadmill” of royalties he has created for himself. Resentful but defeated, Roger capitulates and goes with the twins to shop for ships. We learn that a bit more about the youngest child, Lowell (a/k/a “Buster”). He is a chess whiz who regularly beats his grandmother at chess by reading minds. He can also use a slide rule at the age of four.
- Quiz/reading comprehension questions:
 1. What new character does Grandmother Hazel invent when she takes over writing the *Scourge of the Spaceways* serial?

- (a) a female captain
 - (b) an alien science officer
 - (c) Doc Ellen, a no-nonsense ship's doctor modeled after her daughter-in-law
 - (d) a new villain, the Galactic Overlord
2. Who or what is the Marquis of Queensbury?
- (a) British nobleman who invented the modern rules of boxing
 - (b) the head of RCA in New York
 - (c) the name of the hero's ship in *Scourge*
 - (d) the villain in *Scourge*
3. What does Roger offer to do with the twins?
- (a) help them with their math homework
 - (b) go shopping for spaceships
 - (c) play chess
 - (e) help them with their college applications to Harvard

Answers: 1-d, 2-a, 3-b

- Suggestion for reflection and discussion: Heinlein started his writing career with short stories for “pulp magazines.” Have your students research the “pulp” and, as they read, reflect on what this chapter says about Heinlein’s attitude toward writing.

Chapter III—The Second-Hand Market

- prepare to read:
 - vocabulary
 - salvage
 - centrifugal force
 - conjecture
 - syndicate
 - incoherent
 - focus question/initiating activity: In this chapter, Hazel carries a gun with her on their trip into Luna City. When Castor asks her why she bothers to take a gun, she refers to the reason the White Knight gave Alice for keeping a mouse trap on his horse. When Castor doesn't understand the allusion, she tells him to look it up. Have your students find the passage in *Alice* and figure out the connection. See: *Lenny's Alice in Wonderland*

Site, *Alice In Wonderland*, Chapter 8 (<http://www.alice-in-wonderland.net/books/2chpt8.html>)

- chapter summary: Roger, Hazel, Castor and Pollux go to find a ship. Roger insists that he's simply looking for a vessel in which the family can "take an occasional pleasure trip." We find out more about Grandma Hazel's character and background. She carries a gun into Luna City, which causes comment among arriving tourists. She snorts in disgust that Luna is "just like any other ant hill" and expresses the desire for more elbow room. She was one of the founding figures of the original lunar colony, and Luna is getting too civilized, bureaucratic and crowded for her independent tastes. She also proves to be a shrewd bargainer, and proposes to "Dealer Dan" Ekesian, the owner of the shipyard, that they form a syndicate. He gives her the ship they want, she provides the cargo, and she and the twins take the cargo to the Asteroids for profit. Roger recognizes this for the blackmail that it is, gives in and buys the ship outright to put an end to this scheme.
- quiz/reading comprehension questions:
 1. When explaining why she carries a gun, Hazel alludes to the White Knight's reason for keeping a mouse trap on his horse. Alice says that it's unlikely that there will be mice on the horse. The White Knight
 - (a) agrees, but says "if they do come, I don't choose to have them running all about."
 - (b) agrees and throws away the mouse trap
 - (c) disagrees and points to a mouse on the horse's mane
 2. When they go to the shipyards, Roger Stone says he is in the market for
 - (a) a jumpbug
 - (b) a Detroiter
 - (c) a conservative family ship
 - (d) a commercial freighter
 3. At one point, Hazel says "this city life is getting us covered with moss." How does her statement relate to the book's title and the family's name?

Answers: 1-a; 2-c; 3—The old saying "A rolling stone gathers no moss."
- suggestion for reflection and discussion: How do Hazel's attitude toward guns, her reference to Luna City as an "ant hill" and her desire for "elbow room" reveal her background and character? How does she serve as a catalyst for the family's adventures to come?

- suggested activities/inquiry-based exploration: Hazel’s attitude toward guns reflect her experiences as one of the “frontier settlers” of Luna Colony. Have your students explore the role of guns in the founding of the American colonies and/or in frontier life in the Western United States.

