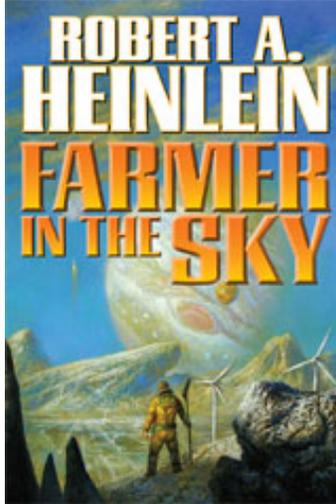


TEACHER'S GUIDE TO *FARMER IN THE SKY*
BY ROBERT A. HEINLEIN



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, and much of his earlier work can also be read by young adults although they were originally marketed to older readers. For use in the classroom, *Farmer in the Sky* is probably most appropriate for readers in grades 5-10. *Farmer in the Sky* has been listed on several recommended reading lists for children and young adults, including The Golden Duck Awards for Excellence in Children's Science Fiction recommended reading list (<http://www.goldenduck.org>).

Biographical information on Robert Heinlein:

Robert Anson Heinlein is considered to be one of the best, if not the best, writers of science fiction of all time. He was a prolific, commercially and critically successful, and, at times, controversial contributor to the genre. He was born in Butler, Missouri, on July 7, 1907, and graduated from the United States Naval Academy in 1929. Heinlein served in the Navy until 1934, but was forced to retire because of tuberculosis. After a few failed business and political ventures, he decided to try writing and sold “Lifeline,” a short story, in 1939 to *Astounding Science Fiction*, which was a “pulp” magazine. These were periodicals published on cheap (pulp) paper that catered to popular tastes for genre fiction (mystery, romance, detective, adventure, horror, and science fiction). 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 *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), and four of his novels won the Hugo Award, which is presented at the annual World Science Fiction Convention. Heinlein wrote the screenplays for two movies: *Destination Moon* (1950) and *Project Moonbase* (1953), and two of his novels have been adapted into films: *The Puppet Masters* (book, 1951; film, 1994) and *Starship Troopers* (book, 1959; film, 1997). His novel *Space Cadet* (1948) also inspired the television show *Tom Corbett, Space Cadet* (1950-1955). Heinlein died in Carmel, California, on May 8, 1988. 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>).

Suggested class activity: Have your students read the information on Heinlein above before they begin the book.

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/>).

- There are several critical studies of Heinlein's work that are available in book form. The first and still one of the best is *Heinlein in Dimension* by Alexei Panshin (Chicago: Advent: Publishers, Inc., 1968). Panshin devotes three paragraphs to *Farmer in the Sky* and refers to it elsewhere in the book. A study that focuses exclusively on Heinlein's young adult fiction is *Heinlein's Children: The Juveniles* by Joseph T. Major (Chicago: Advent: Publishers, Inc., 2006). There is a chapter on every Heinlein book that can be classified as "young adult," including *Farmer in The Sky*, and Major contrasts and compares them with each other as well as Heinlein's other work. Another critical study is *Robert Heinlein* by Leon Stover (Boston: Twayne Publishers, 1987), but it only discusses *Farmer in the Sky* for one paragraph.

Background: Heinlein wrote *Farmer in the Sky* in 1949, and it was serialized and condensed as *Satellite Scout* in *Boys' Life* magazine in 1950. Scribner's published it in hardcover in 1950.

Plot Summary: Heinlein set his story just after the year 2050, about one hundred years from the time he was writing. Bill Lermer is living in the San Diego area with his widowed father George, an engineer, when George announces that he will be emigrated to Ganymede, a moon orbiting the planet Jupiter. Bill is unhappy that George plans to leave Bill behind on Earth to finish his education so George decides to take him along. Four days before they leave, George informs Bill that he is getting married to Molly Kenyon and that Molly's daughter Peggy will therefore become Bill's stepsister. The new family takes to the space shuttle *Bifrost* to the spaceship *Mayflower* for the sixty day voyage to Ganymede. Bill and Hank Jones, a boy he knew from the Boy Scouts, are allowed to visit the control room of the *Bifrost*. Aboard the *Mayflower*, Bill is assigned to bunk in a compartment with nineteen other boys and attends a school that is organized on board. Bill and Hank also organize a troop of Boy Scouts on the *Mayflower*, and Peggy helps organize a troop of the Girl Scouts. Fifty-three days after departure, a meteor hits the ship, creating a hole in the hull in Bill's compartment. Bill plugs the hole with his old Boy Scout uniform and a pillow until a permanent repair can be made. When the *Mayflower* arrives at Ganymede, the passengers are shuttled to Leda, Ganymede's town, via the shuttlecraft *Jitterbug*. Peggy becomes sick immediately. George gets a job as an engineer in Leda and rents a small apartment for them, but Peggy does not recover. After deliberating, they decide not send her back to Earth in the hope that she will eventually get better. Bill joins the Ganymede Boy Scout troop. The Lermer family is assigned a piece of land with which to build their farm, where they meet their next door neighbor, Johann "Papa" Schultz. Bill is hired as a farm hand by Mr. Schultz, and Bill and George start working on their farm in their spare time and build a house and a barn. After a time, the Lermers, including Peggy, move to the farm. Bill becomes a full-time farmer, but George keeps his engineering job part-time, while Peggy improves somewhat. One day, there is an alignment of the Sun, Jupiter, Ganymede, and the other three largest moons of Jupiter, Europa, Io, and Callisto, and the entire family goes outside to watch it. Unfortunately, the alignment causes a massive earthquake which wrecks the house and severely injures Peggy. Bill, George, and Molly put Peggy in a stretcher and attempt to walk to Leda, where there is the only hospital. Although

