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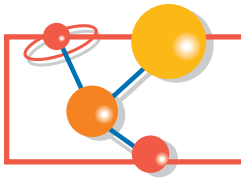
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## Activity Four


### Extraordinary Claims

Have we already found life beyond Earth? Science fiction depicts a universe populated by a grand variety of aliens and other life forms. Movies, television, and books bring an assortment of alien beings into our lives and homes. Tabloids would have us believe that extraterrestrials visit Earth often, and that some even live among us. Meanwhile, scientific journals debate whether the Martian Meteorite may or may not hold fossils of early single-celled life on Mars—life that is starkly different from the aliens depicted in science fiction.

How do we know what to believe? In this activity, you will explore the idea of life beyond Earth. To do this, you will consider two reports regarding the possibility of life on Mars from two very different sources—a tabloid article and an on-line news article. The discovery of extraterrestrial life would undoubtedly be considered one of the most significant events of all time.



#### **Learning Threads: Nature of Science**

 *Strongly held traditions of science, including its commitment to peer review and publication, serve to keep the vast majority of scientists well within the bounds of ethical professional behavior.*

Those who sensationalize events are often less than accurate in their reports of evidence of life on other worlds. Extensive evidence would be needed to support any claim. What would you accept as proof? What is the responsibility of the media when they report on the search for life? How should we—the general public—go about interpreting what is reported?

#### **What You Need to Do**

1. Read *What's the Story? — Pseudoscience and Skeptical Thinking*, and answer the *Checking In* questions.
2. Read and analyze the tabloid article *Science Proves Face on Mars Message!* Write a summary of the arguments and evidence presented. What is the article saying? What do you think about the evidence provided? Are you convinced? Why or why not?
3. Read and analyze the **ABCNews.com** article *The Face on Mars is Produced by Shadows on a Hill*. Write a summary of the arguments and evidence presented. What is the article saying? What do you think about the evidence provided? Are you convinced? Why or why not?

4. Write a one page tabloid-like front-page story that includes a drawing and description of what you think life on another world might really look and be like. Use the *Pseudoscience Tabloid Format* as a guideline for your article. List how you violated the guidelines for valid scientific reporting as outlined in *What's the Story? — Pseudoscience and Skeptical Thinking*.

## The Astrobiology Tabloid Science Proves Face on Mars Message!

**Los Angeles** - The mystery of the Face on Mars has finally been solved. Scientists meeting at an undisclosed location to discuss the possible origins of the Face have drafted a report of their findings to be published soon. Their findings continue to support the theory that the Face on Mars is a message to space-traveling civilizations.

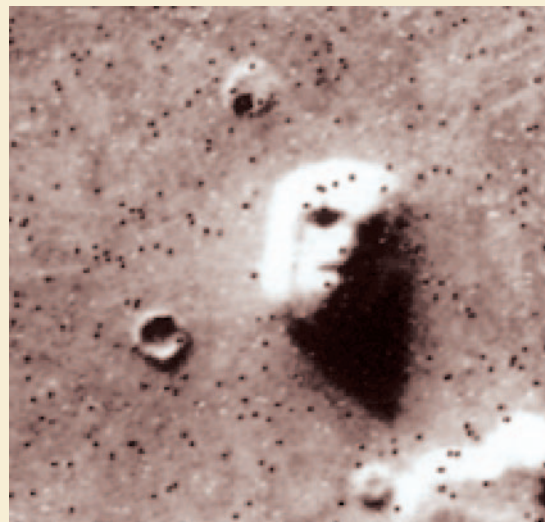
"It's a breakthrough in the deadlock regarding the interpretation of the images," said astrophysicist Jodi Asbell-Edwards.

The report emphasizes that NASA is continuing their cover-up with its latest release of images to the public. These images are reported to show that earlier images of the Face, taken by the Viking space probe, were the result of shadows cast due to the angle of the sun on the surface of Mars.

A former NASA scientist, who preferred to remain anonymous, testified at the meeting that the failed Polar Lander had sent back images of the Face that showed conclusively that the Face was not a "trick of the sun." He went on to say that the images were of such a high resolution that image analysis software allowed technicians to literally "read the writing on the wall" of the monument on Mars.