Chapter IV—Aspects of Domestic Engineering

- prepare to read:
 - vocabulary
 - anarchistic
 - reciprocating
 - metallurgical
 - orthodox
 - culmination
 - tensor calculus
 - quantum theory
 - focus question/initiating activity: What life-lesson do the twins learn in this chapter? Do you think their father was too strict? Why or why not?
- chapter summary: The family overhauls the ship to get her ready for space, with most of the work done by Castor, Pollux, and Grandmother Hazel. Even though the twins are brilliant and have a natural talent for mechanics, their inexperience and eagerness to save time get them in hot water with their father. Roger finds out that, contrary to his specific instructions, they used the old, original gaskets on the ship. He considers this both dangerous and insubordinate. They learn a valuable lesson when their poor decision puts them days behind in the overhaul. Captain’s orders are always to be obeyed! Although Roger originally had planned to leave the twins behind to continue their schooling, this incident convinces him that they need to come along so that they can get used to real ship’s discipline. The family debates a new name for the ship and finally settles on *The Rolling Stone* (from the old saying, “A rolling stone gathers no moss”).
- quiz/reading comprehension questions:
 1. Who does most of the work to get the ship ready?
 - (a) Castor and Pollux
 - (b) Hazel
 - (c) Roger
 - (d) mechanics from Luna City
 2. The new ship needs a name. The family finally decides on

- (a) *The Clunker*
- (b) *Viking*
- (c) *H.M.S. Pinafore*
- (d) *The Rolling Stone*

3. Roger decides that the first stop in their family trip will be

- (a) Venus
- (b) Saturn
- (c) Mars
- (d) Earth

Answers: 1-a, 2-d, 3-c

- suggestion for reflection and discussion: Discuss the three stages of technology Heinlein lays out in this chapter. What are the characteristics of each stage? Which stage does the automobile represent? Do you agree with his opinions of cars?
- suggested activities/inquiry-based exploration: Hazel and Roger both have somewhat unusual views of education. Discuss their views—do you agree or disagree with each of them? If you had to leave school to go on a space voyage with your family, and could only learn from tapes, DVDs, books, “space casts,” and the members of your family, what curriculum would you set up to keep learning? What do you think are the most important things to learn for your future?

Chapter V—Bicycles and Blast Off

Prepare to read:

- vocabulary
 - lateral
 - hydraulic
 - esoteric
 - hydroponics
 - gravity well
 - cadmium
- focus questions/initiating activity: As you read, make notes for discussion on the ways that recycling is important for space travel and how the environment of a space ship mimics the larger environmental cycles of Earth.

- chapter summary: *The Rolling Stone* is moved to the space port. The reader learns more about how Heinlein envisions the technology of space travel, including rockets and recycling. Castor and Pollux have brought cargo on board that they hope to sell to the miners on Mars. When Roger looks over the cargo, he realizes that they have included all the grain and equipment necessary to make moonshine. When Roger refuses to allow them to become whiskey distillers, they are forced to come up with another business. They settle on the idea of exporting bicycles, a common form of transportation for the miners. With that settled, the Family Stone blasts off for Mars.
- quiz/reading comprehension questions
 1. What is Castor and Pollux’s first idea for a business on Mars? Why does their father forbid it?
 2. What is their default idea for a business?

Answers: 1-The twins plan to make grain alcohol (moonshine) to sell to the miners. Roger vetoes this because it is illegal. 2—rehabbing used bicycles (a common form of transportation on Mars) and selling them to the miners.
- suggestion for reflection and discussion: Split the class into teams and have them come up with an idea and a plan for what they think would be a successful business on Mars (given what they know from their reading about its stage of development).
- suggested activities/inquiry-based exploration: How do Heinlein’s predictions about the technology in this future world play out? Recycling? Rockets? Film spools? Ask students to pick one of his technological predictions and do research to find out how close he was (or wasn’t). See Steve A. Hughes afterword to the Baen edition for ideas.

