

# Return to Mars

## *How Not to Teach a Case Study*

*Clyde Freeman Herreid*

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▲ *When the Trojans let a Greek wooden horse through their city gates, that was a mistake.*

▲ *When the Chicago Tribune said Thomas Dewey was elected President of the United States in 1948, that was a mistake.*

▲ *When General Custer attacked Chief Crazy Horse, that was a mistake.*

Mistakes, as we all know, are an integral part of our lives. They vary from the trivial spilt milk to the devastating *Challenger* explosion caused by a defective O ring, to the momentous events that unfolded as Columbus headed west for the East Indies.

Mistakes appear in every chapter of human endeavor from computers (2000 year problem) to cars (Edsel), to politics (Bay of Pigs), to business (dropping “classic” Coca Cola). Whole professions such as law, plastic surgery, or insurance are devoted to correcting or mitigating the effects of mistakes. Other professions capitalize upon mistakes in interpretation or perception as magicians and con men know.

Science is not free from mistakes. Some are happy ones as with Flem-

ming’s accidental discovery of Penicillin or tragic as with thalidomide. Some are debacles as with Pons and Fleishman’s claim of cold fusion.

In education, we have had our share of mistakes as critics of the New Math and the teaching of reading without phonics will attest. Teachers of case studies are not free from mistakes either. I don’t think Salvador Dali’s advice is quite on the mark when he says, “Mistakes are almost always of a sacred nature. Never try to correct them. On the contrary: rationalize them, understand them thoroughly. After that, it will be possible for you to sublimate them.” Indeed? I prefer journalist Walter Lippman’s admonition: “The study of error is not only in the highest degree prophetic, but it serves as a stimulating introduction to the study of truth.” Or, Nikki Giovanii when he says, “Mistakes are a fact of life. It is the response to error that counts.”

In this column, I consider some of the common mistakes case study instructors make. I can think of no better way, though a humbling experience, than to offer a recent example of my errors in trying out the “Life on Mars?” case we published in the most recent issue of *JCST* (Mar/Apr 1998, pp. 307-310). To recap the case, Bruce Allen, a geology student, and I wrote about the recent brouhaha over the NASA report that there were purported fossil bacteria in a Martian

meteorite. The case involved a fictional young NASA scientist, Michael King, who had serious doubts about the evidence and was pondering whether to participate in a sudden press conference. After teaching the case three times in different courses, we reported in the *JCST* article how a successful case might work. We didn’t report the mistakes we made on our first attempt. Now we come clean.

The “discovery of life on Mars” event was so dramatic and relevant to several courses that we hurriedly wrote the case and wanted to try it out at the first available opportunity. We foisted ourselves on a colleague teaching a planetary geology course that was in full swing. He was more than willing for us to try the case out on his general education class. The case material was clearly appropriate as there was plenty of prior discussion of the solar system and meteorites. Also there was a scheduled class period in the syllabus on the topic of NASA’s *Viking Lander* project. Perfect, we thought.

There was a downside to the arrangement, however. The course was taught by the lecture method. What we were proposing to do was go in as strangers and run a discussion-based case study, something that those students had probably never seen before. In addition, the instructor was not willing to have this experience count for any credit. We could not, for example, require that a short paper

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*Clyde Freeman Herreid, editor of JCST’s “Case Study” department, is Distinguished Teaching Professor in the department of biological sciences, State University of New York at Buffalo, Buffalo, NY 14260-1300.*

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be written by the students. Although this might seem a recipe for disaster, we thought we had a good chance at accomplishing this task, but it would take careful planning, courage, and dumb luck.

Here is how we attacked the problem: in the class period prior to our case study, Bruce Allen, who was going to run the case, visited the class for the last 10 minutes to hand out the two-page case and to explain what we were planning. Since only about half of the students were present (a common situation in most lecture-based general education courses), we knew that preparation would be an issue. We asked them to seriously read the case and consider the questions where we asked how scientists knew that the “rock” was a meteorite from Mars, how they knew its age, and how they knew that it contained fossils.

On the day of the class we decided to take half of the 90 minutes class time to show a video of the NASA press conference announcing there was evidence of past life on Mars. We believed this would set the stage for the discussion even if people had not read the case. Also, since students frequently come in late to lecture classes, showing the video would allow the late comers to become involved. Beforehand, we gave preliminary instructions about the plan for the day—to analyze the evidence mentioned by NASA scientists and to report on the dilemma faced by the hero of the case study.

After the video, we asked the students, about 35 out of a 70-person class, to gather together in groups of four or five. This required some shifting of seats because students were spread all over the 150-person auditorium. As with other teaching amphitheaters of today’s modern university, the fixed seats made it awkward but not impossible to group together for conversation.

When the grouping was accomplished, we asked the teams to spend

about 20 minutes reviewing the evidence surrounding the press conference and addressing the questions at the end of the case. The purpose of this session was to get people engaged in the problem in a small group setting before facing a full class discussion. Most groups complied, although there were obvious strains and embarrassed silences. Some groups, consisting of students who knew one another, drifted off task. But for the most part, things went well.

