

# Cognitive scientists use eye-tracking technology to learn what makes a great geologist

August 27 2009

---

Cognitive scientists, geologists, and vision scientists are teaming up to learn how expert geologists unconsciously view landscapes for clues that point the way to important discoveries. The National Science Foundation has awarded the team, led by the University of Rochester and including the Rochester Institute of Technology, \$2 million over the next five years to find the answers.

Not only might the findings shed light on how a seasoned geologist's brain teases out information from a terrain full of complex features, but the results might be applicable to scientists in other fields. Crucially, the findings could help reduce the costs of training young scientists by giving them useful simulated field training without the high costs of travel and equipment.

"This is a new way to look at how experience changes how we see," says Robert Jacobs, professor of brain and cognitive sciences at the University of Rochester, and lead investigator of the project. "In the past, there had been some attempts to understand how radiologists read an X-ray image, but no one has ever done something like this—where we monitor people out in the natural environment and try to understand how experienced and inexperienced scientists see the same scene differently."

John Tarduno, professor of earth and environmental sciences at the University, will take 10 undergraduate students to various areas of

geologic interest, such as the San Andreas Fault, the snowy Sierra Nevada near Yosemite National Park, and the deserts of eastern California including Death Valley. As he and the students walk through different landscapes over the course of 10 days, each will wear a small head-mounted eye-tracking system that will monitor precisely where he or she is looking at any given time.

Back at the University, Jacobs and Tarduno will analyze the data, noting the way each student takes in the geological formations around them, and comparing that to the way Tarduno and his seasoned assistants view the same formations.

"An expert geologist scanning a landscape might notice where a stream is offset from its normal course and deduce that motion on a fault had caused the stream diversion," says Tarduno. "Streams and patterns of erosion in general provide clues to processes shaping landscapes. But we want to know more about how experts make the connections visually. The data could be invaluable in letting us know how a student sees the landscape and how we can teach them to see it through more experienced eyes."

In addition to the eye-tracking data, Tarduno and the project team will bring back high-resolution images of the areas he and his students visit. These images will be projected onto giant 180-degree wrap-around screens, and students' direction of gaze will be monitored as they look around the projected landscapes. If there is a clear correlation between the way student geologists in the field and student geologists in the laboratory take note of the formations around them, then it may be possible to use the simulation to train students without incurring the costs of an actual field trip.

In addition, says Tarduno, it might be possible to give prospective [geologists](#) far more "field" experience than they could normally expect

to receive. Instead of a single trip to geological sites each year, students could take dozens of simulated trips and perhaps hone their observational abilities earlier and be ready to make better use of actual trips.

Along with the scientists from the University of Rochester, two scientists from the Rochester Institute of Technology's Center for Imaging Science, Jeff Pelz and Mitchell Rosen, are part of the project. Pelz is an expert in small, wearable eye trackers, and will not only outfit the team, but will help analyze the data the trackers collect. Rosen will help with the image processing, especially taking ultra-large, high-resolution photographs of the landscapes, which will be used in the simulations.

Source: University of Rochester ([news](#) : [web](#))

Citation: Cognitive scientists use eye-tracking technology to learn what makes a great geologist (2009, August 27) retrieved 26 April 2024 from <https://phys.org/news/2009-08-cognitive-scientists-eye-tracking-technology-great.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.