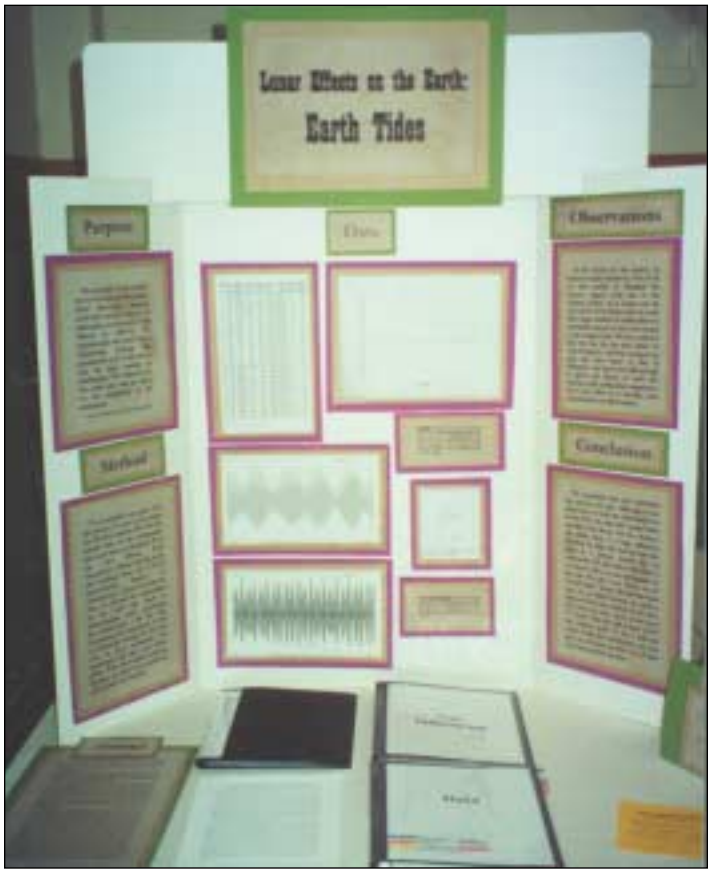
New Mexico Bureau of Mines and Mineral Resources Excellence in Geoscience Award New Mexico Science and Engineering Fair 2000

The New Mexico Bureau of Mines and Mineral Resources presented awards to five young women for their Earth Science exhibits at the New Mexico Science and Engineering Fair held at New Mexico Tech, in Socorro, New Mexico, on April 14–15, 2000. The awards were judged and funded by Bureau staff.

For first place in the Senior Division, Amy Dalness, Deniz Husrev, and Amy Olsen, from Santa Fe High School, received a $50.00 cash award for their team contribution, "Lunar effects on the Earth: Earth tides." Senior Division exhibitor Kira P. Lueth, from Socorro High School, was awarded second place for her exhibit, "Dehydration properties of minerals." She received a $30.00 cash award. First place in the Junior Division went to Diana V. Gonzales, a 9th grader from Wagon Mound Public Schools. Her exhibit titled "Can't retain, must drain" earned her a $25.00 cash award. All winners received subscriptions to *New Mexico Geology* and *Lite Geology* and the opportunity to have their abstracts appear in *New Mexico Geology*.



First Place, Senior Division

LUNAR EFFECTS ON THE EARTH: EARTH TIDES by *Amy Dalness, Amy Olsen*, and *Deniz Husrev*, Santa Fe High School, Santa Fe, NM 87505

Abstract—Our project was to determine if there was a relationship between the series of earthquakes in Bernardo, New Mexico, from 1989–91, and Earth tides. We hypothesized that there would be a direct effect on the magnitude of the earthquakes from the Earth tides. Earth tides are the gravitational pull of the moon and, to a lesser extent, the sun on the Earth's landmasses.

Using data from the New Mexico Tech Geophysics Library of the earthquake swarms in Bernardo and Earth-tide read outs from the USGS, we were able to draw our conclusions. We plotted the earthquake data on the Earth-tide readings by day and hour. After doing this, we analyzed the data through tables, graphs, and percentages to find a correlation between the quakes and the tides.

