25<sup>th</sup> Anniversary Colloquium Schedule at a Glance March 9<sup>th</sup> – 12<sup>th</sup> 2011.

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<th>Times</th>
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<td>10:45 am</td>
<td>Welcoming statements</td>
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<td>Keynote speaker**</td>
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<td>Grad. Oral &amp; Poster</td>
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<td>6:00 pm-8:00 pm</td>
<td>GK-12 ECHS Poster Presentations and Awards</td>
<td>2:30 pm-</td>
<td>Grad. Oral &amp; Poster</td>
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<td>Dinner*</td>
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**Dr. Stephen J. Reynolds from Arizona State University**

Title of talk “Perception, Visualization, Cognition, and Learning in Geoscience Courses”

* Party starts at 6:00pm at Dr. Pavlis and Dr. Serpa’s house.
2011 Colloquium Sponsors

We would like to recognize and thank the following for their generous support!

Shell

Marathon Oil

BP

Asarco

UTEP Geological Sciences Department

UTEP Geology Alumni
## Table of Contents

- Department Chair Greeting.................................................................i
- Colloquium Committee Greeting.......................................................ii
- 2011 Colloquium Committee..................................................................iii
- Colloquium Schedule of Events..........................................................1
- Wednesday Undergraduate Poster Session Schedule...............................2
- Wednesday GK-12 Early College High School Poster Session Schedule........3
- Thursday Undergraduate Poster Session Schedule..................................4
- Thursday Graduate Poster Session Schedule........................................5
- Thursday Graduate Oral Presentations Schedule.....................................6
- Friday Oral Presentations Schedule......................................................8
- Oral Presentation Abstracts.....................................................................10
- Poster Presentation Abstracts..............................................................21
- GK-12 Poster Abstracts..........................................................................33
- Post-Colloquium Party Information.......................................................36
- Colloquium Field Trip Information........................................................37
- Index of Presentations...........................................................................38
- Index of GK-12 Posters ........................................................................43
MESSAGE FROM THE CHAIR

Colleagues, Friends, and Supporters,

I cordially welcome you to the University of Texas at El Paso’s (UTEP) 25th Annual Department of Geological Sciences Colloquium. The Colloquium is our Department’s major showcase of students’ maturity and professionalism in scientific research. We are proud of this 25-year tradition, which encompasses a broad range of activities including student poster and oral presentations, active judging and mentoring, fun field trips, and a closing celebration.

On this 25th Anniversary, our students have developed a very strong program, including research presentations from undergraduate, graduate, and Early College High School (ECHS) students. We welcome the ECHS students for the first time, as they have had the opportunity to work with graduate student Fellows funded by a new grant funded by the National Science Foundation (NSF). Furthermore, we welcome Environmental Science students to this event, as this program now has a home within our Department. In conjunction with the 25th Colloquium, we have also launched a 25 for 5/5 for 25 campaign. The campaign seeks donation from alumni, where we are seeking 25 donations at $5,000 each, and 5 donations at $25,000. This ambitious campaign comes before the 100th Anniversary of UTEP, where the university is seeking $200 million in donations by 2014. In these tough economic times, any donation is most welcome!

UTEP is also currently under an arduous competition for Tier 1 status in Texas, which essentially means that a university conducts advanced research and graduates an impressive amount of Ph.D. students. I am proud to report that indicators show that our Department leads UTEP in research and Ph.D. student production. This new Tier 1 emphasis will strengthen our long-standing approach to science, which is to conduct research within an open and welcoming environment. We are fully committed to continue training more generations of outstanding geoscientists who will impact our field for years to come.

For all potential students visiting us this weekend, welcome to El Paso, TX. I believe that you will be impressed with our student diversity and nationally recognized faculty members. Most importantly, please learn about our unique research opportunities that span from Alaska, to Kenya, to Bhutan, to west Texas, and beyond. Other research venues include the NSF-funded Cyber-SHARE center at UTEP (Center for Excellence for Sharing resources for the Advancement of Research and Education through Cyberinfrastructure) and the National Aeronautics and Space Administration (NASA) Center for Space Exploration Technology Research. I hope that you strongly consider UTEP’s Geology Department for your future studies.

Finally, I wish to thank all participants for taking time out of your busy schedules to make this a fruitful and successful event. I want to especially thank the students organizers - Sarah Cervera, Anita Thapalia, Antony Wamala - and Dr. Jose Hurtado, the faculty lead for organizing all of the Colloquium events. Welcome and enjoy Colloquium!

Sincerely,

Aaron A. Velasco
Professor and Chair
Department of Geological Sciences
El Paso, Texas
799680555
(915) 747-5101
FAX: (915) 747-6073
Message from the Colloquium Committee

On behalf of the Department of Geological Sciences and the University of Texas at El Paso, I would like to welcome you to the 25th Anniversary Student Geological Sciences Colloquium. Each year, Ph. D. students in the department organize this event to showcase the wide range of research being conducted by the undergraduate and graduate students in our department.

This year we have a record setting 60 abstracts being presented for Colloquium. Eight of which are Early College High School students. We hope that through their participation in this event they will strengthen their presentation skills in a friendly and relaxed environment. At the end of Wednesday, awards will be given to the best Early College High School poster presentations.

Students in the Geological Sciences Department have prepared either oral or poster presentations covering a diverse spectrum of modern topics within the fields of geology and environmental sciences. At the end of Friday, awards will be given to undergraduate and graduate Geological Sciences students with the best oral and poster presentations.

Many professional geoscientists have been kind to serve as judges for this event. We appreciate their generous contribution of time and effort to make this Colloquium a success. Following the awards, Geological Sciences Colloquium participants and students, judges, faculty, and guests are invited to the Post-Colloquium Party at the home of Dr. Serpa and Dr. Pavlis. Good food, drinks and atmosphere will be provided.

The 25th Anniversary Colloquium Field Trip will take place on Saturday going to Aguirre Springs New Mexico. This field trip will be lead by Dr. David Borrok where he will discuss the general geology of the area.

I would like to express a special thanks to all of the generous supporters of this year’s Colloquium. I would especially like to thank the students and faculty for their enthusiasm for academic research. Many dedicated individuals have made this special event possible. This commitment has made this 25th Anniversary Colloquium a tremendous success. Finally, I would like to thank previous Colloquium Committees members for their advice and help.

Cheers,

Sarah N. Cervera
2011 Chair

Anita Thapalia
Co-chair

Antony Wamalwa
Co-chair
2011 Colloquium Committee

Chairpersons: Sarah N. Cervera
               Anita Thapalia
               Antony Wamalwa

Colloquium Judges
Mrs. Juli Hennings, ConocoPhillips
Ms. Natalia Canahuati, Marathon Oil
Laura Reich, Marathon Oil
Pierre-André Depret – BP
Olubunmi Elebiju, BP
Alberto Barud, BP
Aaron Kelts, ASARCO
Diana Kelts, Freeport-McMoRan Sierrita Inc.
Dr. Richard B Wanty, USGS Denver
Mr. David Dodge, ARCADIS-US. Inc
Mr. Garrett Ferguson, ARCADIS-US. Inc
Kent Waggonner, P.G., Texas Commission of Environmental Quality

Keynote Speaker: Dr. Stephen J. Reynolds

Volunteers: Sandy Marrufo          Matt Cannon          Abby Rorrer
            Loren Storm           Abdusalam Agail
            Tai Subia             Humberto Garcia
            Christi Cox           Jessica Navarrete
            John Olgin            Dr. Eric Hagedorn
            Tina Carrick          Jaidee Zavala
            Cecilia Del Pardo
            Munazzam Ali
            Patrick Dietzel

Audio-Visual Support: Teira Solis

Slide Show Organizer: Abby Rorrer

Logo Contest Winner: Pawan Budhathoki

Post-Colloquium Party Hosts: Dr. Terry Pavlis and Dr. Laura Serpa

Field Trip Leaders: David Borrock
Colloquium Schedule of Events

**Wednesday**
10:45-10:55 am Welcoming statement
11:00-11:50 am Keynote Speaker Dr. Stephen J. Reynolds from Arizona State University
   “Perception, Visualization, Cognition, and Learning in Geoscience Courses”
12:00-1:30 pm Lunch
1:30-3:30 pm Undergraduate Poster Session
5:00-6:00 pm Dinner
6:00-8:00 pm Undergraduate Poster Session GK-12 VVECHS

**Thursday**
9:00-10:00 am Breakfast
9:50 am Welcoming Remarks, Colloquium Committee
10:00-12:00 pm Morning Graduate Oral and Undergraduate Poster Session
12:00-1:30 pm Lunch
1:30-3:30 pm Afternoon Graduate Oral and Poster Session
5:00 pm Dinner

**Friday**
9:00-10:00 am Breakfast
9:50 am Welcoming Remarks, Colloquium Committee
10:00-12:00 pm Graduate Morning Oral Session
12:00-1:30 pm Lunch
1:30-3:30 pm Afternoon Graduate Oral Session
4:00 pm Slide Show, Awards Ceremony, and Closing Remarks
6:00 pm Post-colloquium Party at Dr. Laura Serpa’s and Dr. Terry Pavlis’ Home

**Saturday**
8:00am-5:00pm Field Trips lead by Dr. Borrok and Dr. Pavlis
Wednesday Afternoon: Undergraduate Poster Session Room 310
March 9th
1:30 – 3:30 PM

A POSSIBLE CONNECTION BETWEEN A GREAT EARTHQUAKE AND AN EARTHQUAKE SEQUENCE: SAMOA ISLANDS, (8.1) AND VANUATU ISLAND
Marissa Cameron and Aaron Velasco

INVESTIGATING THE DEGRADATION OF ENDOCRINE DISRUPTING COMPOUNDS DURING SAMPLE STORAGE
Toni Carrick and Wen-Yee Lee

EXTRACTION OF DIGITAL ELEVATION MODELS USING PHOTOCLINOMETRIC METHODS
Jacquelyn A. Cordova and José M. Hurtado, Jr.

NITRATE FLUXES IN THE RIO GRANDE
Dennise Drury, Anna Szynkiewicz, and David M. Borrok

ADVANCED APPLICATIONS OF MOBILE COMPUTING AND AUGMENTED REALITY FOR FIELD GEOLOGY
Perry I. Houser and Jose M. Hurtado, Jr.

A COMPARISON OF REGIONAL 3-D SUBDUCTION MODELS IN THE WESTERN PACIFIC TO REGIONAL MODELS FROM Slab1.0
Andrew Lopez and Gavin Hayes

CHANGES IN THE TRACE METAL CHEMISTRY OF IRON-OXIDES FORMED IN THE PRESENCE OF BACTERIA
Kimberlin Schnittker and Dr. David Borrok

SEDIMENT DISTRIBUTION IN GLACIAL-FED LAKE LINNÉ, SVALBARD, NORWAY USING LAKE TEMPERATURE, METEOROLOGICAL AND INTERVAL-O-METER DATA WITH TIME -LAPSE PICTURES RECORDED FROM 2009-2010
Diana Zamora-Reyes, Vanessa Lougheed, Richard Langford, Al Werner3, and Steve Roof

MULTI-RESIDUE EFFECTS OF 17ß-ESTRADIOL AND BISPHENOL A WITH A CHEMI-LUMINESCENT ASSAY ON SACCHAROMYCES CEREVISIAE
Anna Cristina Ortiz, Roberto De La Torre-Roche, Marc B. Cox, and Wen-Yee Lee
Wednesday Evening: GK-12 Early College High School Poster
Session Room 310
March 9th
6:00 PM – 8:00 PM

RECORDING THE LEARNING ABILITY OF THE CRAWFISH THROUGH THE USE OF
CLASSICAL CONDITIONING WITH COLOR STIMULI
Jonathan Avila

WHAT IS THE DIFFERENCE BETWEEN THE STRENGTH OF AIRBORNE, WATERBORNE,
AND LONDBORNE REPRESENTATIVES?
Erick Buenrostro

THE PROTECTION FURNISHED BY CALCIUM OXALATE AGAINST ACID RAIN
Raymond Chavez

THE COLLECTION OF AERIAL BACTERIA IN WATER BOTTLES
Jessica Giacomelli

TESLA COILS AND THE 4TH STATE OF MATTER
Emmanuel Hernandez

SCALP HAIR ANALYSIS AS A TOOL IN ASSESSING THE EFFECT OF CHEMICAL
PROCESSING ON THE HAIR CUTICLE OVER TIME
Amanda A. Gutierrez

WHAT WEB BROWSER IS TECHNICALLY SUPERIOR FOR BOTH WINDOWS AND
MAC’S?
Danny Mendoza

EMF/EMP EFFECTS ON PHYSICAL/MENTAL MATURATION
Manny Navarro
Thursday Morning: Undergraduate Poster Session Room 310
March 10th
10:00 AM– 12:00 PM

THE EVOLUTION OF MELT IN SOUTHERN NEW MEXICO USING STRONTIUM ISOTOPE DATA
Lisa Marie Anaya and Jasper Konter

BIOLEACHING OF LUNAR AND MARTIAN PLANETARY SIMULANTS AND ILMENITE IN THE PRESENCE OF IRON-OXIDIZING BACTERIA
Ian J Cappelle, Jesica Navarrete and David M Borrok

DETECTING UNMARKED GRAVES USING GPR AT THE MESCALERO APACHE RESERVATION
Stephanie Y. Chavez, Ashley G. Nauer and Dr. Laura Serpa

A SMALL GRAIN CAN MAKE A BIG DIFFERENCE
Angela De La Fuente and Richard Langford

INVESTIGATION OF SOIL AND GROUNDWATER PROPERTIES OF A MITIGATED WETLAND UTILIZING ELECTROMAGNETIC INDUCTION
Leo Gamboa, Jacob Ruiz, Joshua Villalobos, Diane Doser

THE RELATION OF RECENT SEISMICITY (1988-PRESENT) TO THE 1958 HUSLIA, ALASKA EARTHQUAKE SEQUENCE
Abigail Monreal and Diane Doser

MAPPING UNMARKED GRAVES IN THE MESCALERO APACHE INDIAN RESERVATION
Ashley G. Nauer, Stephanie Chavez, and Laura Serpa

STUDIES OF SEISMICITY NEAR THE ACTIVE VOLCANO MT. SPURR
Sarah J. Olivas and Dr. Diane I. Doser

USING GRAVITATIONAL AND MAGNETIC DATA TO UNDERSTAND INERATIONS BETWEEN ACTIVE SEISMIC ZONES WITHIN THE INTERIOR OF ALASKA
Shane M. Schinagel and Diane I. Doser
Thursday Afternoon: Graduate Poster Session Room 310
March 10th
1:00 PM – 3:30 PM

OUTCROP STUDIES OF FAULTED DEPOSITIONAL SEQUENCES OF INDIOS MOUNTAINS, SOUTH WEST TEXAS
Pawan Budhathoki, Richard P Langford and Terry L Pavlis

SOFTWARE DEVELOPMENT FOR A 3D GRAVITY INVERSION IN THE BORDER RANGES FAULT SYSTEM
Rolando Cardenas and Dr. Diane Doser

APPLICATION OF LIDAR, ALSM, AND AERIAL PHOTOGRAPHY TO RESOLVE BEDROCK STRUCTURE IN AREAS OF POOR EXPOSURE: EXAMPLES FROM THE KATALLA AREA, ALASKA
Sarah N. Cervera and Terry L. Pavlis

UNDERSTANDING THE ‘SHRINKING’ MOON WITH THRUST FAULT DYNAMICS AND 3D VISUALIZATION MODELS: LEE-LINCOLN SCARP, APOLLO 17 LANDING SITE
Jaclyn D. Clark and Jose M. Hurtado Jr.

PHREATOMAGMATIC ACTIVITY ON THE MOON: POSSIBILITY OF ROOTLESS CONES IN MARE FRIGORIS
José H. García and José M. Hurtado, Jr.