they are eventually rescued, Peggy dies, along with about two thirds of the other colonists and almost all the livestock. The Lermers initially decide to return to Earth, but change their minds and rebuild the farm. George and Molly have twin boys. Bill decides to return to Earth to attend a university, but in the meantime he hires out as a cook on a survey expedition. While exploring with his old friend Hank, they discover alien artifacts. Bill comes down with appendicitis and is rushed to the hospital in Leda. While recovering, he decides that Ganymede has become his home and not return to Earth for more formal schooling.

Characters:

- **Bill Lerner** is a fifteen year old boy living in the San Diego area with his father at the beginning of the story. His mother is dead.
- **George Lerner** is Bill's father and works as an engineer.
- **Molly Kenyon Lerner** is Bill's stepmother. She had previously been a draftsman in George's engineering firm.
- **Peggy Kenyon** is Bill's stepsister.
- **Hank Jones** is a contemporary of Bill's whom he knew from the Boy Scouts.
- **Duck Miller** is Bill's best friend on Earth.
- **Captain DeLongPre** is the pilot and captain of the *Bifrost*.
- **Captain Harkness** is captain of the *Mayflower*.
- **Mr. Ortega** is chief engineer of the *Mayflower*.
- **"Noisy" Edwards** is a contemporary of Bill's, but definitely not a friend.
- **Johann "Papa" Schultz** is a farmer who becomes the closest neighbor to the Lerner family on Ganymede.
- **"Mama" Schultz** is Papa's wife.
- **Gretchen Schultz** is the oldest Schultz daughter and a contemporary of Bill's.

CHAPTER SUMMARIES

Chapter I—Earth

- Prepare to read:
 - Vocabulary
 - helicopter
 - regulation
 - automatic
 - emergency
 - compartment
 - insubordination
 - ration
 - newscast
 - cribbage

- accordion
- Focus question/initiating activity: Although still a teenager, Bill is already a licensed helicopter pilot. Ask the students if any of them would like to fly a helicopter.
- Chapter summary: In the chapter, the reader is introduced to Bill, George, his father, and Hank Jones, although at this point Hank is only referred to as “the twerp.” Bill’s mother is dead, and Bill and George live in an apartment in the San Diego area. Food is rationed, and Bill does the cooking. Bill is still young enough to be in the Boy Scouts. George informs Bill of his decision to apply to immigrate to the colony on Ganymede, but leave Bill on Earth so that he can complete his education. Bill does not want to be left behind, and they have an argument. Fortunately, they both cool off by the end of the evening. A few days later, George changes his mind and applies for Bill as well.
- Quiz/reading comprehension questions:
 1. Where has Bill’s Boy Scout troop been hiking at the beginning of the chapter?
 - (a) Yosemite
 - (b) Death Valley
 - (c) The Redwood forests
 - (d) The High Sierras
 2. A new spaceship was just been commissioned. What is its name?
 - (a) *Enterprise*
 - (b) *Discovery*
 - (c) *Mayflower*
 - (d) *Millennium Falcon*
 3. Ganymede orbits what planet?
 - (a) Jupiter
 - (b) Mars
 - (c) Saturn
 - (d) Venus
 4. Where did Bill’s geography class go on its field trip?
 - (a) Hawaii
 - (b) Antarctica
 - (c) Alaska
 - (d) Greenland

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

- Suggestion for reflection and discussion: In Bill’s world, he gets to travel to places like the High Sierras and Antarctica, but food is rationed. Ask the students if they would like to live in a world like that.
- Suggested activities/inquiry-based exploration: The new spaceship is named after an old sailing ship called the *Mayflower*. Have the students research the original *Mayflower* and the Plymouth colony.

Chapter II—The Green-Eyed Monster

- Prepare to read:
 - Vocabulary
 - application
 - psychometrics
 - environment
 - hemorrhage
 - Focus questions or initiating activity: Bill has to decide what belongings to take with him and what to leave behind. Ask the students what they would pack and what they would leave behind.
- Chapter summary: Bill and George take a series of physical and psychological tests to see if they qualify to become space colonists. Fortunately, they both pass. Four days before they leave, George informs Bill that he is getting married and not only will Bill have a new mother but he will also have a new sister. They have another argument, but Bill tries to be polite when they all have dinner together. Bill does not attend their wedding.
- Quiz/reading comprehension questions:

1. How many pounds of belongings is Max allowed?

- (a) None
- (b) 57.6 pounds
- (c) 100 pounds
- (d) There is no limit

2. What is the status of Bill’s accordion?

- (a) Bill has to leave it behind.
- (b) He takes it, but it counts as part of his weight allowance
- (c) It qualifies as a “cultural asset” and does not count as part of his weight allowance.

