

Earthling Exploration of Mars

Student Version

Adapted from Thursday's Classroom activity "Red Planet Time Line" located at www.thursdaysclassroom.com/20jul01/teachtimeline.html

Why should your team do this activity?

Your Engineering Team will be taking on a challenging task in the next few months: designing and constructing a Rover that will be put through a series of demanding tests at the Engineering Design Competition. This is a big challenge, but don't feel overwhelmed! If your team divides this large task into many smaller tasks, you can easily focus on one small task at a time. Once one is complete, you can move on and tackle your next task. Before you know it, you will have an awesome Rover built! Quite an accomplishment!!

In this activity, your team will learn about the exploration of Mars. Then, the directions will help your team create a timeline that summarizes the Mars exploration you just learned about. A timeline is an organized way to list events according to when they happened or when they will happen. By looking at this timeline, you can quickly and easily see past events and current progress. Then you can use your new timeline-making skills to make your own timeline for designing and building your Rover. This timeline will help you focus on smaller tasks during the next few months, so that by the time the Design Competitions roll around, your Rover will be ready to go! Remember, a timeline is one of the requirements for your Idaho TECH Lab Notebook, so we **highly encourage** you to complete this activity!

The Necessities

- ★ "The Earthlings Are Coming" story (see below)
- ★ A ruler, a pencil, and some scratch paper
- ★ Your Idaho TECH Lab Notebook
- ★ **Optional:** poster-sized paper or poster board, and art supplies (paints, markers, construction paper, etc.)

Directions:

As a group, read the story called "The Earthlings Are Coming". You can either read it out loud, taking turns, or if your teacher wants to make a copy for each member of your team, you can read it individually. When everyone has finished reading the story, follow Steps 1-10 below as a group to make **A Red Planet Timeline** for your team's Lab Notebook.

1. First, your team needs to choose roles before you begin to make a timeline. Choose one team member, the **Guide**, to read the following steps aloud to your team (start reading now ☺). Choose another team member to be the **Organizer**, who will write the timeline in your Lab Notebook. The remaining team members will be the **Timekeepers**, and will be in charge of the information that will go on your timeline.
2. **Organizer:** Open your Lab Notebook to a blank piece of paper. Using a ruler and pencil, draw a 12-inch diagonal line on the paper. Write "**A Red Planet Timeline**" across the top of the paper.

3. **Organizer:** Place a dot on the line you just drew at each inch mark on the ruler, starting with the 0-inch mark. When complete, you should have 13 dots.
4. **Organizer:** Below the first dot, write the year “1890.” Below the second dot, write the year “1900.” Below the third dot, write “1910.” Keep following this pattern until you have a year (in multiples of ten) written below each dot. Your last dot should be labeled “2011.”
5. **Timekeepers:** Get out your copy (or copies) of the story about the history of Mars exploration. Skim through and circle all the dates you can find. Also circle the dates that you can figure out (for example, where it may say, “seven months later...”). Slowly read these dates to your **Organizer**.
6. **Organizer:** On scratch paper, make a list of the dates as your **Timekeepers** read them to you. Each date will have an event to go along with it on the timeline. Think about how you will fit this information on your timeline. You will have to keep your comments short since you do not have a lot of room. Will you write horizontally or vertically? Will you write near the line or write above and below the line and draw arrows to the date? The **Timekeepers** can tell you how much information goes along with each date. Brainstorm ideas with all of your team members. **Plan this out before you start writing.** Your timeline will have to be neat for others to read it, so you may want to practice on your scratch paper first.
7. **Organizer:** Write “1892” on the time line where it belongs (on the timeline, it should be between 1890 and 1900 – closer to the 1890 mark). **Timekeepers:** What should the **Organizer** write there? How about “Lowell sees canals on Mars?”
8. **Organizer:** Write “1907” on the time line where it belongs (between 1900 and 1910, right?). **Timekeepers:** What should the **Organizer** write there? Remember to keep it short so you do not run out of room!
9. **Organizer & Timekeepers:** Continue working together within your roles to write all of the dates and events that were listed in the story on your timeline. Remember to be neat and brief!
10. **Guide:** When the timeline is complete, slowly re-read the timeline to make sure it makes sense. Check the dates to see if they are correct and if they are in the right place on the timeline. Finished? Great! Now your whole team can make some drawings to decorate your timeline. Great work!