CHANGING PRIMARY PRODUCTION IN ARCTIC TUNDRA PONDS OVER THE PAST 40 YEARS
Christina Hernandez and Vanessa L. Lougheed

EVIDENCE OF ANCIENT RIFTS BENEATH TEXAS
Keisuke Irie and Aaron Velasco

CORRELATION OF DUNE GEOMORPHOLOGY WITH GRAIN SIZE AND DISTRIBUTION, WHITE SANDS NATIONAL MONUMENT, NEW MEXICO
Slade Jones and Richard P. Langford

NEW METHODS FOR DISCOVERY AND CHARACTERIZATION OF LUNAR LAVA TUBES USING LUNAR RECONNAISSANCE ORBITER DATA
Jonathan A. Meyer and Jose M. Hurtado, Jr.

TIDALLY DRIVEN COULOMB FAILURE OF FAULTS ON ENCELADUS AND EUROPA
John Olgin, Bridget R. Smith-Konter, and Robert T. Pappalardo
Thursday: Graduate Oral Session Room 123
March 10th
10:00 AM– 3:15 PM

10:00 AM  KINEMATICS OF THE CHUGACH METAMORPHIC COMPLEX, SOUTHERN ALASKA: REFLECTIONS ON PLATE GEOMETRY IN THE NORTH PACIFIC MARGIN DURING THE LATE CRETAKEOUS TO EOCENE
Mitchell R. Scharman and Terry L. Pavlis

10:15 AM  DEFORMATIONAL HISTORY OF THE LIBERTY CREEK AND ICEBERG LAKE BLUESCHIST BODIES, SOUTH CENTRAL ALASKA
Erik Day, Terry Pavlis, and Jeffrey Amato

10:30 AM  MODELING GRAVITY DATA FROM A RECENT (2009-2010) SURVEY ACROSS THE BORDER RANGES FAULT SYSTEM, ALASKA
Niti Mankhemthong, Diane Doser, Mark Baker, Galen Kaip, Brain Eslick, and Slade Jones

10:45 AM  Break

11:00 AM  SATELLITE CHARACTERIZATION AND MODELING OF DUST TRANSPORT FROM THE COPPER RIVER VALLEY, ALASKA
Robert Velarde and Dr. Santiago Gassó

11:15 AM  INFLUENCE OF TOPOGRAPHY ON WEATHER PATTERNS IN THE NORTHERN CHIHIUHUAUAN DESERT
Fernanda De La Cerda and Vanessa L. Lougheed

11:30 AM  GEOCHEMICAL ASSESSMENT OF CORROSION POTENTIAL OF COARSE BACKFILL AGGREGATES FOR MECHANICALLY STABILIZED EARTH WALLS
Anita Thapalia, David M. Borrok, Soheil Nazarian

12:00 PM  Lunch

1:30 PM  CHARACTERIZATION OF FRACTURES AT DEPTH FROM THE PB-1 WELL AT THE NOPAL I URANIUM MINE, PEÑA BLANCA URANIUM DISTRICT, CHIHUAHUA, MEXICO
Katrina Pekar-Carpenter, Mostafa Fayek, and Philip Goodell

1:45 PM  AN APPRAISAL OF URANIUM SOURCE POTENTIAL OF NAGAR PARKAR GRANITES, PAKISTAN
Munazzaan Ali, Philip C. Goodell, Minghua Ren, Aqeeq Ahmed Shariiff and Nasser Ali Qamar
2:00 PM  FINDING STRUCTURAL INSIGHT IN THE IBEX HILLS, DEATH VALLEY, CALIFORNIA
Oscar Esparza Jr., Sarah Cervera, and Terry L. Pavlis

2:15 PM  Break

2:30 PM  GEOLOGIC PLASTIC SURGERY: A 3-D TIME-DEPENDENT CRUSTAL DEFORMATION MODEL FOR THE SAN ANDREAS FAULT USING GEOLOGIC, GEODETIC AND TIDE GAUGE DATA
Garrett M. Thornton and Bridget R. Smith-Konter

2:45 PM  STRAIN EVOLUTION OF THE DEATH VALLEY FAULT ZONE AS INFLUENCED BY THERMAL INTRUSIONS USING THREE-DIMENSIONAL THERMO-MECHANICAL NUMERICAL MODELS
Cecilia Del Pardo, Benjamin P. Hooks, Bridget R. Smith-Konter, Laura F. Serpa and Terry L. Pavlis

3:00 PM  ANALYSIS OF PALEO-EVENT CHRONOLOGIES AND TIME DEPENDENT STRESS THRESHOLDS OF THE SAN ANDREAS FAULT SYSTEM OVER THE LAST 2000 YEARS
Teira Solis, Bridget Smith-Konter, and Garrett Thornton

3:15 PM  INVESTIGATING THE EAST JHOMOLARI FAULT SYSTEM AND ITS RELATION TO A 90° SHIFT IN ACTIVE EXTENSION DIRECTION, NW BHUTAN
J. Matthew R. Cannon and Jose M. Hurtado Jr.

3:30 PM  SEISMIC STUDY OF CARLSBAD, NEW MEXICO
Undergraduate Steven M. Espinosa and Aaron A. Velasco
Friday: Graduate Oral Session Room 123

March 11th
10:00 AM – 3:00 PM

10:00 AM  IMPERIAL BARREL COMPETITION
Drew Chenoweth, Patrick Dietzel, Jonathan Meyer, Ibrahim Cerda, Jackie Clark
and Dr. Richard Langford

10:30 AM  CRUSTAL THICKNESS AND VP/VS RATIO ESTIMATION UNDER A BROAD
BAND STATION ON KENAI PENINSULA USING RECEIVER FUNCTIONS
Oscar M. Romero and Diane I. Doser

10:45 AM  Break

11:00 AM  AN INVESTIGATION OF THE SEISMIC HAZARDS OF THE EL PASO-
JUAREZ REGION: THE NATURE AND EXTENT OF THE SOUTHERN EAST
FRANKLIN MOUNTAINS FAULT ZONE
Victor Avila, Diane Doser and Oscar Dena

11:15 AM  SAN MIGUEL VOLCANIC SEISMIC AND STRUCTURE IN CENTRAL
AMERICA: INSIGHT INTO THE PHYSICAL PROCESSES OF VOLCANOES
Ezer Patlan, Cara Schiek, Andrew Lopez, Aaron A. Velasco, and Jasper Konter

11:30 AM  MODELING THE COAST MOUNTAINS BATHOLITH, BRITISH COLUMBIA,
CANADA USING 3D SEISMIC TOMOGRAPHY
Sarah M. Quinonez, Ibrahim Cerda, Aaron Velasco, Kate Miller, and Steven Harder

12:00 PM  Lunch

1:30 PM  ANALYSIS OF WELL LOGS AND CUTTINGS SHOWING CHANGE IN
DEPOSITIONAL ENVIRONMENTS IN AN ACTIVE RIFT BASIN, HUECO
BOLSON, WEST TEXAS
Sandy Marrufo, Sarah Quinonez, Diane Doser, and Richard Langford

1:45 PM  FOLD-THRUST SYSTEMS OVERPRINTING SYN-RIFT STRUCTURES ON
THE MARGIN OF AN INVERTED RIFT BASIN: INDIOS MOUNTAINS, WEST
TEXAS
Seth J. Page, Pawan Budhathoki, Terry L. Pavlis, and Richard P. Langford
CONCLUSIONS RELATED TO A PROTEROZOIC AULACOGEN IN NORTHERN MEXICO, BASED ON DIRECT METHODS, DESCRIBED IN 1985 BY PC GOODELL, R Dyer AND R. KELLER, COMPARED TO THOSE OBTAINED BY GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING, AS INDIRECT METHODS, IN 2010
Carlos Martinez-Pina, Philip Goodell and Carlos Montana

Break

DO SULFIDE MINERAL WEATHERING RATES CONTROL THE ISOTOPIC SIGNATURES OF DISSOLVED Fe AND Cu IN METAL-RICH STREAMS?
Ana L. Gutierrez and Dr. David Borrok

COPPER ISOTOPE FRACTIONATION DURING SURFACE ADSORPTION AND INTRACELLULAR INCORPORATION BY BACTERIA
Jesica U. Navarrete, David M. Borrok, Marian Viveros, Joanne T. Ellzey
AN APPRAISAL OF URANIUM SOURCE POTENTIAL OF NAGAR PARKAR GRANITES, PAKISTAN

Munazzam Ali1, Philip C. Goodell1, Minghua Ren1, Aqeel Ahmed Shariff2 and Nasser Ali Qamar2
1 Department of Geological Sciences, University of Texas at El Paso, El Paso, Texas 79968
2 Regional Exploration Office, Karachi, PAEC, Pakistan
mali3@miners.utep.edu

Nagar Parkar granites situated in the extreme southeastern part of Pakistan covering an area of about 410km² and are adjacent to Rajasthan Malani Igneous Suit (MIS) have been interpreted as the rift related anorogenic and within plate A-type granites. In this study geochemistry of these intrusive rocks has been discussed in detail with particular reference to uranium. The uranium content of southern and eastern plutons is relatively higher as compared to the northern part of the complex and is more pronounced in biotite-hornblende pink granites as compared to riebeckite-aegirine grey granites.

Major element data revealed that the chances to host any primary mineralization within the granites are not very high. Trace elements pattern and low aegirine-riebeckite concentrations suggest that the pink granites have strong crustal input, and are more favorable for uranium concerns. Rate of disintegration of the rocks, size, paleodrainage and relative age also suggest that the pink granites are more likely the source for any small scale secondary mineralization in a nearby host.

Negative disequilibrium was observed in some samples of granites and kaolins, indicating the labile uranium from the system. Also moderate to high concentration of uranium in spatially related kaolins, ground water, calcretes in the adjacent desert, and lignite related Paleocene sandstones (overlying weathered kaolinized granitic basement in the Thar coal basin) indicate the availability of active (leachable) uranium in the system. However to quantify the uranium concentration within the refractory accessory phases like zircon, monazite and xenotime EMP studies are in progress, this will be very helpful to interpret and estimate the amount of labile and active uranium available to the sedimentary systems. Based on our results detailed hydrogeochemical survey (in the immediate vicinity of uraniferous calcretes to calculate the “Carnotite Solubility Indices”) supported by resistivity and satellite image studies is recommended to fully delineate if there is any mineralized channel in the Thar desert.

AN INVESTIGATION OF THE SEISMIC HAZARDS OF THE EL PASO-JUAREZ REGION: THE NATURE AND EXTENT OF THE SOUTHERN EAST FRANKLIN MOUNTAINS FAULT ZONE

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The active Rio Grande Rift is an extensional system that runs through central New Mexico down to El Paso Texas and Juarez Mexico border. It is the source of Quaternary deformation in the sedimentary basin between the Franklin Mountains (El Paso, Texas, USA) and the Sierra de Juarez (Juarez, Chihuahua, Mexico). East Franklin Mountains Fault is catalogued by the National Seismic Hazard (USGS) as an active Quaternary fault with an estimated slip rate of 0.1 mm/yr. The fault extends from the northeast margin of the Franklin Mountains in southern New Mexico, south through Texas along the Franklin Mountains and across the Rio Grande along the southeast margin of the Sierra de Juarez in Chihuahua, Mexico. The Limits of the faults in the south end is poorly known. Gravity data collected will be modeled to show the location of the fault through downtown El Paso-Ciudad Juarez. Surveying offset of geomorphic features. These data will aid in the location of the faults in the El Paso-Ciudad Juarez region, a key task in assessing seismic hazards.

IMPERIAL BARREL COMPETITION

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We are reporting on our progress in interpreting data assigned to us to compete in the Imperial Barrel Program. This annual competition is sponsored by the American Association of Petroleum Geologists. Last year 57 universities from 18 countries competed in 12 divisions. Teams are judged as if they are a professional exploration team presenting to management. A regional competition will be held in Midland on March 26th and the finals will be held on
April 9th in Houston at the annual national AAPG conference. Our data set consists of seismic and well data including well logs and completion records. Software to be used include SMT Kingdom Core, SedPak and Promax. These software programs will be used to complete well analysis, basin development simulation/prediction and seismic analysis of our basin. At present we have located the log data, performed a regional tectonic synthesis, analyzed the geologic history and described a history of the development of our target basin. We have discovered and outlined sources, reservoirs, seals, and traps.

INVESTIGATING THE EAST JHOMOLARI FAULT SYSTEM AND ITS RELATION TO A 90° SHIFT IN ACTIVE EXTENSION DIRECTION, NW BHUTAN

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This study documents a little known, high angle, SE dipping, active normal fault system, in NW Bhutan, the East Jhomolari Fault System (EJFS). This investigation utilizes field observations and mapping, detrital thermochronology, and paleoseismic analysis to determine the extent and timing of motion on the EJFS as well as its relation to the STDS. The EJFS trends NE-SW paralleling the Yadong Cross Structure (YCS) for at least 80 km, and has 2 to 5 km of net displacement depending on subsurface interpretation. The surface trace is present from 10 km southwest of the village of Jangothang to at least the Tibetan border, and likely continues north into Tibet. Portions of the EJFS appear on some published maps, but its full geographic extent and total displacement, the onset of faulting, and the most recent activity have not been documented before. Geomorphic observations and paleoseismic dating indicate that the EJFS is a young active fault system. Stratified lateral moraines with significantly disrupted strata along strike of the EJFS suggest tectonic activity since the last glacial maximum. A calibrated 14C age of 6000 B.P. collected from sediments deposited against an EJFS fault scarp provide a minimum age for most recent motion, indicating Holocene activity. This study will also use detrital thermochronology to document the onset of rapid uplift of the Jhomolari range and determine its temporal relation to E-W extension in the southern Tibetan plateau. NW Bhutan is a geologically significant area due to the nearly orthogonal intersection of the EJFS and the South Tibetan Detachment System (STDS). These intersecting extensional fault systems are evidence of a 90° change in the direction of active extension from N-S to E-W. The results of this study not only document a little known regionally significant fault system, but also shed light on how and when this shift in active extension direction occurred in NW Bhutan.

DEFORMATIONAL HISTORY OF THE LIBERTY CREEK AND ICEBERG LAKE BLUESCHIST BODIES, SOUTH CENTRAL ALASKA

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The Iceberg Lake and Liberty Creek blueschist bodies are located along the Border Ranges Fault (BRF) system in the central Chugach Mountains. These blueschists are being studied to determine the timing of initiation of Mesozoic subduction in southern Alaska. Geologic mapping of these blueschist bodies was done at nominal scales of 1:24,000 and 1:12,000 using digital mapping techniques and has revealed a more complex deformation history than has been described by previous authors. The map scale structures of these two blueschist localities are distinctly different. The Iceberg Lake blueschists are kilometer scale blocks within the younger McHugh Complex mélangé, whereas the Liberty Creek schist is a coherent terrane along the Border Ranges Fault (BRF) and the younger McHugh mélangé. Despite these differences at the map scale, the blueschist bodies record a similar structural history in their fabrics. Both assemblages have a pronounced north dipping continuous cleavage (S1) defined by a crystallographic and dimensional preferred orientations. Original bedding, where visible, has become transposed by this first cleavage. An S2 cleavage overprints the previously described north dipping layering and S1 cleavages and has a shallow to moderate south dip. Intersection lineations created by both S0-S1 and S1-S2 overprints plunge shallowly to the ENE-WSW. These fabrics are overprinted by an ~N-S striking vertical cleavage, S3, which wraps older lineations around (F3) fold axes creating basin and dome structures within the older fabrics. Tying these fabrics to specific deformation events is difficult because the earliest record of the BRF is cryptic due to its almost 200 million year history. The Iceberg Lake schist may have been exhumed by a mechanism similar to that proposed by Karig (1980), which explains blueschist exhumation by movement through the accretionary wedge along strike-slip faults. The Liberty Creek schist in contrast, appears to have been
exhumed by a mechanism closer to that proposed by Platt (1986), which explains blueschist exhumation by normal faulting resulting from wedge failure. The map scale structure of the Iceberg Lake and Liberty Creek schists match these models. More recently Platt (2000) presented a tectonic model describing visco-plastic deformation along a transpressional subduction zone. This model creates a non-deforming frontal wedge and transpression is accommodated along the oblique edges of the model by strike-slip faulting. Because of the close proximity of these blueschists to one another (60-120 km), and their similar fabric history, I propose a new tectonic model that combines aspects of these general tectonic models. This model includes the dominant strike-slip motions necessary to create the kilometer scale blocks of the Iceberg Lake schist. This new model can also initiate normal faulting via wedge thickening and failure to create a coherent terrane as exhibited by the Liberty Creek schist, and allows for the close proximity of these different emplacement styles. Microstructural and geochronologic analyses are being carried out to further clarify the structural and temporal history of the Iceberg Lake and Liberty Creek blueschist bodies and their relationship to the earliest history of the BRF.