(d) He smuggles it on board the ship.

3. How did Molly, George's new wife, meet George?

- (a) She was a draftsman in George's engineering firm.
- (b) They met through an on-line dating service.
- (c) They live in the same apartment building.
- (d) They met in a bar.

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

- Suggestion for reflection and discussion: Bill reacts negatively to the news that his father is going to re-marry. Ask the students how they would feel if their mother died and their father remarried.
- Suggested activities/inquiry-based exploration: Bill and the others are required to report to a space port in the Mojave Desert. Have the students research the Mojave Desert and explain why it would make a good space port.

Chapter III—Space Ship *Bifrost*

- Prepare to read:
 - Vocabulary
 - acceleration
 - helium
 - oxygen
 - incinerator
 - subsurface
 - billiard
 - awning
 - Focus question/initiating activity: The Mojave Desert is the site of a space port. Ask the students if any of them have ever been inside an airport or in a large ship harbor.
- Chapter summary: Bill talks with George on the telephone the night before they leave. They are polite but cool to each other. Bill has made his own hotel reservations in Mojave so they will not see each other until they arrive at the spaceport. After Bill finishes packing, he decides that he cannot bear to leave his scout uniform behind so he wears it instead. He takes the train to his hotel in Mojave which he finds is overbooked and has to sleep on a cot in the billiard room. He arrives at the space port the following morning and joins George, Molly, and Peggy, his new stepsister. They board the space shuttle together but do not sit together, because passengers are seated by weight. Bill declines to take any motion sickness medication. Eventually the ship takes off.

- Quiz/reading comprehension questions:
 1. Bill's friend Duck Miller sees him off at the space port and gives him what gift?
 - (a) A book to read
 - (b) A pound of chocolate
 - (c) A DVD
 - (d) A magazine
 2. Which space shuttle does Bill and his family take?
 - (a) The *Bifrost*
 - (b) The *Icarus*
 - (c) The *Daedalus*
 - (d) The *Challenger*
 3. Bill is uncomfortable that morning. Why is that?
 - (a) He has the flu.
 - (b) He overate the night before.
 - (c) He did not sleep the night before.
 - (d) His Boy Scout uniform is too warm for the desert.

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

- Suggestion for reflection and discussion: Bill makes his own hotel reservation, cleans out the apartment, and travels by himself to Mojave. Ask the students if any of them think they would know how to do this.
- Suggested activities/inquiry-based exploration: Two of the spaceships ferrying people from the spaceport to the *Mayflower* are named *Icarus* and *Daedalus*. Both names are from Greek mythology. Have the students research the myths associated with those names.

Chapter IV—Captain DeLongPre

- Prepare to read:
 - Vocabulary
 - *g*
 - ballistics
 - trajectory
 - stanchion
 - injector

- geography
 - transcription
 - telescope
 - periscope
- Chapter summary: The *Bifrost*'s engines blast for three minutes before cutting off. Bill finds that weightlessness makes him sick and receives an injection for motion sickness from the stewardess. After a time, he feels comfortable enough to move around and looks out a viewport. Then he encounters Hank Jones, aka "the twerp." At Hank's suggestion, they make their way to the control room and to Bill's surprise, the pilot, Captain DeLongPre, lets them in. The pilot and copilot explain a few of the instruments. After Hank and Bill leave, Bill finds George, Molly, and Peggy. Then they return to their seats for a course correction. The *Bifrost* docks with the *Mayflower*, and the passengers disembark.
 - Quiz/reading comprehension questions:
 1. Why is Captain DeLongPre famous?
 - (a) He was an Olympic champion.
 - (b) He single-handedly busted a gang of space pirates.
 - (c) He set a space speed record.
 - (d) He was the first person to walk on Mars.
 2. What ship is still under construction?
 - (a) The *Star Rover III*
 - (b) The *Enterprise*
 - (c) The *Millennium Falcon*
 - (d) The *Discovery*
 3. When Bill and Hank visit the control room, the pilot and copilot are drinking coffee. What did they use to hold the coffee?
 - (a) Styrofoam cups
 - (b) Mugs with their names on them
 - (c) Plastic bags with nipples on them
 - (d) Bottles

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

- Suggestion for reflection and discussion: Ask the students if any of them would like to travel to space.
- Suggested activities/inquiry-based exploration: Have the students research the old American space shuttle program.