We discovered that we had to make many modifications on our project in order for the results to be logical. We first wanted to exclude the Socorro magma body in and around Socorro, thinking it would effect our results. We thought Bernardo was far enough away to exclude this factor, but were proven wrong when we learned from the USGS that Bernardo is on the edge of the magma body. We concluded that the magma body would, after all, not make a major impact on our results. We also figured that our project would be more accurate if our Earth-tide data had a relatively small time frame that would allow us to analyze the earthquake from hour to hour, not just day to day. The Bernardo swarms seemed to provide a good time frame and a large number of earthquakes to plot.

We concluded that our original theory that Earth tides directly affect the earthquake magnitude was not true; although we did draw some other theories that point at the possibility of there being some relationships. Our initial theory was disproved for a few reasons. When taking the average Earth-tide magnitude, it came out to be approximately 6.23, which is only slightly over the median (our scale was from 120 to -120). When looking at the data and comparing tide magnitude versus number of earthquakes to determine percentage, we found that 20 of the 43 counted earthquakes occurred in a period of "high tide," (which we determined to be anything above or below 50 or -50), which gave us only 47% occurring at high tide. Although we could not determine a direct relationship to magnitude, we did notice a few other things. In a day with a high fluctuation in tide magnitude, a "mini-swarm" occurred when three or more earthquakes shook the Earth in a 24-hour time frame. This became one of our theories; maybe the tides were creating just enough extra stress on the Earth's crust that the almost exact same area could harbor another earthquake. We also believe that Earth tides are constantly effecting earthquakes due to the fact that the Earth is being pushed and pulled every minute. The Earth's crust can fluctuate a matter of a few feet every 6–7 hours. This gave us our "straw on the camel's back" theory. The Earth tides are a constant factor in earthquakes, and we believe that they are not the cause of earthquakes but are a constant factor in their formation.

Conclusions—We concluded that our hypothesis was proven not true. Although it was disproved, we took the information we found from the data and created other theories. One theory was that during a day when there is a huge difference between the high tide and the low tide, there is a greater chance for an earthquake. We also believe that there is a constant effect on the earthquakes by the pull. We call it our "straw on the camel's back" theory. We feel that there must be an effect because the Earth is being moved every minute by the tides. The crust can move up to a foot every 6–7 hours. The tide pull is the final "push" the tension needs to be a full-scale quake. From the information our data gave us, we came up with a lot of ideas and many possible theories.

Second Place, Senior Division

DEHYDRATION PROPERTIES OF MINERALS by *Kira Lueth*, Socorro High School, Socorro, NM 87801

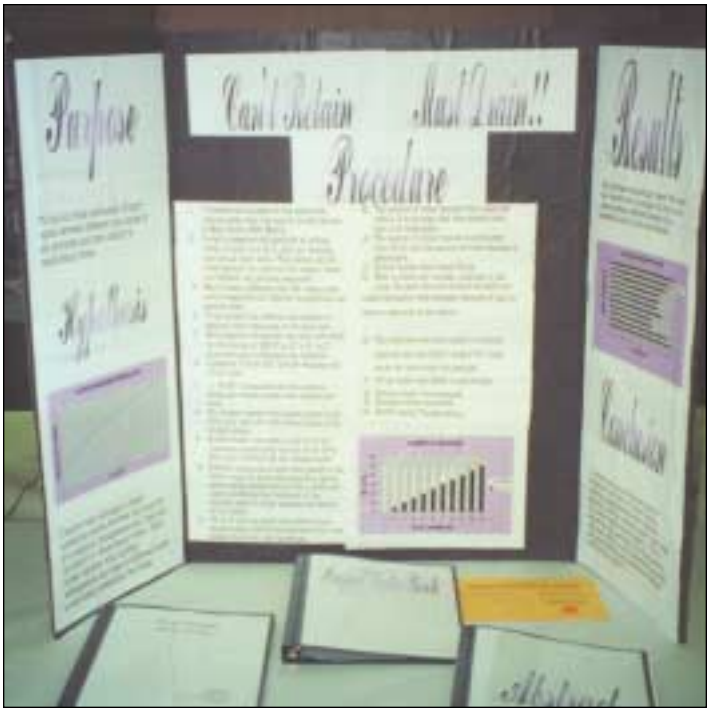
Abstract—This project tested the dehydration properties of some minerals. These minerals were stilbite, hornblende, chabazite, talc, and chrysocolla. The minerals were heated at 200°, 400°, and 600°C. The products were then analyzed by an X-ray diffractometer. The minerals proved the hypothesis, which is, samples that showed loss of water and rehydration showed no signs of structure alteration. Samples that lost water but did not rehydrate showed altered structures. Samples that showed no sign of water loss show no signs of alteration.