Chapter VI—Ballistics and Buster

- prepare to read:
 - vocabulary
 - brennschluss (see: *Wordnik*, “Brennschluss,” <http://www.wordnik.com/words/brennschluss>)
 - doppler-radar
 - free fall
 - perigee
 - hyperboloid
 - ellipsoid

- salubrious
- initiating activity: Ask your students to try one or more of the activities in the interactive lesson “Free Fall: Activities You Can Do At Home” at the website of National Air and Space Museum's Educational Services Department and be prepared to discuss their results.
<http://www.nasm.si.edu/exhibitions/gall109/lessons/text/freefall.htm>
- chapter summary: Free fall is hard on everyone, but especially those who have never experienced it before. During free fall, Buster throws up and passes out. Unfortunately, some people are never able to adjust to free fall. If Buster isn't able to tolerate it, they will have to go back to Luna, aborting their trip to Mars. After an anxious time, they discover that Buster wasn't having a reaction to free fall but to the sedative his mother gave him to help him through it. The twins surprise their parents by voting to abort their trip and go back to Luna so as not to risk their brother's health further. Although he is touched by the “family solidarity,” their father assures them that Buster is fine.
- quiz/reading comprehension questions:
 1. A sudden crisis almost makes the family turn back. What happened?
 2. Why are collisions between spaceships almost unheard of?

Answers: 1—Buster gets very sick during free fall, and it turned out that he was allergic to the sedative his mother had given him to help him through the trauma of free fall. 2—“Space is very large and ships are very tiny.”

Chapter VII—In the Gravity Well

- prepare to read:
 - vocabulary
 - kinetic energy
 - focus question: What are some of the things Heinlein points to that make space navigation so tricky?
- chapter summary: The Stones plan to use a maneuver to gain kinetic energy from the Earth's gravity well, a very tricky bit of navigation, to save energy on their trip to Mars. Suddenly, the blip of a radar beacon appears on their radar screen. They appear to be on a collision course with the vessel indicated by the blip, but it veers off at the last minute. It turns out to be an experimental rocket satellite from

Harvard Radiation lab. With the maneuver accomplished, they are on their way to Mars.

- quiz/reading comprehension questions:
 1. When they leave the Moon on route for Mars, the Stones make their ship go faster with less fuel by
 - (a) heading straight for Mars
 - (b) dropping first toward Earth
 - (c) taking an elliptical trajectory toward the Sun
 2. They see an unexpected radar-beacon blip on the screen and come close to colliding with it. It turns out to be
 - (a) a spaceship traveling to the Moon
 - (b) a bomb rocket from Mars
 - (c) an experimental rocket satellite of Harvard Radiation Laboratory

Answers: 1-b, 2-c

- suggested activity/inquiry-based exploration: Discuss Heinlein's explanation of why a ship leaving the Moon for a distant planet can go faster on less fuel by dropping first toward Earth. Explore kinetic energy through some of the activities suggested at the website for the state of Wisconsin's K-12 Energy Education program: "What is Energy? Activities and Experiments," <http://www.uwsp.edu/cnr/wcee/keep/Mod1/Whatis/experiments.htm>

Chapter VIII—The Mighty Room

Prepare to read:

- vocabulary
 - Procrustean
 - Arcturus
 - Hippocratic Oath
- focus question/initiating activity: When she reads the ship's schedule Roger has put together, Hazel asks whether they are headed to Botany Bay. Have your students find the historical background for this allusion.
- chapter summary: Now that they're safely headed to Mars, Roger posts a "Ship's Routine," which includes several hours of school. Hazel spends part of her time working on more episodes of *Scourge of the Galaxy*, since she picked up Roger's option to do several more episodes. In addition to starting intensive math study,

the twins start working on their trade bicycles, using spacesuits to work outside the ship. They encounter another ship, the *War God*, and find that there is sickness on board. Dr. Stone agrees to do what she can for the sick, and the ships “match” so that she can make the transition. The Stones are forced to jettison much of their cargo, including the boys’ bicycles. They wire all the jettisoned cargo together and rig a radar reflector, hoping they will be able to come back and pick it up later. Edith says goodbye to her family, telling them that she’ll see them on Mars. She can’t risk bringing a disease back to *The Rolling Stone*.

- quiz/reading comprehension questions

1. Roger finds out that the twins cheated at school. How did they do it and what effect does it have?

2. When they encounter another ship called the *War God*, what problem does it bring with it and what is the consequence for the Stone family?