Chapter V—Captain Harkness

- Prepare to read:
 - Vocabulary
 - solvent
 - theatrical
 - amateur
 - impromptu
 - compensator
 - Focus questions/initiating activity: The *Mayflower* flies by the Moon enroute to Ganymede. Ask the students whether they would like to go to the Moon.
- Chapter summary: The most striking observation Bill makes about the *Mayflower* is how bad it smells. Not only are a lot of people packed into a close space, but some have been sick from motion sickness and others are nervous because it is there first time in space. There is mass confusion at first, because everyone is trying to find their bunks/acceleration couches. It takes Bill half an hour to find his, and he barely has enough time to strap in before the *Mayflower* starts to accelerate. He finds himself in a kind of barracks with 19 other teenage boys located on the lowest and outermost deck. Compared to the *Bifrost's* lift-off, the *Mayflower's* acceleration is anti-climactic. Bill barely notices when it starts. Captain Harkness appears on a television screen and orders the passengers to stay put and explains that unnecessary movement by large numbers of people can cause the ship to go off course. He also says that the ship aides will serve lunch while the ship is under acceleration. It seems to take a long time for lunch to arrive, so another boy, “Noisy” Edwards, goes off in search of lunch. Shortly afterward, the ship’s aide arrives with their lunches. “Noisy” not only misses his lunch, but he is strapped down for the remainder of time the ship is under acceleration. For Bill, the highlight of the time under acceleration is the ship’s fly-by of the Moon, which they watch on the television. After four hours of acceleration, the ship’s engines are turned off, and the ship is put into a spin that provides an artificial gravity equivalent to Ganymede’s so the colonists can acclimate. Bill and his bunkmates are required to attend a Captain’s Mast, a kind of trial in which Captain Harkness heard testimony about Noisy’s and another passenger’s behavior during acceleration. Both were accused of moving around the ship in defiance of his orders. The captain finds them guilty and orders them punished.
- Quiz/reading comprehension questions:
 1. What is Noisy’s punishment?

2. What is the woman's punishment?
- (a) Imprisonment for ten days
 - (b) She becomes a full-time dishwasher for the duration of the trip, which will be sixty days.
 - (c) A fine of \$10,000
 - (d) Probation

Answers: 1-Since he refused to wait for lunch, he is sentence to eat and drink only bread and water for ten days. 2-b.

- Suggestion for reflection and discussion: Were these punishments fair?
- Suggested activities/inquiry-based exploration: Have the students study the concept of centrifugal force.

Chapter VI— $E=MC^2$

- Prepare to read:
 - Vocabulary
 - constitutional
 - monarch
 - resolution
 - hydroponics
 - Eel
 - mass
 - conversion
 - Initiating activity: Ask if any of the students had ever sailed on a cruise ship and how it differed from the *Mayflower*.
- Chapter summary: After the Captain's Mast, Bill finds the rest of his family. George and Molly have their own compartment, but Peggy, like Bill, is staying in the equivalent of a barracks. Shortly afterward, the captain orders an election for a ship's council, which will act as the ship's court. The council sets up meal periods and also orders that everyone under a certain age must go to school. The first day of school consisted of a tour of the ship, which also serves to explain to the reader how the ship is laid out and how it is powered, which is by a mass-conversion engine derived from Albert Einstein's famous equation " $E=MC^2$ ".
- Quiz/reading comprehension questions:
 1. What happens if a repair to the main engine is necessary?
 2. How many view ports are there and where are they located?

Answers: 1— Mr. Ortega, the chief engineer, will make the repair and quickly die of radiation poisoning. 2—There are only four view ports, and they are located in the floor of the outermost deck.

- Suggestion for reflection and discussion: Ask the students how they would feel if they went off on an adventure and learned they would have to go to school.
- Suggested activities/inquiry-based exploration: Have the students research the theories of Albert Einstein, especially the famous “ $E=MC^2$ ” equation.

Chapter VII—Scouting in Space

- Prepare to read:
 - Vocabulary
 - university
 - Focus question: Ask the students if any of them had found summer vacation boring and were relieved when school started.
- Chapter summary: Bill and Peggy attend school for five hours a day. There are no tests or homework, simply adults talking about subjects they know. After a time, Bill does not have enough to do while he is not attending a class. One night, Bill and Hank are talking, and Bill has the idea of starting a Boy Scout troop. At an organizational meeting, Hank is elected chairman. They organize into three troops led by the dozen Eagle Scouts among them. Bill is appointed one of the troop leaders. At the same time, Peggy helps organize a Girl Scout troop.
- Quiz/reading comprehension questions:
 1. Which one of the following is NOT the name of one of the three Boy Scout Troops?
 - (a) Baden-Powell
 - (b) Saint George
 - (c) Aguinaldo
 - (d) Junipero Serra
 2. Which of the following is NOT one of the merit badges attainable on board the *Mayflower*?
 - (a) Hydroponics
 - (b) Ballistics
 - (c) Beekeeping
 - (d) Astrogation

Answers: 1-b, 2-c

- Suggestion for reflection and discussion: Ask the students if any of them is or was a member of the Boy Scouts or Girl Scouts.
- Suggested activity/inquiry-based exploration: Have the students research the history of the Boy Scouts and Girl Scouts.

Chapter VIII—Trouble

- Prepare to read:
 - Vocabulary
 - flywheel
 - reveille
 - meteorite
 - tertiary
 - Focus question/initiating activity: Bill acts quickly in an emergency situation. Ask the students if any of them had ever been in an emergency and what they did.
- Chapter summary: Bill is folding his Boy Scout uniform when a meteor breaks through the floor of his compartment, creating a hole almost as big as Bill's fist. To prevent air from escaping from the ship, Bill stuffs his uniform into the hole. Realizing the air is still leaking, he has one of the other boys give him a pillow with which he covers the hole. After a time, two crewmen in spacesuits enter the compartment and take over for Bill. One of them, Mr. Ortega, has a metal patch which they use to replace the uniform and pillow. Later that day, Captain Harkness holds a Captain's Mast at which he recognizes Bill's heroism. After the ceremony, Mr. Ortega gives Bill the meteor, which Bill keeps as a souvenir.
- Quiz/reading comprehension questions:
 1. What does Noisy do to Bill a few days later?
 2. What happened to Bill's Boy Scout uniform?