At the end of this small group session, Bruce Allen led an open class discussion. He posed questions about the NASA scientists’ evidence on the questions surrounding the meteorite’s origin, age, and composition and worked on the blackboard to summarize the students’ thoughts. This period lasted perhaps 20 minutes and was simply a hurried listing of the lines of evidence.

This left us with a handful of minutes to deal with the personal dilemma faced by Michael King, the hero of the case. We asked for brief comments on what his concerns would be and his possible course of action. We finished by asking for a show of hands by the students as they voted their preferences. Class dismissed. This was hardly an ideal way to run a class. We made five classic mistakes and numerous faux pas in handling the case.

▲ *Lack of clear goals.* If you don’t know where you are headed, how do you know when you have arrived? Like many case instructors, we were initially captured by the excitement and potential of an event that we knew in our hearts would capture the students’ attention. After all, the world was captivated by the Mars press conference. There would be many opportunities to discuss issues in astronomy, geology, biology, ethics, and career discussions in science. The case would work for various courses, although the issues would have different emphases.

When it came time to teach the case we decided to hit all issues to see what worked. It was a little like eating Louisiana gumbo hoping to pull out a tasty morsel without knowing what lay in its gooey depths. Of course, in all first attempts at a case we should expect uncertainty, but our goals for the students were too diffuse. Part of this may be excused because of our eagerness to seize the moment. Part of it may be excused because we did not have control of the course and course content. Yet all cannot be excused. On our third try in another general education course called Scientific Inquiry, we got our act together and focused only on two questions: Why the NASA team believed there were fossils and why scientists shouldn’t hold press conferences before publication.

*Moral: Be sure you know what you want to accomplish in the case, what facts, principles, viewpoints the students should cover. Without clear, prioritized goals we consumed a thin broth rather than rich gumbo, to keep the soup metaphor alive.*

▲ *Lack of time.* Some cases are so rich and complex that one cannot deal with the issues in the available time. That was our problem in Planetary Geology. Sometimes the lack of time can be solved neatly by editing or focusing the case, but that isn’t always possible. As a colleague of mine is fond of saying, “You can’t shorten a nine month pregnancy by putting nine women on the job.”

There is another approach to the time issue. We could have chosen the strategy of some case instructors who simply do not take the issue of coverage so seriously. They let the class discussion follow its own course and stop whenever time runs out. Then it is on to another case. This laissez-faire approach will not appeal to most instructors.

The Mars case is best handled by

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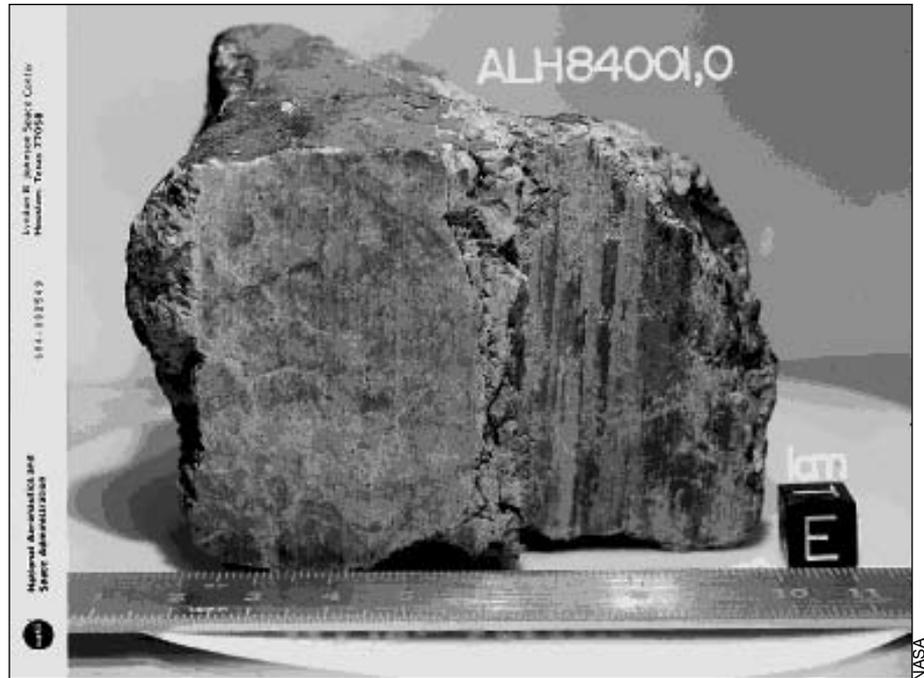
devoting more than one class period to its analysis and having time for students to do outside reading and work. The Problem-Based Learning strategy is particularly effective; students use parts of three class periods to discuss the case, and between classes they do literature searches and interesting assignments. For example, in our latest teaching of the case, we had the students show the case to a scientist and then interview the scientist about the ethical and career questions facing the hero. This greatly enhanced student discussion, for young students have seldom considered such issues.