Now.....your team is ready to make a timeline for the Idaho TECH : Mars Rover Challenge!

1. First, your team needs to choose roles again, or if you want, you can stay in the same roles as before. You will need a **Guide**, who will read the following steps aloud to your team (start reading now ☺), an **Organizer**, who will write the timeline in your Lab Notebook, and several **Timekeepers**, who will be in charge of the information that will go on your timeline.

2. **Organizer:** Open your Lab Notebook to **the first page**, and using the ruler and your pencil, draw a 12-inch diagonal line on the paper just like before. Write “**The Mars Rover Challenge 2016**” across the top of the paper.
3. **Organizer:** Place a dot on your timeline at each inch mark on the ruler, starting with the 0-inch mark. When complete, you should have 13 dots.
4. **Organizer:** Below the first dot, write the month “January.” You should receive your Lego® kits by January. Below the *fourth* dot, write “February.” Below the *seventh* dot, write “March.” Keep following this pattern until you have a month written below **every third dot**. Your last dot should be labeled “May.” This means that you will have *three inches* to write down all the information for *one month*. In other words, every inch represents about 10 days on your timeline.
5. **Timekeepers:** Your job will be to lead your team during the next part in making your timeline. Your team needs to brainstorm about all of the things that you can think of that you need to do to have your Rover ready for the Design Competition. Get out some scratch paper and write down all of the ideas that your team thinks of. For example, one of the first things your team needs to do is inventory your Lego® kits! Other ideas include designing your Rover and making your Display for your Presentation. Write down all of your ideas. If you need help thinking of ideas, ask your teacher to help you get started.
6. **Organizer:** Next, your team needs to choose the 12-15 most important things from your list. Read the whole list to your team, and ask your team to help you decide which are the most important. Once you have chosen the most important things, which will be your “targets,” you and your team will need to decide in what order you should complete these targets. Of course, some will overlap, and some will take a long time to finish. Just try to put your targets in a general order from start to finish. Once you have all agreed upon what order you will do your targets, make a list starting with your first target and ending with your last.
7. **Timekeepers:** Now your team needs to set a date for when each target will be complete. For example, perhaps your team will decide that you want to inventory your Lego® kits by January 15th. Write the dates you choose next to each target on your list.
8. **Organizer:** Now think about your list of targets. How you will fit this information on your timeline? Will you write horizontally or vertically? Will you write near the line or write above and below the line and draw arrows to the date? Brainstorm ideas with all of your team members. **Plan this out before you start writing.** Your timeline will have to be neat for others to read it, so you may want to practice on scratch paper first!
9. **Organizer & Timekeepers:** Work together to place all of the dates and targets that are on the target list on your timeline. For example, if you want to inventory your Lego® kits by January 15, write “January 15” about halfway between the third and fourth dots on the timeline. Remember, each inch represents about 10 days. Write “Inventory Lego® kits” near January 15. Remember to be neat and brief!
10. **Guide:** When the **Timekeepers** and **Organizer** are done with the timeline, slowly re-read the timeline to make sure it makes sense. Check the dates to see if they are correct and in the right place on the timeline. Finished? Great! Now your team has a game plan

for the Idaho TECH: Mars Rover Challenge! You know what you want to start with, and you know when you want to get that target done by! You can always refer to your timeline to see what you should be doing next. You just finished one of the requirements of your Notebook as well – Great Work!!

11. Finally, decorate your timeline in your Lab Notebook. You may want to use the timeline in your Lab Notebook to make a bigger poster of this timeline to hang in your classroom or wherever your team usually meets so you can look at it often. Then it will only be a glance away!



1970	2 April 1969 -- Mars 1969B 27 March 1969 -- Mars 1969A 27 March 1969 -- Mariner 7 25 February 1969 -- Mariner 6 18 July 1965 -- Zond 3 30 November 1964 -- Zond 2 28 November 1964 -- Mariner 4 5 November 1964 -- Mariner 3 4 November 1962 -- Sputnik 24 1 November 1962 -- Mars 1	1960	10 October 1960 -- Marsnik 1 14 October 1960 -- Marsnik 2 24 October 1962 -- Sputnik 22
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The Earthlings Are Coming!