Answers: 1- Noisy beats Bill up. 2—It was ruined, so Bill cut off the merit badges and had the rest incinerated.

- Suggestion for reflection and discussion: Why does Noisy beat up Bill?
- Suggested activities/inquiry-based exploration: Have the students research meteors.

Chapter IX—The Moons of Jupiter

- Prepare to read:
 - Vocabulary
 - hypothetical
 - councilor
 - cynical
 - impeach
 - satellite
 - equator
 - Focus question/initiating activity: Ask if any of the students if anyone has ever pointed out Jupiter to them in the night sky.
- Chapter summary: The *Mayflower* approaches Ganymede in a roundabout way in order to minimize the danger of being hit by another meteor. Bill was allowed to watch from a view port for about two minutes as passengers took turns, and he watched the rest of the approach on a television screen. After the ship goes into orbit around Ganymede, the passengers are shuttled to the surface of the moon. There is only one small spaceship for the task, and it takes several days. Bill and his family are transported on the third day. Ganymede has an atmosphere as a result of the terraforming project that started about fifty years earlier, but the air pressure is lower than what they were used to, causing Peggy’s nose to bleed. Furthermore, it is snowing when they land, they have to use a rope ladder to exit the ship, and they have to walk half a mile to a shelter. Bill and George are recruited to help with the luggage. When they return, they found that the males and females are being sent to separate dormitories.
- Quiz/reading comprehension questions:
 1. What is the name of the spaceship that shuttles to and from the surface of Ganymede?
 - (a) The *Enterprise*
 - (b) The *Millennium Falcon*
 - (c) The *Discovery*
 - (d) The *Jitterbug*
 2. Who is the captain of the spaceship?
 - (a) A woman named “Captain Hattie”
 - (b) A Scotsman named “Scottie”
 - (c) An African named “Lando”
 - (d) An American named “Han”

Answers: 1-d, 2-a

- Suggestion for reflection and discussion: The disembarkation process seems rather hectic. Ask the students whether they have ever sailed on a cruise ship and how the disembarkation went.
- Suggested activities/inquiry-based exploration: Have the students research Jupiter and its moons, except for Ganymede.

Chapter X—The Promised Land

- Prepare to read:
 - Vocabulary
 - igloo
 - microfilm
 - dormitory
 - hominy
 - endive
 - queue
 - uranium
 - eclipse
 - commissary
- Chapter summary: George protests the separate of families, but his complaint is ignored. On the other hand, the food is good and plentiful. Bill gets to see the hydroponics sheds and the retail exchange. After a few days, the snow stops, and they can see Jupiter.
- Quiz/reading comprehension questions:
 1. In the hydroponics sheds, Bill sees plants tagged “M-G” and “N.T.”. What do they mean?
 2. What does Bill discover about merchandise imported from Earth?
 3. What is the name of the town?

Answers: 1—“M-G” stands Mutation-Ganymede, which means they are special mutations adapted to conditions on Ganymede. “N.T.” stands for Normal Terrestrial, which means they are the same plants grown on Earth. 2—They are too expensive for him to buy. 3—Leda.

- Suggestion for reflection and discussion: Bill describes the food in great detail. He has grown up in a world where food is strictly rationed, but now he can eat as much as he wants. Ask the students if any of them get hungry.

- Suggested activities/inquiry-based exploration: Have the students research Ganymede.

Chapter XI—“Share Croppers”

- Prepare to read:
 - Vocabulary
 - share cropping
 - homestead
 - partition
 - barrack
 - ecology
 - Focus questions/initiating activity: The colony on Ganymede was set up to accept five hundred immigrants each year, but six thousand people arrived on the *Mayflower*. Do the new arrivals have the right to be unhappy?
- Chapter summary: A week after they arrive, George accepts a staff engineering job with the colonial government, which entitles him and his family to a small apartment. There is a big, contentious meeting between the colonial administrators and representatives of the new arrivals, when they learn how long it will be before they can start building their homesteads. Because of the shortage of machinery, it will be longer than they had expected. One of their options is to become a share cropper with one of the established homesteaders until their own homesteads are available.
- Quiz/reading comprehension questions:
 1. When can the new arrivals expect to start building their homesteads?
 - (a) Five months
 - (b) Twenty-one months
 - (c) Three years
 - (d) Five years

Answers: 1—b

- Suggestions for reflection and discussion: Explain to the students the difference between share cropping and homesteading.
- Suggested activities/inquiry-based exploration: Bill mentions the story of Jacob in the Bible. Have the students read the story, which appears in the book of Genesis.

Chapter XII—Bees and Zeroes

- Prepare to read:
 - Vocabulary
 - deadhead
 - pressurize
 - tenderfoot
 - agronomy

- Focus questions/initiating activity: Ask the students if they would go home to Earth if they were in the Lermers' situation.