The images were so shocking that higher-ups pulled the plug on the Lander. They had a fail-safe device that they triggered to send it plunging into the surface of Mars. This was the preferred response that had been agreed upon by government officials should further proof of a civilization—past or present—be discovered by the Lander.

Those that have seen the Polar Lander images said that they contain further proof that the Face on



**Figure 1-17: Enhanced image of the Face on Mars.** The pyramidal nature of the structure as seen in the shadow to the right provides further evidence of the artificial nature of the Face.

Mars is part of a city that has a parallel architecture to the Egyptian pyramids. The city is laid out in a similar mathematical pattern that, like the pyramids, is easily deciphered from space. The pattern, thought to be part of a "spaceport" used by travelers between Earth and Mars, is one of several issues that deserve further study.

NASA officials, when contacted to review the report, stated that they have "no comment on such reports" as part of their official policy.

The report asks for the President to commission a blue-ribbon panel to continue to analyze the mass of data that supports the theory that the Face is part of a city on Mars with ties to cities and civilizations on Earth.

## Science Article

### The Face on Mars is Produced by Shadows on a Hill

**Pasadena:** In 1976, NASA's *Viking 1* spacecraft was circling Mars, snapping photos of possible landing sites for its sister ship, *Viking 2*, when it imaged the shadowy likeness of a human face. It looked like just another Martian mesa, common enough in this region of Mars called Cydonia, and only this one had unusual shadows that made it look like the face of an Egyptian Pharaoh.

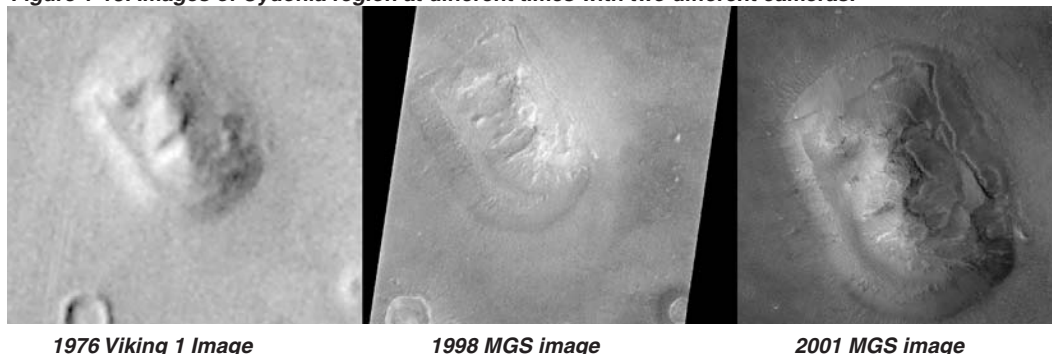
A few days later, NASA unveiled the image with the caption: a "huge rock formation resembling a human head formed by shadows giving the illusion of eyes, nose and mouth." NASA reasoned it would be a good way to attract public attention. It certainly did!

Few scientists believed an alien civilization made the Face. Yet, photographing Cydonia became a priority for NASA because the agency wanted to lay to rest charges that it was covering up top secret information about extraterrestrials. The next mission to Mars, *Mars Global Surveyor (MGS)*, arrived in September 1997. "We photographed the Face as soon as we could get a good shot at it," explained Dr. Jim Garvin, chief scientist for NASA's Mars Exploration Program.

On April 5, 1998, when MGS flew over Cydonia, Dr. Michael Malin and his camera team snapped a picture ten times sharper than the original *Viking* photos. Thousands of anxious web surfers were waiting when the image first appeared on a NASA web site, revealing ... a natural landform. The Face was not a monument after all.

As good as the images were, they were taken through wispy clouds. NASA wanted even better ones. On a cloudless April 8, 2001, "Malin's team captured an extraordinary photo thirty times sharper than the *Viking* photos." Garvin reported. "At this resolution, you can see objects the size of an airplane, an Egyptian-style pyramid, or even small shacks!"