INFLUENCE OF TOPOGRAPHY ON WEATHER PATTERNS IN THE NORTHERN CHIHUAHUAN DESERT

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The Chihuahuan Desert is one of the most biologically diverse arid regions on Earth, due in part to the isolation and unique habitats provided by the many mountain ranges that run through it. The effect of topography on its sub-regional weather patterns, however, is not fully understood. Indio Mountains Research Station (IMRS) is located in the northern Chihuahuan Desert and seems to exhibit the characteristics of a rainshadow area when comparing its weather with that from surrounding towns. We compared data collected from weather stations at IMRS Headquarters, six permanent or ephemeral water bodies throughout the IMRS property, and publically available data for Van Horn, Guadalupe Pass, and Marfa, TX. Early analysis of these datasets show IMRS weather as consistently hotter and less windy than the surrounding areas; time series analysis will be performed to understand how meteorological variables vary throughout the seasons. Monthly temperature and wind data from the sites within IMRS show consistent patterns through time. For example, Peccary Tank was consistently the hottest site and Echo Canyon Overlook was the windiest. Seasonally, the highest average temperatures were observed in July 2009 and August 2010; precipitation was also highest during the summer, while March 2009 was the windiest month. These data, together with detailed water level data collected from various IMRS water bodies, will be used to understand the relationship between precipitation patterns, topography, and water availability at IMRS; ultimately, these data can help understand how movement patterns of organisms, such as rattlesnakes, are impacted by seasonal water availability.

STRAIN EVOLUTION OF THE DEATH VALLEY FAULT ZONE AS INFLUENCED BY THERMAL INTRUSIONS USING THREE-DIMENSIONAL THERMO-MECHANICAL NUMERICAL MODELS

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Near surface (~ 10 km), high temperature (~1000°C) intrusions have been suggested to play an important role in the development of surface deformation patterns associated with the Death Valley Fault Zone (DVFZ). This study tests this hypothesis by developing three-dimensional thermo-mechanical numerical models that analyze the strain evolution of the DVFZ driven by thermal perturbations as a result of intrusions. These models allow for the study of an intrusion’s influence on the rheology of the crust and associated deformation and strain patterns along a fault system. The DVFZ, located in southeastern California, consists primarily of two dextral strike-slip faults whose motion produced a pull-apart basin that has been extending since its formation approximately 6 Ma. The model consists of a 350 x 500 x 35 km rectangular grid representing the crust within the DVFZ area. A pressure-dependent, non-associative, Mohr-Coulomb plasticity and a temperature-dependent viscous model are used to define the mechanical behavior of the upper and lower crust, respectively. A basal drag velocity is applied in the fault-parallel direction, with a gradient along the same axis, which produces a surface velocity field approximating geodetic velocities spanning the region. An intrusion
(represented by a 20 x 50 x 4 km rectangular-shaped box) is placed at a depth of 10 km at three different locations within the area of extension. The initial temperature of the intrusion is set at 1000°C and is allowed to decay with time. The driving kinematics, along with the thermal source and mechanical material behavior, are used to analyze the temperature-dependent deformation processes and the extensional structure of the DVFZ. These models show that motion of the faults is primarily responsible for the extensional stress field in the pull-apart basin, however the presence of a young intrusion (~ 0.5 Myr) can increase the strain field magnitude by approximately 100 MPa and its spatial distribution varies over a region of ~ 300 km, mostly along the faults. Additional extensional stresses produced by the models obtained in this analysis imply that other faults in the vicinity of the DVFZ (i.e. Garlock fault) might have significantly been influenced the formation of the present day structures in the area.

FINDING STRUCTURAL INSIGHT IN THE IBEX HILLS, DEATH VALLEY, CALIFORNIA

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The Ibex Hills, in southern Death Valley, are bounded by three major regional structures. To the northeast, the Sheep Head Fault Zone trends in a steeply dipping East-West striking fault system, and to the west, the active Southern Death Valley Fault Zone (DVFZ) trends in a Northwest-Southeasterly direction until it intersects to the Avawatz Mountain Thrust Zone (AMTZ) just south of the Ibex Hills. The Ibex Hills are composed mainly of Late Proterozoic Sedimentary rocks overlying middle Proterozoic basement, and retain evidence of several deformational events from Mesozoic contraction to Neogene extension. Brittle deformation of both extensional and strike-slip origin appear throughout the area, but another important element of the structure appears to be a significant thrust system. Reconnaissance mapping suggests a structural window exposes younger rocks beneath a thrust with an associated ductile deformational event. This ductile deformation is recognized as tight folding and refolding which is not correlated to surrounding areas either up ridge or even across the canyon where the apparent window is exposed. Fold data is currently being examined through stereo net and thin section analysis to study the refolding and strain; it should aid in future studies aimed at resolving this critical structure. Ultimately, the final structural interpretation will improve the correlation of Ibex Hills’ local structural geology to its bounding and active (DVFZ) regional structures and aid in tectonic reconstruction for the region.

DO SULFIDE MINERAL WEATHERING RATES CONTROL THE ISOTOPIC SIGNATURES OF DISSOLVED FE AND CU IN METAL-RICH STREAMS?

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The oxidative weathering of sulfide minerals like pyrite and chalcopyrite at the Earth’s surface largely controls the distributions of sulfate and metals in natural environments. Moreover, subsequent mineral weathering involving sulfuric acid derived from sulfide oxidation can impact atmospheric CO$_2$ levels over geologic time scales. In order to evaluate the larger-scale influence of sulfide weathering on element cycling and CO$_2$ fluxes, it is necessary to understand the geochemical rates that control the weathering process. Although these rates can be estimated empirically in present day systems, we do not have a tool to estimate these rates in the geologic past. Because the isotopes of Fe and Cu are fractionated during the sulfide weathering process, it is possible they could be used as a proxy for rates. In this study we tested the hypothesis that sulfide mineral weathering rates control the isotope signatures of Fe and Cu in metal-rich streams. To evaluate this hypothesis we collected water and rock samples from acidic drainages (most from abandoned mining sites). The waters were measured in-situ for dissolved oxygen, dissolved Fe(II), pH, and conductivity. Filtered and raw samples were brought back to the laboratory for analysis of dissolved organic carbon and metal concentrations. We used a Multicollector Inductively Coupled Plasma Mass Spectrometer to measure the isotopic signatures of Fe and Cu. Weathering rates for each sampling site were estimated using the following empirically-derived equation: R=10$^{8.58(±0.15)}(\langle m_{Fe^{3+}}\rangle^{0.30(±0.02)}\langle m_{Fe^{2+}}\rangle^{0.47(±0.03)}\langle m_{Cu}\rangle^{0.32(±0.04)})$, where R is the weathering rate in moles per meter squared per second. This equation is valid for situations when dissolved oxygen is present and the rate of oxidation is affected only by Fe(II) and Fe(III). The calculated empirical weathering rates will be plotted against the isotopic data to determine whether there are any statistical correlations. If so, Fe and Cu isotopes may be a useful tool for evaluating the historical impacts of sulfide weathering.
MODELING GRAVITY DATA FROM A RECENT (2009-2010) SURVEY ACROSS THE BORDER RANGES FAULT SYSTEM, ALASKA

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We have collected ~1,000 gravity observations within the Anchorage and Kenai Peninsula regions to better determine the structural geometry of the Border Ranges fault system (BRFS). The BRFS is characterized by a strong gradient between the deep low (~ -130 mGal) of the Cook Inlet Basin and the gravity high of ~10 mGal associated with the western range front of the Chugach Mountains. On the Kenai Peninsula the gravity field remains high across the Chugach Mountains, but in the Anchorage region it decreases, possibly due to the presence of the Eagle River thrust sheet. We have begun 2.5-D forward modeling of the combined new and existing gravity data using densities constrained by density logs, hand samples, seismic velocities and Nettleton’s density inversion method. Our preliminary results suggest the main fault of the BRFS dips steeply (60 to 70 degrees) toward the west. Many subsidiary buried faults are also apparent. Our ultimate goal is to test several plausible models of structure along the BRFS by implementing a novel 3-D inversion scheme that directly models known geology, and revises a priori uncertainties on the geologic model to let us compare alternative interpretations.

CONCLUSIONS RELATED TO A PROTEROZOIC AULACOCENGE IN NORTHERN MEXICO, BASED ON DIRECT METHODS, DESCRIBED IN 1985 BY PC GOODELL, R DYER AND R. KELLER, COMPARED TO THOSE OBTAINED BY GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING, AS INDIRECT METHODS, IN 2010.

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Tectonic events in northern Mexico, cannot be fully interpreted without considering the tectonic events in southwestern USA, and vice versa. Two different types of research end with the same conclusions. Goodell et al., (1985) hypothesized a Proterozoic aulacogen in northern Mexico based on geochemical and petrologic affinities of late Proterozoic (~ 1 Ga) bimodal igneous rocks of the Franklin Mountains, west Texas. They stated a rift origin with a southerly trend and considered the west Texas craton and the Sierra del Nido block as boundaries to the feature. In addition, the separation of Sierra del Nido Block occurred ~1 Ga, and that the Mojave-Sonora-Megashear truncated the aulacogen and Sierra del Nido. Based on the existence of the Late Paleozoic (Pedregosa) and mid Mesozoic (Chihuahua trough) basins, a reactivation of the aulacogen happened during this ages, and finally, that Rio Grande rift represents the most recent reactivation of the aulacogen. Independently of their data, their idea is restated with data obtained and processed by GIS and remote sensing and we state that: 1) The aulacogen has a southwestern trend parallel to cratonic NA. 2) Aulacogen measures 220 km across, and has a length in the range of 1500-1900 km. 3) Outcrops of La Noria and Castner Marble located in the Franklin Mts., are also found in the Plomosas-Carrizalillo area, 320 km to the south. 4) Bisbee, Pedregosa and Chihuahua trough are within the aulacogen zone. 5) Sierra del Nido is a craton rifted from the Colorado Plateau about ~ 1 Ga, and is contemporaneous to the predecessor of the Rio Grande Rift, the Swiss-DeBaca rift. 6) The Mojave-Sonora-Megashear truncate the Sierra del Nido block, but does not truncate the aulacogen. 7) The aulacogen developed in several stages: Proterozoic the first one, during the Paleozoic (Pedregosa basin) and the Mesozoic (Chihuahua trough) and finally the Cenozoic, when the Rio Grande rift occurred, and the Mojave-Sonora-Megashear was reactived. Porphyry copper and U deposits cluster in the Cananea-La Caridad north-south fault zone, west of the Sierra del Nido, 8) Sierra del Nido constituted a barrier to any type of magmatic migration.
**ANALYSIS OF WELL LOGS AND CUTTINGS SHOWING CHANGE IN DEPOSITIONAL ENVIRONMENTS IN AN ACTIVE RIFT BASIN, HUECO BOLSON, WEST TEXAS**

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The Hueco Bolson in West Texas is located in the Rio Grande rift basin and provides water to El Paso County and Juarez, Mexico. El Paso Water Utilities (EPWU) recently drilled thirty one wells up to 350 m into this aquifer, which provide 40% of El Paso’s water supply. These wells provide a unique opportunity to study the interaction of tectonics and sedimentation in an actively subsiding rift. Stratigraphy and sedimentation in active extensional basins have received little study because they are usually buried. This research will help document these processes. EPWU drilled sixteen wells in 2005 along the western-central portion of the Bolson. These wells were drilled to provide brackish water to a desalination plant and to create a trough in the ground water to prevent incursion of saline water into the fresh water aquifer. We observe a northwest to southeast increase in TDS (from 976 to 1979 ppm) across this area; for this reason four wells (601, 605, 610 and 615) were chosen to document this gradient. The wells penetrate numerous clay, silt and soil beds, as well as several faults. These beds can be correlated between the wells and help vertically subdivide the reservoir. The clay beds adjacent to one of the faults help prevent the incursion of the saline water into the fresh water aquifer. Also, this fault offsets strata by up to 20 m. We analyzed the grain-size distribution for wells 601, 605, 610 and 615 using sieves for particles larger than 1 mm and a Malvern particle analyzer for particles smaller than 1 mm. We correlated the means and percentages of gravel, coarse to medium grained sand, medium to fine grained sand, silt, and clay with well logs using the Petra and Kingdom software packages. We used the log correlation and sediment properties to model the depositional environments and stratigraphy. Five major environments could be correlated across the sixteen wells: 1) desert floor sands and playa clays; 2) playa margin clays interbedded with gravel and coarse sand; 3) playa margin delta coarsening upward from clay to sand; 4) alluvial fan toe units and muddy gravel; 5) alluvial fan gravel. We have selected two wells located farther south for grain-size analysis, and will use the same methods as the previously analyzed wells. In addition, we will collect gravity data to locate the faults identified through well log correlations.

**COPPER ISOTOPE FRACTIONATION DURING SURFACE ADSORPTION AND INTRACELLULAR INCORPORATION BY BACTERIA**

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Copper isotopes may prove to be a useful tool for investigating bacteria–metal interactions recorded in natural waters, soils, and rocks. However, experimental data which attempt to constrain Cu isotope fractionation in biologic systems are limited and unclear. In this study, we utilized Cu isotopes ($\delta^{65}$Cu) to investigate Cu-bacteria interactions, including surface adsorption and intracellular incorporation. Experiments were conducted with individual representative species of Gram-positive (Bacillus subtilis) and Gram-negative (Escherichia coli) bacteria, as well as with wild-type consortia of microorganisms from several natural environments. pH-dependent adsorption experiments were conducted with live and dead cells over the pH range 2.5-6. Surface adsorption experiments of Cu onto live bacterial cells resulted in apparent separation factors ($\Delta^{65}$Cu$_{solution-solid} = \delta^{65}$Cu$_{solution} - \delta^{65}$Cu$_{solid}$) ranging from +0.3‰ to +1.4‰ for B. subtilis and +0.2‰ to +2.6‰ for E. coli. However, because heat-killed bacterial cells did not exhibit this behavior, the preference of the lighter Cu isotope by the cells is probably not related to reversible surface adsorption, but instead is a metabolically-driven phenomenon. Adsorption experiments with heat-killed cells yielded apparent separation factors ranging from +0.3‰ to -0.69‰ which likely reflects fractionation from complexation with organic acid surface functional group sites. For intracellular incorporation experiments the lab strains and natural consortia preferentially incorporated the lighter Cu isotope with an apparent $\Delta^{65}$Cu$_{solution-solid}$ ranging from ~+1.0‰ to +4.4‰. Our results indicate that live bacterial cells preferentially sequester the lighter Cu isotope regardless of the experimental conditions. The fractionation mechanisms involved are likely related to active cellular transport and regulation, including the reduction of Cu(II) to Cu(I). Because similar intracellular Cu machinery is shared by fungi, plants, and higher organisms, the influence of biological processes on the $\delta^{65}$Cu of natural waters and soils is probably considerable.
FOLD-THRUST SYSTEMS OVERPRINTING SYN-RIFT STRUCTURES ON THE MARGIN OF AN INVERTED RIFT BASIN: INDIO MOUNTAINS, WEST TEXAS

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Detailed mapping in the Indio Mountains in west Texas, reveal a complex stacking of thrust sheets that record inversion of the Mesozoic Chihuahua Trough rift basin. Important newly recognized structural complexities include both folding of older thrust sheets and development of younger, out-of-sequence thrusts that cut across older folds; detachment fold horizons within thrust sheets; and a regional anticlinorium that exposes a deeper thrust sheet in a structural half-window bounded on the west by a Neogene normal fault. The Chihuahua trough originated as part of the late Mesozoic border rift system and was inverted during Laramide thrusting. Remnants of Mesozoic rifting are preserved in Cretaceous strata as facies and stratigraphic thickness variations between different thrust sheets as well as presence of numerous syn-depositional normal faults that involve strata as young as the Middle Albian. Stratigraphic thickness variations are particularly prominent in the Yucca Formation. A well exposed transgression divides the upper yucca into a fluvial lower interval and a coastal upper interval. The Upper Yucca is over 600m thick in the hanging wall of the Squaw thrust and 300 m in the structurally lowest thrust sheet. Reported Klippenfenster relationships indicate a minimum displacement of 7-10km for the structurally highest thrust (Squaw thrust). However, after evaluating the newly identified duplex through balanced cross-section reconstructions a new minimum displacement of 13km is estimated. Section reconstruction also indicates that a cryptic basin margin normal fault is carried in the hanging wall of the Squaw Peak thrust to account for both stratigraphic variations and hanging-wall cutoff relationships.

