New Mexico Science and Engineering Fair 2010 New Mexico Bureau of Geology and Mineral Resources and New Mexico Geological Society Excellence in Geoscience Award

Hundreds of high school and middle school students from across New Mexico presented their research at the 58th annual New Mexico State Science and Engineering Fair, April 9th and 10th. These student finalists, having already survived local and regional science fairs, competed for awards and the opportunity to be one of the six students to represent New Mexico at the International Science and Engineering Fair in San Jose, California. Students competing in either the junior division (grades 6 through 9) or senior division (grades 9 through 12) presented their work in one of fifteen categories: behavioral and social sciences, botany, cellular and molecular biology, chemistry, computer science, earth and planetary sciences, energy and transportation, engineering, environmental sciences, mathematical sciences, medicine and health sciences, microbiology, physics and astronomy, zoology, or as a team project. Judges assigned to each category interviewed the finalists and evaluated their research projects on such traits as creativity, thoroughness, and their ability to knowledgeably and clearly describe their work. In addition to the prizes in each category, students vied for dozens of special awards sponsored by government agencies, professional societies, industrial organizations, branches of the armed forces, and individual donors. A complete list of the award-winning

students, the titles of their exhibits, and their prizes can be found on the New Mexico Tech Web site, http://infohost. nmt.edu/~science/fair/

This year the New Mexico Geological Society partnered with the New Mexico Bureau of Geology and Mineral Resources to sponsor the "Excellence in Geoscience" special award for one junior and one senior division student. This year's winners are Dennis A. Huang in the junior division and Majdolene Z. Khweis in the senior division. They both received cash awards of \$200.00, certificates, and one-year subscriptions to *New Mexico Geology*.

The bureau's junior division award winner, Dennis A. Huang, placed third in his division in the category Earth and Planetary Sciences. He also received special awards from the Association of Women Geoscientists and the National Oceanic and Atmospheric Administration as well as the David K. Shortess Award for a project exhibiting outstanding quality in logic and clarity of presentation.

The bureau's senior division award winner, Majdolene Z. Khweis, placed first in her division in the category Earth and Planetary Sciences. She also received a special award from the Association of Women Geoscientists and a \$100.00 cash award from the New Mexico Tree Farm Program for the best forestry project.

Impact of aerosol indirect effect on global warming by Dennis A. Huang Desert Ridge Middle School, Albuquerque Winner, Junior Division

A classroom experiment was designed for simulating the impact of indirect effect of aerosol particles in the lower atmospheric layer on global warming by mixing sprayed liquid aerosol particles with a chemically generated layer of carbon dioxide in a tank. The changes in the rising rate of tank temperature were first measured and then compared for two cases, i.e., with/without a layer of carbon dioxide. The crucial role played by the carbon dioxide layer is found to reflect most of the thermal radiation from the dark substrate back to it. The sprayed liquid aerosol droplets induce multiple scattering of thermal radiation between the carbon dioxide layer and the bottom of the tank and are associated with the reduction of carbon dioxide greenhouse effect. The indirect aerosol effect is expected to decrease water droplet size and increase its concentration, leading to enhanced scattering of thermal radiation and

decreased tank temperature. The obtained experimental data will greatly improve the understanding and the origin of global warming and stimulate the interest about the indirect roles played by aerosol particles. outcome of industrial pollution in the global warming issue.



Photo courtesy of Phil Miller.

The connection between the current study and industrial pollution is also remarked at the end, along with a brief discussion of the Don't let it slide IV: fire factor! by *Majdolene Z. Khweis* Taos High School, Taos Winner, Senior Division

In 2009 alone, wildfires destroyed 5,914,821 acres. These damaged areas have numerous

detrimental effects on the environment as well as plant, animal, and human health. It is vital to re-grow these areas, but it is a difficult process. The purpose of this project is to determine whether polyethylene oxide (PolyOx) and ammonium nitrate can be used to regenerate damage caused by a forest fire by preventing water erosion and stimulating growth. It is hypothesized that PolyOx will adhere to the soil and seeds to prevent water erosion. The fire will kill all of the naturally occurring bacteria and nutrients. Ammonium nitrate and PolyOx will retain the nutrients in place,

allowing for nutrient and bacteria regeneration as well as alfalfa growth.

The following method was utilized: Fill 10 containers with mountain loam soil and plant 8 g of alfalfa seeds. After the plants have sufficiently grown, simulate a forest fire by baking the soil in an oven at 500° F for 1 hour.

Measure a 15° angle from the bottom of the container. Fill the containers with the burnt soil and level with the 15° angle. In one container, plant 1.5 g of alfalfa seeds in the top 3 cm of the slope. Repeat in the second container, but place 1 mL of ammonium nitrate on the soil. Repeat in the next four containers, this time with a PolyOx-alfalfa seed solution.

Repeat for the last four containers, this time adding 1 mL of ammonium nitrate to the PolyOx-seed solution. Remove a soil sample from each container everyday and plate the bacteria. Observe alfalfa erosion, growth, height, moisture, and bacteria.

After 8 days of water erosion, it was observed that the trials with PolyOx had the least erosion. The best growth occurred in control 1 because it contained no PolyOx and ammonium nitrate, which have a bactericidal effect. The trials with PolyOx had less growth, but better moisture levels, less erosion, and greater plant heights.



Photo courtesy of Phil Miller.