Do aliens chew gum? Are there other beings out there in the dark sky? And, as Bullwinkle would ask, "Are they friendly?" Many movies and books tell stories of bad aliens from other worlds taking over our planet. Those scary stories make you wonder: could it happen?

Mars is a hot spot when it comes to thinking about possible creatures from other planets. Since Mars is a neighbor to the Earth, scientists have been able to see it through telescopes more clearly than other planets. It is also an interesting and mysterious planet. Stories about invaders from Mars (like H.G. Wells' "*War of the Worlds*") are popular. Always looking for the truth, scientists have been studying Mars since Galileo invented the telescope in 1609.

Why Mars? Well, it is close and you can see it through a telescope. There have also been more exciting rumors spread about Mars than about other planets. These rumors started over one hundred years ago. An Italian scientist, Giovanni Schiaparelli, thought that he saw lines on the surface of Mars. That was 1877 -- and when the story was translated into English, someone translated a word wrong and said that the scientist had seen canals on Mars. At that time, we were building lots of big canals on our planet, too. Many people decided that creatures on Mars were designing and building canals of their own.

What were Martians doing with these canals? Another scientist, Percival Lowell, was very interested in Martian canals. In 1892, Lowell began a long series of observations of Mars. With his giant telescope in Arizona, he looked at Mars night after night. Watching Mars while most people sleep is not easy. Because we have so much water in our air, the view of Mars from Earth sometimes shimmers -- just like looking at something on the bottom of the pool. He would look through his telescope for hours and sometimes be rewarded with a clear view. Lowell excitedly announced to the world that there were indeed canals on Mars. Martians were probably using the canals to send water from the polar caps to the warmer areas around the equator of Mars, he said. He believed that Mars was a little like the Arizona mountains -- dry and cool, with thin but breathable air. Many people agreed with Lowell. In 1907, Alfred Wallace argued that Mars was too cold and dry for water. Wallace said that canals on Mars "would be the work of madmen rather than intelligent beings." Still, the idea that Martians were building canals was more popular.

Actually, there are no creatures building canals on Mars. We know that Lowell was wrong because scientists have continued to look for the Martians! Because it is so hard to get a good look at Mars from our planet, we Earthlings have sent spaceships to Mars for a closer look. In the 1960's, the Soviet Union, also known as Russia, sent 8 missions to Mars. Each mission had a problem and failed, but curious and determined scientists kept trying to find out more about Mars by sending more spaceships. In 1964, the United States tried to send a ship past Mars to take pictures, but the solar panels did not open; that little spacecraft is now in orbit around the Sun!

In 1965, a spaceship from the United States named Mariner 4 arrived at Mars! Mariner 4 was the first Earthling spaceship to reach Mars and send back pictures. Mariner 4 did not land on Mars, it flew close to the planet to get a good look (that's called a "flyby!"). Mariner sent 22 close-up pictures of the cratered red surface. These pictures did not show any dirt moving machinery for Martian canal building! Mariner 4 also told us that there was hardly any air pressure on Mars (air pressure is the weight of all the gases in the air pressing down on you). One really interesting part about the Mariner mission is that after the ship had left Earth, the scientists on Earth sent messages to the ship to change the program. Back then, changing the program directions in flight was a big, new idea.

Four years later, two other Mariner missions arrived at Mars. These ships also did not land, but took close pictures and measurements of Mars. Mariner 6 and Mariner 7 each took more than 200 pictures of Mars, measured the temperature of the surface, examined the atmosphere of Mars to see what was in it, and measured the air pressure. The Mariners found that there was carbon dioxide ice (like dry ice), water ice clouds, carbon monoxide, some hydrogen, and a little oxygen. There was no nitrogen or ozone. This was a lot of new information about the Red Planet, but scientists needed even more before they could send a ship to land on Mars.

In 1971, Mariner 9 made it to Mars (Mariner 8 unfortunately fell into the Atlantic Ocean), ready to orbit for 349 days. Mariner 9 sent more than 7,000 pictures back to Earth. This spacecraft took pictures of 80 percent of the planet. The pictures showed that Mars had many interesting places to explore: there were old riverbeds, craters, canyons, volcanoes and plains. The weather was also diverse, with dust storms, weather fronts, ice clouds, and even morning fogs.