SAN MIGUEL VOLCANIC SEISMIC AND STRUCTURE IN CENTRAL AMERICA: INSIGHT INTO THE PHYSICAL PROCESSES OF VOLCANOES

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The San Miguel volcano lies near the city of San Miguel, El Salvador (13.43N and -88.26W). San Miguel volcano, an active stratovolcano, presents a significant natural hazard for the city of San Miguel. In general, the internal state and activity of volcanoes remains an important component to understanding volcanic hazard. The main technology for addressing volcanic hazards and processes is through the analysis of data collected from the deployment of seismic sensors that record ground motion. Six UTEP seismic stations were deployed around San Miguel volcano from 2007-2008 to define the magma chamber and assess the seismic and volcanic hazard. We utilize these data to develop images of the earth structure beneath the volcano, studying the volcanic processes by identifying different sources, and investigating the role of earthquakes and faults in controlling the volcanic processes. We initially locate events using automated routines and focus on analyzing local events. We then relocate each seismic event by hand-picking P-wave arrivals, and later refine these picks using waveform cross correlation. Using a double difference earthquake location algorithm (HypoDD), we identify a set of earthquakes that vertically align beneath the edifice of the volcano, suggesting that we have identified a magma conduit feeding the volcano. We also apply a double-difference earthquake tomography approach (tomoDD) to investigate the volcano’s plumbing system. Our preliminary results show the extent of the magma chamber that also aligns with some horizontal seismicity. Overall, this volcano is very active and presents a significant hazard to the region.
CHARACTERIZATION OF FRACTURES AT DEPTH FROM THE PB-1 WELL AT THE NOPAL I URANIUM MINE, PEÑA BLANCA URANIUM DISTRICT, CHIHUAHUA, MEXICO

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The Nopal I uranium mine is part of the Peña Blanca uranium district, Chihuahua, Mexico. The Nopal I deposit is hosted in Tertiary rhyolite tuffs located in a semi-arid region over 200 m above the water table in an oxidizing, unsaturated zone. Many researchers recognized the similarities in the geologic and climatic conditions between the Nopal I deposit and the Yucca Mountain site, Nevada, formerly proposed as a geologic repository for high-level nuclear waste disposal. Therefore, the Nopal I deposits has been used as a natural analogue for the Yucca Mountain Project to provide additional ways of testing long term evolution models that support the Yucca Mountain total system performance assessment (TSPA). The main objective of this study is to investigate mineralogical relationships and uranium remobilization in fractures associated with the deposit. Primary uraninite within the main ore body and secondary uranium minerals associated with the deposit are fine-grained (<50 μM), which makes Nopal I geochronology difficult. Secondary ion mass spectrometry (SIMS) was used to obtain in situ U-Th micro-analysis of uranium minerals. Previously reported ages of uranium minerals from Nopal I range from less than one million years to over 30 Ma. New SIMS analysis of $^{234}$U/$^{230}$Th disequilibrium ratios of secondary uranium minerals in fractures at depth indicate that uranium minerals are between 375 thousand years and 1 million years old. Electron microprobe and x-ray diffraction analyses of these fractures show that uranium minerals are associated with silica and kaolinite, and less commonly iron oxyhydroxides. The uranium minerals are also associated with a TiO$_2$ phase and pyrite, indicating a potential reducing mechanism.

MODELING THE COAST MOUNTAINS BATHOLITH, BRITISH COLUMBIA, CANADA USING 3D SEISMIC TOMOGRAPHY

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The Coast Mountains Batholith on the west coast of British Columbia, Canada comprises a series of granitic to tonalitic plutons. Just offshore, the Juan de Fuca plate subducts beneath the North American plate, providing a constant supply of mafic material. Felsic to intermediate minerals dominating the resulting plutons, contradictory to the basaltic source, is typical to continental arc systems, but why is this so? Where does the remainder of the mafic material go? Seismic tomography will be utilized in an attempt to determine what happened to the remainder of the mafic material. In July of 2009, student volunteers from multiple universities deployed 1,800 one-component and 200 three-component geophones and 2400 Texan data recorders along a 400km east-west transect from Bella Bella, British Columbia into central British Columbia. The instruments were spaced at 200-m intervals and the shot points were spaced at 30-km intervals. The 18 shot sources, ranging from 160 to 1,000 kg of high explosive. The data will be processed to produce a model of the lithosphere beneath the Coast Mountains. To do this, I will pick the first arrivals for all of the shots and will then use the travel time data to develop 3-D tomographic models using the a seismic travel time tomography code written by Dr. John A. Hole of Virginia Tech. A user interface and visualization framework for the Hole code created by the CyberShare project at UTEP will also be used.
CRUSTAL THICKNESS AND VP/VS RATIO ESTIMATION UNDER A BROAD BAND STATION ON KENAI PENINSULA USING RECEIVER FUNCTIONS

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We analyzed ~500 teleseismic events of a temporary broad band station operating in the central Kenai Peninsula, in order to investigate the crustal thickness and Vp/Vs ratio at this site. The recorded events are from three periods: July, 2006 to October, 2006; January, 2007 to March, 2007; and September, 2008 to December, 2008. These events correspond to epicentral distances from 30° to 90° and different azimuthal coverage. We determined receiver functions in the time domain using the iterative deconvolution technique. By forward modeling we stacked the most prominent converted phases Ps, PpPs and PpSs+PsPs. The method is carried out in four steps: 1) A wide range of possible crustal thicknesses (H) and the ratio $K = V_p/V_s$ are considered; 2) Then, we compute arrival times of the phases for each H-K value pair; 3) Next, all the radial components of the receiver functions are evaluated at the predicted arrival times, and then they are stacked to construct the function $S(H,K)$. 4) Finally, the method determines the optimal H and K when the function $S(H,K)$ reaches a maximum when all the radial components are coherently stacked. This methodology cancels out the lateral effects of the seismic structure, achieving an average crustal thickness, regardless of azimuthal coverage. Our results showed a thickness of 34 and a Vp/Vs ratio of 1.45.

KINEMATICS OF THE CHUGACH METAMORPHIC COMPLEX, SOUTHERN ALASKA: REFLECTIONS ON PLATE GEOMETRY IN THE NORTH PACIFIC MARGIN DURING THE LATE CRETACEOUS TO EOCENE

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During the late Cretaceous to Eocene the plate geometry in the north Pacific margin was complicated, but the exact plate geometry at this time is problematic. The Chugach metamorphic complex, southern Alaska, is a high-temperature/low-pressure metamorphic sequence in the Mesozoic Chugach terrane accretionary complex, and the metamorphism is widely ascribed to a ridge subduction event produced by the complicated plate geometry. Two possible plate geometries are indicated for this time period in the north Pacific margin: a single mid-ocean ridge separating the Kula and Farallon plates subducting beneath the North American plate, and the existence of an additional Resurrection plate, creating simultaneous subduction of two mid-ocean ridges beneath the North American plate. Recent work on the kinematics of deformation and timing of the metamorphism have clarified this history, indicating a rapid two-phase deformational sequence occurred over a time period of less than 2 m.y., which is difficult to reconcile with any existing hypotheses for the plate configuration that produced the event. Combining results from kinematic modeling of overprinting in the Chugach metamorphic complex with plate velocity models, we reflect on the best fit plate geometry for formation of the Chugach metamorphic complex.

ANALYSIS OF PALEO-EVENT CHRONOLOGIES AND TIME DEPENDENT STRESS THRESHOLDS OF THE SAN ANDREAS FAULT SYSTEM OVER THE LAST 2000 YEARS

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A comprehensive paleo-earthquake database is critical for investigating the relationship between stress evolution and occurrence of major earthquakes in southern California. Recent paleoseismic research supported by the Southern San Andreas Fault Evaluation project (SoSAFE) has improved our understanding of the chronology of paleo-events and slip distributions along the San Andreas Fault System (SAFS) over the past 2000 years. These new data are beginning to clarify the sequence of major ruptures along fault segments of the SAFS, the San Jacinto, and the Elsinore faults. Using these data, we assembled a database of fault slip history for 21 fault segments using 100 historical and prehistorical earthquake events reported in the literature spanning the last 2000 years. We include all of these events in a new stress accumulation evolution model of the SAFS that also includes improved fault geometry (geographic representation and fault locking depth). By comparing 100 years of stress accumulation and relaxation along
several fault segments, we are able to evaluate how they influence the spatial and temporal pattern of earthquake occurrence. For example, along the Mojave segment of the SAFS, two significant events occurred in 1812 (Wrightwood, M7.5) and 1857 (Fort Tejon, M7.9). Cross-sectional profiles of accumulated stress before each event reveal a maximum accumulation of 1 MPa just before the Wrightwood event, and 3 MPa just before the Fort Tejon event. We also note the relatively large stress levels along the Coachella segment, ≥ 4 MPa of accumulated stress, which is nearly double the stress levels along this segment at the end of its previous earthquake cycle. This modeling study allows us to better understand the exchange of stress between parallel faults in southern California over several earthquake cycles and quantifies stress thresholds for repeating earthquakes.

GEOCHEMICAL ASSESSMENT OF CORROSION POTENTIAL OF COARSE BACKFILL AGGREGATES FOR MECHANICALLY STABILIZED EARTH WALLS

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The corrosion rates of metallic reinforcements within construction aggregate largely control the service life of structures like Mechanically Stabilized Earth (MSE) walls. Hence, it is critical to effectively evaluate construction aggregates for their corrosive potential prior to their use. However, a problem with current Department of Transportation (DOT) methods for the geochemical assessment of construction aggregates is that they specify the use of only fine materials (less than 40 sieve size). Whereas, a recent survey reveals that about 44% of Texas statewide construction uses coarser aggregates more than 85% retained in sieve size 4 (and less than 10% finer than 40 sieve size) for MSE walls. In this study we tested the assumption that the fines are chemically representative of the bulk rock. Rock samples were collected directly from the field and sieved into different size fractions. These rocks were compared to chemically homogeneous materials of the same size that were crushed in the laboratory and sieved into different sizes. By testing the same sieve sizes of field vs. lab-crushed rocks, we will be eliminating kinetic leaching affects and testing chemical differences. Both types of materials were tested using the U.S. Geological Survey’s Field Leach Test (FLT) for pH, resistivity, and chloride and sulfate concentrations. Results demonstrate that the fines have different chemistry than the coarse aggregates. Also the field fines are chemically distinct as compared to the lab crushed materials. This is likely the result of the chemical weathering due to the atmospheric acid deposition. Mostly SOx and NOx compounds react with carbonates to produce reactive outer layers that are easily chemically leached and mechanically abraded producing a different chemistry than the bulk rocks. This work suggests that existing DOT methods for assessing corrosion potential should be modified when applied to coarse aggregates.

GEOLOGIC PLASTIC SURGERY: A 3-D TIME-DEPENDENT CRUSTAL DEFORMATION MODEL FOR THE SAN ANDREAS FAULT USING GEOLOGIC, GEODETIC AND TIDE GAUGE DATA

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Understanding the properties of the Earth’s crust along faults is essential in better estimating short and long-term fault behaviors, and mitigating potential seismic hazards. While horizontal motions are typically associated with strike-slip faults, vertical motions can occur along strike slip faults when the fault is not exactly parallel to the sense of motion. For example, the strike slip motion along the San Andreas fault is accommodated vertically near areas such as the “Big Bend” due to its counter-clockwise orientation creating a transpressional environment. The extent of these vertical motions are controlled by rheological properties of the crust and geologic, geodetic and tide gauge measurements of vertical motion can be used to study these properties. Geologic data collected from measurements made in marine terraces and incised river terraces represent thousands of years of deformation, but can include significant sources of uncertainty. These data comprise over 1800 data points (ranging from -7 to 19 mm/yr uplift) in southern California, and are available from the Southern California Earthquake Center Geologic Vertical Motion Database. GPS data are collected from over 1000 stations throughout California and are available from the EarthScope Plate Boundary Observatory Network website. These data contain uplift measurements between -10 and 10 mm/yr over 10 to 20 year time spans. Tide gauge data from 10 stations along the California coast are maintained by the Permanent Service for Mean Sea Level and are
available over intermediate time periods ranging from 30 to over 100 years. The compilation of these three data sets provide a means for studying vertical deformation along the San Andreas Fault over both short time scales and multiple earthquake cycles. In this study we use these data to estimate elastic plate thickness, viscosity, fault locking depth, and slip rates along the San Andreas fault using a 3-D time-dependent crustal deformation model. Input parameters of this model affect the vertical deformation results; a thicker elastic plate or a deeper locking depth lessens the vertical motion along the fault. For example, vertical motion rates produced by a 60 km elastic thickness model indicate ~3-5 mm/yr of subsidence near the Salton Trough and ~4 mm/yr of uplift in the San Gabriel Mountains. In this study we search for the appropriate parameter space that minimizes the residual misfit of both data and models. We tune a suite of models to fit the geologic, geodetic and tide gauge data to better estimate the rheological properties of the crust.

SATELLITE CHARACTERIZATION AND MODELING OF DUST TRANSPORT FROM THE COPPER RIVER VALLEY, ALASKA

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Katabatic winds from the Copper River Valley in Alaska deposit substantial quantities of dust into the Gulf of Alaska. The main thrust of this study is to better understand dust events in the Copper River Valley and subsequent biogeochemical impacts these events have in the Gulf of Alaska. A number of dust events (in late October, 2009) were detected by MODIS (Moderate Resolution Imaging Spectroradiometer) detector were subsequently analyzed and correlated with HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) simulations. Transport distances, heights, and concentrations values of fine sand (50μm), silt (2μm - 50μm), and clay (<2μm) were estimated relative to these textural size classes. There is a large variance between HYSPLIT simulation results and actual wind dust events evident in MODIS images; therefore, resulting deposition values are inconclusive. However, these HYSPLIT simulation parameters can be applied to other studies in high latitude regions. Since few studies of this nature have been conducted in this area, this investigation can provide useful information for future phytoplankton propagation research in the Gulf of Alaska.
Poster Presentations

THE EVOLUTION OF MELT IN SOUTHERN NEW MEXICO USING STRONTIUM ISOTOPE DATA

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Samples have been obtained from along the Rio Grande Rift in southern New Mexico in order to understand the evolution of regional volcanic melts. Lead isotope data has been collected from the Potrillo Mountains, located approximately 35 km to the southwest of the city of Las Cruces, New Mexico as well as the Elephant Butte region and the Hillsboro Volcanic Field, both of which are located in Sierra County, New Mexico. The lead isotopes, combined with a few available strontium isotope ratios from this area, suggest that upper mantle melts initially interacted with lower crust, and later were contaminated by variable amounts of upper crust. By running the samples through chemistry columns, strontium was separated out in order to measure strontium isotope ratios on the UTEP multi-collector mass spectrometer. This allows further analysis of the origin of the melt. Through this study, initial results obtained for rock standards are compared to isotope ratios obtained in other laboratories. This allows for a critical test of the technique, and provides assurance in our understanding of the relationship between mantle-originated melts and continental lithosphere in southern New Mexico volcanic fields.