Answers: 1- Castor took both courses in analytical geometry and Pollux took both courses in history. The effect, as Roger says, is that “such offenses carry their own punishments. When you need it, you don’t know it worth a hoot.” 2—There is an epidemic spreading on the ship, and Dr. Edith goes to the *War God* to see what help she can give them.

- suggestion for reflection and discussion: When the twins are outside the ship, Heinlein says, “They had forgotten how cold and unfriendly the black depths around them had seemed only a short time before. Now it was an enormous room, furnished in splendor, they not yet fully inhabited. It was their own room, to live in, to do with as they liked.” Discuss the idea of humanity “moving out” and inhabiting space. Do you find the idea frightening or exciting? Why do you think we as a species haven’t moved out and inhabited more of space?
- suggested activities/inquiry-based exploration: Since the advent of the Space Shuttle Program, we have seen many instances of astronauts going outside the shuttle to do experiments or repairs. Show your class some of the videos of these space walks and have them compare the equipment with that worn and used by the twins when they go outside the *Rolling Stone*. How accurate were Heinlein’s speculations?

Chapter IX—Assets Recoverable

- prepare to read:
 - vocabulary
 - epidemic

- quarantine
 - jettison
 - rendezvous
- chapter summary: The family finds it difficult to cope with Dr. Stone’s absence. Lowell has temper tantrums, and Roger has difficulty keeping his own temper in check. When Edith is able to communicate with them, she tells them that the problem on the *War God* may be a mutant strain of measles. Since Roger and the children have never had measles, this further confirms her decision not to return to the *Rolling Stone*. When she refuses to return calls from them the next day, they deduce that she has caught the disease. Even though she continues to refuse to talk to them, they get second-hand reassurance that she has made enough progress on a treatment that all of the new cases are “doing nicely.” Since the ship is under quarantine, Roger decides that he can’t abandon the rest of his family to go to her, since most of them are too inexperienced to bring the *Rolling Stone* safely to port on their own. The captain of the *War God* survives the epidemic and offers to link up with the *Rolling Stone* to give them Super-H fuel. With the new fuel, they can make the detour to pick up their jettisoned cargo.
- quiz/reading comprehension questions
 1. The disease that has infected the crew of the *War God* was probably
 - (a) small pox
 - (b) space fever
 - (c) a type of encephalitis
 - (d) a mutant strain of measles
 2. What happened to the bicycles the twins had to jettison?
 - (a) The captain of the War God gives them enough extra fuel to go back and recover them.
 - (b) They had to abandon the cargo and get Dr. Stone, who is still very ill, to Mars for treatment.
 - (c) Unscrupulous space traders steal the bikes.

Answers: 1-d, 2-a

Chapter X—Phobos Port

- Prepare to read:
 - vocabulary
 - slag

- incredulous
 - escape velocity
 - winch
- focus question: Mars has two tiny moons—Phobos and Deimos. What is the significance of their names?
- chapter summary: When they land on Phobos, the family finds out the Dr. Edith and the *War God* are already in port, but still under quarantine. Roger goes to try to get in to see his wife, but is only able to see her through a porthole. Since he has brought the rest of the family into port safely, Roger decides to go into quarantine with Edith. He leaves Hazel in command.
- quiz/reading comprehension questions
 1. What are the two moons of Mars?
 2. Why is the force of gravity less on Phobos than on Earth?
 3. What decision does Roger make at the end of the chapter?

Answers: 1—Phobos and Deimos; 2—less mass; 3—to go into quarantine with his wife on the *War God*.
- suggested activities/inquiry-based exploration:
 - One way that planets and moons differ is in force of gravity. Explore the phenomenon of planetary gravity. See this lesson plan for younger students on planetary gravity: “Gravity and Weight on Other Planets,” *Teachervision*, <http://www.teachervision.fen.com/planets/lesson-plan/353.html>. See also: Abby Cessna, “Gravity on Other Planets,” *Universe Today*, <http://www.universetoday.com/guide-to-space/the-solar-system/gravity-on-other-planets/>.
 - Have groups of student invent a low-G sport or modify a sport to the gravity on Phobos.
 - Let students figure out what their weight would be on Mars and the other planets of the solar system at this website: “Your Weight on Other Worlds,” *Exploratorium—the Museum of Science, Art and Human Perception*, <http://www.exploratorium.edu/ronh/weight/>

Chapter XI—Welcome to Mars!