- Chapter summary: The Lermers meet in Peggy's hospital room to discuss whether they want to return to Earth. Molly wants to send Peggy back alone to live with Molly's sister, but Peggy pleads to be allowed to stay. When Bill offers to accompany her, they decide to remain as a family. Bill discovers that there is a Boy Scout troop in Ganymede. Although Bill is an Eagle Scout, the Ganymede Scouts regard him as a tenderfoot, and he is placed on one year probation before they will recognize his Eagle status. He studies for merit badges in agronomy and ecology.

- Quiz/reading comprehension questions:
 1. Where does the Ganymede colony get its oxygen for humans and animals?
 2. Where does the colony get its heat?
 3. Where does the colony get carbon dioxide for plants?
 4. Where does the colony get soil for farming?
 5. What is the penalty for stepping on a bug?

Answers: 1—by melting ice; 2—the power plants generate heat; 3—by melting dry ice; 4—grinding up rocks; 5—a stiff fine.

- Suggestions for reflection and discussion: Ask the students if any of them have any experience in gardening.

- Suggested activities/inquiry-based exploration: Have the students research the Homestead Act of 1862.

Chapter XIII—Johnny Appleseed

- Prepare to read:
 - Vocabulary
 - cultivation

- lava
- boisterous
- volcano
- cairn
- bluegrass
- boulder
- hermit
- yodel
- prodigal

- Focus question/initiating activity: Ask the students if any of them have ever picked an apple directly from an apple tree.
- Chapter summary: Three weeks later, Bill and George learn the location of their land, and they walk there to inspect it. While they are studying it, they meet their next door neighbor, Johann “Papa” Schultz, who invites them to his farm for tea and cake. Bill and Papa are already familiar to each other, because four of Papa’s sons are in the Boy Scouts. The only apple tree, in fact the only tree of any kind, on Ganymede is located on Papa’s farm. Papa picks an apple and gives it to Bill. Inside the house, they meet Mrs. “Mama” Schultz and several of the Schultz children. The house’s most distinctive feature is that it has a fireplace, although there is no wood to burn. After Bill eats the apple, Papa carefully extracts the seeds from the core, places them in an envelope, and gives them to Bill to plant one day in the future. Then Papa offers Bill a job on his farm.
- Quiz/reading comprehension questions:
 1. What is the name of the oldest Schultz daughter?
 - (a) Susan
 - (b) Sally
 - (c) Gretchen
 - (d) Leah
 2. What kind of apple does Papa give Bill?
 - (a) Winesap
 - (b) Stark’s Delicious
 - (c) Rhode Island Greening
 - (d) Rome Beauty
 3. What are the chairs made from?
 - (a) Wood
 - (b) Fence posts
 - (c) Plastic

(d) Oil Drums

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

- Suggestions for reflection and discussion: The Schultzes have nine children. Ask the students if any of them come from a family that large.
- Suggested activities/inquiry-based exploration: Have the students research the legend of Johnny Appleseed.

Chapter XIV—Land of My Own

- Prepare to read:
 - Vocabulary
 - oxide
 - wheelbarrow
 - caponize
 - dynamite
 - nitroglycerine
 - silicosis
 - nitrate
 - nitric acid
 - Initiating activity: Ask the students if any of them have ever milked a cow.
- Chapter summary: Bill works as a hired hand on the Schultz farm to learn to become a farmer. The Schultzes raise pigs, cows, and chickens and make their own soil. In the meantime, George works for the colonial administration as an engineer, Molly works as a school teacher, and Peggy stays home trying to get well. George spends his free time on their farm breaking up boulders with dynamite. Eventually, the rock crusher arrives and levels about five acres of the Lerner farm. The next week, Bill is given the chance to use a “cud-chewer,” a smaller version of the rock crusher to further break down the stones and start converting them to soil, for a week. Then the Lerners receive their allotment of “pay dirt.” The Schultzes donate six wheelbarrow loads of organic garbage. Finally, Bill adds some artificial nitrates before planting grass. Once the grass starts to grow, the Lerners start building their house using Ganymede rock. They cannot afford to make it earthquake-proof, but Peggy’s room has to be airtight and equipped with an air lock, because she still cannot handle Ganymede’s low air pressure. Bill’s Boy Scout troop and the Schultz family help raise the house.
- Quiz/reading comprehension questions:
 1. What is “pay dirt”?

2. The absence of what item makes farming easier?
3. Why is dynamite cheap?
4. Who supervises the application of the “pay dirt”?
5. Why is Ganymede susceptible to earthquakes?

Answers: 1—concentrated soil cultures with the bacteria, fungi, and microscopic worms conducive to the growth of plants; 2—There are no weeds on Ganymede; 3—Dynamite can be manufactured on Ganymede; 4—Papa Schultz; 5—Ganymede is close to Jupiter and its gravity field. In addition, melting the ice caps to generate an atmosphere redistributed the moon’s mass.

- Suggestions for reflection and discussion: Ask the students whether any of them have lived on a farm.
- Suggested activities/inquiry-based exploration: Have the students research the earthworm and its importance.