**Figure 1-18: Images of Cydonia region at different times with two different cameras.**



What the pictures show is the Martian equivalent of a butte or mesa, landforms common in the American West. "Cydonia is littered with mesas like the Face, but the others don't look like human heads, so they've attracted little popular attention," says Garvin. Malin plans to acquire even more images of the Face. "Not only is the public interested, but there are valid scientific reasons to examine Cydonia landforms, which, after all, is why *Viking* photographed the area in the first place."

Garvin and other members of the *MGS* Science Team used another instrument on board *MGS*, a laser altimeter, to study the Face. It uses a laser beam to measure the heights of things with great precision. "We took hundreds of measurements of Cydonia's mesas," says Garvin, "including the Face—its height, volume, and aspect ratio. It is similar to the other mesas. It's not exotic in any way." Computerized maps created from the data show the mesa from any angle, unaltered by light and shadow. There are no eyes, no nose, and no mouth!

The mesas could have been gouged by glaciers, carved by winds and water, or thrust upward by vertical tectonics. Any of these processes, all well documented on Mars, could have created the depressions and irregularities that produced the Face-like shadows. "We simply don't know. Mars is a special place. One day we are going to go there," says Garvin. "That's why the Face on Mars is so popular: it reinforces that dream. But even without a Martian monument, there will be plenty for future explorers to do. Climbing the mesas of Cydonia will be just the beginning."



## What's the Story?

### Pseudoscience and Skeptical Thinking

What is **pseudoscience**? At its most basic, pseudoscience is “false science.” That’s what *pseudo* means—false. More descriptively, pseudoscience is a way to explain or make claims about phenomena that cannot be proven scientifically through experimentation that can be reviewed and repeated by other scientists.

Science deals with theories that are measurable, testable, and verifiable. Scientists conduct experiments and make observations to collect data upon which conclusions can be based. They then report their conclusions, data, and methods so that other scientists can repeat that work and verify the results. As new evidence becomes available, scientific theories are subject to change or modification. Pseudoscience makes claims without meeting these requirements and often ignores new evidence disproving a pet theory.



Pseudoscience is pervasive in our society. Consider the popularity of astrology, Big Foot, and the Loch Ness monster. Although it can be entertaining, pseudoscience undermines developing a scientifically literate public. The ability to think critically is important when evaluating information that can influence decisions about anything from our quality of life to how the government allocates money for scientific research. For example, topics such as global warming and the existence of intelligent civilizations on Mars can only be resolved through critical examination. Your success in interpreting such reports depends on your ability to pick out which theories can be supported scientifically and which cannot. Those that cannot are pseudoscience.

Why has pseudoscience become so pervasive in our society? One reason is that sensational claims, like those that use the “Face on Mars” to say there is intelligent life on Mars, help sell tabloid newspapers or books on the subject. Also, many people like to believe certain ideas, no matter how poorly supported they are. Pseudoscience offers a way for people to believe in fantastic ideas just because they sound so real and scientific. Pseudoscience frequently uses scientific language that sounds impressive to non-critical readers and viewers, but is, in fact, purposely misleading.

How do you tell the difference between science and pseudoscience? When evaluating reports that claim to be scientific—whether in print, on television, on the Internet, or by word of mouth—it is important to be a *skeptical thinker*. A skeptical thinker is one who recognizes, or at least questions, if a claim or theory is supported by evidence. Here are some basic guidelines for recognizing pseudoscience:

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### ***How valid are the sources of information?***

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Experts are usually cited in support of a claim. Check them out. What are their biases? Are they likely to benefit significantly by supporting one claim over another? Experts cited without names, without affiliations, or without other references that would make it possible to identify and contact them are suspect. Anonymity is not part of the scientific process. Moreover, a legitimate scientist will have publications. These are often available on the Web. If in doubt about sources cited in an article, use a search engine to see if the individuals have been active in the field of research they are being referenced on, or if these people even exist!

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### ***How do alternate theories compare?***

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When a specific theory is being presented, consider alternate explanations. Start with the simplest explanation first. The more complex, confusing, and twisted the logic used to support a hypothesis, the greater the likelihood that it is false. Theories that depend on conspiracies or that deny any contrary evidence are most suspect. Often in pseudoscience, any data that question the validity of a claim are rejected as having been faked or covered up.