Conclusions—The data collected in this experiment supported the hypothesis. The hypothesis was that the H_2O in the minerals would be removed and replaced, but the OH would not. The minerals stilbite, chrysocolla, and chabazite (H_2O minerals) lost water at all the temperatures and regained all or most of it at 200°. At 400° and 600°C, the minerals regained little or no water.

The OH minerals did little in the way of weight change. Any big differences were most likely human error. This lack of change would be because OH is more strongly held in the structure of the molecule and a higher temperature than that used is needed to remove the water.

As shown by the data, it is possible to dehydrate and "rehydrate" minerals. This data was analyzed and the why of it was then tested. After X-raying, it was possible to see why or why not the specimen was able to regain its lost water. The specimens that showed dehydration and rehydration also showed evidence of a structure change. Those that showed no loss of water showed little or no alteration of their structure. Those that dehydrated but did not rehydrate showed massive changes in their structure.

These tests show that when minerals are heated and lose part of their structural water, they may or may not change the rest of their structure. Part of it depends on the type of water. OH, which is held tighter in a mineral structure, will destroy the mineral sample if it is removed. H_2O may or may not alter the structure. If the H_2O is held in a structure such as it is in the zeolites (held loosely in channels), it will only be destroyed by higher temperatures. If it is like chrysocolla,



Junior Division

CAN'T RETAIN, MUST DRAIN by *Diana Gonzales*, Wagon Mound Public Schools, Wagon Mound, NM 87752

Purpose—To find out what correlation (if any) exists between different mix ratios of soil particles and their ability to retain / drain water.

Hypothesis—I believe that although a linear correlation exists between the quantity of a singular homogeneous soil type and its ability to drain / retain water, when mixed together with another homogeneous soil type at different ratios a non-linear correlation will exist.

Results—My hypothesis was partially correct. The water that drained from my samples did form a non-linear correlation. However, instead of an exponential curve, a bell curve resulted.

Soil samples were collected on a ranch with help from the Soil Survey of Mora County. Soils are classified into several textural groups. They include sandy clay, silty clay, clay loam, sandy clay loam, silty clay loam, and loamy sand. A sand grain ranges in diameter from 0.05 to 2 mm; a silt particle ranges from 0.002 to 0.05 mm in diameter, and clay is a grain having a diameter less than 0.002 mm. If a grain of sand is as big as a two-story building, a grain of silt would be the size of a tennis ball and a grain of clay would be the size of a grain of sand.

Conclusions—I learned that although clay and sand by themselves have their own water-holding-capability characteristics, when combined, especially when the ratios are closer to each other, they have reduced water-holding capacities. This is because the clay particles are approximately ten times smaller than sand, and they actually reduce the available pore space between the sand particles and reduce the water-holding capacity.

Call for papers: Tucumcari 2001
New Mexico Geological Society 52nd Fall Field Conference

On 26–29 September 2001, the 52nd Fall Field Conference of the New Mexico Geological Society will visit eastern New Mexico and west Texas from the conference's central point in Tucumcari, New Mexico. Three days of field trips will encompass the area from Palo Duro Canyon in west Texas to Santa Rosa, New Mexico. Articles for the conference guidebook are invited in all areas of geoscience relevant to the conference area, which includes all of eastern New Mexico north of Roswell, all of west Texas north of Midland and adjoining areas of Colorado, Kansas and Oklahoma.

Articles must be submitted by 15 January 2001 to be published in the NMGS Guidebook in Fall 2001.

To contribute an article you must send a title and estimated manuscript length (number of double-spaced typescript pages, number of figures) by 30 September 2000 to:

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After receipt of your title and length estimate, you will receive detailed instructions to authors to aid you in preparation of your manuscript.