

# Alien contact: Proof positive or a case of let's play pretend?

by Michael A. DiSpezio

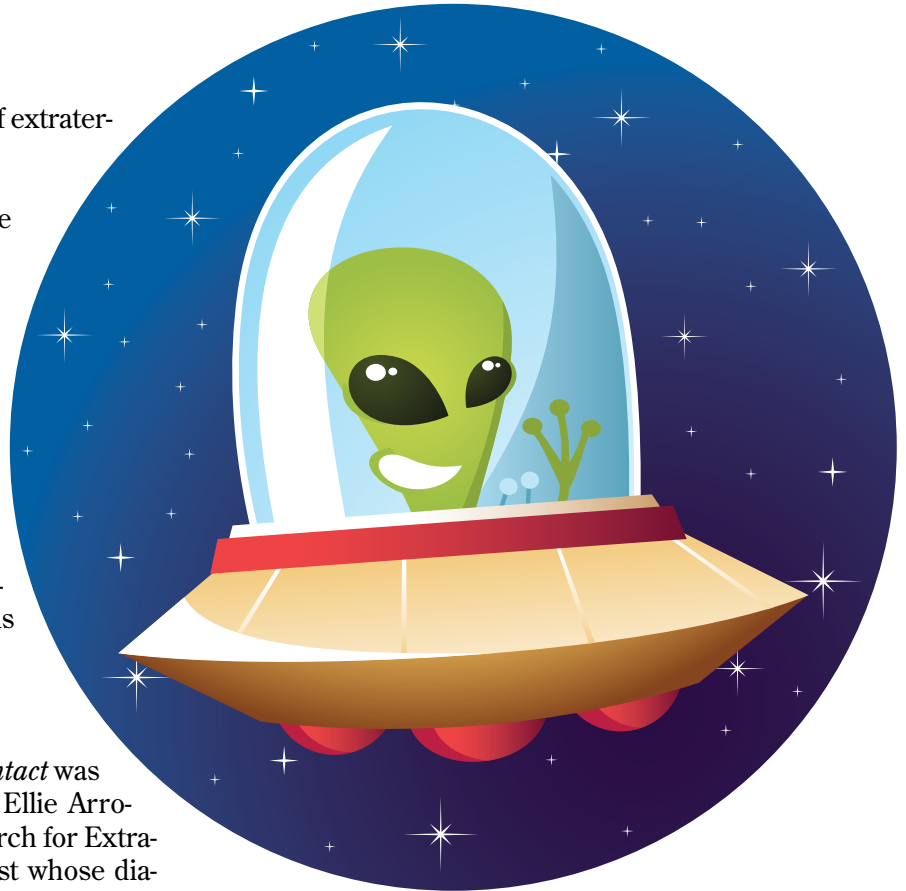
Irrefutable evidence for the existence of extraterrestrial life is found in

- a. an interstellar radio message (e.g., the Wow! signal)
- b. Martian meteorites
- c. the Roswell incident
- d. none of the above

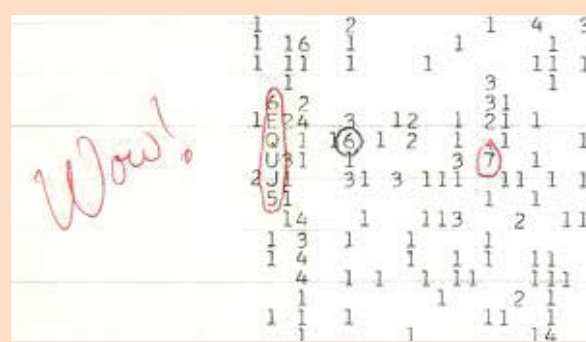
The column's title might give away the answer: It's "d, none of the above." However, even though there's no "proof positive" for extraterrestrial life-forms of any flavor, by offering up an alluring set of answers, we've set the stage for applying a battery of critical-thinking skills to the valid analysis of scientific data.

## The Wow! signal

Back in 1997, the science fiction film *Contact* was released. In it, Jodie Foster played Dr. Ellie Arroway, a pragmatic and brilliant SETI (Search for Extraterrestrial Intelligence) Institute scientist whose dialogue reflected the deep understanding of astronomer



**FIGURE 1** Image of Wow! signal



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and science communicator Carl Sagan. (Sagan wrote the novel *Contact*, on which the movie was based.) In the story, Sagan's protagonist's first contact with extraterrestrials arrives in the form of a radio signal. Brilliant, though this plot element wasn't as original as you might imagine. Twenty years before the film's release, one such signal was thought to be detected by SETI listeners.