OUTCROP STUDIES OF FAULTED DEPOSITIONAL SEQUENCES OF INDIO MOUNTAINS, SOUTH WEST TEXAS

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What are mechanisms which accommodate expansion of stratigraphic section into an actively subsiding basin? Units may onlap and truncate against the basin margin, or tilted older sediments. Individual units may thin, with earlier layers tilting and thickening into the basin. Syn-sedimentary faults may accommodate thickening by either slow subsidence that gradually thickens the each unit or by punctuated subsidence that result in thickening of individual units. In the Indio Mountains along the border between the United States of America and Mexico, syn-depositional faults block rotation accommodate thickening of sediments in Aptian and Albian rift fill.

In the region, the sedimentary package varies from 120 m at the margin of the formation to over 3 km in the trough interior. A continuous outcrop extends over 30 km oblique to the basin margin with abrupt change in thickness. Depositional environments range from alluvial fans through coastal to shallow marine and represent a transgression. Yucca Formation, Bluff Mesa Formation, Cox Sandstone and Finlay Formation represent the waning stages of this Jurassic to Cretaceous extensional basin. Out of three observed syn-depositional faults, two are antithetic and one is synthetic. Evidence of syndepositional tectonism is quite conspicuous as change in facies across the synthetic fault can be easily observed. Measured sections from the Cox Sandstone show variation in facies across the syndepositional fault. Carbonate beds, mostly bioclastic grainstone are found on the hanging wall and are completely absent in the footwall. Similarly, cliff forming trough cross stratified white sandstone of the upthrown side correlates much higher in the section on the downthrown side. It is evident that marine strata were deposited on the downthrown side and then eroded during fluvial deposition on the upthrown side. South of the fault, on the hanging wall of one fault, the marine strata reappear and lap onto the top of the underlying Bluff Mesa formation. Surveying with a GPS unit indicates a 6 degree rotation of the footwall. It is evident that the block rotated during deposition. The important mechanism for thickening is rotation of the strata that were deposited during highstands followed by truncation along the sequence boundaries. For example, shale beds thicken within the rotated strata and accommodate some of the tilting which varies from 18m to 70m within a 2 km distance.

A POSSIBLE CONNECTION BETWEEN A GREAT EARTHQUAKE AND AN EARTHQUAKE SEQUENCE: SAMOA ISLANDS, (8.1) AND VANUATU ISLAND

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Dynamic triggering, a subject of some debate, describes the possibility of certain earthquakes causing, or ‘triggering’ events at great distances. The elastic rebound theory helps explain how stress
accumulates and releases along a fault. In fact, static triggering commonly occurs, for example, large earthquakes cause smaller earthquakes, known as aftershocks. These aftershocks redistribute the stress, generally within two lengths of the ruptured fault. Dynamically triggered events occur outside of these bounds, however the exact reason why remains unknown. By examining data collected from possible dynamically triggered events, we may gain a better understanding of the mechanisms at work. On September 29, 2009, an 8.1 earthquake took place along a 175km fault rupture in Samoa, an island along the Tonga Trench in South Pacific Ocean. A week later, a string of earthquakes occurred over 2000km away, well beyond the bounds for static triggering, in Vanuatu, another island in the South Pacific. Investigation of these events and others, utilizing the USGS and Global CMT website, yielded data that was plotted and mapped. Future research aims to analyze this data more thoroughly, as well as compare it to accepted instances of dynamic triggering in the hopes of determining if the Samoa earthquake presents evidence of such.

**BIODELEACHING OF LUNAR AND MARTIAN PLANETARY SIMULANTS AND ILMENITE IN THE PRESENCE OF IRON-OXIDIZING BACTERIA**

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The in-situ utilization of resources from other planets, moons, and asteroids will likely be an important component of future space exploration. Traditional techniques that may be used to extract metals like iron, titanium, and aluminum from planetary rocks have large energy and/or hardware requirements that may not be feasible in all cases. In this study, we investigated bioleaching as a possible alternative to high-temperature combustion and reduction techniques for the breakdown of basaltic rocks and ilmenite (FeTiO$_3$). The objectives of our study were (1) to determine whether the presence of *Acidithiobacillus ferrooxidans*, an Fe-oxidizing bacterial strain, increased leaching rates, and (2) to determine whether the bacteria could grow on the low concentrations of ferrous Fe generated by the available substrates. Experimental results demonstrated that more Fe was leached from ilmenite (FeTiO$_3$) and a lower pH was maintained in the presence of Fe-oxidizing bacteria than compared to abiotic control experiments. This suggests that the bacteria were able to grow using the ferrous iron from ilmenite (and a metal-free growth media) as a substrate; however the elemental release rates of Si, Ca, and Al in the presence of *A. ferrooxidans* were actually the same or lower than those from the abiotic control experiments. This may be attributable to the metabolically active bacteria creating a thick altered layer at the mineral surface that decreased the rate of diffusion or it may be caused in part by adsorption or precipitation of Fe(III) onto the existing mineral surfaces. Additional experiments utilizing *P. mendocina*, a heterotrophic organism capable of using siderophores to scavenge Fe from refractory minerals, are underway. Results from these experiments will be presented and compared to the results obtained for the iron-oxidizing systems.

**SOFTWARE DEVELOPMENT FOR A 3D GRAVITY INVERSION IN THE BORDER RANGES FAULT SYSTEM**

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The Border Ranges Fault system bounds the Cook Inlet and Susitna Basins, an important petroleum province within south-central Alaska. An initial research goal is to test several plausible models of structure along the Border Ranges fault system by developing a novel, 3D inversion software package. This research involves the creation of inversion modeling software using a Borland C++ compiler as part of the Rapid Application Development (RAD) Studio 2009. The inversion utilizes gravity data constrained with geophysical, borehole, and surface geological information. The novel inversion approach involves directly modeling known geology, initially free-air corrected data, and revising *a priori* uncertainties on the geologic model to allow comparisons to alternative interpretations. This technique to evaluate 3-D structure in regions of highly complex geology can be applied in other studies of energy resources.

The software reads an ASCII text file containing the latitude, longitude, elevation, and Free Air anomalies of each gravity station as well as gridded surface files of known topology. The contributions of each node in the grid are computed in order to compare the theoretical gravity calculations from a forward model to the gravity observations. The computations of solutions to the linearized inversion yields a range of plausible densities. The user will have the option of
varying body proportions and dimensions to compare variations in density for changing depths of the gridded surface.

INVESTIGATING THE DEGRADATION OF ENDOCRINE DISRUPTING COMPOUNDS DURING SAMPLE STORAGE

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Endocrine disrupting compounds (EDCs) are either naturally occurring or man-made compounds that mimic natural hormones, and thus interfere with the natural function of the endocrine system. EDCs have been linked to cancer, as well as abnormalities within the developmental and reproductive systems of humans and wildlife. Wastewater has been shown to contain EDCs. In addition, wastewater effluent provides a direct route of exposure of these EDCs to wildlife through environmental water. The objective of this study is to gain an insight into the stability of these compounds using both chemical and biological analyses. Tests will be performed on wastewater influent, wastewater effluent, and deionized water samples at specific time intervals to determine the total degradation of three targeted EDCs: bisphenol A, nonylphenol, and estradiol. Wastewater samples were obtained from a wastewater treatment plant in El Paso, Texas. Gas chromatography/mass spectrometry will be used to qualitatively and quantitatively indentify the EDCs during the period of study; a yeast assay using S. cerevisiae, which contains an estrogen receptor, will be used to determine the change in total estrogenic activities in the water samples. The results from each of the analyses will be compared and presented.

APPLICATION OF LIDAR, ALSM, AND AERIAL PHOTOGRAPHY TO RESOLVE BEDROCK STRUCTURE IN AREAS OF POOR EXPOSURE: EXAMPLES FROM THE KATALLA AREA, ALASKA

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LiDAR and ALSM data along with various forms of aerial photography allow construction of improved regional maps of bedding, and fault traces in areas of poor outcrop. These regional maps can be used to develop 3D and 4D models either directly through 3D visualization or through reconstruction of cross-sections. With these remote sensing methods geological features such as fault scarps, bedding and fault traces can be identified and accurately traced in three dimensions. Once these geologic features are identified they can be studied through structural analysis. 3D and 4D models can be compared to current geologic data collected in the field, or current geologic data can be overlaid or plotted on these models to produce an accurate reconstruction of the structural history of an area. These kinds of data are being analyzed in the Katalla area in the St. Elias Mountains of southern Alaska. Here we emphasize results from draping of high resolution aerial photography onto a LiDAR DEM in the southern Alaskan data set acquired during the St. Elias Erosion and Tectonics Project (STEEP). The resultant 3D visualization, together with bare-ground LiDAR terrain models provide unprecedented abilities to visualize the geology in this complexly deformed terrain, as well as provide insights into the origins of large numbers of surface ruptures in the region.

DETECTING UNMARKED GRAVES USING GPR AT THE MESCALERO APACHE RESERVATION

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In Mescalero, New Mexico, on an Apache Indian Reservation, Dr. Serpa, Ashley Nauer and I were asked to survey the Mescalero Cemetery in order to locate unmarked graves. Back in the late 1800’s, proper documentation of graves were never made, now as a result, what is thought to be a new potential burial site is discovered to be an old undocumented grave. Reservation officials have asked us to survey the cemetery and document exact locations of unmarked graves. To achieve this goal, we will use ground penetrating radar (GPR) and a differential global positioning system (DGPS). The collected data will be processed by using EKKO-Map and EKKO-View Deluxe. These data processing programs will allow us to view our collected data, edit noise out of the data, and enable us to view our surveyed area in Google Earth by apply DGPS points obtained during the survey. From the processed data, we will identify possible grave sites and inform the reservation officials of the findings. There are 3 cemeteries in the region and our initial study will only cover part of one of the cemeteries. This project
could continue for many years and generate a number of research projects.

UNDERSTANDING THE ‘SHRINKING’ MOON WITH THRUST FAULT DYNAMICS AND 3D VISUALIZATION MODELS: LEE-LINCOLN SCARP, APOLLO 17 LANDING SITE.

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With high resolution images from the Lunar Reconnaissance Orbiter Camera (LROC), many small, lobate scarps, interpreted to be the surface traces of thrust faults, have been found all over Earth’s moon. In the mid 1970’s, thermoelastic stress calculations were conducted on lobate scarps, and assuming an initially molten Moon, the results showed compressional stress buildup over time. More recently, analyses of LROC images have shown that lobate scarps are globally distributed and may be the result of large scale, regional contraction of the Moon as it has cooled. Determining the depth of faulting is essential for testing this hypothesis. Deeper faulting that involves basement rocks may be expected to be associated with a contracting Moon while shallow faulting, confined to the regolith, may instead indicate other processes. In addition, an understanding of the stress field associated with lobate scarps is needed to test the contractional cooling hypothesis. To place constraints on depths and stress fields, we must first conduct basic structural analyses of the lunar fault scarps. Simple calculations using Mohr-Coulomb failure laws and Andersonian fault theory can be used to constrain quantities such as maximum depth of faulting and the magnitudes of compressive stresses. Using remote sensing methods, input parameters for these calculations, including the radius of curvature, fault trace length, and strike-and-dip, can be directly measured from high-resolution LROC imagery. The well-known Lee-Lincoln scarp is located west of the Apollo 17 landing site and the only lobate scarp to be visited by humans. It has been chosen to be the main focus for structural analysis in this study and the starting point for a regional/global survey of lobate scarps and their structural geology. We present constraints on the geometry and mechanics of the Lee-Lincoln scarp, and, with the resulting data, construct 3D visualization models with Fledermaus and 3DMove software to further understand the geological story behind our ‘shrinking’ Moon.

EXTRACTION OF DIGITAL ELEVATION MODELS USING PHOTOCLINOMETRIC METHODS

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Aside from retrieving rock samples and radiometrically dating them, the most widely used method for dating planetary surfaces is through crater counting. This method is based on the simple observation that older surfaces are more heavily cratered than younger surfaces. It assumes a relationship between the rate of impacts over time and the size and distribution of the resulting impact craters. Because this method relies on the population statistics of a large number of craters, it can only be applied to areas large enough (and sufficiently old enough) for a statistically adequate number of craters to have accumulated. Given image data of some minimum spatial resolution, this therefore limits the size of geologic features that can be dated by crater counting. In addition, crater counting assumes that the impact flux is known, while, in fact, it is not tightly constrained. Furthermore, it is desirable to be able to date individual landscape features, such as single impact craters. To address all of these issues, a possible alternative to crater counting is morphologic dating, which has been used on Earth to date fault scarps and cinder cones. This method focuses on the changes that occur to the cross-sectional shape of a crater as it erodionally degrades over time. To do this, detailed, high-resolution topographic data from impact craters are necessary. We use a method of extracting this topographic data from images called photoclinometry. Photoclinometry is a process in which a two-dimensional, high-resolution image is converted into a Digital Elevation Model (DEM) by computationally modeling the geometric relationships between solar illumination, a topographically irregular surface, and the image of that surface. We have successfully created a MATLAB implementation of an existing “shape-from-shading” algorithm that rapidly extracts DEMs from imagery of the Moon. We are currently using the best data available, images from the Lunar Reconnaissance Orbiter Camera (LROC) narrow-angle camera (NAC), which have a resolution of 0.5 meters per pixel. For visualization purposes, the resulting DEMs – and the LROC imagery from which they were extracted – are overlain on the Google Moon virtual globe. We are currently modeling craters from Balmer Basin, an impact basin on the nearside of the Moon, and from the Highlands.
Feldspathic Terrane. The purpose of this research is to compare the morphologies of small impact craters excavated in target materials of different types (e.g. mare basalt vs. highlands) to determine if there is a relationship between crater form and target properties. In addition, the crater-degradation for impacts of a wide range of sizes in both basaltic and feldspathic targets will be investigated. At the Fall 2010 AGU Meeting, another group presented a similar study that uses profiles extracted from LROC NAC stereo images to study the relationships between crater morphologies, ages, and target materials. Using LOLA (Lunar Orbiter Laser Altimeter) topography with ~1m vertical resolution, they calculated depth/diameter ratios for selected craters. We will compare their findings with our own to ascertain the accuracy and efficiency of each method.

A SMALL GRAIN CAN MAKE A BIG DIFFERENCE

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I will be studying at the world’s largest gypsum dune field. This unique sight is just an hour north of El Paso. It is the White Sands of New Mexico. White Sand’s most prominent feature is its dunes. These dunes are moving approximately 1 meter a year, this is fairly rapid process, it can be observed on a daily basis. This project will feature sand grain variation in vegetation areas located in interdunes. Samples will be gathered on a weekly basis over the course of a month. Analysis of the samples will be done after the sample gathering process at 4 interdunes is completed. The sample gathering process consists of one type of plant and gathering small sand samples in different areas of its platform. The main objective will be to study grain size variation between areas in a plant and seeing if there is a pattern. The data and analysis may come into use in future studies as well. Some future studies may include sand dune erosion projects, vegetation projects, and a sider study of sand grain variation in dunes. This project struck my interest because I have worked on and erosion project in the past. I just finished taking Sedimentology and Stratigraphy and Structural Geology and I feel that my newly obtained knowledge will go great alongside this research project.

