# New Mexico Science and Engineering Fair 2006
# New Mexico Bureau of Geology and Mineral Resources
# "Excellence in Geoscience" Award

On April 7 and 8 more than 500 middle and high school students and their parents and teachers came to Socorro from across the state to participate in New Mexico's 54th annual Science and Engineering Fair on the campus of New Mexico Tech. New Mexico Bureau of Geology and Mineral Resources is proud to be among the more than 50 organizations, companies, and individuals sponsoring special awards. The bureau's "Excellence in Geoscience " Award is supported solely by the employees of the bureau and is presented to a student in the junior division (grades 6 through 9) and a student in the senior division (grades 9 through 12; ninth graders may choose the division in which they wish to compete). *New Mexico Geology* is pleased to acknowledge this year's recipients of the bureau's Excellence in Geoscience Award, to print the abstracts of their research, and to list their other special awards and their placement within the junior and senior divisions of the 13 science fair categories.

This year's winners of the bureau's Excellence in Geoscience Award are Alexander K. Kendrick in the junior division and Tara J. Elkins in the senior division. Both Tara and Alexander will receive cash awards of $100.00 and 1-year subscriptions to *New Mexico Geology* and *Lite Geology*.

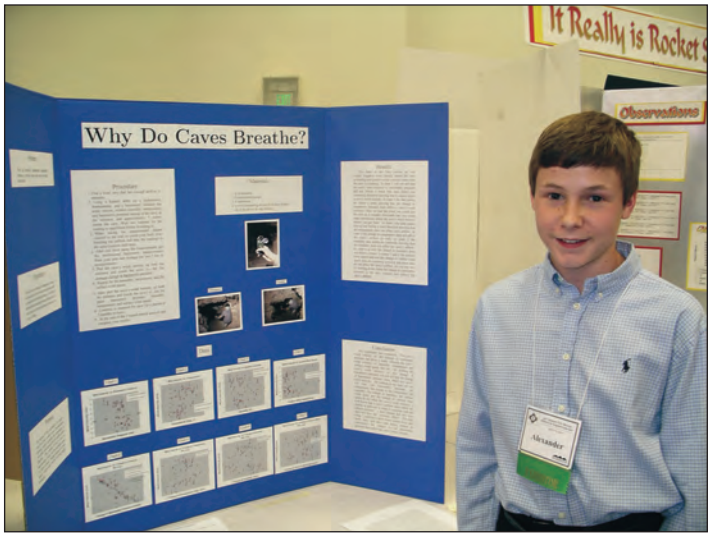
The bureau's junior division award winner, Alexander Kendrick, placed first in the junior division in the category Earth and Space Science. He was also awarded $200.00 for first-place honors from the New Mexico Chapter of the American Vacuum Society and $100.00 from the New Mexico Geological Society. Alexander received a pin, certificate, and invitation to enter the Discovery Channel's Young Scientist Challenge, which is awarded to junior high students for good science and the ability to communicate about science.

The bureau's senior division award winner, Tara Elkins, placed third in the senior division in the category Environmental Science. She also received a certificate and an invitation to enter the Stockholm Junior Water Prize competition, which is awarded by the Water Environment Federation to an outstanding water-related science project. Tara received a $100.00 award from the New Mexico Water Resources Research Institute, a $50.00 award from the Rocky Mountain Water Environment Association, a $20.00 award and tote bag from the New Mexico Network for Women in Science and Engineering, a certificate from the Association for Women Geoscientists, and a book award for use at New Mexico Tech.

## Why do caves breathe?

by *Alexander K. Kendrick*
Los Alamos Middle School,
Los Alamos
Winner, Junior Division

The purpose of this experiment was to find out if the barometric pressure, the relative humidity, the temperature or surface wind speed affected a cave's wind velocity. In order to do this we found a local cave that had enough air speed to measure. Then using a device called the Kestrel 4000 (which measures the temperature, humidity, barometric pressure, and wind speed) we measured the cave's wind speed at the entrance of the cave and approximately 5.2 m inside the cave. We noticed that you should plaster yourself to the cave wall when taking the measurement to avoid your body affecting the airflow. We also used the barometric pressure measured at a lab near the cave (TA54). We continuously monitored the cave over a period of about 3 months. We plotted the cave's wind velocity vs. barometric pressure, humidity, temperature, and surface wind speed and found no correlation. So we plotted the cave's wind velocity vs. the change in the barometric pressure, humidity, temperature, and surface wind speed. To get our change in pressure, humidity, temperature, and surface wind speed, we calculated the change for a 15-minute interval using the TA54 measurements (because these measurements were taken every 15 minutes). We averaged 20 of the 15-minute intervals to get a 5-hour average, which we used to make the plots. After we plotted the data, we noticed that the cave's wind velocity vs. the change in barometric pressure showed a trend. We also noticed that when the pressure decreased the cave exhaled and when the pressure increased the cave inhaled, also supporting our theory. The cave reached high wind speeds whenever there was a low or a high that caused a large change in barometric pressure. From this experiment I learned that the change in barometric pressure does affect the cave's wind velocity. I also learned that caves are very accurate weather predictors when there is a low or a high. Another thing I learned was that when we saw the trend in the cave's wind velocity vs. the change in barometric pressure, it became fairly easy to predict the cave's wind velocity before arriving at the cave. My results did support my hypothesis. The change in pressure did affect the cave's wind velocity. I learned that cave wind velocity is a very interesting topic and you can learn many intriguing things from it.



**Contamination migration**
by *Tara J. Elkins*
Grants High School, Grants
Winner, Senior Division

Hype rages from all sides of the debate concerning contamination and the Homestake Milan uranium mill/tailings ponds, not just in reference to the actual contamination levels, where and how fast the contamination is moving, but in who is to blame, what is happening, and what should be happening to remediate the issue. Every family that lives or raises livestock in that area has a different fear, a different complaint, and a different statistic of the "polluted" water just a few hundred feet below them, but only a small few have a fact-based, strong understanding of the issue. The purpose of this investigation is to determine if there is an apparent trend in the migration of contaminants in the alluvial aquifer southwest of Homestake's Milan tailings pile. Because of the gradient of the base of the alluvium, it is speculated that if contaminants in the aquifer are flowing, then they are flowing in a general southwest direction.


To accomplish this, data of various major and minor constituents at 16 wells (each in the alluvial aquifer southwest of the tailings pile) over a 9 year period were collected from Homestake Mining Company records. The concentrations of uranium, selenium, total dissolved solids (TDS), and sulfate were analyzed, and their average yearly change in concentration was calculated. Once the average amount of change at each site was established, the results were plotted on maps of the site, which were then observed in search of a general trend in contamination flow. To better understand Homestake's data sources, water samples were collected from four of the analyzed plots. Following the state's and Homestake's procedures, these samples were filtered, preserved, and tested for concentrations of the four constituents at hand. After all of the data were analyzed and plotted, small correlations hinting toward a southwesterly routed contamination flow, but no overall trend in migration of uranium, selenium, TDS, or sulfate, were observed.

Because it is possible that plotting more data points and further research of the idea could possibly present a more apparent trend, this investigation will remain inconclusive. It's believed that the data observed at the present time are not sufficient to determine the authenticity of the hypothesis.

Photographs by Maureen Wilks.