Chapter XV—Why Did We Come?

- Prepare to read:
 - Vocabulary
 - apparatus
 - ultraviolet
 - broody
 - plankton
 - algae
 - entomology
 - bionomic
 - fortissimo
 - billiard
 - Initiating activity: Ask the students whether any of them have ever stayed in a house without indoor plumbing.
- Chapter summary: Bill moves into the house before it is hooked up to the electrical grid, which provides both heat and light. Then George, Molly, and Peggy move in, although the house does not have indoor plumbing. George keeps his job in town on a part-time basis, but Molly becomes a full-time farm wife. Peggy stays mostly in her room, and the family usually have their meals there. They buy a “bubble stretcher” on credit, which allows them to take Peggy outside. As the name implies, this is an airtight stretcher with an oxygen supply. On one occasion, she improves sufficiently to go outside without the stretcher, but she can

only tolerate the low air pressure for about ten minutes

- Quiz/reading comprehension questions:
 1. At what temperature does water boil on Ganymede?
 2. Why are there no bees?
 3. What song does Bill play on his accordion one night?

Answers: 1—140 degrees Fahrenheit; it boils at 212 degrees at sea level on Earth. 2—Normal bees cannot fly in Ganymede’s low air pressure. 3—*The Green Hills of Earth*.

- Suggestions for reflection and discussion: Ask the students if any of them had a brother or sister who was very ill and what accommodations had to be made for them.
- Suggested activities/inquiry-based exploration: George makes a reference to the Eskimos, aka the Inuit. Have the students research the Inuit people and their lifestyles.

Chapter XVI—Line Up

- Prepare to read:
 - Vocabulary
 - barrow
 - compost
 - benediction
 - germinate
 - Initiating activity: Ask the students if any of them have ever been in a major earthquake.
- Chapter summary: During the spring planting, George gives up his job in town, although he will spend his Saturdays teaching engineering. He also raises the possibility of installing a window in the house now that they have started manufacturing glass on Ganymede. Three weeks later there is a special alignment of the four largest moons of Jupiter. They will all be perfectly lined up on the same side of the giant planet with the sun directly behind them. The entire family gathers outside to watch it early in the morning before returning to the house for breakfast. Then the biggest earthquake Bill has ever felt takes place, and Bill grew up in southern California where earthquakes are common. Their house is destroyed, and, more importantly, Peggy’s room loses its air pressure. They manage to get her into her bubble stretcher and start walking the nine miles to

town. Then it starts to snow, because the power plants stop working and therefore are not pumping heat into the atmosphere. After about 5 or six miles, they are rescued by a rock crusher carrying other survivors.

- Quiz/reading comprehension questions:
 1. How often does this alignment occur?
 - (a) Once every 200,000 years
 - (b) Every year
 - (c) Every seven hundred and two days
 - (d) Every Christmas
 2. What happens to the cow?
 - (a) Nothing
 - (b) She is rescued along with the others.
 - (c) She freezes to death.
 - (d) George cuts her throat.
 3. What happens to the chickens and rabbits?
 - (a) Nothing
 - (b) They are rescued.
 - (c) They are left to fend for themselves.
 - (d) Bill and George put them down before leaving.

Answers: 1—a; 2—d; 3—c

- Suggestion for reflection and discussion: Besides earthquakes, ask the students whether any of them have been in a natural disaster such as a flood, tornado, or hurricane, and how they coped.
- Suggested activities/inquiry-based exploration: Have the students research earthquakes and their causes.

Chapter XVII—Disaster

- Prepare to read:
 - Vocabulary
 - notation
 - hummock
 - immaculate
 - magnitude

- equator
 - repatriation
- Initiating activity: Ask the students who have been in natural disasters whether they returned home or moved somewhere else.
- Chapter summary: The rock crusher runs out of power just as they reach the town. The driver helps them carry Peggy to the hospital, which has emergency power and a pressurized room. Molly stays with her, George rejoins the engineering staff to help with the recovery, and Bill goes to a shelter. The shelter has no electricity, and it is 24 hours before Bill receives any food. After power is restored, Bill returns to the hospital to check on Molly and Peggy, who is stable. Bill is recruited to help find the people who are missing. They do not find anyone alive in the countryside and load the dead livestock into vehicles to salvage the meat. After returning, he meets up with George and they return to their own neighborhood to check on their farm and the Schultzes. To their relief, they discover that the Schultz house is still standing and that the Schultzes have survived by cutting down their apple tree and burning the wood in their fireplace. They also saved the livestock by bringing them inside the house, which is quite a mess. Bill and George return to their own house and salvage what they can. The chickens and rabbits they left behind all died, and all the crops failed. When they return to town, both Bill and George help with the rebuilding, but the family decides to return to Earth on the next ship. However, when Bill and George actually go to sign up, Bill finds that he cannot do it. George and Molly, on the other hand, decide that they have to take Peggy back to Earth. Bill moves back to the farm, and, two weeks before George, Molly, and Peggy are scheduled to leave, Peggy dies. George and Molly change their minds and decide to stay after all.
- Quiz/reading comprehension questions:
 1. How many people died as a result of the earthquake?
 - (a) 24,000
 - (b) zero
 - (c) 37,000
 - (d) 6,000
 2. How many people lived on Ganymede before the earthquake?
 - (a) 24,000
 - (b) one million
 - (c) 37,000
 - (d) 6,000

Answers: 1—a; 2—c

- Suggestion for reflection and discussion: Ask the students how they would feel if any of their sisters or brothers died.
- Suggested activities/inquiry-based exploration: Have the students research how communities respond to natural disasters such as earthquakes, floods, tornadoes, or hurricanes.

