



Welcome to the *Natural Inquirer* Monograph— **Time Warp Series!**

U.S. Fish and Wildlife Service photo.

Glossary words are in **bold**
and are defined on page 28.

This monograph presents the fifth article in the Time Warp Monograph Series. Have you ever thought about time warps? A time warp is a **hypothetical** state that involves a feeling or place in which time seems to stop or go backward. In this Time Warp Monograph Series, every article presents a research topic that has been under scientific investigation for a long time. Each monograph features a recent research study and highlights a similar research study from the past.



When you see the
Time Warp icon, get
ready to read about
the historic research
study related to the
“Where There’s Smoke, There’s
Fire” research.

Time Warp section begins on
page 36.

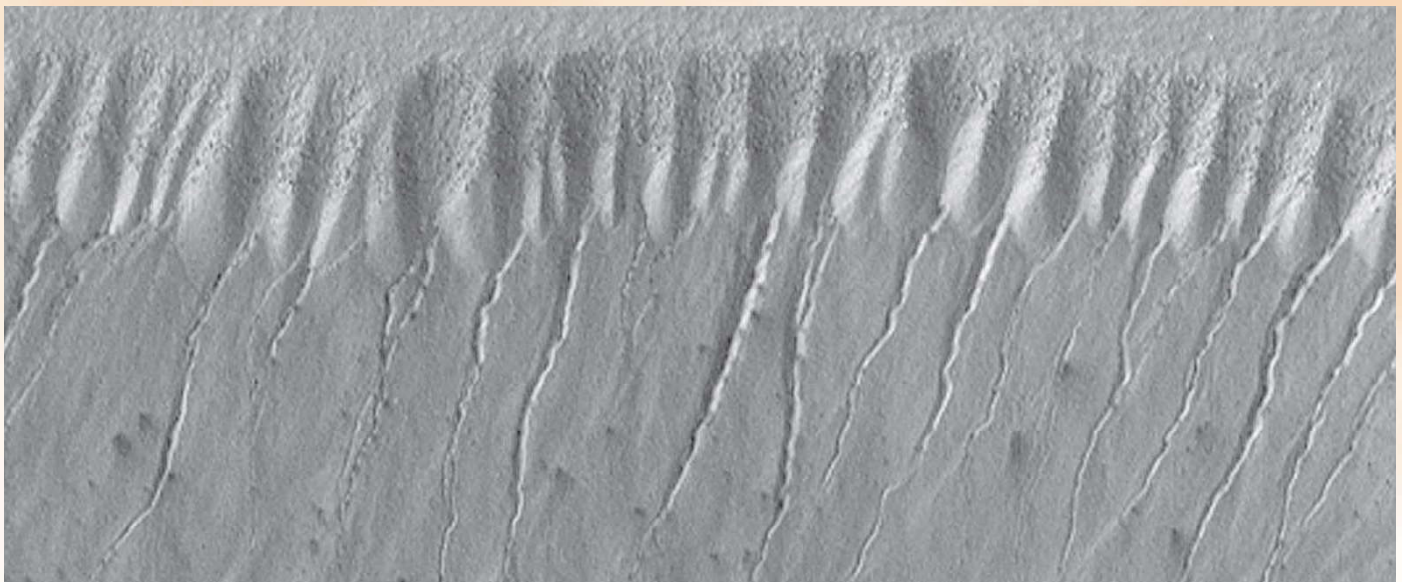
To learn more about monographs, read
“About *Natural Inquirer* Monographs!” on page 5.

Science results in the steady **accumulation** of knowledge. Recent scientific research builds on previous research. Sometimes over time, scientists discover that what they thought was true may not be true. For example, the National Aeronautics and Space Administration (NASA) recently announced the discovery of liquid water on Mars. Jim Green, NASA's Director of Planetary Science, said that Mars is "not the dry, arid planet that we thought of in the past."

With new research, scientists can create more accurate understanding. Often, new technology is the key. New technology provides new ways

of collecting and **analyzing** data. For example, photographs taken by the Mars Rover Curiosity enabled NASA scientists to discover evidence for recent water on Mars. New technology enabled Curiosity to be flown to Mars and take close-up photographs of Mars' surface.

New scientific studies may be like previous scientific studies, but in different ways. For example, scientists might study a different ecosystem or a similar ecosystem in a different location. Scientists work to discover if the same results will be found across different natural conditions. For example, in the past, scientists might have studied how rainbow trout



Although Mars may look dry and arid, National Aeronautics and Space Administration scientists discovered areas on the planet with evidence of water. Streaks on the land are one piece of evidence that scientists believe shows water on Mars. In this photo, the streaks are channels caused by the movement of water. These channels stretch down and toward the left in the photo.

National Aeronautics and Space Administration photo.

respond to water temperature changes in the Western United States. Later, other scientists might ask the same question about rainbow trout in the Eastern United States.

Scientists might study the same ecosystem or species that was studied in the past. These scientists might ask new questions that help them better understand the ecosystem or species. Scientists work to build more accurate knowledge. A direct link between the previous and current research may or may not exist.

Research on **wildland fire** is one example of how research can change human understanding over time. Forest Service scientists began studying wildland fire in the 1920s. Research at that time focused on how fire impacted wood production. Scientists and managers thought that wildland fire harmed forests. Later research, however, showed that both wildland fires and **prescribed fires** could actually keep forests healthy.

Some scientific studies focus on one thing over a period of years. These studies may answer one or more

questions. Called **longitudinal** studies, the research produces results that occur over a long time. Let's say that a team of scientists wants to know whether reading *Natural Inquirer* as a middle school student influences students' choice of careers. The scientists would have to follow the same students through middle school, high school, college, and until the students' first jobs.

Two related studies are presented in this monograph. In the *historic* research, scientists investigated fire guards and fire lookouts to see if they successfully spotted wildland fires. The *current* research is also focused on wildland fires. Scientists look for patterns between **climate** before, during, and after very large wildland fires. This is done to better understand, **predict**, and prepare for wildland fires.

Science always proceeds across time. Careful reading and thinking about historic and recent research will bring their similarities and differences to light. Whenever you read historic or recent research findings, think about the past and future. One day, you might be the scientist advancing the knowledge in that topic!