- Prepare to read:
 - vocabulary

- truncated
 - terrestrial
 - extortionate
- focus questions/initiating activity: Have your students do some research on Mars. What conditions on Mars would make it possible to have a colony there? What conditions would cause difficulties for human habitation?
- chapter summary: Roger, of course, catches the disease that has plagued the *War God*, extending the quarantine for everyone. The rest of the family takes the shuttle from Phobos to Mars Port, a very expensive trip. They immediately run into Martian bureaucracy. They find they all have to pay an entry fee for off-worlders, and Hazel is outraged to discover that her gun is banned in the city limits. Rejecting hotels as much too expensive, they look for an apartment. They finally find one at Casa Mañana.
- suggestions for reflection and discussion:
 - Why are things so expensive on Mars? How does this fit in with the twins' plans to sell used bicycles?
 - Discuss Heinlein's attitude toward bureaucracy and government interference as reflected in this chapter.

Chapter XII—Free Enterprise

- Prepare to read:
 - vocabulary
 - capital crime
 - Greenwich time
- chapter summary: Castor and Pollux go out to peddle their bikes. They visit the shop of Tony Angelo. They try to sell him on the idea of their used bikes. In the process, he sells them a creature called a flat cat. Their little brother has been disappointed at not seeing any “real Martians,” so they buy this indigenous creature for him. The flat cat is a pie-shaped, boneless being with sleek fur and a talent for purring and snuggling. They name their new acquisition “Fuzzy Britches.” Mr. Angelo isn't interested in their used bikes, since he already has an oversupply. It turns out that miners are moving out of Mars and on to the Hallelujah Node, a rich strike of uranium and core metals out in the Asteroid belt. Since their bike scheme is a bust, they try to figure another way to make money. They get the idea to enter Buster in the Mars chess championship contest next month and bet on him. Since Buster is telepathic and wins by reading people's

minds, they reluctantly conclude that this scheme would be unethical. They talk about at least using the bikes to get around themselves, then Pollux has a brainstorm—start a bike rental service for tourists! Since they are at the Old Southern Dining Room having lunch when they have this brilliant idea, they pitch the idea to the owner Joe Pappalopoulos. Since his restaurant is a natural gathering place for tourists, they sell him on the idea of buying their bikes and getting tour guides to operate in front of the restaurant.

- quiz/reading comprehension questions:
 1. What goes wrong with Castor and Pollux’s plan to sell used bikes to miners?
 2. What is the Hallelujah Node?
 3. What is a flat cat?
 4. What new scheme do they come up with to make a profit on the bikes?

Answers: 1—many of the miners are leaving Mars and going out to the Asteroids where there has been a “strike”; 2—the “strike” that is attracting miners, a rich source of metals out in the Asteroids; 3—a native Martian animal, a pie-shaped, boneless creature with sleek fur and a talent for purring and snuggling; 4—they sell a local restaurant owner on the idea of buying the bikes and setting up a tourist operation.

- suggested activities/inquiry-based exploration: Have your students do research on the Gold Rush and compare what they find with the situation in this chapter.

Chapter XIII—Caveat Vendor

- Prepare to read:
 - vocabulary
 - impassively
 - fraud
 - sovereignty
 - tariff
 - embargo
 - confiscation
 - nefarious
 - Machiavellian
 - hellions
 - multifarious
 - ramifications