Chapter XVIII—Pioneer Party

- Prepare to read:
 - Vocabulary
 - infirmary
 - longitude
 - pioneer
 - topography
 - Initiating activity: Ask the students if any of them has ever gone on a camping trip.
- Chapter summary: Molly and George move back to the farm with Bill, rebuild and earthquake proof the house, and replant their crops. They also add windows and a fireplace. The Schultzes buy plow horses. Molly and George have twin boys. Bill decides to go back to Earth to attend college, but before leaving, he and his old friend Hank Jones join a survey party where Bill is the cook. One night they have a disturbing discussion of the future of humanity.
- Quiz/reading comprehension questions:
 1. How many people now live in Ganymede?
 - (a) 45,000
 - (b) 10,000
 - (c) 33,000
 - (d) Zero. The colony has been abandoned.
 2. What is the name of Bill's specialty as a cook?
 - (a) Beef Wellington
 - (b) Chernobyl Chili
 - (c) Omnibus Stew
 - (d) Sassafras Spaghetti

Answers: 1—a; 2—c

- Suggestion for reflection and discussion: What is the difference between grief and self-pity?
- Suggested activities/inquiry-based exploration: Have the students research the concept of population growth and how it affects us.

Chapter XIX—The Other People

- Prepare to read:
 - Vocabulary
 - contour
 - lichen
 - spore
 - crystal
 - moot
 - glacier
 - stalactite
 - appendix
 - Initiating activity: Ask the students if any of them have ever been inside a cave.
- Chapter summary: The survey party explores two valleys. Although Bill is not feeling well, Hank and Bill get some time off to do some hiking on their own before it is time to break down the camp and move to another valley. They come across crystals and some odd rock formations. The crystals lead them to a cave, where they find alien artifacts. Bill starts to feel pain in his side and passes out. Hank thinks it may be appendicitis. While Bill sleeps, Hank discovers that one of the artifacts has legs, walks, and is big enough to carry them, which is fortunate because Bill is unable to walk. Through experimentation, Hank learns how to control the artifact, and they use it to return to the camp. They are late, but one member of the survey party is waiting for them. All three use the artifact to rendezvous with the rest of the party. During the trip, Bill's appendix bursts.
- Quiz/reading comprehension questions:
 1. How many legs does the artifact have?
 - (a) 38; nineteen on each side
 - (b) two
 - (c) four
 - (d) six
 2. What happens when Hank tries to pick up one of the crystals?

- (a) It sings.
- (b) It projects a hologram of a damsel in distress.
- (c) It breaks apart and cuts Hank's glove and hand.
- (d) It expands into a fortress.

Answers: 1—a; 2—c

- Suggestion for reflection and discussion: Several times during their hike, Bill wants to return to camp, but Hank persuades him to keep going. Which one was right?
- Suggested activities/inquiry-based exploration: Have the students research the possibility of life on other planets.

Chapter XX—Home

- Prepare to read:
 - Vocabulary
 - esoteric
 - environment
 - Initiating activity: Ask the students if any of them have spent time in the hospital.
- Chapter summary: Bill is transported to the hospital, where he recovers. Scientists confirm that Bill and Hank discovered alien artifacts. Bill decides that he does not need to return to Earth for school, because Ganymede is his home now.
- Quiz/reading comprehension questions:
 1. When the scientists study the artifacts, what deduction do they make about the aliens who made them?
 - (a) They had no eyes.
 - (b) They were humanoid.
 - (c) They had three sexes.
 - (d) They came from Mars.
 2. What does George want Bill to do?
 - (a) Stay on their farm on Ganymede
 - (b) Move to Callisto
 - (c) Return to Earth and attend a prestigious university
 - (d) Become a space pilot

Answers: 1—a; 2—c

- Suggestion for reflection and discussion: Ask the students whether they think Bill is making the right decision about returning to Earth and going to school.
- Suggested activities/inquiry-based exploration: Bill cites American president Andrew Johnson as an example of a successful person who had no formal education. Have the students research the life of Johnson.

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

- In his book *Heinlein in Dimension*, Alexei Panshin discusses recurring character types in Heinlein's fiction: Stage 1 and Stage 2. A Stage 1 individual is young and competent, but naïve. A Stage 2 individual is older, often functions as a mentor for the Stage 1 individual, and knows how things work. Panshin argues that both Bill and Hank are in intermediate points between the two stages. Have the students analyze in what ways Bill and Hank are at Stage 1 and at Stage 2.
- In the colonization of Ganymede, Heinlein draws on the human history. Have the students research the European settlements of North America, Australia, New Zealand, and South Africa.