On August 15, 1977, the Big Ear radio telescope at Ohio State University picked up what seemed to be a transmission with the hallmarks of an extraterrestrial broadcast. Based on the electromagnetic wave's characteristics, the 72-second signal appeared to originate somewhere in the constellation Sagittarius. "Wow!" you

## Aliens among us

In December 2010, NASA announced the discovery of a new form of alien life. It was a single-celled microbe that broke the rules. Unlike all other organisms found on Earth, this one has a unique cache of life's six key elements. These main constituents included carbon, oxygen, nitrogen, sulfur, and hydrogen, but phosphorus was missing. Replacing it was another group V element—arsenic!

The concept of an alternative biochemistry is not new to scientists (or, for that matter, *Star Trek* fans). In the mid-1970s, a major dogma of biology was shattered with the discovery of thermal-vent communities. Here, in the absolute darkness of the deep sea, was an assemblage of organisms that depended upon chemosynthetic microbes. No sunlight needed! Although chemosynthetic organisms had been known on Earth's surface, this was the first time the organisms were found serving as a food source for a group of consumers, allowing those consumers to thrive on a diet that was not sunlight-dependent.

**FIGURE 2**

**ALH84001 (inset) and controversial electron-microscope image**



might say. And that's what its discoverer, astronomer Jerry Ehman, wrote on the computer printout that displayed the signal parameters (Figure 1).

Disappointingly, the Wow! signal, as it has become known, never reappeared. You can be sure that the SETI telescopes continually scoured that portion of the sky for any rebroadcast of the signal, but nothing was found. The lack of repeatable evidence led to all sorts

## Student activities

### Activity 1: Critical analysis of alien encounters

Have students research reported alien encounters. Suggest investigating UFO incidents reported by pilots and aircraft crews, tracked by radar, and responded to by the military. Encourage students to apply critical-thinking analysis to these reports. Then, in an open and nonjudgmental classroom environment, discuss, analyze, and evaluate the validity of these reported encounters.

### Activity 2: Communicating with alien intelligence

Supply students with a copy or access to the pictograph message broadcast into space in 1974 by the Arecibo radio telescope. Explain that this message contained a digital code for a series of symbols that communicated aspects of intelligent life on planet Earth. Have students research and explain the meaning of each symbol. Then have student teams create their own version of a message that would provide information about the life of a middle school student to their extraterrestrial counterparts.

You could also reference the golden phonograph records that were placed aboard the two *Voyager* spacecraft. These records carry hundreds of sound recordings and images that depict life on planet Earth. Have students research these records. Challenge them to compose their own "Top 10 Countdown" list of sounds and pictures they would place on a record to communicate middle school life.

### Activity 3: In search of ET

Have student teams compose blueprints for a planetary lander that will test for the presence of extraterrestrial life-forms. What types of experiments will the lander perform? Where will it land, and where will it look for life? What signatures of life will it search for? What sort of mechanical devices will be required to perform these activities? Once the blueprints are completed, challenge the teams to build a scale model of their design.



of alternative and less exotic explanations of the signal. Possibly, the signal originated on Earth and reflected off a piece of space matter? (However, the signal was carried by a broadcast frequency that radio transmitters on Earth are restricted from using.) Maybe it was the product of an interstellar interaction with natural radio-wave emissions? Or maybe—just maybe—it was a contact beacon sent by an intelligent civilization that was giving the search for intelligence one last try?

Enter Occam’s razor: When presented with options, the simplest explanation is more likely to be the correct one. Therefore, when considering the possibility of a reflected radio signal versus a one-time communication beacon from a trans-galactic intelligent civilization, the more probable explanation may be the more mundane one.

## Meteoric Martians

For centuries, the possibility of alien visitation has fueled the imaginations of science fiction writers. From H.G. Wells to Steven King, stories suggesting the arrival of extraterrestrial life in meteoric vehicles have terrified and tantalized audiences. Surely, such stories are pure fantasy. Or are they?

In 1984, scientists discovered a space rock on the frozen landscape of Antarctica (Figure 2). Named ALH84001, this softball-sized rock was thought to have crashed into Earth about 13,000 years ago. The more scientists studied this meteorite, the more re-

markable the rock appeared. Similar to several dozen other meteorites discovered on Earth, ALH84001 had a composition that suggests an origin on Mars. How did it get to Earth?

Further analysis of ALH84001 suggests that about 16 million years ago something big struck Mars, sending pieces of the planet into space. ALH84001, or the parent rock from which it was derived, was one of those ejected chunks. Eventually, ALH84001 fell under the spell of Earth’s gravity, and the rest is history.

Fast-forward to 1996, when an article published in *Science* announced the discovery of signatures of life in ALH84001. In this highly publicized paper, scientists claim to have uncovered evidence suggesting the existence of microbes on Mars. Their analysis of ALH84001 showed that its age, composition, and formation were consistent with a time when water might have flowed on Mars. Remember, water is essential for all life as we know it. Find water and you uncover an environment that might support life.