None of these pictures showed canals or Martians. Scientists interested in life on Mars began to think microbial life on the Red Planet was more likely than little green men! Microbial life means living creatures that are so tiny you need a microscope to see them. For example, there are many microbes living right now in your mouth! Scientists began to study Earth microbes that could live in places as cold and dry as Mars. Some scientists have gone to Antarctica to study the microbes there. Another scientist, Carl Sagan, imitated the conditions of Mars in "Mars Jars" and threw in some Earth microbes to see if they could live. Some of them did! Even though there were no big Martians in the pictures from the Mariner spacecraft, scientists were very curious to see if there were any teeny-tiny Martian creatures living there.

The cameras on Mariner 9 taught us lots -- enough that scientists were able to design missions to land on Mars. The first mission to land on Mars was sent out by the United States in 1975. This was the Viking mission. This mission had two spacecraft: Viking 1 and Viking 2. Each of the spacecraft contained one ship to orbit the planet and another ship to land on the surface. The Viking 1 orbiter took more pictures to help find a good landing site. The Viking 1 lander separated and landed at Chryse Planitia in July 1976. Later in 1976, the Viking 2 lander touched down at Utopia Planitia. The landers took color pictures of the planet and did experiments to look for microbial life in the soil. The experiments were inconclusive because Mars dirt is so different from Earth dirt. But most scientists agree that the landers did not find signs of life.

Scientists kept studying the pictures and facts sent back by the Viking landers. They needed more information! But what was the best way to get it? After many years, NASA developed the Pathfinder mission. Pathfinder was designed to show that a low cost mission could land on and explore the surface of Mars. Mars Pathfinder was launched on December 4, 1996. Seven months later, it reached Mars. The experimental landing was thrilling. As Pathfinder entered the atmosphere, a parachute opened to slow the ship down to about 70 meters per second. The heat shield came out and then about 10 seconds before landing, four air bags inflated! Finally, three rockets fired to slow the fall. The lander dropped to the ground and bounced about 16 times before stopping. The lander then went to work. It opened up its solar panels and started to measure the atmosphere and take pictures.

Inside the lander was a tiny remote-control jeep called Sojourner designed to explore the surface of Mars. The scientists sent the signal for this little rover to roll out and nothing happened! The rover was stuck! How could they get it out? After working on the problem for two days, the rover finally rolled out and started to explore the surface. The rover sent information back to the lander,

which relayed the data to Earth. The rover and the lander continued to send information back for 5 months. On November 7, 1997, the mission was declared over.

Just as that mission ended, Mars Global Surveyor was launched to the Red Planet. The name 'Global Surveyor' describes the job of this spacecraft. It flies all around Mars taking many pictures and measurements. It has been taking pictures since 1997. Mars Global Surveyor recently took some pictures that really surprised scientists. The pictures did not show Martian-made canals, but they did show something almost as surprising. There are gullies on Mars! Gullies are ditches caused by flowing water. How could Mars have gullies if there is no water to be found on the surface of the Red Planet? This mystery is exciting! And if there is water, could there be tiny microbes living in there, as on Earth? Scientists are eager to find out.

In April 2001 NASA launched an orbiter, called 2001 Mars Odyssey. 2001 Mars Odyssey is carrying instruments to study what Mars is made of and what its radiation environment is like, and is still in orbit around the Red Planet.

NASA also sent two small rovers to Mars in the year 2003, which landed on different parts of the planet. The rovers, called Spirit and Opportunity, landed on Mars almost the same way that Pathfinder did. They have been and are still exploring the planet, looking for water and signs of life. Water is important because life (*as we know it*) depends on water. People who travel to Mars will need water as well.

At present NASA's Phoenix Mars Lander is preparing to end its long journey and begin a three-month mission to taste and sniff fistfuls of Martian soil and buried ice. The Lander is scheduled to touch down on the Red Planet on May 25th. "Phoenix will land farther north on Mars than any previous mission."

One research goal is to assess whether conditions at the site ever have been favorable for life. The composition and texture of soil above the ice could give clues to whether the ice ever melts. Another important question is whether the scooped-up samples contain the building blocks and food for life itself.

If our missions go well, one day human astronauts will land on Mars! Then, will we be able to look at Mars through telescopes and finally see canals? Will people who explore Mars be called Martians? Are there little microscopic bugs living on Mars? It will take years of hard work and good thinking to answer these questions. Until then, keep your eyes on the Red Planet!