NITRATE FLUXES IN THE RIO GRANDE

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The Rio Grande is the most important source of water for the irrigation of agricultural fields in the Rio Grande Valley of West Texas. Return flows from this irrigation likely add to the salinity of the Rio Grande and may include the addition of excess nutrient chemicals like nitrate (NO₃). To date, however, the seasonal concentrations of NO₃ within the Rio Grande and the sources that contribute this nutrient chemical have not been well-defined. To address this problem, we measured NO₃ concentrations of the Rio Grande surface water in five locations of the Mesilla Valley, stretching approximately 100 kilometers between Radium Springs, New Mexico and El Paso, Texas. Samples were collected monthly from these five sites in 2010. In general, NO₃ concentrations were significantly lower in the upper part of the Mesilla Valley, ranging from 0.1 to 1.3 mg/L, as compared to higher values of 3.9 to 5.0mg/L in downstream locations near El Paso. However, the highest NO₃ fluxes (as large as 27 mg/L) were found in the central part of the Mesilla Valley, adjacent to the town of Vado, New Mexico. This NO₃ flux is most likely associated with a surface water and/or groundwater discharge from dairy farms common in this area. The flux is diluted as the river moves downstream. The seasonal variation of NO₃ shows that during non-irrigation season we see slightly higher concentrations compared to lower concentrations during irrigation season. The significance of these findings leads us to believe that there are various contamination issues related to return irrigation flows and/or discharges of municipal/dairy effluents. This initial work demonstrates that NO₃ concentrations in the Rio Grande increase in downstream locations. The contamination of nitrate in the Rio Grande is additional factor causing the decrease of water quality in the region.
SEISMIC STUDY OF CARLSBAD, NEW MEXICO

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Since January 1, 2000, there have been numerous earthquakes recorded in the vicinity of Carlsbad, NM. Importantly, these shallow (10km) earthquakes with magnitudes < 4.3, do not have a fault or system of faults directly mapped to explain these events. We will be relocating the largest and most recent earthquake, which occurred 25km west of Carlsbad, NM of magnitude 4.1 on March 28, 2010. Data recorded by seismic stations from the USArray, a large National Science Foundation project, and our local Kidd Observatory will be used for this analysis. The use of Standing Order of Data (SOD) allows us access seismograms, and the Seismic Analysis Code (SAC) helps in the analysis of the seismic data. We will correlate the hypocenters of aftershocks to the main event hypocenter, allowing us to identify the fault plane. Once a fault plane has been identified, we will begin work on relocating a second event, thereby identifying the responsible faults. We believe that faulting in this area is related to the Rio Grande Rift extension and can be used as evidence for an active rift.

INVESTIGATION OF SOIL AND GROUNDWATER PROPERTIES OF A MITIGATED WETLAND UTILIZING ELECTROMAGNETIC INDUCTION

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This project focused on the soil properties of a mitigated wetland located within the ancient flood plain of the Rio Grande in Far West Texas. Soil properties of this wetland were analyzed using an EM (Electromagnetic) induction survey. A Geonics EM-31 conductivity meter was utilized to find trends based on soil composition and moisture. As the soil types changed over the study area so did the electrical conductivity. It was determined that soils that were saturated with moisture or of small grain size were highly conductive. Inversely, soils that were unsaturated with moisture or of large grain size were less conductive. The results of this study indicated that the hydrology of the wetland was in part controlled by the presence of these conductive soils. This study gave insight on some of the possible soil types and characteristics throughout the mitigated wetland and suggests the main source of water to the wetland is an underground source. This source is believed to be fed by mountain-front recharge by a near-by fault-block mountain range, the Franklin Mountains. To further understand the key component of the sub-surface hydrology of the site, this project identified the extent of the soils in the wetlands beyond its physical boundary (the Keystone Dam) by recording data with the EM-31 behind the dam. The analysis from this project using the EM31 provided a better understanding of the source of groundwater for wetland springs and to assist in future sites for wetland restorations.

PHREATOMAGMATIC ACTIVITY ON THE MOON: POSSIBILITY OF ROOTLESS CONES IN MARE FRIGORIS.

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New high-resolution images from the Lunar Reconnaissance Orbiter (LRO) allow us to take a closer look at features on the lunar surface that were not as clearly visible in older photography from the Apollo and Clementine missions. Some of these features could be rootless cones (pseudocraters). Rootless cones are volcanic features that form as a result of steam explosions from the interaction between lava flows and surface or near-surface water. In the Moon’s case, the mechanism of formation could be triggered by the interaction between mare lava flows and ice in the lunar regolith. The discovery of water and hydroxyl on the Moon by the Moon Mineralogy Mapper (M3) and the LRO Lyman Alpha Mapping Project (LAMP) observations of the plume generated by the Lunar Crater Observation and Sensing Satellite (LCROSS) impact, raises the possibility that lava-water interactions occurred in the past. The region of interest for this study is located in Mare Frigoris just north of Mare Imbrium, between the Fontenelle and Plato craters (56°30'2.86"N, 16°18'47.33"W). In this area, several clusters of circular features can be seen on top of basaltic lava flows. The arrangement of these features is very similar to how rootless cones in Myvatn, Iceland are distributed. A previously published numerical model for the formation of rootless cones on Mars is being modified and
parameters chosen to account for the surface conditions on the Moon. The model will determine the feasibility of having rootless cones formed on the lunar surface. In addition, images from the LROC WAC (wide-angle camera) and NAC (narrow-angle camera) will be studied in detail to determine the crater/cone diameter ratio for the features in Mare Frigoris. This ratio can be used, for example, to determine if the features are similar in morphology to rootless cones in Myvatn and those on Mars. LRO Lunar Orbiter Laser Altimeter (LOLA) topographic data will also be used to determine if the crater floors of the circular features in Mare Frigoris are located above the surrounding lava plains. Rootless cones on Earth always have the crater floor above the median height of the surrounding plains. The study will also help determine and approximate the probable amount of water ice present in the lunar regolith, which can shed light on an important lunar surface processes. Constraints on the amount of water ice near the lunar surface can also help determine the best landing sites for future exploration missions, since water ice is an in-situ resource that can be processed for drinking, breathing (O₂), and as rocket fuel (H₂) and oxidizer (O₃).

**CHANGING PRIMARY PRODUCTION IN ARCTIC TUNDRA PONDS OVER THE PAST 40 YEARS**

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In the 1970’s, Barrow, Alaska was host to a detailed ecological study, the International Biological Program (IBP), which examined the physical, chemical and biological characteristics of Arctic tundra ponds. Forty years later, this area has experienced warming and potential release of nutrients from permafrost; however, there have been no follow up studies since the IBP and any biological changes in these ponds remain unknown. The 1970’s, research suggested that algae had temperature optima much warmer than the ambient temperatures and that algal growth was limited by phosphorus. The goal of this study was to understand trends in algal growth during the growing season, the role of limiting nutrients, and how both these have changed through time. In addition, we examined the effect of anthropogenic activity on algal production in the Arctic by examining algal nutrient limitation in pristine (BEO), impacted (IBP), and heavily impacted (Barrow) pond sites. Periphyton and phytoplankton were extracted in 90% acetone with corrections for turbidity and phaeopigments by acidification. Nutrient diffusing substrates with known quantities of nitrogen (N) and phosphorus (P) were utilized to determine and benthic and pelagic nutrient limitation. Preliminary results show both periphyton and phytoplankton biomass increased noticeably during early August as a result of warmer temperatures. Overall, algal biomass was greater than that observed in the 1970s. Benthic nutrient limitation experiments demonstrated that N limitation or NP co-limitation was prevalent in the ponds, notably in the more heavily impacted Barrow ponds. Pelagic nutrient limitation experiments conducted at the IBP also showed NP co-limitation thus suggesting a shift in nutrient limitation from phosphorus to nitrogen/phosphorus in impacted ponds since the 1970’s. Further studies are necessary to better understand the implications of these trends in algal production to nutrient budgets in the Arctic.

**ADVANCED APPLICATIONS OF MOBILE COMPUTING AND AUGMENTED REALITY FOR FIELD GEOLOGY**

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Mobile GIS is a transformative technology for field geologists. We are working on three innovations on this theme. First, we are experimenting with geologic applications for devices such as Google’s Android handhelds, which are equipped with communication, positioning, voice recording, camera, and other functions, along with the ability to run programs such as Google Earth. This creates the possibility of using a single device to take photographs, make structural measurements, record field observations, and integrate the data into a GIS, with each function implemented as a separate software tool that can interact with the other tools. To this end, we are experimenting with Blender, a 3-D modeling environment that can be used to create cross-platform, stand-alone “worlds” including DEMs, imagery, and other base map data, as well as a framework for manipulating and adding geologic objects and data. Second we are adapting the concept of “augmented reality” (AR) to field geology. AR for handhelds uses their internal camera, sensors, and display to present geo-located data as a “digital overlay” superimposed on the physical world. AR can thus be a tool for increasing the “situational awareness” of field geologists. Third, is the notion...
that digital audio data is an underutilized data type that can greatly enrich the collection, presentation, and organization of field geologic data in a GIS. Our geologic applications and AR framework will incorporate the ability to add a voice annotation to any data object, just as it is already standard to add a geographic coordinates to any data object in a GIS. In this way, the already high density of data presented in graphical form on a digital map can be complemented by equally important information presented in audio form. Moreover, audio data is often more convenient and rapid to collect in the field compared to handwriting on a notebook, or typing on a keyboard. Among the many potential uses of the technologies we are working on are interactive field trip guides, new ways of collaborating in the field, and immersive geologic maps. In addition to uses in education and research, all these concepts can serve as proofs-of-concept for advanced field IT for planetary exploration.

EVIDENCE OF ANCIENT RIFTS BENEATH TEXAS

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Continental rifts are defined as geological features where Earth’s lithosphere is pulled away by surface expansion of the Earth. Their physiographic features include linear rift valleys associated with active volcanism. Many rifts fail to split a continent and ancient rifts that failed to split can be found by using seismic waves to image these ancient structures. Using seismic data collected by EarthScope USArray stations in Texas, I will calculate teleseismic receiver functions and utilize surface wave dispersion curves to simultaneously invert for the 2D velocity structure beneath each seismic station. EarthScope is a scientific program funded by NSF that provides geophysical data from all around the United States to students and researcher for free. For my data I used USArray, the network of 400 transportable seismic stations now stationed in the central US states, including Texas. With the calculated receiver functions, I will produce a map showing preliminary 3-D crust/upper mantle boundary structure, the velocity ratio of P and S waves, and S-wave velocity structure. Based on this information, I will locate and analyze any ancient rift zones that exist in Texas that are characterized by a shallow crust mantle boundary and high velocity ratio. Finally, with this information on ancient rifts, I will compare my results to a local rift: the Rio Grande Rift in New Mexico. By making this comparison, I hope to determine whether Rio Grande rift is still active or doomed to be another failed rift.

CORRELATION OF DUNE GEOMORPHOLOGY WITH GRAIN SIZE AND DISTRIBUTION, WHITE SANDS NATIONAL MONUMENT, NEW MEXICO

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In desert sand dune fields around the world, the mechanisms by which grain-size interacts with dune geomorphology remain poorly understood. The homogenous composition, relatively simple flow regime, variety of interdunes, and increased local variability of grain size make White Sands National Monument an ideal candidate for study of these relationships. This study is a attempt to map grain size across many dunes and a variety of interdune types to determine how sand is transported within the dune field. This is the first attempt ever at this type of study. GPS-located surface samples are being collected within a 3 x 0.3 km swath oriented SW-NE across barchan, transverse/barchanoid, and parabolic dunes and their corresponding interdunes. Preliminary grain size analysis performed via laser diffraction demonstrates a complex suite of interactions. Interdune grain sizes correlate with type of interdune, e.g. erosional vs. evaporitic or vegetated. Grain size over dunes shows variation dependent on dune location, with stoss-side sediments occurring in patches of varying size, while lee-side grains present a more well-mixed distribution. Continued sampling will demonstrate how grain size changes of broader areas within the dune sea.

A COMPARISON OF REGIONAL 3-D SUBDUCTION MODELS IN THE WESTERN PACIFIC TO REGIONAL MODELS FROM Slab1.0

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The largest earthquakes occur along subduction zones, regions where one tectonic plate slides underneath another. In order to assess which regions that may be most susceptible to future earthquakes, it
is critical to understand the rupture process of earthquakes, especially along subduction zones. To create accurate models of subduction zone geometries we use Slab1.0, a three-dimensional model of global subduction zone geometries created using teleseismic data, and regional data when available. We assess the accuracy of Slab1.0 3-D models, by comparing a selection of these models to models derived from previous regional studies. By digitizing models of subduction zones collected from readily available geoscience literature, we quantitatively compare these models to Slab1.0, identifying discrepancies in slab interface depth. Plausible reasons for such discrepancies include differences in data coverage and bias in the location of the earthquake epicenters in regional and teleseismic catalogs. Here, we show comparisons between subduction zone models in Japan, Sumatra and the Tonga trench, all well defined in Slab1.0. In Japan, where we have collected several regional models, we find that the Slab1.0 models are consistently shallower than their regional counterparts in the shallow sections of the subduction zone. This may indicate that discrepancies are due to well-known bias in teleseismic earthquake locations in subduction zones, or that perhaps that the regional data are biased because of poor azimuthal coverage in recordings of offshore events.

NEW METHODS FOR DISCOVERY AND CHARACTERIZATION OF LUNAR LAVA TUBES USING LUNAR RECONNAISSANCE ORBITER DATA.

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The idea of using lunar lava tubes as shelters for a lunar base was first proposed by Horz (1985), and, since then, a host of studies have been conducted investigating both the utility and feasibility of lunar lava tubes as long-term lunar habitats. Lava tubes provide a twofold proposition: offering a natural cavity for protection, while providing a possible natural entrance for unprecedented subsurface exploration. Previous searches have been inhibited by the sparse coverage of high-resolution photography, which has limited investigation to only a few mare regions. With so few data points, it is very difficult to describe a general model for their formation. Furthermore, as future exploration missions will likely take place in a diverse range of locations, the operational utility of lunar lava tubes is in many ways tied to their spatial distribution. However, even with global coverage of high-resolution imagery from the Lunar Reconnaissance Orbiter (LRO) and other missions, the exclusive use of surface imagery for the discovery and study of lava tubes has limited value. With the exception of a distinct topographic profile, lava tubes are largely subsurface features. A fair lava tube investigation, then, requires the use of other remote sensing methods. LRO offers global coverage of the Moon with thermal, radar, topographic, and image data. We hypothesize that this suite of datasets, analyzed in an integrated fashion, may be useful for detecting features specific to the formation of lava tubes. Using previously identified lava tube segments as a control, Lunar Orbiter Laser Altimeter (LOLA), Diviner Lunar Radiometer Experiment (DLRE), Lunar Reconnaissance Orbiter Camera (LROC), and Miniature Radio Frequency Experiment (Mini-RF) data will be applied to known lava tube segments. Using ENVI, ArcGIS, and Fledermaus 3D visualization software, DLRE, LROC, and Mini-RF data will be draped over a LOLA digital elevation model base map. This will allow for an accurate analysis of the cross axis topographic profiles of a lava tube, while determining both the thermal and textural characteristics along the trend of the tube. Test results from different lava tube segments will be analyzed for consistencies, which may yield lava tube signatures that could subsequently be applied to a global search, and help constrain their operational feasibility as long term habitation shelters.