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### ***Is a statement or theory open to scientific testing?***

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If scientists cannot design an experiment to test a theory, then the theory is out of the realm of science. Statements based on faith or opinion are not necessarily unimportant, but they are not open to scientific scrutiny. Be wary of statements supported by scientific-sounding explanations but that stop short of offering real evidence that can be verified by independent researchers. Scientific testing includes peer review (review by other scientists) and publication in professional journals. Be cautious of reports presented in obscure publications or publications that are not open to peer review.

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### ***Can evidence offered in support of a statement or theory be confirmed?***

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Speculation without evidence is nothing more than opinion. Opinion is useful to begin a discussion, but it is unacceptable as the basis for sound decisions. Other people should be able to set up an experiment and come to similar conclusions. If new data call a theory into question, then the theory must be reconsidered. It may be totally false, or it may need to be revised based on new evidence. This is one of the cornerstones of science. Scientists do not fear the revision of a theory as a result of new data. In some cases, a theory is thrown out altogether while in others it is strengthened by new evidence.

## ***If in doubt, check it out***

Pseudoscience is most obvious when it is presented in a tabloid that specializes in exaggerated and unsubstantiated claims. However, it is important to recognize it when it appears in scientific reporting by the non-tabloid media. To simplify the reading level or to catch the attention of a passerby, reporters might overstate or sensationalize what they are reporting. Be a skeptical thinker; analyze everything; and if in doubt, check it out.



### ***Checking In***

1. What are some of the characteristics of pseudoscience?
2. What is the nature of “scientific proof?”

## **Pseudoscience Tabloid Format**

**Title**

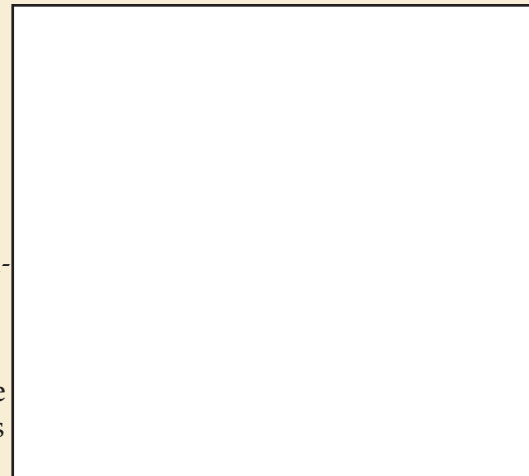
**Date**

**Introductory Paragraph** – This paragraph should catch the attention of the reader and make an extraordinary claim. It should tell the reader why this extraordinary claim should be believed.

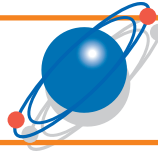
**Supporting Paragraphs** – These paragraphs should include details about where your life form was found and what it looks like. Begin by describing the environment where it was found. Include in these paragraphs descriptions of the organism’s physical features and how these features enable the organism to survive in its environment. Be sure to make your descriptions sound scientific.

These paragraphs should also attempt to convince the reader of this discovery’s importance and how it will affect human lives. Be sure to include official-sounding quotes whenever possible to make your story sound credible.

**Concluding Paragraph** – Restate the importance of the discovery and what “scientists” plan to do in order to follow up on it.



*Drawing of life form goes here.*



## Think and Reflect

### ***Think About It***

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1. In each article, what is the theory or hypothesis used to explain the *Viking* image of the “Face” on Mars?
2. What experiment did scientists use to collect data to prove or disprove each theory?
3. Compare how the two articles used data in their contradictory reports on the “Face” on Mars.
4. How would you check out the statements made in each article to verify the claims?
5. Which article would you classify as pseudoscience? Explain your answer.

### ***Reflecting on the Activity and the Challenge***

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In this activity, you saw how easy it is to make an extraordinary claim sound scientific. Much of our view on whether we should expend time, energy, and money on searching for life in our universe is determined by reports we see presented in print or shown on television. What is the responsibility of the media in reporting on the search for life? What is the responsibility of the scientific community in reporting what their research shows? What is your responsibility when you read such reports?