*Moral: Some cases are snacks, others are banquets. Be sure you give each the proper attention.*

▲ **Lack of preparation.** The Boy Scouts' motto, "Be Prepared," is an ideal aspiration for not only America's youth but for us veterans of academia. Truth to tell, exquisite preparation for a class is not always possible. In spite of the advertisement by Orson Wells saying he will drink no wine before its time, sometimes we must sip the drink that is served or not drink at all. In our case, as instructors, we felt we wanted to capture a "breaking" news story and did not have time to choose the ideal conditions for the case.

Then there were students. Students do not always prepare adequately for class. Surprised? While it is hardly noticed in a lecture class, a lack of preparation is debilitating in discussion-based courses. The students rapidly learn this. If discussions are held regularly, any delinquency will be detected. There are consequences for laziness, especially if peer evaluation is used.

In our Planetary Geology experience we had to live with the results of no preparation. We tried to make the best of a bad situation by showing the NASA press conference video. This helped a great deal but used so much time that minutes were in short sup-



*Mars meteorite ALH84001 prompted NASA's "Life on Mars" press conference in August 1996 and was the subject of JCST's March/April "Case Study" column. In this article, the author reports the glitches he encountered when teaching the Mars case.*

ply. Small group discussion also helped because information could be shared among teammates. But permanent groups are even more powerful. There the group pressure to prepare and participate is enormous.

*Moral: Even the best laid plans may go astray, but no preparation at all is a recipe for disaster for students and faculty.*

▲ **Lack of experience with the case method—it takes time to get good at anything.** Learning how to analyze a case study and to participate in discussions is no exception. When I have used only one case study in a semester, students are often uncertain how to prepare and how to interact in class. The more cases, the better they get. So we should not be surprised that we encountered trouble in our first trip to Mars.

The geology students did not have a clear understanding of what this break in the routine was all about. A

case study? What is that? They did not know what to do, or what their role should be. Placing students into small groups for a preliminary discussion and giving them explicit instructions about which questions they were to address definitely helped. Awkward though it first seemed, in this setting students had a chance to try out a few preliminary ideas to see how they would fly. Yet, as was evident in the general discussion, their analysis was superficial. For example, when asked to tell why scientists believed that the meteorite spent 16 million years in space or 13,000 years on earth before its discovery in the Antarctic, they felt they were finished when they answered, "by radioactive dating." It takes significant experience for students to recognize what is an adequate answer.

This only comes from frequent interaction with an instructor pushing and probing for a greater depth of analysis. How long does it take? Unfortunately, it requires at least a

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third to half a semester for there to be noticeable improvement, but there will be exhilarating moments along the way.

*Moral: Give more than one case study and be incredibly explicit about what you wish them to do. Do not simply say, "OK, discuss this among yourselves," and expect miracles. Those are the province of gospel tents and prayer meetings, not classrooms.*

▲ **Lack of commitment or involvement in the case—unless the students have a stake in the outcome of the case, the results will be mediocre.** One way to fail is to write a case that is without relevance to their interests. We think we bypassed this error because the NASA press conference received such notoriety in the press and we had students who had voluntarily chosen the course, Planetary Geology. Yet, because the case was given by strangers with no leverage in the course and no way to influence their grades, we had to rely solely upon the basic curiosity of students and their tendency to generally go along with authority figures. Not

surprisingly, many students had attitudes of "Who cares? It doesn't count anyway," or, "Entertain me."

There was not the kind of intensity and interest in understanding that the case study approach demands and normally gets. Indeed, case study classes, especially those involving small group work, have almost 100 percent attendance. So as Gypsy Rose Lee, famous for her chutzpah as well as her physical endowments in burlesque, was fond of saying, "You've gotta have a gimmick." Without it the patrons won't show. Nor will the students. Without an interest-grabbing case or a reason for the students to care, case study teaching is no more likely to result in learning than will poor lecturing.

*Moral: Without a carrot or a stick, neither mules nor students are inclined to move. Give them a reason to get the train moving and they can pull heavy loads.*

There you have the five classic errors and some solutions. In spite of our errors, there was some good news: From the students' viewpoint, we had reason to believe that some received an

insight into the questions of the "Life on Mars" debate. One student rushed up afterward and effused that she loved the case and said it was the best class she had attended. That's not bad. From our viewpoint, we clearly accomplished one of our private goals: to try out the case and see how to modify it for future classes.

And modify it we did, with decided improvement as we discussed last time in *JCST*. Still, case studies are always elusive and each time they are taught there are surprises. The potential for mistakes is always present. Nonetheless, let us hope that Piet Hein is correct when he says, "*The road to wisdom?—Well, it's plain and simple to express:*

*Err  
and err  
and err again  
but less  
and less  
and less.*"

So a return to Mars should be even smoother next time. ■