THE RELATION OF RECENT SEISMICITY (1988-PRESENT) TO THE 1958 HUSLIA, ALASKA EARTHQUAKE SEQUENCE

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We have examined how recent seismicity in the Huslia region of central Alaska is related to active faults and the 1958 earthquake sequence (with at least 3 events of magnitude >6). Most of this region is swampy lowland dominated by alluvial material deposited by the Koyukuk River, making surficial identification of active faults difficult. This portion of Alaska is also of interest because it appears to be a region in transition between the strike-slip faulting of the Salcha-Fairbanks-Minto Flats seismic zone and normal faulting of western Alaska (Norton Sound/Seward Peninsula). Researchers have suggested this change in the nature of faulting is due to the rotation of western Alaska away from central Alaska and the formation of a new microplate called...
the Bering Block. The eastern edge of the Bering Block is postulated to be located just east of Huslia. Our eventual goal is to combine information on recent seismicity, geology and geophysics with a careful analysis of the waveforms of the 1958 sequence in order to better understand the seismic hazards and tectonic processes of the area.

MAPPING UNMARKED GRAVES IN THE MESCALERO APACHE INDIAN RESERVATION

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Citizens living on the Apache Indian Reservation in Mescalero, New Mexico have experienced difficulty in burying their dead because when they dig a new grave, they often find a body from an earlier burial. The reservation does not have rigorous rules on locating and marking graves and, thus, there are numerous unmarked burial sites within and outside of the existing cemeteries. Officials from the reservation approached Dr. Serpa for assistance to map grave locations in the area’s three graveyards. In this project, we will use shallow ground-penetrating radar (GPR) to find the graves and digital global positioning system (DGPS) to pin point actual locations of the graves. To process the raw data collected in the field, we will use Ekko View Deluxe software to apply gains and other editing techniques to present our results on a map in various formats such as a *.kml file for Google Earth. Our goal is to complete collection and processing of our findings in one out of the three graveyards by May 2011. Completion of the entire project will continue for a few years for future students to partake in research experience.

TIDALLY DRIVEN COULOMB FAILURE OF FAULTS ON ENCELADUS AND EUROPA

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The icy fractured surfaces of both Enceladus and Europa offer many candidate faults for studying both past and potentially present tectonic activity. Here we investigate the role of both diurnal and non-synchronous rotation (NSR) tidal stresses in the development of Enceladus’s tiger stripes and Europa’s Agenor Linea. For Enceladus, our objectives are to constrain ice shell thickness, and thus its implied water ocean depth, through assessment of the conditions which permit tidally driven (diurnal) Coulomb failure of the tiger stripe fractures. We find that thin to moderate ice shell thicknesses (< 40 km) support failure along the Enceladus tiger stripes, assuming low ice coefficients of friction (0.1 – 0.3) and shallow fracture depths (< 3 km). In contrast, diurnal tidal stresses on Europa may be insufficient to cause Coulomb failure at Agenor Linea, primarily due to Europa’s larger gravitational force. Thus, we investigate the role of NSR as a secular stress source for strike-slip faulting. Preliminary application of the Coulomb failure criterion, assuming nominal friction and fracture depth values, reveals that a combination of NSR (10^4 – 10^5 yr period) and diurnal tidal stresses are required for selected target locations along Agenor Linea to succumb to right-lateral shear failure. We further explore the relationship of NSR to Agenor Linea’s east-west orientation and find that if the fault were instead oriented in the north-south direction, NSR would generate only left-lateral shear and compressive normal stress, neither of which could constructively combine to produce the inferred right-lateral offsets. Together, these tidally driven failure models for Enceladus and Europa are providing key insights into the frictional and material properties, and their variation and orientation with depth, of active fault systems on icy satellites.

STUDIES OF SEISMICITY NEAR THE ACTIVE VOLCANO MT. SPURR

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There have been many moderate magnitude, shallow earthquakes in the Strandline Lake region about 100km from Anchorage, Alaska near the eastern slopes of the active volcano, Mt. Spurr. Previous researchers (Roman et al., 2004; Kilgore et al., 2009) have found that the local stress under Mt. Spurr before and after its 1992 eruption (1992-1997) differed from that of the regional stresses, which are related to subduction of the Pacific Plate and Yakutat micro plate. We are analyzing the locations and patterns of earthquakes occurring since 1998 to determine if more recent seismicity is similar to that occurring before or after the 1992 eruption. By using the Alaska Earthquake Information Center website,
we obtained about 933 events. We found two major groups of earthquakes. One was directly linked to volcanic activity, and the other might be associated with an active fault near the area called the Capps Glacier Fault. We will use seismic arrival times from the Alaska Earthquake Information Center to locate the positions of recent earthquakes more precisely and then compare the relocations to geologic and other geophysical information, especially the recently identified Capps Glacier fault (Finzel et al., 2009). First motions of seismic waves will be used to help determine orientation of small faults that produced earthquakes. The seismicity patterns and fault orientations will tell us if the stress field since 1998 is the same as pre-eruption or post-eruption.

**MULTI-RESIDUEW EFFECTS OF 17β-ESTRADIOL AND BISPHENOL A WITH A CHEMI-LUMINESCENT ASSAY ON SACCHAROMYCES CEREVISIAE**

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The concern about the impacts of endocrine disrupting compounds (EDCs) in the environment has increased recently with their high occurrence in surface waters and sex changes in various aquatic organisms. EDC’s include ubiquitously used pharmaceuticals and personal care products, such as soap, detergents, contraceptives, and other medicines, which are constantly released into the environment, in waste water treatment plant effluent. Though toxicological effects of these individual, EDC’s have been studied, knowledge on how these chemicals interact together in the environment is very limited. The objective of this project is to study the multi-residue effect of EDCs using a chemi-luminescent yeast assay with Saccharomyces cerevisiae, where there is an expected increase in estrogenicity. The dose response curve for 17β-Estradiol (E2, a natural hormone), and varying concentrations of the Bisphenol A (BPA, a monomer used in many chemical products) effective concentration at 50% (EC50) were tested simultaneously. Results indicate antagonistic effects in estrogenicity with multiple combinations of E2 and BPA. The EC50 for all the experimental treatments was found to be more estrogenic than the individual BPA EC50. These results lessen the gap on knowledge about EDC interactions in surface waters, and provide new information for future toxicological data on aquatic environmental health.

**USING GRAVITATIONAL AND MAGNETIC DATA TO UNDERSTAND INERATIONS BETWEEN ACTIVE SEISMIC ZONES WITHIN THE INTERIOR OF ALASKA**

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Differences in rock density, along with changes in the orientation of the magnetic field, provide vital information about the tectonic environment within the interior of Alaska in a region where outcrop exposure is poor due to recent glacial and fluvial activity. Analysis of the gravity and magnetic field can help identify relationships between recent (1989-2008) and historic (pre-1971) seismicity and suspected strike-slip, reverse, and thrust faults within the region, as differences in density and magnetic properties of materials may be observed across fault zones. Our overall objective is to better understand the complicated interactions between the strike-slip Denali fault system and surrounding faults, especially how the 2002 M=7.9 Denali fault earthquake may have brought surrounding faults closer to failure.

**CHANGES IN THE TRACE METAL CHEMISTRY OF IRON-OXIDES FORMED IN THE PRESENCE OF BACTERIA**

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Bacterial surfaces can act as templates for mineral formation and influence grain sizes, lattice spacing, surface defects, and the amount of trace metals present in the resulting precipitates. These changes can impact the surface reactivity of iron-oxide minerals in natural systems on Earth, but might also be used to identify biologic activity in Martian rocks rich in iron-oxide minerals. For this study we will explore the differences in trace metal incorporation in iron-oxide precipitation experiments with and without the presence of Escherichia coli (E. coli). Precipitation of 2-Line Ferrihydrite (amorphous 5Fe2O3•9H2O) was induced by rapidly raising the pH of an acidic Fe(III)90-bearing electrolyte solution. 2-Line Ferrihydrite is a hydrous ferric oxyhydroxide...
mineral with an amorphous structure. It is composed of grains smaller than one tenth of a micrometer (i.e., nano-sized particles) and produces only two diffuse peaks when analyzed using powder X-ray Diffraction. Trace metals like Zn, Cu, Co, etc., can substitute into the lattice structure of the amorphous mineral. Over time the ferrihydrite transforms into a more crystalline structure (such as Hematite α-Fe₂O₃ or Goethite α-FeOOH), but the trace metals remain trapped within the mineral.

With the use of an Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) we will measure the amounts of trace metals incorporated in ferrihydrite formed during biotic versus abiotic precipitation pathways. In addition to the possible identification of biosignatures, these results have implications for natural systems because ferrihydrite can control the distributions of trace metals in surface waters and influence their transport from the continent to the oceans. Future work will consist of using different bacteria types and precipitation pathways. Furthermore, we will explore the possibility of altering the mineral properties with bacteria to achieve enhanced performance of iron-oxides used for industrial purposes like photovoltaic coatings.

SEDIMENT DISTRIBUTION IN GLACIAL-FED LAKE LINNÉ, SVALBARD, NORWAY USING LAKE TEMPERATURE, METEOROLOGICAL AND INTERVAL-O-METER DATA WITH TIME–LAPSE PICTURES RECORDED FROM 2009-2010

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Lake Linné (78° 2’N, 13° 49’E), a glacial-fed lake that is approximately 4.6 km long, 1.2 km wide and 38 meters deep. It is located in the High Arctic in Svalbard, an island north of Norway. Sediments in this lake are supplied by the Linné Glacier—8 km away from the lake—and by the mountains on the west and east side of the lake. The sediments are transported by the melt stream and deposited in the lake, creating laminations with a strong signal of seasonal deposition. Due to its immaculate environment, this site is an ideal place to study past-climate proxies and determine how the changing environment is affecting pristine areas by calibrating the laminations.

The objective of this study is to understand the sedimentation distribution in Lake Linné by analyzing different lake processes such as overflows, underflows, interflows or homopycnal flows. This is done by using lake temperature data recorded from July 2009 to July 2010 at different depths and sites using temperature loggers located throughout the lake. We compare the lake processes to meteorological data, which include air temperature, precipitation, wind direction, wind speed and solar insulation gathered from a weather station near the lake, in order to decipher if and how those lake processes are affected by meteorological factors. The last step in the study is to use time-lapse pictures of the lake and data gathered from an interval-o-meter, which records the amount of sedimentation, and compare which types of lake processes mostly affect sedimentation distribution throughout the lake.

Previous studies made by participants in the Svalbard Research for Undergraduates (REU) have tried to correlate grain size and thickness of sediment using various sediment traps throughout the lake to the temperature loggers and the meteorological weather station data, but no attempt has been made to further understand lake processes and their effect on sedimentation distribution. The most important annual event to decipher is the spring melt, which runs from late-April to early-October, and provides the most sediment influx and lake activity. The data analysis is made using HOBOware and D-Plot software to correctly identify lake processes and their correlation to meteorological data.
RECORDING THE LEARNING ABILITY OF THE CRAWFISH THROUGH THE USE OF CLASSICAL CONDITIONING WITH COLOR STIMULI

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The purpose for this project can be interpreted many different ways; however my initial reason for doing this project is that I want to educate people and hopefully help individuals understand the complexity and beautiful structure of marine animals. I also purpose that this experiment will helping with the mass production of crayfish by understanding the learning ability of these animals so that they could be harvested easier.

In my experiment I expose six crayfish to two different methods of learning: punishment and reward. I paired these different methods with two different light neutral stimuli (red and blue) and two different unconditioned responses (fishing net and food). Each unconditioned response was exposed to the crayfish separately. Over a period of thirty days of my experiment consisted of first introducing the unconditioned response (action) with the neutral stimuli response (light). In the experiment what I expected was to have the original neutral stimuli change into the conditioned response which basically means that hopefully over time the crayfish would begin to associate the neutral stimuli with the unconditioned response and ended up receiving the same reaction as the unconditioned response would produce.

My data should that over time they were successful at learning through classical conditioning, however the method of punishment was learned much faster that the method of reward which is only bring up the question. Is it better to be feared or loved? In conclusion my hypothesis was right the crayfish could learn through classical conditioning with the use of color stimuli.

WHAT IS THE DIFFERENCE BETWEEN THE STRENGTH OF AIRBORNE, WATERBORNE, AND LANDBORNE REPRESENTATIVES?

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The purpose of this experiment was to further investigate the effect of certain representatives and how they could play an effect on different types of plants as well as how they could correlate to human diseases.

In order to try and prove the hypothesis, I tested a total of 9 plants per season, except for the last in which 12 were tested, due to a new addition in plant type. In the first trial, one plant is infected with bug spray; one plant is infected with ammonia, and the last with dry ice. In each season, I did three trials. I monitored temperatures as well as damage, in order to calculate time range in which the disease made an impact. A 10th plant was used as a control to compare the results and ending effects. After repeating this process throughout a year, I was able to successfully record all data and transfer it to charts.

The data showed that dry ice was the strongest representatives in 4 of the 5 trials it was administered in. When it was compared to the other representatives, it showed an accelerated rate at which the plant showed signs of weakness as well as change in color.

By the end of experimentation, I was able to conclude that my hypothesis was incorrect and correct as well. Airborne diseases did not affect the plants faster and stronger, but it did have the ability to win in one trial. When I administered dry ice to the different plants, time varied by minutes and showed that the plant has little to no play in the effect of the certain disease or representative.
THE PROTECTION FURNISHED BY CALCIUM OXALATE AGAINST ACID RAIN

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This experiment is aimed at discovering a new and more effective chemical that will protect against the harmful consequences of acid rain. Besides having disastrous effects on plant and animal life, acidic rain, which is caused by this pollution, can also have destructive effects on our buildings and homes made form limestone and marble.

The basic procedures of this experiment are to first attain three marble tiles, each weighing grams. Next, I labeled one beaker “No Coating”. In the “No Coating” beaker, I placed one of the marble chunks without sealant or acid inside of the beaker. Next, I labeled the second beaker “Sealant” and placed the marble chunk coated with the commercial coated with oxalic acid inside of the beaker. Finally, I prepared the imitation acid rain/vinegar using the following equation 20 ml (4tsp) of vinegar + 2 liters (2qt) of water = imitation acid rain with a pH of 4. After preparing the vinegar, I poured 400 ml of the imitation acid rain into each of the beakers. To organize my data, I created a table to record the weight of the marble tiles at the end of each day for the next five days.

My hypothesis that the marble surface coated with commercial marble sealant will show the least amount of decay has been proven to be false. During the course of the experiment, the marble coated with the calcium oxalate dissolved least in the vinegar solution with an ending weight of 80g. Secondely, the marble coated with the commercial sealant dissolved with an ending weight of 71g. The marble without coating dissolved the quickest with an ending weight of 17g. Therefore, oxalic acid coated on marble to create calcium oxalates served as better protection against acid rain than marble coated with commercial marble sealant or without coating.

THE COLLECTION OF AERIAL BACTERIA IN WATER BOTTLES

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This experiment was done to determine what amount of the bacteria that collects within water bottles comes from the environment. The experiment involved drinking out of one set of water bottles in various conditions, while another set of bottles remained uncapped, but not drunk out of. Once the experiment was completed, samples were taken from the water and from the mouth of the bottle.

While the set of bottles that were drank out of produced much more bacterial colonies than the set that were not, the second set did produce significantly greater results than the control group. This indicates that while the environment does affect bacterial growth, it does not affect it so much as to warrant extra precautions when drinking out of a bottle in certain environments.

SCALP HAIR ANALYSIS AS A TOOL IN ASSESSING THE EFFECT OF CHEMICAL PROCESSING ON THE HAIR CUTICLE OVER TIME

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Hair samples from the scalp where used in assessment of the hair cuticle to determine whether chemical processing over time damages the hair structure. The samples were taken from female subjects ranging in ages 15 through 52. Equal number of samples from females who dyed (chemically-processed) their hair were compared to equal amount of virgin (never chemically-processed) hair.

