

**THE UNIVERSITY OF TEXAS AT SAN ANTONIO**

**1<sup>st</sup> ANNUAL  
MORE SCIENCE COLLOQUIUM  
ABSTRACTS**

**Colloquium will be held  
on Friday, November 17<sup>th</sup>, 2006**  
(12:30-3:30 pm at room SB2.03.06,  
refreshment and drinks will be provided)

**All students and Faculty are welcomed!**

**For detail information ask Burcu Cicek  
(7851 or [burcu@drcicek.com](mailto:burcu@drcicek.com))**

<http://www.utsa.edu/lrsg/MOREScience/>

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# **Small-Scale Performance of a Novel Arsenic Sorbent from Contaminated Groundwater**

## **Undergraduate Student**

Alexander S. Castillo

## **Advisors**

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Several arsenic (As) treatment technologies exist for arsenic-contaminated groundwater, but the majority of them are cost-prohibitive for rural communities and small municipalities around the world. Our proposed technology relies on a packed bed reactor (PBR) system, utilizing a novel, low-cost, As filter medium, i.e., the drinking-water treatment residuals (WTRs). The drinking-water treatment process generates a by-product, the WTRs, which are available, free of charge from the drinking water treatment facilities in the U.S. Earlier batch experiments have shown the tremendous affinity of WTRs for soluble As(V) and As(III). A small-scale (30 x 5 cm) PBR system containing the WTRs were tested for its effectiveness in treating As-contaminated, synthetic groundwater. Influent groundwater composition was  $150 \mu\text{gL}^{-1}$  As added either as As(V) or As(III) mixed with  $2 \text{ mg Fe}^{++}$  at a pH of 6.5. Influent solution was constantly purged with  $\text{N}_2$  to simulate typical anaerobic conditions in groundwater, and it was delivered to the PBR filter medium consisted of either an Al-, or Fe-based WTRs (<1-mm). The total bed volumes processed varied between the WTR type (Fe-, or Al-based), and the As oxidation state (III vs. V). The Al-WTR was superior to the Fe-WTR effectiveness in treating both As(V) and As(III)-contaminated groundwater, processing > 18,000 bed volumes before exceeding the current MCL value for As in the U.S. and Europe ( $10 \mu\text{gL}^{-1}$ ) for As in India and other developing countries that are being poisoned by their drinking water. Continuous monitoring of several metals (Al, Fe, Cr, Cu, Zn, Pb, and Mn) did not show that WTRs leached metals to the effluent solution to any measure of significance.

# **Statistical analysis and prediction of mean temperature on West Texas based on El Niño Southern Oscillation Index**

## **Undergraduate Student**

Melissa Quiñones

## **Advisor**

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This research explores the possibility of predicting monthly temperatures in stations located in the Trans Pecos division (NOAA Climatic division number 5: Alpine, Brewster, El Paso and Winkler counties) based on a correlation with El Niño Southern Oscillation (ENSO) index, using the NOAA mean monthly temperature from 1954 to 2004 in NOAA climatic stations spanning the geographical region of the Trans Pecos division. Through statistical analysis of temperature data and correlation with the ENSO index the predictability of monthly temperature is determined for each station. Results found that predictability of temperature varied greatly depending on the conditions of the ENSO index. The best chance of prediction occurs in the winter months of years with an active El Niño phenomenon. Conversely, the lowest chance of prediction corresponds to neutral years, when no El Niño or La Niña phenomena are occurring. Ability to predict temperature also varied spatially, as evidenced by different predictability results in different stations. This suggests that prediction can be achieved to some degree locally but may not be possible in a regional effort. Therefore, it is recommended that future studies focus on smaller geographic regions in order to increase the chance of successful prediction.

# **Measurement of the benthic loading from an aquaculture operation in Culebra, Puerto Rico**

## **Undergraduate Student**

Melissa Quiñones

## **Advisor**

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The following study is part of a multidisciplinary long term project to determine the environmental impact caused by fish farms on the west coast of Culebra, P.R. It is believed that such fish farms may produce environmental changes including the action of the sedimentation, affecting grain size distribution and composition. A change in sedimentary processes may affect organisms that live on the ocean floor, adding a pronounced environmental effect. Four stations were set up along a transect on the study area. Each station contains 2 sediment traps (replicates). Samples of sediment traps were complemented by core samples. X-Ray diffraction analysis, grain size and distribution, and composition analysis were done in the sediments. Traps and cores have similar mineralogical composition in all the samples. The cumulative curves show that there is not a significant change in grain size as we move along the transect away from the cage. The exception was the station located under the cage, where the grains are finer. The organic matter was always lower in the sediment traps compared with the cores measured. There were also more terrigenous sediment in the traps than in the cores. The most abundant component in traps and cores were carbonates. There were more carbonates in the cores than in the traps. The information obtained in the study suggests that the organic loading from the cage (traps) is not impacting the bottom significantly because the organic material is not being deposited on the bottom (cores).