- focus question/initiating activity: Ask your students to look up the phrase *caveat emptor*. How does it relate to the chapter title and the plot of this chapter? See: “Caveat Emptor,” *Answers.com*, <http://www.answers.com/topic/caveat-emptor>
- chapter summary: As an unfortunate side effect of their brilliant deal with Pappalopoulos, the twins are thrown in jail for fraud and conspiracy to evade custom duties. Mars has a strong selective tariff, since they are forced to import many things but have little to export. Bikes used for pleasure are classified as luxury items. Since the twins didn’t pay the tariff, they are subject to the 40% tax, plus 40% penalties and confiscation of the bikes. “Poppa” is suing for fraud because the bikes were impounded for unpaid duty penalties. Hazel acts as the twins’ defense counsel. It turns out that the judge, like Hazel, is from one of the founding families of Luna. She gets the twins off the hook by persuading the judge that the bikes are “articles of production” instead of luxury goods, since they produce valuable credits needed on Mars. To teach the twins a lesson, she takes two-thirds of their profits as her fee for defending them. They also find out that their bikes are subject to a “profit tax.” Once they give Hazel her cut and figure the taxes, their whole bike moneymaking scheme only nets them a few cents.
- quiz/reading comprehension questions
 1. The twins are thrown in jail for
 - (a) buying the flat cat—it’s an endangered species
 - (b) disorderly conduct
 - (c) fraud and conspiracy to evade custom duties
 2. Who acts as the boys’ defense counsel?
 - (a) Hazel
 - (b) Roger
 - (c) Lowell
 - (d) Edith
 3. Approximately how much profit do the twins end up making on their bike enterprise?
 - (a) 50,000 credits
 - (b) \$1,000 dollars
 - (c) \$50 dollars
 - (d) \$.05 dollars

Answers: 1-c; 2-a; 3-d

- suggestions for reflection and discussion: Do you think the taxes on the twins' bikes are fair? Why or why not? How do you think Heinlein feels about taxes? Support your position.

Chapter XIV—Flat Cats Factorial

- Prepare to read:
 - vocabulary
 - factorial
 - predestination
 - determinist
 - exponential
 - initiating activity: Have your students explore the concept of exponential growth. Older students may want to look at this lesson, “Exponential Functions: Introduction,” *Purple Math*, <http://www.purplemath.com/modules/expofcns.htm>. You may want to use one of these images from Google.com to illustrate the problem with the flat cats:
http://www.google.com/images?hl=en&rlz=1G1GGLQ_ENUS256&q=exponential+growth&um=1&ie=UTF-8&source=univ&ei=3H5ITJybKsTflgAYdjYCw&sa=X&oi=image_result_group&ct=title&resnum=11&ved=0CGcQsAQwCg&biw=1024&bih=580
- chapter summary: Since Buster remains disappointed at not meeting the “real Martians,” Captain Vandenberg offers to arrange a meeting. He and Buster visit the treaty town of Richardson for three days. The “real Martians,” are reclusive and secretive, so Buster has to promise not to discuss this meeting with anyone. The Stones are fed up with the crowded conditions in their apartment, and the owner reneges on a promise to find them more spacious quarters. At first, they decide not to remain on Mars but to go on to Venus. The twins, however, aren't enthusiastic about the Venus plan. They suggest that their parents and other siblings go on to Venus, while they head to the Hallelujah Node with Hazel as pilot. When Roger refuses to countenance this plan, the twins say that their preferred plan all along was that they *all* go to the Asteroids. They propose that the family pay for the trip by offering “cold sleep” space to miners going to the Node. Since only one in five people in cold sleep live through it, Roger rejects this idea. Undeterred, the twins propose that they go as miners themselves, and Grandma Hazel seconds the motion. Roger gives in to the idea of the whole

family going, and they head to the Asteroids, a six-week trip. They decide to pay extra for a cometary orbit to save time, and Hazel grinds out more Galactic Overlord episodes to pay for the trip. Roger tells the twins to go ahead with their mining scheme if they really want to, but he suggests that “a man can do more productive work, and make more money if that is his object, by sitting down with his hands in his pockets than by any form of physical activity.” Hazel suggests that the way to really make money is on the things miners need: hardware, groceries, and laundry. The boys take her advice and take cargo to set up a grocery/general store, with some drugs, vitamins and “spools” for entertainment. Fuzzy Britches, the flat cat, has kittens (eight to be exact). Sixty-four days later each kitten has eight kittens of its own. Each of those kittens.... Realizing that the ship will soon be literally littered with flat cat litters, the Stones decide they have to put a stop to it. Since Martian creatures hibernate in the cold, they put the flat cats into cold storage to stop the breeding while they figure out a more permanent solution.

- quiz/reading comprehension questions
 1. What does Buster tell his family about the nature of the ‘real Martians’ he meets?
 2. What is the first idea Castor and Pollux have about how to pay for the family trip to the Asteroids?
 3. Why does Roger refuse to be part of this plan?
 4. What business do they decide to get into instead?
 5. How do they solve the immediate problem of the proliferating flat cats?