Tests also confirmed that the meteorite contained traces of organic molecules that resembled metabolic products of terrestrial bacteria. However, the most attention-grabbing evidence was in the form of electron microscopic imagery. There, in the laboratory-captured images, were shapes and forms that resembled earthly microbes.

As you might imagine, ALH84001 created quite a bit of controversy. Although its Martian origin is not debated, the interpretation of its analysis is. Critics claim

that some of the rock’s signatures of life may be earthly contaminants. Others suggest that the microbe-like shapes are “pseudo fossils,” the products of abiotic chemical and physical reactions. Recent publications suggesting that the rock’s biomorphic shapes are a product of Martian magnetic bacteria have landed the rock back in the public spotlight. The debate continues.

## The Roswell incident

It was the summer of 1947. A few weeks after the term *flying saucer* was coined, the residents of Roswell, New Mexico, woke up to a curious newspaper headline: “RAAF

**FIGURE 3**      **Headline announcing capture of flying saucer**



## Critical-thinking analysis

As presented in the *National Science Education Standards* (NRC 1996, p. 23), understanding entails the ability to distinguish between what is and what is not a scientific idea. Essential to this differentiation is the ability to apply a battery of higher-level thinking skills. These cognitive tools allow the learner to become actively involved in evaluating information and, based upon that analysis, construct a valid scientific understanding.

*Ready, Set, Science! Putting Research to Work in K-8 Science Classrooms* identifies various skills and strategies that facilitate the construction of fair-minded scientific literacy (Michaels, Shouse, and Schweingruber 2008). Using case studies, it addresses a hybrid of content and process with approaches that help visualize a dynamic and ongoing thinking process. *Taking Science to School: Learning and Teaching Science in Grades K-8* also addresses best practices for the evaluation and construction of valid understanding (NRC 2007).

Captures Flying Saucer On Ranch in Roswell Region” (Figure 3).

Within a day, the story was retracted. Apparently, Roswell Army Air Field (RAAF) personnel had misidentified the wreckage of a crashed weather balloon. However, increased military presence and the abrupt atmosphere of secrecy and concealment seemed to suggest that there was more to the story.

Actually, there was. It took the army decades to admit a cover-up, but in 1994 they came clean. According to the declassified report, the Roswell wreckage had no meteorological connection at all. It was the remnants of a crashed spy balloon! Part of Project Mogul, the high-flying platform carried listening devices into the upper atmosphere. At these great altitudes, the microphones could detect the distinct signatures of atomic explosions associated with the fledgling Russian nuclear arms program.

When its wreckage was discovered on a Roswell ranch, the army fabricated the weather balloon cover-up. Working on behalf of U.S. citizens, they were acting to keep the top secret Mogul Project a secret. Or perhaps their new story is the smoke screen? Perhaps their explanation was the cover-up? Obviously, circular

reasoning can go round and round without ever proving a central point.

## Conclusion

When it finally comes down to indisputable evidence of extraterrestrial life, where do we stand today? We’re still looking. SETI telescopes are aimed at the sky searching for signals broadcast by advanced civilizations. *Pioneer* and *Voyager* spacecraft are carrying the message of human civilization beyond our solar system. In the lab, we’re still analyzing those Martian meteorites and reevaluating the data collected by long-retired planetary landers. We’re also planning for the future with robotic explorers designed by engineers who were our middle school students a decade ago. To be sure, there’s hope, and in the words of Carl Sagan, “Somewhere, something incredible is waiting to be known.” ■

## References

- Michaels, S., A.W. Shouse, and H.A. Schweingruber. 2008. *Ready, set, science! Putting research to work in K-8 science classrooms*. Washington, DC: National Academies Press.
- National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academies Press.
- National Research Council (NRC). 2007. *Taking science to school: Learning and teaching science in grades K-8*. Washington, DC: National Academies Press.

## Resources

- Downloadable curriculum from the SETI Institute—[www.seti.org/Page.aspx?pid=364](http://www.seti.org/Page.aspx?pid=364)
- Information on the Big Ear Radio Observatory and Wow! signal—[www.bigear.org/wowmenu.htm](http://www.bigear.org/wowmenu.htm)
- NASA news story describing the alien microbe discovery—[http://science.nasa.gov/science-news/science-at-nasa/2010/02dec\\_monolake](http://science.nasa.gov/science-news/science-at-nasa/2010/02dec_monolake)
- NASA site with hyperlinks that offers a primer on meteorite ALH84001—<http://nssdc.gsfc.nasa.gov/planetary/marslife.html>
- Sagan, C. 1985. *Contact*. New York: Simon & Schuster.

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