

## Passage IV

**NATURAL SCIENCE:** This passage is adapted from “Publish and Punish: Science’s Snowball Effect” by Jon Van (©1997 by The Chicago Tribune Company).

It’s a scientific finding so fundamental that it certainly will make the history books and maybe snag a Nobel Prize if it pans out, but the notion that cosmic snowballs are constantly pelting Earth is something  
5 Louis Frank just as soon would have ducked.

Frank is the University of Iowa physicist whose research led him to declare more than a decade ago that Earth is being bombarded by hundreds of house-sized comets day after day that rain water on our planet and  
10 are the reason we have oceans. That weather report caused the widely respected scientist to acquire a certain reputation among his colleagues as a bit unstable, an otherwise estimable fellow whose hard work may have pushed him over the edge.

Frank and his associate, John Sigwarth, probably went a way toward salvaging their reputations when they presented new evidence that leaves little doubt Earth is indeed being bombarded by *something* in a manner consistent with Frank’s small-comet theory.  
20 Rather than gloating or anticipating glory, Frank seemed relieved that part of a long ordeal was ending. “I knew we’d be in for it when we first put forth the small-comet theory,” Frank conceded, “but I was naive about just how bad it would be. We were outvoted by  
25 about 10,000 to 1 by our colleagues. I thought it would have been more like 1,000 to 1.”

To the non-scientist this may seem a bit strange. After all, the point of science is to discover information and insights about how nature works. Shouldn’t every  
30 scientist be eager to overturn existing ideas and replace them with his or her own? In theory, that is the case, but in practice, scientists are almost as loath to embrace radically new ideas as the rest of us.

“Being a scientist puts you into a constant schizophrenic existence,” contends Richard Zare, chairman of the National Science Board. “You have to believe and yet question beliefs at the same time. If you are a complete cynic and believe nothing, you do nothing and get  
40 nowhere, but if you believe too much, you fool yourself.”

It was in the early 1980s when the small-comet theory started to haunt Frank and Sigwarth, who was Frank’s graduate student studying charged particles called plasmas, which erupt from the sun and cause the  
45 aurora borealis (northern lights). As they analyzed photos of the electrical phenomena that accompany sunspots, they noted dark specks appearing in several images from NASA’s Dynamics Explorer 1 satellite. They assumed these were caused by static in the transmission.  
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After a while their curiosity about the dark spots grew into a preoccupation, then bordered on obsession.

Try as they did, the scientists couldn’t find any plausible explanation of the pattern of dark spots that  
55 appeared on their images. The notion that the equipment was picking up small amounts of water entering Earth’s upper atmosphere kept presenting itself as the most likely answer.

Based on their images, the Iowa scientists estimated 20 comets an hour—each about 30 feet or so  
60 across and carrying 100 tons of water—were bombarding the Earth. At that rate, they would produce water vapor that would add about an inch of water to the planet every 10,000 years, Frank concluded. That may  
65 not seem like much, but when talking about a planet billions of years old, it adds up.

Such intimate interaction between Earth and space suggests a fundamentally different picture of human evolution—which depends on water—than is commonly presented by scientists. Frank had great difficulty getting his ideas into a physics journal 11 years ago and was almost hooted from the room when he presented his theory at scientific meetings. Despite the derision, colleagues continued to respect Frank’s main-  
70 stream work on electrically charged particles in space and the imaging cameras he designed that were taken aboard recent NASA spacecraft to explore Earth’s polar regions.

Unbeknown to most, in addition to gathering information on the northern lights, Frank and Sigwarth designed the equipment to be able to snatch better views of any small comets the spacecraft might happen upon. It was those images from the latest flights that caused even harsh critics of the small-comet theory to  
80 concede that some water-bearing objects appear to be entering Earth’s atmosphere with regularity.

To be sure, it has not been proved that they are comets, let alone that they have anything to do with the oceans. But Frank’s evidence opens the matter up to  
90 study. Had he been a researcher of lesser standing, his theory probably would have died long ago.

31. Which of the following conclusions about new theories in science can reasonably be drawn from the passage?
- A. Important new theories will eventually be accepted, no matter how controversial they are or who proposes them.
  - B. Important but unusual new theories have a better chance at acceptance when they are proposed by well-respected scientists.
  - C. Research on new, nontraditional theories is widely respected within the scientific community.
  - D. Scientists welcome the opportunity to overturn existing ideas in favor of useful new theories.

32. Which of the following best describes how Frank’s colleagues perceived him after he first presented the small-comet theory?
- F. Their doubts about the theory led them to also question his work on particles in space.
  - G. They felt his theory had ruined his reputation as a widely respected scientist.
  - H. He acquired a reputation among them as someone who had worked hard to develop his theory.
  - J. They still respected his traditional research but felt he was overly committed to an improbable theory.
33. The passage indicates that at the time Frank and Sigwarth presented new evidence supporting the small-comet theory, Frank most nearly felt:
- A. relieved but bitter about how he had been treated.
  - B. grateful that ridicule of his work would end.
  - C. proud that he had been proved right.
  - D. satisfied and filled with anticipation of glory.
34. The author uses the fourth paragraph (lines 27–33) primarily to:
- F. continue his earlier criticisms of scientists.
  - G. reveal the role science serves in society.
  - H. present then undermine common perceptions of scientists.
  - J. explain the difference between theoretical and practical scientific research.
35. According to the passage, the research that led to the development of the small-comet theory began with a project originally intended to study:
- A. the electrical activity accompanying sunspots.
  - B. water entering Earth’s upper atmosphere.
  - C. static in satellite transmissions.
  - D. specks in satellite images.
36. The main function of lines 64–66 in terms of the eighth paragraph (lines 59–66) as a whole is to:
- F. give a sense of proportion to the numbers provided earlier in the paragraph.
  - G. point out the limitations of the evidence provided by the Iowa scientists.
  - H. supplement the paragraph’s description of the comets with additional details about their size and capacity.
  - J. provide readers with a sense of how old the planet really is.
37. It can reasonably be inferred from the passage that within the scientific community the year the passage was published, the small-comet theory was:
- A. tremendously unpopular and condemned for its incompleteness.
  - B. widely accepted and seen as conclusive.
  - C. regarded as tentative but deemed worthy of consideration.
  - D. seen as correct by most scientists but was highly criticized by some.
38. The author italicizes the word *something* in line 18 most likely to emphasize the:
- F. great skepticism with which critics regard Frank and Sigwarth’s new evidence.
  - G. remaining uncertainty about what exactly is bombarding Earth.
  - H. lack of doubt among scientists about the small-comet theory’s practical value.
  - J. concern among scientists about the usefulness of Frank and Sigwarth’s methods of collecting evidence.
39. When Richard Zare says that scientists lead a “constant schizophrenic existence” (lines 34–35), he most nearly means that they:
- A. often suffer psychologically from the demands of their work.
  - B. tend to be either complete cynics or people who believe too much.
  - C. are often guilty of either doing nothing or of fooling themselves.
  - D. have to maintain a balance between accepting and challenging ideas.
40. It can reasonably be inferred that Frank and Sigwarth conducted the study of the dark specks they found with a:
- F. detached, scientific mindset.
  - G. casual interest that developed into a mild curiosity.
  - H. steadily increasing level of involvement.
  - J. great intensity that began when they discovered the specks.

**END OF TEST 3**

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