## **Texas and the Edward's Aquifer**

### **Undergraduate Student**

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### **Advisor**

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For my More Sciences project, Dr. Kyle Murray and I got together to produce the idea of creating GIS maps of both Shavano Park and the counties that overlay the Edwards Aquifer. We chose this idea because we both have experience in this field. Since I have already taken the class in GIS mapping and Dr. Murray specializes in it, it only seem an elementary idea. The area in the first map which is of Shavano Park is special because we wanted to show where the fluorescent tracing dyes were being found and help find contaminated runoff into the aquifer. The second was simply a map displaying the aquifer with the counties and showing the importance of the preservation of the Edwards Aquifer. The tools we used were simply Arc map and Arc catalog. We also got some gis data from several other state agency websites. Dr. Murray did actually use one of the maps for a paper he composed about using fluorescent dyes and OBs (optical brighteners) to locate contaminated water runoff from the Shavano Park streets and sewers and into the aquifer below.

# **Time Series Resistivity Surveys of Water Content in Edwards Fissures**

## **Undergraduate Student**

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The purpose of this project was to test current theories which state that recharge and pollution of the Edwards Aquifer tend only to happen rapidly at sites of low and level elevations. Water content variations in fissures and porous media were measured, in a time series, at a high elevation site near Headquarters cave, Camp Bullis, Bexar County, Texas. The water content measurements were taken by setting up a fixed resistivity sampling line at the site and collecting data, every two weeks, to determine where water accumulated and moved in the ground after precipitation had fallen. Variations in these water content numbers and their placement in relation to the fissures should allow determination of preferential flow pathways of water at that site. One of two alternative flow pathways is expected to dominate after further investigation. The first of these two is that the precipitation will run down the slope of the land towards levels of lower elevation (which would show if the water content stayed and moved along the surface). The second includes the possibility that the water will run directly through the fissures present and go straight to the subsurface karst features (the water content would accumulate in fractures and not percolate through high amounts of soil). The study is still being conducted and the results are pending but through preliminary investigations the suspected results will be a lean towards the latter of the two scenarios aforementioned. The conclusions of this study will indicate whether the fissures play a large factor in preferential flow pathways of water and precipitation. Further studies could allow a look at the aquifer recharge in high elevation areas and could find more rapid aquifer recharge and contamination potential in areas of high elevation than originally believed were true.

**Utilizing the Soil Survey Geographic (SSURGO) Database for the  
Analysis of Soils in Bexar County, Texas**

**Undergraduate Student**

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A preliminary study was conducted to determine the accuracy of the SSURGO Database in regard to soil samples that were collected from various locations in Bexar County, Texas. An analysis of those samples was then conducted; these procedures conducted included soil moisture content, particle size distribution and soil textures as well as soil pH and the amount of organic matter. In SSURGO it was indicated that the three sites selected were situated over different soil series. The SSURGO metadata provided soil characteristics for each of the series. The soil series that were analyzed in this study included the Frio soil series, Crawford soil series, as well as the Patrick soil series. Utilizing ArcMap software a map was created of several layers to produce a visual representation of the collection sites. Once the various analyses for each sample were completed the results showed that the classifications provided by SSURGO were accurate for each of the sites. The samples collected from the area that pertained to the Frio soil series were found to contain a higher amount of clay content as it was stated in the SSURGO metadata. Through analysis in the laboratory, it was demonstrated that the Crawford soil series area did contain more organic matter than the others analyzed which were deficient in carbon content. The samples collected in the area designated Patrick soil series did meet the characteristics the metadata SSURGO provided. Further similar studies in different locations of Bexar County could strengthen the findings of this preliminary study.



**Using OMEGA data to determine the optical depths of water vapor absorption bands in the Martian atmosphere**

**Undergraduate Student**

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This paper retrieved optical depths of four selected water vapor absorption bands at 1.126 $\mu\text{m}$ , 1.385 $\mu\text{m}$ , 1.871 $\mu\text{m}$ , and 2.566 $\mu\text{m}$  from the OMEGA/Mars Express hyperspectral imagery, based on a tau algorithm implemented using the Module Builder of Erdas Imagine. About 164 images covering latitudes 75°N to 75°S and spanning from solar longitude Ls=330 to Ls=118 were processed. The capability of those 4 bands in retrieving optical depths were compared and distribution maps of optical depth on the Latitude and Ls plane were created and compared as well. Our results show that all four bands are capable of retrieving optical depths of water vapor in the atmosphere, however, band 1.385 $\mu\text{m}$  and 2.566 $\mu\text{m}$  show the most consistent with previous instruments for seasonal distribution.