Answers: 1—nothing; 2—to transport miners in cold sleep; 3—because most of the people who go into cold sleep don’t live through it; 4—they decide to become shopkeepers (groceries, drugs, vitamins, etc.); 5—putting them in “cold storage” (since Martian creatures hibernate in the cold, it will stop them breeding until they can come up with a more permanent solution).

- suggested activities/inquiry-based exploration:
 - Have your students research and discuss the viability and ethical implications of human cryogenics.
 - Watch “The Trouble With Tribbles,” an episode from the original *Star Trek* television series. For a discussion of the similarities between Chapter XIV of *The Rolling Stones* and the *Star Trek* episode, see David Eversole’s article, “The Trouble With Flat Tribbles,” *Orion Press*, http://www.fastcopyinc.com/orionpress/articles/trouble_with_flat_tribbles.

[htm](#). Heinlein himself said he may have been influenced, at least subconsciously, by Ellis Parker Butler’s 1905 story about proliferating guinea pigs (“Pigs is Pigs,” *Wikipedia*, http://en.wikipedia.org/wiki/Pigs_is_Pigs_)

Chapter XV—“Inter Jovem et Martem Planetam Interposui”

- prepare to read:
 - focus question/initiating activity: Have your students look into Bode’s Law. See “Bode’s Law,” at Cornell University’s course website “Astronomy 2201: The History of the Universe, Fall 2010,” http://www.astro.cornell.edu/academics/courses/astro201/bodes_law.htm.
- chapter summary: On their approach to the Asteroids, the family get a call from City Hall informing them that they are going too fast on approach. This incites the usual complaints from Roger and Hazel about interfering bureaucrats. Suddenly, someone comes knocking at the “door” (hatch). The visitor is Shorty Devine, a miner. He had heard there was a doctor on board. He is seeking help for his partner, who has broken his leg. Dr. Stone and Roger go with him, leaving Hazel in charge.
- quiz/reading comprehension questions
 1. What is Bode’s Law?
 2. Edith is pressed into duty as a doctor once again. What problem is she asked to help with this time?
 3. What is the name of the capital city of the Asteroids?

Answers: 1—a rule for planetary distances; 2—a miner named Shorty Devine comes to their ship asking for help for his partner who has broken his leg; 3—Rock City.

Chapter XVI—Rock City

- Prepare to read:
 - vocabulary
 - torus ring
 - arbitrary
 - abyss

- proclamation
 - initiating activity: Ask your students to do some research into the characteristics of the Asteroid belt and some of the different ideas about its origins.
- chapter summary: The Asteroid belt is vast and very thinly populated. The fact that it has a human population at all, Heinlein implies, is testament to human ingenuity and drive. The Mayor of Rock City tries to recruit Roger for Citizen’s Committee and Dr. Stone to function as their doctor. Edith agrees to tend the sick while she is there. The twins go to Charlie’s Hole (a local shop) hoping to find a scooter to do some sightseeing. They end up trading some chocolate and a flat cat for scooter parts.
- quiz/reading comprehension questions
 1. The Asteroid Belt is shaped like
 - (a) a doughnut
 - (b) a hemisphere
 - (c) a helix
 - (d) an ellipse
 2. Why does Heinlein call the three thousand inhabitants of the asteroid belt who live outside the larger planetoids the Belt’s “floating population”?
 - (a) because they split their time between the Belt and Earth
 - (b) because they are transients
 - (c) because they are migrants from Luna
 - (d) because they live and work in free fall
 3. What do the twins trade the owner of Charlie’s Hole for scooter parts?
 - (a) one of their sister’s paintings
 - (b) books
 - (c) a flat cat and some chocolate
 - (d) they agree to sweep out the shop

Answers: 1—a; 2—d; 3—c

- suggestion for reflection and discussion: In spite of the harsh conditions in the Asteroid belt, Heinlein says, “Wherever there is power and mass to manipulate, Man can live.” Have your students read the transcript of a 1952 radio broadcast by Heinlein (Robert A. Heinlein, “This I Believe,” The Heinlein Society, <http://www.heinleinsociety.org/rah/thisibelieve.html>). Have them write and/or

discuss Heinlein's faith in humanity and how it is reflected specifically in this chapter and in the book so far.