The samples were observed for color, luster, and breakage. The hair cuticle of each sample was examined through the use of high power microscopy for type of cuticle (imbricate or spinous) and the smoothness of the cuticle. Upon microscope examination of the cuticle, the undyed/virgin and dyed (chemically-processed) hair samples were not distinguishable. Upon direct observation, the hair with the most breakage was in the younger age group below 30 years of age. Upon further questioning, this age group washes their hair daily and uses the hair
straightener daily. In the age group over 30, everyone chemically processed their hair for more than twenty years. However, they wash their hair every other day and on occasion use the blow-dryer. Repeatedly dying the hair may dry out the hair and make it very brittle. However, no permanent hair structure damage occurs with frequent chemical processing of the scalp hair. Other causes of hair structure damage may be the daily use of hair style appliances such as hair straighteners and daily washing of the hair, stripping it of essential oils. Combined use of the hairstyle appliances with frequent chemical processing of the hair can lead to breakage (split ends). If the hair has to be dyed frequently, await eight weeks between coloring to rid of the hair excess dye and the chemicals in it.

**TESLA COILS AND THE 4TH STATE OF MATTER**

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The purpose of this project is to find out what causes a Tesla Coil to form plasma when given electricity and also to find out if the Tesla Coil is able to power electrical appliances from a distance without any means of connection. The Tesla Coil is a high frequency coil that transforms regular energy into higher frequencies at tremendous voltages. Though I have tried to search for the cause of the plasma, I have come up with no results.

To perform my experiment, I first had to gather together all the materials that I needed to make a Tesla Coil. After obtaining the materials I needed, I constructed a crude, homemade model of a Tesla Coil which worked just about the same as a regular Tesla Coil. Then I tested it and placed a light bulb near the main structure.

I believe that the Tesla Coil worked based on how much electricity was given to the coil and if the energy that was transmitted into the air was given off by means of electromagnetic field. I provide this by running a magnet through the outside and inside of the secondary coil, which had a magnetic pull. I also proved that the Tesla Coil could give off wireless energy into the air by placing a fluorescent light bulb at different distances from the Tesla Coil, which lit up. I don’t know what future awaits the Tesla Coil, but I hope it will be used for a good use some day.

**WHAT WEB BROWSER IS TECHNICALLY SUPERIOR FOR BOTH WINDOWS AND MAC’S??**

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My project has to do with computer science I am trying to find out which network (Firefox and Safari) works better on both a PC and Mac. This project will help me to know more about my career and for other people to know which one is better to purchase when by a new PC or Mac.

I am testing this project by recording the data of each computer while downloading the browser or opening a page and also getting the data of which browser has better graphics.

To perform this project first I use a recording resource and started recording the data, then I had a time watch even though the recording resource already was telling the time. Then I took more times opening and downloading the browsers. Then in the end you will see which network work better on both systems PC and Mac.

This project really got my career going I was learning more about computers and more of how they work and how they function inside the computer system. The project is going to be a great success if it scores high in the science fair because it will bring more understand of the project and I could improve more so I could score better on the other competition.

I also had people who help with this project my teachers, Mrs. Welsh and Miss. Evera who gave the resources to get the idea of this great project that most had not thought of but it is going to be a good resource in my career. When am looking for a good quality job.
EMF/EMP EFFECTS ON PHYSICAL/MENTAL MATURATION

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The purpose of this experiment was to observe if there was any mental or physical deficiency or change in the hamster when exposed to electromagnetic frequencies. I hoped from my research experimentation I would spread knowledge to society as to what type of role technology plays in our daily lives. First I obtained six different specimens, two per trial. I had to separate the vertebrae specimen and identify them as test subject A and test subject B. For a total of ten days both hamsters were put on a regular basis schedule where they ate, drank, and slept at the same time. Every day they were put through the maze test at night. In the fourth through tenth day subject A, was exposed to one hour of radiation (3X) a day before tested. I observed the behavioral status of both specimens while looking at the time it took both to complete the maze in the allotted time. My hypothesis that there would be great physical defects or intelligence deficiency imposed n the organisms provide to be incorrect, although my quantities data proved to be somewhat as expected my qualitative observation data was not.
POST-COLLOQUIUM PARTY INFORMATION

Where:
Dr. Terry Pavlis’ and Dr. Laura Serpa’s House
4309 Ridgecrest Dr.
El Paso, TX 79902
(See map below)

When:
Friday, March 11th, 2011 @ 6:00 pm
4309 Ridgecrest Dr.
COLLOQUIUM FIELD TRIP INFORMATION

What:
Aguirre Springs New Mexico field trip lead by Dr. Borrok.

When:
Saturday March 12th, 2011
Meet at the south side of the Geology building for departure at 8 am and returns by 5 pm.
Index of Presentations (by author)

AN APPRAISAL OF URANIUM SOURCE POTENTIAL OF NAGAR PARKAR GRANITES, PAKISTAN
Munazzam Ali, Philip C. Goodell, Minghua Ren, Aqeel Ahmed Shariff and Nasser Ali Qamar

THE EVOLUTION OF MELT IN SOUTHERN NEW MEXICO USING STRONTIUM ISOTOPE DATA
Lisa Marie Anaya and Jasper Konter

AN INVESTIGATION OF THE SEISMIC HAZARDS OF THE EL PASO-JUAREZ REGION: THE NATURE AND EXTENT OF THE SOUTHERN EAST FRANKLIN MOUNTAINS FAULT ZONE
Victor Avila, Diane Doser and Oscar Dena

OUTCROP STUDIES OF FAULTED DEPOSITIONAL SEQUENCES OF INDIAN MOUNTAINS, SOUTH WEST TEXAS
Pawan Budhathoki, Richard P Langford and Terry L Pavlis

A POSSIBLE CONNECTION BETWEEN A GREAT EARTHQUAKE AND AN EARTHQUAKE SEQUENCE: SAMOA ISLANDS, (8.1) AND VANUATU ISLAND.
Marissa Cameron and Aaron Velasco

INVESTIGATING THE EAST JHOMOLARI FAULT SYSTEM AND ITS RELATION TO A 90° SHIFT IN ACTIVE EXTENSION DIRECTION, NW BHUTAN
J. Matthew R. Cannon and Jose M. Hurtado Jr

BIOLEACHING OF LUNAR AND MARTIAN PLANETARY SIMULANTS AND ILMENITE IN THE PRESENCE OF IRON-OXIDIZING BACTERIA
Ian J Cappelle, Jesica Navarrete and David M Borrok

SOFTWARE DEVELOPMENT FOR A 3D GRAVITY INVERSION IN THE BORDER RANGES FAULT SYSTEM
Rolando Cardenas and Dr. Diane Doser

INVESTIGATING THE DEGRADATION OF ENDOCRINE DISRUPTING COMPOUNDS DURING SAMPLE STORAGE
Toni Carrick and Wen-Yee Lee

APPLICATION OF LIDAR, ALSM, AND AERIAL PHOTOGRAPHY TO RESOLVE BEDROCK STRUCTURE IN AREAS OF POOR EXPOSURE: EXAMPLES FROM THE KATALLA AREA, ALASKA
Sarah N. Cervera and Terry L. Pavlis
DETECTING UNMARKED GRAVES USING GPR AT THE MESCALERO APACHE RESERVATION
Stephanie Y. Chavez, Ashley G. Nauer and Dr. Laura Serpa.................................23

UNDERSTANDING THE ‘SHRINKING’ MOON WITH THRUST FAULT DYNAMICS AND 3D VISUALIZATION MODELS: LEE-LINCOLN SCARP, APOLLO 17 LANDING SITE.
Jaclyn D. Clark and Jose M. Hurtado Jr. .................................................................24

EXTRACTION OF DIGITAL ELEVATION MODELS USING PHOTOCLINOMETRIC METHODS
Jacquelyn A. Cordova and José M. Hurtado, Jr.........................................................24

DEFORMATIONAL HISTORY OF THE LIBERTY CREEK AND ICEBERG LAKE BLUESCHIST BODIES, SOUTH CENTRAL ALASKA
Erik Day, Terry Pavlis, and Jeffrey Amato..................................................................11

INFLUENCE OF TOPOGRAPHY ON WEATHER PATTERNS IN THE NORTHERN CHIHUAHUAN DESERT
Fernanda De La Cerda and Vanessa L. Lougheed......................................................12

A SMALL GRAIN CAN MAKE A BIG DIFFERENCE
Angela De La Fuente and Richard Langford...............................................................25

STRAIN EVOLUTION OF THE DEATH VALLEY FAULT ZONE AS INFLUENCED BY THERMAL INTRUSIONS USING THREE-DIMENSIONAL THERMO-MECHANICAL NUMERICAL MODELS
Cecilia Del Pardo, Benjamin P. Hooks, Bridget R. Smith-Konter, Laura F. Serpa and Terry L. Pavlis..........................................................12

NITRATE FLUXES IN THE RIO GRANDE
Dennise Drury, Anna Szynkiewicz, and David M. Borrok.......................................25

FINDING STRUCTURAL INSIGHT IN THE IBEX HILLS, DEATH VALLEY, CALIFORNIA
Oscar Esparza Jr., Sarah Cervera, and Terry L. Pavlis.............................................13

SEISMIC STUDY OF CARLSBAD, NEW MEXICO
Steven M. Espinosa and Aaron A. Velasco..................................................................26

INVESTIGATION OF SOIL AND GROUNDWATER PROPERTIES OF A MITIGATED WETLAND UTILIZING ELECTROMAGNETIC INDUCTION
Leo Gamboa, Jacob Ruiz, Joshua Villalobos, Diane Doser.........................................26

PHREATOMAGMATIC ACTIVITY ON THE MOON: POSSIBILITY OF ROOTLESS CONES IN MARE FRIGORIS
José H. Garcia and José M. Hurtado, Jr.................................................................26
COPPER ISOTOPE FRACTIONATION DURING SURFACE ADSORPTION AND INTRACELLULAR INCORPORATION BY BACTERIA
Jesica U. Navarrete, David M. Borrok, Marian Viveros, Joanne T. Ellzey

TIDALLY DRIVEN COULOMB FAILURE OF FAULTS ON ENCELADUS AND EUROPA
John Olgin, Bridget R. Smith-Kanter, and Robert T. Pappalardo

STUDIES OF SEISMICITY NEAR THE ACTIVE VOLCANO MT. SPURR
Sarah J. Olivas and Dr. Diane I. Doser

MULTI-RESIDUE EFFECTS OF 17β-ESTRADIOL AND BISPHENOL A WITH A CHEMI-LUMINESCENT ASSAY ON SACCHAROMYCES CEREVISIAE
Anna Cristina Ortiz, Roberto De La Torre-Roche, Marc B. Cox and Wen-Yee Lee

FOLD-THRUST SYSTEMS OVERPRINTING SYN-RIFT STRUCTURES ON THE MARGIN OF AN INVERTED RIFT BASIN: INDIO MOUNTAINS, WEST TEXAS
Seth J. Page, Pawan Budhathoki, Terry L. Pavlis, and Richard P. Langford

SAN MIGUEL VOLCANIC SEISMIC AND STRUCTURE IN CENTRAL AMERICA: INSIGHT INTO THE PHYSICAL PROCESSES OF VOLCANOES
Ezer Patlan, Cara Schiek, Andrew Lopez, Aaron A. Velasco, and Jasper Konter

CHARACTERIZATION OF FRACTURES AT DEPTH FROM THE PB-1 WELL AT THE NOPAL I URANIUM MINE, PEÑA BLANCA URANIUM DISTRICT, CHIHUAHUA, MEXICO
Katrina Pekar-Carpenter, Mostafa Fayek, and Philip Goodell

MODELING THE COAST MOUNTAINS BATHOLITH, BRITISH COLUMBIA, CANADA USING 3D SEISMIC TOMOGRAPHY
Sarah M. Quinonez, Ibrahim Cerda, Aaron Velasco, Kate Miller, and Steven Harder

CRUSTAL THICKNESS AND VP/VS RATIO ESTIMATION UNDER A BROAD BAND STATION ON KENAI PENINSULA USING RECEIVER FUNCTIONS
Oscar M. Romero and Diane I. Doser

KINEMATICS OF THE CHUGACH METAMORPHIC COMPLEX, SOUTHERN ALASKA: REFLECTIONS ON PLATE GEOMETRY IN THE NORTH PACIFIC MARGIN DURING THE LATE CRETACEOUS TO EOCENE
Mitchell R. Scharman and Terry L. Pavlis

USING GRAVITATIONAL AND MAGNETIC DATA TO UNDERSTAND INTERACTIONS BETWEEN ACTIVE SEISMIC ZONES WITHIN THE INTERIOR OF ALASKA
Shane M. Schinagel and Diane I. Doser

CHANGES IN THE TRACE METAL CHEMISTRY OF IRON-OXIDES FORMED IN THE PRESENCE OF BACTERIA
Kimberlin Schnittker and Dr. David Borrok
ANALYSIS OF PALEO-EVENT CHRONOLOGIES AND TIME DEPENDENT STRESS THRESHOLDS OF THE SAN ANDREAS FAULT SYSTEM OVER THE LAST 2000 YEARS
Teira Solis, Bridget Smith-Konter, and Garrett Thornton…………………………………………18

GEOCHEMICAL ASSESSMENT OF CORROSION POTENTIAL OF COARSE BACKFILL AGGREGATES FOR MECHANICALLY STABILIZED EARTH WALLS
Anita Thapalia, David M. Borrok, Soheil Nazarian……………………………………………………………19

GEOLOGIC PLASTIC SURGERY: A 3-D TIME-DEPENDENT CRUSTAL DEFORMATION MODEL FOR THE SAN ANDREAS FAULT USING GEOLOGIC, GEODETIC AND TIDE GAUGE DATA
Garrett M. Thornton and Bridget R. Smith-Konter……………………………………………………………19

SATELLITE CHARACTERIZATION AND MODELING OF DUST TRANSPORT FROM THE COPPER RIVER VALLEY, ALASKA
Robert Velarde and Dr. Santiago Gassó………………………………………………………………………20

SEDIMENT DISTRIBUTION IN GLACIAL-FED LAKE LINNÉ, SVALBARD, NORWAY USING LAKE TEMPERATURE, METEOROLOGICAL AND INTERVAL-O-METER DATA WITH TIME-LAPSE PICTURES RECORDED FROM 2009-2010
Diana Zamora-Reyes, Vanessa Lougheed; Richard Langford; Al Werner; Steve Roof….32
Index of GK-12 Presentations (by author)

RECORDING THE LEARNING ABILITY OF THE CRAWFISH THROUGH THE USE OF CLASSICAL CONDITIONING WITH COLOR STIMULI
Jonathan Avila

WHAT IS THE DIFFERENCE BETWEEN THE STRENGTH OF AIRBORNE, WATERBORNE, AND LANDBORNE REPRESENTATIVES?
Erick Buenrostro

THE PROTECTION FURNISHED BY CALCIUM OXALATE AGAINST ACID RAIN
Raymond Chavez

THE COLLECTION OF AERIAL BACTERIA IN WATER BOTTLES
Jessica Giacomelli

SCALP HAIR ANALYSIS AS A TOOL IN ASSESSING THE EFFECT OF CHEMICAL PROCESSING ON THE HAIR CUTICLE OVER TIME
Amanda A. Gutierrez

TESLA COILS AND THE 4TH STATE OF MATTER
Emmanuial Hernandez

WHAT WEB BROWSER IS TECHNICALLY SUPERIOR FOR BOTH WINDOWS AND MAC’S?
Danny Mendoza

EMF/EMP EFFECTS ON PHYSICAL/MENTAL MATURATION
Manny Navarro