Chapter XVII—"Flat Cats Financial"

- chapter summary: Castor and Pollux make a scooter. The miners set up a stand-by taxi service for Dr. Stone to enable her to go see anyone who needs her services. The twins decide to peddle their over-supply of flat cats and decide to start a "suit radio" program (the miners can receive radio signals through their helmets). The show is their advertising vehicle -- a music and chat show with lots of commercials. The show isn't very good, but it's free.
- quiz/reading comprehension questions

1. How does Dr. Stone get around the Belt to see patients?

- (a) the miners set up a taxi service for her
- (b) jet packs
- (c) her own scooter
- (d) trick question – they have to come to her

2. How do the twins peddle their oversupply of flat cats?

- (a) set up a "pet shop" in Charlie's Hole
- (b) use their scooter to take flat cats to miners on a trial basis
- (c) start advertising on a "suit radio" program that they create
- (d) set up a stand outside City Hall

Answers: 1—a; 2—c

- suggestion for reflection and discussion: Do you think the twin's suit radio show is a satire of television and/or advertising? Discuss.

Chapter XVIII—The Worm in the Mud

- Prepare to read:
 - vocabulary
 - chattel
 - hemispherical
 - sloven

- chapter summary: Dr. Stone needs to make a house call on a patient. Buster and Grandmother Hazel decide to go with her, so they take the twins' scooter. Since Dr. Stone needs to stay with the patient, Hazel and Buster decide to go back by themselves. On the way, they have gyro problems and can't navigate. Adrift, they're running out of oxygen and Hazel gives hers to Buster. The problem turns out to be the fault of the twins, since they left the scooter with faulty gyros and didn't log it in. Castor and Pollux get Old Charlie to take them out on his scooter to search, and they find Hazel and Buster just in time to revive their grandmother.
- quiz/reading comprehension questions
 1. Why do Hazel and Buster and up by themselves in the twins' scooter?
 2. What caused the scooter problem that almost results in a tragedy for the family?

Answers: 1—they have gone with Dr. Stone to visit a patient. When the doctor decides to stay with the patient, they take the scooter and head for home; 2—the twins left the scooter with faulty gyros and didn't log it in.
- suggestion for reflection and discussion: Write and/or discuss Hazel's "worm that crawled up out of the mud" story. How does this story exemplify the Stone family as well as Heinlein's attitude toward humanity. What does it have to do with space exploration?

Chapter XIX—The Endless Trail

- Prepare to read:
 - vocabulary
 - fakir
 - gore
- chapter summary: When they get ready to leave for Ceres, the Stones are made honorary citizens of Rock City. Hazel decides to go on alone to Titan, since she's always wanted to see the rings. When Roger asks her why, she says, "I've never seen the Rings. That's reason enough to go anywhere. The race has been doing it for all time. The dull ones stay home—and the bright ones stir around and try to see what trouble they can dig up." The whole family decides to join Hazel and sets out for Titan, joining the thousands of others "outward bound" to the ends of the universe.
- quiz/reading comprehension questions

1. How does Hazel survive her brush with death in the twins' scooter?
2. Where is the Stone family heading at the end of the book?

Answers: 1—she uses the ancient fakir's trick of breathing as shallowly as possible and going quickly into a coma to conserve oxygen; 2—Titan

Suggestions for more extended papers/projects, which allow students to reflect on major themes in the book as a whole:

- Have students read Steve A. Hughes' "Afterword: The Endless Frontier" and write papers or do projects on the parallels between the Stone family and the three stages of development in the Westward expansion that Hughes outlines.
- Heinlein might be called a humanist, a conservative, or a libertarian (among other things). Have students explore one or more of the major themes of the book (entrepreneurship, desire for independence from government bureaucracy, family instead of government as the foundation of the good life, the interrelationship between science and human evolution, education, moral responsibility) in light of one or more of the political/philosophical positions listed above.
- Another of Heinlein's major themes is the human need to always be "outward bound." What frontiers (physical, spiritual, intellectual, or in any other sense) do you want to explore?